CD audio recordings before the Hearings Officer on C36 6/17/08, 7/15/08 and BOCC Business meeting of 10/20/08
**(These meetings are included on one CD and Included in Oversized Exhibits)**

# WILL BE PRESENTED AT HEARING

LUBA # 2008-203
00001

Deschutes County Board of Commissioners
1300 NW Wall St., Suite 200, Bend, OR 97701-1960
(541) 388-6570 - Fax (541) 385-3202 - www.deschutes.org

# AGENDA REQUEST & STAFF REPORT

## For Board Business Meeting of October 20, 2008

*Please see directions for completing this document on the next page.*

**DATE:** October 15, 2008

**FROM:** Ruth Herzer Community Development Department 388-6575

**TITLE OF AGENDA ITEM:**
Consideration of Board signature of Order No. 2008-083, denying hearing of the Appeal of the Hearings Officer decision regarding the Thornburgh Resort file # M-07-2 and MA-08-6.

**PUBLIC HEARING ON THIS DATE?** NO

**BACKGROUND AND POLICY IMPLICATIONS:**
The application for Final Master Plan was submitted on April 21, 2008 and was deemed complete on May 21, 2008. The 150th day on which the County has to make a final decision regarding this application is October 20, 2008. Staff is requesting that the Board sign this order denying to hear any appeal regarding this matter because there is not enough time left to hear any appeal without violating the 150 day time limit for land use decisions.

**FISCAL IMPLICATIONS:**
NONE

**RECOMMENDATION & ACTION REQUESTED:**
Board signature of Order No. 2008-083, denying the request to hear the appeal.

**ATTENDANCE:** Ruth Herzer

**DISTRIBUTION OF DOCUMENTS:**
Ruth Herzer, Associate Planner, CDD

REVIEWED

LEGAL COUNSEL

For Recording Stamp Only

BEFORE THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON

An Order Denying Review of Hearings Officer's Decision in File No. M-07-2 and MA-08-6 * ORDER NO. 2008-083

WHEREAS, Nunzie Gould appealed the Deschutes County Hearings Officer's Decision on Application No. M-07-2 and MA-08-6; and

WHEREAS, Section 22.32.027 of the Deschutes County Code allows the Deschutes County Board of County Commissioners ("Board") discretion on whether to hear appeals of Hearings Officers' decisions; and

WHEREAS, the Board has given due consideration as to whether to review these applications on appeal; now, therefore,

THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON, HEREBY ORDERS as follows:

Section 1. That it will not hear on appeal Application A-08-19 pursuant to Title 22 of the Deschutes County Code and other applicable provisions of the County land use ordinances.

Section 2. Pursuant to DCC 22.32.015, there shall be a refund of $2,517.00.

DATED this 29th day of Oct, 2008.

BOARD OF COUNTY COMMISSIONERS

DENNIS R. LUKE, Chair

TAMMY (BANEY) MELTON, Vice Chair

MICHAEL M. DALY, Commissioner

ATTEST:

Recording Secretary

**DESCHUTES COUNTY**
**PLANNING DIVISION**
117 NW Lafayette Avenue, Bend OR 97701
**Phone: (541)388-6575 FAX: (541)385-1764 http://www.co.deschutes.or.us/cdd/**

# APPEAL APPLICATION FORM

DATE SUBMITTED: OCTOBER 16, 2008 FEE: $2517

APPELLANT: ANNUNZIATA (NUNZIE) GOULD PHONE: (541) 317-1993

MAILING ADDRESS: 1539 NW VICKSBURG CITY: BEND ST: OR ZIP: 97701

LAND USE APPLICATION BEING APPEALED: M-07-2; MA-08-6 (THORNBURGH)

PROPERTY DESCRIPTION: T 15 R 12 S _____ TAX LOT: 5000, 5001, 5002, 7700, 7701, 7800, 7801, 7900 & 8000

APPELLANT'S SIGNATURE Paul Dewey DATE: 10/16/08
Attorney for Appellant

**IT IS THE RESPONSIBILITY OF THE APPLICANT (APPELLANT) TO COMPLETE A NOTICE OF APPEAL AS SET FORTH IN CHAPTER 22.32 OF THE COUNTY CODE, "APPEALS."**

EVERY NOTICE OF APPEAL SHALL INCLUDE: See attached Notice of Appeal

1. A statement describing the specific reasons for the appeal;
2. If the Board of County Commissioners is the Hearings Body, a request for review by the Board stating the reasons the Board should review the lower Hearings Body's;
3. If the Board of County Commissioners is the Hearings Body and de novo review is desired, a request for de novo review by the Board stating the reasons the Board should provide de novo review as provided in Section 22.32.027 of Title 22.

**The Notice of Appeal on the reverse side of this form must include the items listed above. Failure to complete all of the above may render an appeal invalid. Any additional comments should be included on the Notice of Appeal.**

**EXCEPT AS PROVIDED IN SECTION 22.32.024, APPELLANTS SHALL PROVIDE A COMPLETE TRANSCRIPT OF ANY HEARING APPEALED FROM, FROM RECORDED MAGNETIC TAPES PROVIDED BY THE PLANNING DIVISION UPON REQUEST (THERE IS A $5.00 FEE FOR EACH MAGNETIC TAPE RECORD). APPELLANTS SHALL SUBMIT TO THE PLANNING DIVISION THE TRANSCRIPT NO LATER THAN THE CLOSE OF THE DAY 5 DAYS PRIOR TO THE DATE SET FOR THE DE NOVO HEARING OR, IN ON-THE-RECORD APPEALS, THE DATE SET FOR RECEIPT OF WRITTEN RECORDS.**

**NOTICE OF APPEAL**

**NOTICE OF APPEAL OF NUNZIE GOULD OF HEARINGS OFFICER'S DECISION OF OCTOBER 6, 2008, ON M-07-2 AND MA-08-6 (THORNBURGH FMP)**

**Introduction.**

Nunzie Gould hereby appeals the October 6, 2008, decision of the Deschutes County Hearings Officer on Case No. M-07-2 and MA-08-6. We request the Board to grant *de novo* review for the reasons stated below.

**Party Status.**

Nunzie Gould is entitled to file this appeal pursuant to DCC 22.32.010 as she is a party to the review for land use approval in M-07-2 and MA-08-6, having participated below.

**Appeal Form and Filing Fee.**

We have completed the attached Notice of Appeal form and paid the required appeal fee pursuant to DCC 22.32.015(A).

**Timely Filing.**

This appeal is being timely filed within the 12-day period from the mailing of the decision on October 8, pursuant to DCC 22.08.070.

**Statement of Issues on Appeal.**

1. It is not consistent with the Deschutes County Code (DCC) to approve a final master plan (FMP) without first having a final conceptual master plan (CMP), which is currently on appeal to the Court of Appeals.

2. The Applicant improperly introduced evidence as part of its final argument.

3. The Hearings Officer erred in rejecting a request under ORS 197.763(6)(c) to respond to new evidence submitted by the Applicant.

4. The Hearings Officer erred in relying on an earlier OWRD determination of consumptive use of groundwater instead of making a determination based on the factual record of this case.

5. The Hearings Officer failed to require the Applicant to "specify" all recreational facilities as required by CMP Condition of Approval #13, to identify uses of open space (CMP Condition #13), to provide the description and size of all commercial uses (DCC 18.113.090(6)), and to show coordination on evacuation routes with ODOT and OSP (CMP Condition #19).



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1539 NW Vicksburg
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OCT 16 2008

6. The Hearings Officer approved a Phasing Plan not consistent with the resort's FMP development plans.

7. The Hearings Officer failed to identify "natural" open space areas and the use and location of open space areas as required by DCC 18.113.090(A) and CMP Condition of Approval #34.

8. The Conditions of Approval referring to following various plans in the Record are inadequate where it is not clear what is required in these plans, including Condition of Approval #38 which incorporates an April 2008 wildlife mitigation plan, an August 2008 supplemental plan and unspecified agreements with BLM and ODFW for management of off-site mitigation efforts.

9. The Hearings Officer erred in finding that the Applicant's fish and wildlife mitigation plans are "likely and reasonably certain to succeed."

10. The Hearings Officer failed to explain whether she was making findings of compliance with the Code criteria or that it is merely feasible to comply with the Code criteria regarding the fish and wildlife mitigation plans.

11. The Hearings Officer erred in finding compliance with the DCC regarding fish and wildlife resources where:

a. there is no data or description of actual species or numbers on the site;
b. there is no quantitative vegetation data on the site;
c. the location of the wildlife mitigation has not been selected and the mitigation may be shifted to anywhere in Deschutes County;
d. there has not been a showing of adequate funding in perpetuity; and
e. there are no measures to show success or failure of mitigation efforts.

12. The Hearings Officer misinterpreted the requirements of DCC 18.113.070(D) in ruling that:

a. its mitigation allows substitution of species;
b. it does not require mitigation of at least a 1:1 ratio;
c. mitigation of habitat alone satisfies the Code requirement; and
d. dollars contributed to measure stream temperatures constitute mitigation for impacts to fish and wildlife resources.

13. Contrary to the Court of Appeals' ruling, the Hearings Officer has again deferred the development of a specific fish and wildlife plan and the determination of a location for



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mitigation and has delayed an assessment of compliance without the opportunity for a public hearing on what is finally adopted.

14. The Hearings Officer erred in finding that there had been one on-site survey of the animal species of the site when in fact there had been none.

15. No condition was imposed to require additional or alternative mitigation if the proposed mitigation is not sufficient to protect fish and wildlife habitat.

16. There is no finding or evidence of feasibility of mitigation water from COID.

17. The Hearings Officer failed to make adequate findings based on substantial evidence that the addition of 106 AF into Whychus Creek will compensate for impacts of increased temperature at Alder Springs due to Thornburgh groundwater withdrawals.

18. The Hearings Officer improperly relied on outdated opinions of ODFW and BLM that were not based on the evidence in front of the Hearings Officer.

19. The Hearings Officer failed to address a number of issues and arguments raised by the opponents, including:

a. that the CMP Phasing Plan is inconsistent with the FMP development proposal;
b. that the COID mitigation water has not been shown to be feasible;
c. that traffic impacts due to the new FMP development proposal must be addressed; and
d. that consumptive use of groundwater will be 90-100%.

20. The FMP proposal is not consistent with the CMP proposal where:

a. the FMP development proposal is not consistent with the CMP Phasing Plan;
b. the FMP provision of visitor lodging is not consistent with the CMP; and
c. the FMP provides for additional development and access roads not considered in the CMP.

***De Novo* Review.**

The following are additional appeal issues and reasons to grant *de novo* review:

1. A *de novo* hearing is needed to correct erroneous findings contained in the Hearings Officer's decision and to address significant policy issues such as the interpretation of DCC 18.113.070(D) and what constitutes a complete mitigation and no loss of fish and wildlife resources.



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2. *De novo* review will allow opponents of the resort to comment on conditions of approval which have been raised by the Hearings Officer for the first time in her decision and which are inadequately explained. It will also enable the County to correct factual errors in the decision.

3. The substantial rights of the opponents will be significantly prejudiced without *de novo* review where the Hearings Officer's decision fails to address inadequate proof of compliance with approval criteria and fails to address a number of significant issues raised by opponents.

4. The request for a *de novo* hearing is not necessitated by the failure of the opponents to present evidence at the time of the previous hearing.

Respectfully submitted this 16th day of October, 2008.

PAUL D. DEWEY
Attorney for Nunzie Gould



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OCT 16 2008

**Community Development Department**
Planning Division Building Safety Division Environmental Health Division

117 NW Lafayette Avenue Bend Oregon 97701-1925
(541)388-6575 FAX (541)385-1764
http://www.co.deschutes.or.us/cdd/

## CERTIFICATE OF MAILING

**FILE NUMBER:** M-07-2; MA 08-6

**DOCUMENT(S) MAILED:** Hearings Officer's Decision

**TAX LOT NUMBER(S):** 15-12; 5000,5001, 5002, 7700, 7701, 7800, 7801, 7900, 8000

I certify that on the 8th day of October, 2008, the attached notice(s)/report(s), dated October8th, 2008, was/were mailed by first class mail, postage prepaid, to the person(s) and address(es) set forth on the attached list.

Dated this 8th day of October, 2008.

**COMMUNITY DEVELOPMENT DEPARTMENT**

By: Bend Mailing Services

| | |
|---|---|
| Peter Livingston, Attorney<br>Schwabe, Williamson & Wyatt, PC<br>1211 SW Fifth Avenue, Suite 1600<br>Portland, OR 97204 | Martha Pagel, Attorney<br>Schwabe, Williamson & Wyatt, PC<br>530 Center Street, Suite 400<br>Salem, OR 97301 |
| Kameron DeLashmutt<br>Thornburgh Resort Company<br>PO Box 264<br>Bend, OR 97702 | Paul Dewey<br>1539 NW Vicksburg<br>Bend, OR 97701 |

| | |
|---|---|
| Nunzie Gould<br>19845 JW Brown<br>Bend, OR 97701 | Steve Munson<br>Vulcan Power Company<br>345 SW Cyber Drive, Suite 103<br>Bend, OR 97702 |
| Janet Wilson<br>Goal 1 Coalition<br>642 Charnelton, Suite 100<br>Eugene, OR 97401 | Mark Yinger<br>69860 Camp Polk Road<br>Sisters, OR 97759 |
| Sandy Lonsdale<br>64925 McGrath Road<br>Bend, OR 97701 | Laura Stauss<br>Northwest Land and Water<br>6556 37th Avenue NE<br>Seattle, WA 98115 |
| MerryAnn Moore<br>69225 Hawks Flight Drive<br>Sisters, OR 97759 | Marianne Fellner<br>64688 Cook Avenue<br>Bend, OR 97701 |
| Scott Terrall<br>65965 Gerking Market Road<br>Bend, OR 97701 | Tom Davis<br>69217 Topidero<br>Sisters, OR 97756 |
| Carol Macbeth<br>PO Box 8813<br>Bend, OR 97708 | Craig Miller<br>60587 Barlow Trail<br>Bend, OR 97708 |
| Jim Guild<br>19845 JW Brown Road<br>Bend, OR 97701 | Dick Nichols<br>521 SW 6th Street<br>Redmond, OR 97760 |
| David Newton<br>521 SW 6th Street<br>Redmond OR 97760 | Jennifer Hawkins<br>Tetra Tech EC<br>19803 Northcreek Parkway<br>Bothell WA |
| Lynn Sharp<br>Tetra Tech EC<br>1750 SW Harbor Way, #400<br>Portland, OR | Charles Huntington<br>23252 S. Central Point Road<br>Canby, OR 97013 |
| David Dobkin<br>19526 Mammoth Drive<br>Bend, OR 97702 | Bret Michalski<br>19325 Kiowa Road<br>Bend, OR 97702 |
| Rex Barber JR.<br>70460 NW Lower Bridge Way<br>Terrebonne, OR 97760 | |

## DECISION OF THE DESCHUTES COUNTY HEARINGS OFFICER

## THORNBURGH RESORT COMPANY FINAL MASTER PLAN

**FILE NUMBER:** M-07-2; MA-08-6

**APPLICANT/ OWNER:** Thornburgh Resort Company
PO Box 264
Bend, OR 97702

**APPLICANT'S REPRESENTATIVE:** Schwabe, Williamson & Wyatt, PC
Peter Livingston, Attorney at Law
1211 SW Fifth Avenue, Suite 1600
Portland, OR 97204

**REQUEST:** The Applicant requests approval of a Final Master Plan (FMP) and a Modification of Application (MA) for a 1,970-acre Destination Resort located near Cline Buttes, west of Redmond.

**STAFF CONTACT:** Ruth Herzer, Associate Planner

**HEARING DATES:** June 17, 2008, continued to July 15, 2008
Record held open for written submittals until September 11, 2008
Final written legal argument submitted September 17, 2008

**DECISION ISSUED:** October 6, 2008

### I. APPLICABLE CRITERIA:

**Title 18, Deschutes County Code, County Zoning Ordinance**
Chapter 18.113.090, .100, .110

**Title 22, Deschutes County Land Use Procedures Ordinance**
**Title 23, The Deschutes County Comprehensive Plan**

**CU-05-20 CMP, issued by the Board of County Commissioners on May 11, 2006, and revised on remand from the Oregon Court of Appeals on April 9, 2008**

**Oregon Revised Statutes (ORS) Chapter 197.435 to 197.467**

### II. BASIC FINDINGS:

A. **LOCATION:** The subject property consists of approximately 1,970 acres of land located west of Redmond, Oregon, on the south and west portions of a geologic feature known as Cline Buttes. The property is bordered on three sides by BLM land, and is also in close proximity to Eagle Crest, another destination resort development. The subject property is identified on County Assessor's Index Map 15-12, as tax lots 5000, 5001, 5002, 7700, 7701, 7800, 7801, 7900 and 8000.[1]

[1] The applicant also has leased inholding parcels from the Department of State Lands for buffer and access roads. See August 12, 2008 rebuttal testimony, Ex. F-2.

B. **ZONING:** The subject properties are zoned Exclusive Farm Use (EFU-TRB). The subject properties are also mapped within the Destination Resort (DR) overlay zone for Deschutes County.

C. **SITE DESCRIPTION:** The resort site is located on an approximately 1,970-acre parcel located adjacent to Cline Buttes. This parcel was formerly a large ranch and has a varied terrain which includes rock outcroppings and drainage washes. On the upper portion of the property there are panoramic views of the Cascade Mountains. Vegetation consists of Juniper woodland with many old growth juniper trees. Three dwellings are located on the property along with the associated roads/driveways. Access to these dwellings is via Cline Falls Highway.

D. **SURROUNDING LAND USES:** The site is surrounded by public land. Over seventy five percent of surrounding property is managed by the US Bureau of Land Management (BLM). A central section is managed by the Oregon Department of State Lands (DSL). The applicant has acquired lease rights for the DSL property. Eagle Crest destination resort is located close to the northern portion of the proposed development.

E. **PROPOSAL:** The applicant is requesting Final Master Plan (FMP) approval for the 1,970-acre destination resort. The applicant has amended the Final Master Plan application to include the Wildlife Mitigation Plan as required by the remand decisions from the Court of Appeals and the Land Use Board of Appeals (LUBA).

F. **LAND USE HISTORY:**

CONCEPTUAL MASTER PLAN:
The Conceptual Master Plan application was approved by the Board of County Commissioners (BOCC) on May 11, 2006 (file no. CU-05-20). The decision was appealed to LUBA and portions of that decision were further appealed to the Court of Appeals. *Gould v. Deschutes County*, 54 Or LUBA 205 (*Gould I*), *rev'd and remanded* 216 Or App 150, 171 P3d 1017 (*Gould II.*) These courts remanded the decision back to Deschutes County. The BOCC held a remand hearing on March 19, 2008. On April 9, 2008, the BOCC signed a decision that adopted much of the initial decision, and included additional findings and conditions. (*Gould III.)* The BOCC decision on remand was appealed to LUBA, which affirmed on September 11, 2008 *Gould v. Deschutes County*, __ Or LUBA __ (LUBA No. 2008-068, September 11, 2008), *Court of Appeals review pending* (*Gould IV.)*

FINAL MASTER PLAN:
An application for Final Master Plan approval was submitted on August 1, 2007 (file no. M-07-2). The application was deemed complete and accepted for review on August 31, 2007. On September 18, 2007 the applicant tolled the deadline for a final decision for 45 days. On December 14, 2008, the applicant again tolled the deadline for 45 days. A hearing was scheduled for February 12, 2008, and interested parties were notified of the hearing on January 4, 2008. The February 12, 2008 hearing was canceled at the applicant's request.

In response to the *Gould III* decision, the applicant submitted a Modification of Application on April 21, 2008 which re-started the 150 day clock. This application was

deemed complete on May 21, 2008. The 150th day in which the County has to make a final decision regarding this application is October 20, 2008.

G. **AGENCY COMMENTS**: The Planning Division mailed notice of the proposed land use to the following agencies: Redmond Fire Department, Deschutes County Assessor, Deschutes County Building Division, Deschutes County Environmental Health, Deschutes County Road Department, Property Address Coordinator, Watermaster, Central Electric Co-op, Pacific Power and Light, Qwest, Redmond School District, Department of Environmental Quality, Division of State Lands, Oregon Department of Transportation, Bureau of Land Management, U.S. Forest Service, Oregon Health Division, Deschutes County Senior Transportation Planner, Central Oregon Parks and Recreation and the Oregon Department of Fish and Wildlife.

The June 10, 2008 staff report summarizes the agency responses and they are not reiterated here. To the extent those comments pertain to applicable approval criteria, they are addressed in the findings below.

H. **PUBLIC COMMENTS**: The Planning Division mailed notice to property owners within 750 feet of the subject property and to other interested parties. Many of those parties submitted written testimony or testified at the hearing. Relevant comments are addressed in the findings below.

## III. FINDINGS OF FACT AND CONCLUSIONS OF LAW:

### A. INTRODUCTION

As is typical for a complex development proposal, the applicant submitted written evidence at different times, and the opponents' testimony and evidence responds to those waves of evidence. To simplify references to the various materials, the hearings officer offers the following shorthand citations:

The revised conceptual master plan conditions of approval: CMP COA #__. Unless otherwise noted, the COA # corresponds to the numeric listing in this decision.

M 07-2 and supplemental exhibits: M 07-2, Ex. __
MA 08-6 and supplemental exhibits: MA 08-6, Ex. ___
Applicant's August 12, 2008 rebuttal: August 12, 2008 rebuttal, Ex. __
The applicant's Wildlife Mitigation Plan, including addenda: WMP (and page references, if appropriate)
Correspondence is referenced by agency/author and date, e.g., Gould, June 17, 2008 submittal; ODFW 6/17/08 email
The BOCC and appellate decisions: *Gould I, II, III or IV,* as appropriate.

### B. PRELIMINARY MATTERS

Paul Dewey, representing Nunzie Gould, raised several issues pertaining to the timeliness, scope and sufficiency of the FMP application. Gould, June 17, 2008 submittal. They include:

1. Applicable Approval Standards. Ms. Gould argues that DCC 18.113.060 and 18.113.070 include approval standards that apply to each step of the destination resort approval process, and not just to the CMP stage. DCC 18.113.060 and .070 include standards for

destination resorts. For the most part, those standards were considered and addressed in the CMP phase, and where appropriate, conditions of approval were imposed to ensure that the applicant would comply with the criteria through subsequent land use reviews. Here, the BOCC deferred compliance with DCC 18.113.070(D), but otherwise found that the applicable approval standards had been satisfied. The hearings officer cannot ignore those findings, because they form the basis for the conditions of approval that must be applied to the FMP. *See* DCC 18.113.040(A) and (B), which explain the relationship between the CMP and FMP processes. The hearings officer concludes that the staff report sets out the applicable review standards for the FMP application.

2. CMP is not a final decision. As noted above, the BOCC's decision on remand has been appealed to the Court of Appeals. Ms. Gould argues that the county cannot rely on a CMP decision that is not yet final to provide review standards for the FMP. The matters at issue in *Gould IV* are rather narrow, in that they challenge the BOCC's decision to defer compliance with DCC 18.113.070(D) to the FMP stage, which would include proceedings and evidence presented to the hearings officer, rather than to the planning director. Ms. Gould argued that the BOCC's deferral must first include a finding that shows that it is feasible for the standard to be met before deferring actual findings of compliance to the latter stage. LUBA rejected that argument, concluding that nothing in the Court of Appeals decision in *Gould II* required a feasibility finding when a determination of compliance was deferred to a later proceeding, infused with the same procedural safeguards offered through the initial proceeding. *Gould IV*, slip op 13. This is the latter proceeding where the issue of compliance with DCC 18.113.070(D) is addressed. The hearings officer finds no impediment to addressing compliance with the standard in this proceeding, as it has not yet been addressed in the CMP process.

In addition, Ms. Gould challenged the BOCC's findings with respect to compliance with overnight lodging ratios, internal access phasing, and road crossings over Barr Road. These issues can be addressed through clarifying findings and conditions in the FMP; they need not wait until the CMP appeals are completed. Even if the hearings officer errs in addressing these issues in this proceeding, it is not clear how that error prevents the applicant and the hearing officer from relying on the findings and conditions of approval in that decision to provide the framework for decision making in this application.

3. Specificity of Submittals and Identification of Modifications. Ms. Gould argues that the FMP evidence is not sufficiently specific to demonstrate (1) that the proposal is consistent with the CMP approval and (2) that the proposal satisfies FMP criteria. In addition, Ms. Gould argues that unless each aspect of the CMP application that is being modified in this decision is identified in this application, the hearings officer has no basis to conclude that the application implements the CMP, and that the FMP is not a substantial modification that requires plenary review as a new CMP.

The hearings officer agrees with Ms. Gould that in most instances, it is much easier to make a determination as to whether the proposal is generally consistent with the initial approval when the applicant identifies the changes that are being made from one phase to the next. With that said, the hearings officer has reviewed the materials that have been cited as being different than the original proposal, and concludes that none of the changes, either alone or cumulatively, are significant enough to warrant either a modification to the FMP application or a new CMP approval.

Turning to the specificity of the evidence, the hearings officer concludes that the evidence provided by the applicant is specific enough to demonstrate that the applicable approval criteria are satisfied.

Other parties submitted testimony and arguments that challenge the need for and appropriateness of the Destination Resort Overlay designation for the site, or request that a decision on the application be postponed until legislative and administrative rule amendments are adopted. The hearings officer concludes that these arguments are outside the scope of these proceedings, and do not provide a basis for delaying or denying the application. With respect to arguments that the applicant needs to demonstrate that the proposal is consistent with the Endangered Species Act (ESA), the hearings official concludes that the ESA is not an approval criterion for FMPs, although it may apply to the applicant's proposal. Therefore, compliance with the ESA is not addressed in this decision.

## C. CHAPTER 18.113, DESTINATION RESORTS

### 1. 18.113.090 Requirements for Final Master Plan

***It shall be the responsibility of the applicant to provide a Final Master Plan (FMP) which includes text and graphics explaining and illustrating:***

***A. The use, location, size and design of all important natural features, open space, buffer areas and common areas;***

**FINDING:** The applicant's exhibits explain and illustrate the use, location, size and design of all important natural features, open space, buffer and common areas. According to the applicant, *"there are no natural streams, watercourses, or wetlands on the property. The site does not contain any significant natural features * * * which define the topography of the area. The site is characterized by bunchgrass. The site contains scattered areas of rock outcroppings. There are no threatened or endangered, or designated Goal 5 habitat areas on the site, as explained in the Wildlife Evaluation approved by the CMP Decision."*

The applicant's exhibits depict approximately 1,293 acres of open space. These are divided into three categories: golf open space (approximately 632 acres,) common open space (approximately 569 acres) and buffer open space (approximately 92 acres.) This buffer is a 50 foot wide strip abutting the perimeter of the resort. The open space totals 66 percent of the gross developed acreage. The evidence refines and clarifies the more general depictions set out in the CMP materials.

The applicant's submittals satisfy DCC 18.113.090(A).

***B. The use and general location of all buildings, other than residential dwellings and the proposed density of residential development by location;***

**FINDING:** The applicant submitted a map (MA-08-6 Ex. A3.1) depicting the location of all buildings other than residential dwellings and the proposed density of residential development by location. The applicant states, *"Building associated with the resort infrastructure (including maintenance buildings, shops, substation, pump houses, reservoirs, and sewer treatment building, as well as others) will be located in the areas designated for "infrastructure" on the Master Development Plan. The resort will also include buildings associated with the significant recreational amenities provided. These structures will include: two golf clubhouses, a recreation*

*center, a spa and fitness center, a boat club house, game rooms, libraries, a golf learning center, a pro-shop, tennis pro-shop and learning center, swimming pools and associated structures, and sports facilities"* Proposed visitor-oriented facilities include restaurants, convention facilities, business center, art gallery and cultural center. The overall residential density of the development will not exceed 0.72 dwelling units per acre (see Burden of Proof, MA-08-6, page 4, and Ex. A-8d).

DCC 18.113.090(B) is satisfied.

***C. Preliminary location of all sewer, water, storm drainage and other utility facilities and materials, and specifications and installation methods for water and waste water systems;***

**FINDING:** The applicant submitted revised maps (MA 08-2, Exhibit B2.1 and B1.1) depicting the proposed sewer and water easements, and a map showing where the utilities will be located within the resort roadways. Storm drainage from individual lots will be contained and disposed of on each lot. Treatment and disposal of drainage within roadways will involve the use of treatment swales, retention ponds or other means. DCC 18.113.090(C) is satisfied.

***D. Location and widths of all roads, streets, parking, pedestrian ways, equestrian trails and bike paths;***

**FINDING:** The applicant has submitted a map depicting the location of all roads, parking areas and trails located within the resort. All on-site streets will be privately owned and maintained. Accordingly, the streets will comply with the private road standards set out in DCC Title 17. In addition, a significant network of trails is depicted within the resort. These trails generally follow the proposed interior road system. The path system will accommodate pedestrians and bicycles in a multi-use design. These trails will be constructed to the standards set out in DCC Title 17.48.140. DCC 18.113.090(D) is satisfied.

***E. Methods to be employed to buffer and mitigate potential adverse impacts on adjacent resource uses and property;***

**FINDING:** Most of the land surrounding the resort is owned by the BLM. The applicant has negotiated a Memo of Understanding (MOU) with the BLM to mitigate offsite impacts that the resort may have on the public lands. The applicant has included the signed MOU dated September 28, 2005. In accordance with this MOU, the applicant has agreed to:

- Participate in all phases of the Cline Buttes Recreation Area planning process

- work with BLM to determine appropriate mitigation measures for the protection of the Tumalo Canal Area of Critical Environmental Concern (Canal ACEC).

- adhere to the specific "Protective Treatment Measures" outlined in MA 08-6, Ex. C3. These measures include additional setbacks from the historic resource, fence construction standards, measures for the screening of the resource, the rehabilitation of existing ATV trails in the area and the curtailment of livestock grazing in the immediate vicinity of the resource. Based upon the agreed mitigation measures, BLM has determined that development of the resort will have "no adverse effect on the historic property."

- construct and maintain cattle guards and/or gates on all access roads and entry points to insure the resort development does not impact livestock grazing.

With respect to abutting DSL property, the applicant has acquired leases to use the property consistent with DSL rules, and the development proposal. DCC 18.113.090(E) is satisfied.

***F. Building elevations of visitor-oriented accommodations, recreational facilities and commercial services sufficient to demonstrate the architectural character of the proposed development;***

**FINDING:** The applicant submitted building elevations of visitor-oriented accommodations, recreational facilities and commercial services. *See* M-07-2 Ex. D1, depicting conceptual designs and elevations for the community center, the welcome center, cottages and townhomes. The welcome center will contain real estate sales offices. The community center will include physical fitness and swimming pool facilities. DCC 18.113.090(F) is satisfied.

***G. A description of all commercial uses including approximate size and floor area;***

**FINDING:** The applicant has indicated that the commercial activities, including specialty retail and real estate related uses, will include 20,000 square feet and 15,000 square feet, respectively. The applicant grouped dining, eating areas and hotel (and related services) into Commercial Facilities/Visitor Oriented Accommodations. These structures include approximately 75,000 square feet. The commercial uses are likely to include, but are not limited to, the types of uses described in the Amenities Description included in M 07-2 Ex A8d. DCC 18.113.090(G) is satisfied.

***H. The location of or distance to any emergency medical facilities and public safety facilities;***

**FINDING:** The applicant provided maps showing the proximity of the Deschutes County Sheriff, Redmond Fire Station Nos 1 and 2, St. Charles Hospital, Redmond Police, and the Cline Falls Fire Station, (see M 07-2, Ex. F1). The applicant also included a Wildfire/Natural Hazard Protection Plan (M 07-2, Ex. F2), a map showing the fire evacuation routes (M 07-2, Ex. F.7.1), and a letter from former County Sheriff Les Stiles, (M 07-2, Ex. F6) finding the evacuation plan is adequate for this stage of the development. In its modified application, the applicant provided a revised fire evacuation map (M 08-6, Ex. F7.1), and a letter from Tim Moor, Deschutes County Rural Fire Protection District #1 (M 08-6, Ex. F8). Finally, the applicant submitted a September 10, 2008 letter from the Redmond Fire and Rescue, stating that the internal roads are adequate to accommodate emergency vehicles.

DCC 18.113.090(H) is satisfied.

***I. When a phase includes a residential subdivision, a general layout of the subdivision shall include the number of lots, minimum and maximum lot sizes, and approximate location of roadways shall be included:***

**FINDING:** The CMP site plan shows that the Resort will be developed in seven phases, A through G, (see M 07-2, Ex. G1.1b). A general layout of the residential subdivisions, including the number of lots, minimum and maximum lot sizes, and approximate location of roadways is shown on the Residential Development Plan (M 07-2, Exhibit G1.1b). According to that exhibit,

the resort will consist of 950 lots ranging in size from 3,200 square feet to 97,300 square feet. The applicant proposes to submit a more precise layout for each lot through subsequent subdivision applications. DCC 18.113.090(I) is satisfied.

***J. A description of measures taken, with copies of deed restrictions, CC&R's and rental contracts, to implement the measures identified in DCC 18.113 assuring that individually-owned lodging units considered to be overnight lodgings for at least 45 weeks per calendar year through a central reservation and check-in service.***

**FINDING:** The applicant has submitted copies of the deed restrictions, CC&R's and rental contracts (MA 08-6, Ex. H3a, H3b.1, H4.1, and H5b). DCC 18.113.090(J) is satisfied.

***K. A description of measures taken, with copies of deed restrictions and a final management plan, to implement the open space management plan required by DCC 18.113.***

**FINDING:** The CMP decision concludes that the applicant's open space proposals are sufficient to maintain more than 50 percent open space through all phases of the development. Condition #14 ensures that the 50 percent open space requirement is maintained in perpetuity. The delineation of open space required by condition 14 (A) is included in the FMP application as Exhibit A1 (Open Space Plan), which is substantially similar to the open space plan submitted as Ex. 9, B-14 of the "Memorandum of Applicant" dated September 25, 2005. In addition, the CC&Rs have been amended in accordance with Condition 14 (B) to provide that land designated as open space on the plat shall be used and maintained as such in perpetuity. The applicant has also prepared deed restrictions requiring the perpetual maintenance of open space areas, as required by Condition 14 (C). DCC 18.113.090(K) is satisfied.

***L. The status of all required off-site roadway improvements.***

**FINDING:** A Memorandum of Understanding (MOU) with the Oregon Department of Transportation (ODOT), dated September 25, 2005 (Exhibit 14) requires the applicant to make a substantial contribution of funds towards the construction of a grade separated interchange at the Highway 20/Cook Avenue intersection in Tumalo.[2] The MOU with ODOT also requires the applicant to construct to ODOT standards, a westbound left-turn lane and an eastbound right-turn lane on Highway 126 at Eagle Crest Blvd. at the time ODOT issues an approach permit to Thornburgh. The applicant has obtained a right of way grant from the BLM authorizing a connection between Oregon Highway 126 and the northern resort access point in Section 17. This road has been constructed. The right-of-way grant is included with the application materials as Exhibit 12. The applicant also intends to construct turn lanes on the Cline Falls Highway at the southern resort entrance.

Opponents argue that these proposals are inadequate to assure that necessary road improvements are implemented prior to or concurrent with development. They note that several intersections in the Tumalo area are at or near failure, and that the additional trips on these roads will exacerbate traffic, pedestrian and bicycle safety concerns. They argue that additional traffic studies must be conducted to address changes in road conditions since the application

[2] The applicant is obliged to contribute in proportion to the impact the development will have on nearby roads. At the hearing, the applicant's representative testified that the applicant's intended contribution will likely exceed its proportionate share.

was initially approved in 2006, and additional conditions of approval should be imposed to ensure that the traffic from the proposed development will not significantly impede road capacity and safety.

The applicant responds that its proposal is fully consistent with the MOU, and that its documented actions since the MOU became effective demonstrate the applicant's commitment to minimizing the resort's impact on local transportation systems. However, the applicant emphasizes, it is not obliged to fully remedy existing system deficiencies. The applicant argues that the FMP application provides evidence regarding the status of all required off-site roadway improvements sufficient to satisfy DCC 18.113.090(L). The hearings officer agrees.

***M. Methods to be employed for managing automobile traffic demand.***

**FINDING:** The applicant states that the resort will construct the transportation improvements proposed in the Transportation Impact Analysis and approved in the CMP. Applicant will adhere to the requirements of its MOU with ODOT. Internal roadways within the resort development will be developed and constructed consistent with the Access, Circulation and Trail Plan and DCC Title 17. In addition, the hearings officer adopts the findings set out in DCC 18.113.090(L) to support a finding that DCC 18.113.090(M) is satisfied as well.

***N. A copy of a WPCF permit issued by DEQ consistent with the requirements of DCC 18.113.070(L).***

**FINDING:** A copy of the Water Pollution Control Facilities Permit (WPCF) has been submitted with the application. (M-07-2, Ex. J1.) DCC 18.133.090(N) is satisfied.

2. 18.113.100 Procedure for Approval of Final Master Plan

***A. The FMP shall be submitted in a form approved by the County Planning Director consistent with DCC Title 22 for a development permit. The Planning Director shall review the FMP and if the Planning Director finds that all standards of the CMP have been met, the FMP shall be approved in writing without notice. If approval the FMP involves the exercise of discretion, the FMP shall be treated as a land use action and notice shall be provided in accordance with DCC Title 22;***

**FINDING:** The CMP approval included 37 conditions of approval. Some of the conditions of approval must be satisfied prior to final FMP approval. Others carry through to specific development proposals that must be submitted for each phase of development. In this decision, the hearings officer sets out findings for each condition, concluding whether it applies to FMP approval in the first instance and, if so whether the condition of approval is fully satisfied. For those conditions that cannot be satisfied prior to FMP approval, the hearings officer adopts FMP conditions that are intended to ensure compliance throughout the development process, and in some cases, through the life of the development itself.

1. **Approval is based upon the submitted plan. Any substantial change to the approved plan will require a new application.**

**FINDING:** The FMP substantially conforms to the plan approved in the BOCC's remand decision, and a condition of approval is imposed to maintain conformity throughout the development process.

2. **All development in the resort shall require tentative plat approval through Title 17 of the County Code, the county Subdivision/{Partition Ordinance, and/or Site Plan Review through Title 18 of the County Code, the Subdivision Ordinance.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

3. **Applicant shall provide a signed grant right of way from the US Department of the Interior-Bureau of Land Management for an access easement connection to US Highway 126, prior to submission of a Final Master Plan application.**

**FINDING:** The applicant has submitted the signed right-of-way agreement which allows the applicant to construct, operate, maintain, and terminate a paved access road and bike path, and 8 inch sewer pipeline, an 8-12 inch water pipeline and two signs on public lands. COA 3 is satisfied.

4. **Subject to US Department of the Interior- Bureau of Land Management (BLM) approval, any secondary emergency ingress/egress across the BLM-owned land or roadways shall be improved to a minimum width of 20 feet with all-weather surface capable of supporting a 60,000-lb. fire vehicle. Emergency secondary resort access roads shall be improved before any Final Plat approval or issuance of a building permit, whichever comes first.**

**FINDING:** The above mentioned MOU allows for access easements in sections 8, 9, 28, 29 and 30 in T. 15, S. R. 12, E. This allows for both a northern and southern access from Cline Falls Highway. The applicant testified that the northern road has been constructed. To ensure that this condition is satisfied and a southern access road is constructed, it is made a condition of FMP approval.

5. **The developer will design and construct the road system in accordance with Title 17 of the Deschutes County Code (DCC). Road improvement plans shall be approved by the Road Department prior to construction.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

6. **All easements of record or right-of-ways shall be shown on any final plat. Plans shall be approved by the road Department prior to construction.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

7. **All new proposed road names must be reviewed and approved by the Property Address Coordinator prior to final plat approval.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

8. **Plan review and approval of water supply plans for phase 1 will be required by Oregon Department of Human Services-Drinking Water Program (DHS-DWP0 prior to Final Master Plan approval.**

**FINDING:** The applicant has received approval from the Oregon Department of Human Services for the Final Master Plan for Thornburgh Resort. It has been approved as a "Master Plan" by DHS-DWPO and therefore will not require further review at the different levels of development so long as they work with a registered professional engineer.

9. **Applicant shall designate the location of all utility lines and easements that burden the property on the FMP.**

**FINDING:** The applicant has submitted a map with the Modification of Application showing the location of all utility lines and easements that currently burden the property.

10. **Applicant shall comply with all applicable requirements of state water law as administered by OWRD for obtaining a state water right permit and shall provide documentation of approval of its application for a water right permit prior to approval of the final master plan. Applicant shall provide, at the time of tentative plat/site plan review for each individual phase of the resort development, updated documentation for the state water right permit and an accounting of the full amount of mitigation, as required under the water right, for that individual phase.**

**FINDING:** The applicant obtained approval of a water right application. *See* MA 08-6, Ex. K2. It will become final upon a showing that the required mitigation has been provided for. A condition of approval is imposed to require documentation that mitigation and a water rights permit has been issued for each development phase.

11. **At the time of submission for Final Master Plan (FMP) approval, Applicant shall include a written plan for entering into cooperative agreements with owners of existing wells within a two-mile radius of Applicant's wells. The plan shall include a description of how Applicant will provide notice to affected well owners and of the terms and conditions of an option for well owners to enter into a written agreement with Applicant under which Applicant will provide indemnification to well owners in the event of actual well interference as a result of Applicants water use. The plan shall remain in effect for a period of five years following full water development by Applicant.**

**FINDING:** The applicant has submitted its written plan for entering into cooperative agreements with owners of existing wells within a two-mile radius of the resort. The plan describes how the applicant will provide notice to affected will owners including the terms and conditions under which well owners may enter into an indemnification agreement with Thornburgh in the event of

actual interference as a result of the resort's water use. The specific terms and conditions of the plan were developed in cooperation with County staff and the Oregon Water Resources Department. COA 11 is satisfied.

12. **Commercial, cultural, entertainment or accessory uses provided as part of the destination resort shall be contained within the development and shall not be oriented to public roadways. Commercial, cultural and entertainment uses allowed within the destination resort shall be incidental to the resort itself. As such, these ancillary uses shall be permitted only at a scale suited to serve visitors to the resort. Compliance with this requirement shall also be included as a condition of FMP approval.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

13. **Applicant shall specify all recreational facilities within the proposed resort as part of final master plan submittal.**

**FINDING:** The applicant has specified the recreational facilities within the proposed resort. They have also shown locations of recreational facilities along with the layout of trail heads, trails and viewpoints. COA 13 is satisfied.

14. **Applicant and it successors shall do the following to ensure that all open space used to assure the 50% open space requirement of Section 18.113.060 (D) (1) is maintained in perpetuity:**

A. **Applicant shall submit for approval, as part of the Final Master Plan, a delineation of the Open Space that is substantially similar to the area shown in the Open Space Plan submitted as Ex. 9, B-14 to the "Memorandum of Applicant, in a response to public comments dated September 28, 2005, Open Space shall be used and maintained as "open space areas" as that term is used in DCC 18.113.030 (E).**

**FINDING:** The applicant has proposed approximately 1,293 acres of open space (Exhibit A1.1 of MA-08-6). This is divided into three categories, golf open space, common open space and buffer open space. The acreage that is included as open space constitutes approximately 66% of the entire acreage of the resort. The map submitted as part of the Modification of Application is substantially the same as the Open Space map that was approved as part of the CMP. COA 14A is satisfied.

B. **The CC&R's, as modified and submitted to the County on December 20, 2005, shall be further revised such that, Section 3.4 retains the first two sentences, but then the balance of 3.4 is replaced with the following:**

**At all times, the Open Space shall be used and maintained as "open space areas." The foregoing sentence is a covenant and equitable servitude, which runs with the land in perpetuity and is for the benefit of all of the Property, each Owner, The Declarant, and the Association, and the Golf Club. All of the foregoing**

**entities shall have the right to enforce covenant and equitable servitude. This Section 3.4 may not be amended except if approved by affirmative vote of all Owners, the Declarant, the Golf Club and the Association.**

**FINDING:** The applicant has submitted CC&R's which contain the above referenced language. *See* M07-2, Ex. H4. COA 14B is satisfied.

**C. All deeds conveying all or any part of the subject property shall include the following restriction:**

**This property is part of the Thornburgh Resort and is subject to the provisions of the Final Master Plan for Thornburgh Resort and the Declaration of Covenants, Conditions and Restriction of Thornburgh Resort. The final Master Plan and the Declaration contain a delineation of open space areas that shall be maintained as open space areas in perpetuity.**

**FINDING:** The proposed deeds contain this statement. *See* M07-2, Ex. H3a and H5b. A condition of approval is imposed to ensure the standard is met throughout the life of the project.

**D. All open space areas shall be clearly delineated and labeled on the Final Plat.**

**FINDING:** The applicant has submitted maps which clearly delineate the open space. As a condition of any approval, the applicant should be required to clearly delineate and label open space areas on subsequent plats. A condition of approval is imposed to ensure this condition is satisfied through full build-out.

**E. Any substantial change to the open space approved under this decision will require a new land use permit.**

**FINDING:** The applicant asserts that the open space areas depicted on the FMP site plan is identical to the open space drawings referred to in Condition 14A. If the applicant proposes to revise the open space areas in future development proposals, the open space requirements will be submit to new land use approval. This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

**15. Applicant shall obtain an approved Water Pollution Control Facility (WPCF) permit (as described in DCC 18.113.070 (L) prior to application for Final Master Plan.**

**FINDING:** The applicant has obtained the necessary permit from the Department of Environmental Quality. It is included in the application as Exhibit J1 and is permit number 102900. COA 15 is satisfied.

**16. All temporary structures shall be limited to a maximum of 18 months on the resort site.**

**FINDING:** The FMP proposal does not propose temporary structures. This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

17. **All development within the proposed resort shall meet all fire protection requirements of the Redmond Fire Department. Fire protection requirements shall include all minimum emergency ingress/egress roadway improvements.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

18. **No development shall be allowed on slopes of 25% or more on the site.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

19. **Applicant shall implement a "Wildfire/Natural hazard Protection Plan" for the resort, as identified in Ex. 15, B-29 of the burden of proof statement. Prior to approval of the Final Master Plan and each subdivision and site plan, Applicant shall coordinate its evacuation plans through that development phase with the Deschutes County Sheriff's Office and the Redmond Fire Department. At the same time, Applicant shall also coordinate its plans for the movement of evacuees over major transportation routes with the Oregon State Police and the Oregon Department of Transportation.**

**FINDING:** The applicant has submitted a revised fire evacuation plan which shows the fire evacuation routes during the various phases of the development. A letter from former Deschutes County Sheriff, Les Stiles, and a letter from Tim Moor, Fire Chief of the Deschutes County Rural Fire Protection District #1 is included, stating the evacuation plan is adequate for this stage of the development. A condition of approval is imposed to ensure that it is addressed in each development phase.

20. **The cumulative density of the development at the end of any phase shall not exceed a maximum density of 0.72 dwelling units per acre (including residential dwelling units and excluding visitor-oriented overnight lodging).**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

21. **Each phase of the development shall be constructed such that the number of overnight lodging units meets the 150 overnight lodging unit and 2:1 ratio of individually owned units to overnight lodging unit standards set out in DCC 18.113.060 (A) (1) and 18.113.060 (D) (2). Individually owned units shall be considered visitor oriented lodging if they are available for overnight rental use by the general public for at least 45 weeks per calendar year through one or more central reservation and check-in services. As required by ORS 197.445 (4) (b) (B), at least 50 units of overnight lodging must be constructed in the first phase of development, prior to the closure of sale of individual lots or units.**

**In addition to complying with the specific requirements of DCC 18.113.070 (U), 1-5, Applicant, its successors and assigns, shall at all times maintain**

**(1) a registry of the individually owned units subject to deed restriction under DCC 18.113.070 (U) (2), requiring they be available for overnight lodging purposes; (2) an office in a location reasonable convenient to resort visitors as a reservation and cheek-in facility at the resort; and (3) a separate telephone reservation line and website in the name of "Thornburgh Resort", to be used by members of the public to make reservations. As an alternative to or in addition to (3), Applicant may enter into an agreement with a firm (booking agent) that specializes in the rental of time-sharing of resort property, providing that Applicant will share the information in the registry required by (1) and cooperate with the booking agent to solicit reservations for available overnight lodging at the resort. If Applicant contracts with a booking agent, Applicant and the booking agent shall cooperate to ensure compliance with the requirements of DCC 18.113.070 (U) (5), by filing a report on January 1 of each year with the Deschutes County Planning Division.**

**FINDING:** The applicant has agreed to comply with the above stated agreement at each phase of development. The applicant agrees to meet the 150 overnight lodging unit requirement in the first phase, as required by DCC 18.113.06 (A)(1). The applicant will meet the 2:1 ratio requirement of DCC 18.113.06 (D)(2).

22. **Applicant shall submit final covenants, conditions and restrictions to the county prior to Final Master Plan approval. The final covenants, conditions and restrictions adopted by the developer and amendments thereto shall conform in all material respects to this decision and the requirements of the DCC.**

**FINDING:** The applicant has submitted covenants, conditions and restrictions. The CC&R's comply with the requirements of the Deschutes County Code. A condition of approval is imposed to require conformance with the FMP CC&Rs through the life of this development.

23. **No permission to use or improve Barr Road as access to the Resort is given or implied by this decision.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

24. **Applicant shall complete annexation of the property in any area of development into Deschutes County Rural Fire Protection District No 1 before commencing combustible construction in the area.**

**FINDING:** The applicant has submitted a letter from the Deschutes County Rural Fire Protection District No 1 stating that the property has been annexed to the district.

25. **Applicant shall submit a detailed erosion control plan with the first Tentative Plat or Site plan, whichever comes first.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

26. **Lot size, width (frontage), coverage, off-street parking and setbacks, including solar setbacks, are permitted as described in Applicant's Exhibit 8, B-24a in the Burden of Proof document, subject to review during the subdivision approval process to confirm that there will be safe vehicle access to each lot. Compliance with the dimensional standards shall be confirmed during subdivision approval for each development phase. All multi-family units, commercial structures, and other resort facilities are exempted from meeting the solar setback standards.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

27. **Road width shall be consistent with the requirements set forth in the County's subdivision ordinance. DCC Chapter 17.36.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

28. **Applicant shall demonstrate compliance with DCC 18.113.070 (D) by submitting a wildlife mitigation plan to the County as part of its application for Final Master Plan approval. The County shall consider the wildlife mitigation plan at a public hearing with the same participatory rights as those allowed in the CMP approval hearing.**

**FINDING:** This condition was remanded to the BOCC. The *Gould III* decision includes this as COA #38. It is discussed below.

29. **Applicant shall abide at all times with the MOU with ODOT, regarding required improvements and contributions to improvements on ODOT administered roadways (Agreement Number 22759, dated 10/10/05).**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

30. **Applicant shall submit a detailed traffic circulation plan, delineating resort access roads, resort internal circulation roads and resort secondary emergency ingress/egress roads, prior to Final Master Plan approval.**

**FINDING:** The applicant has submitted the required plan. COA 30 is satisfied.

31. **All exterior lighting must comply with the Deschutes County Covered Outdoor Lighting Ordinance per Section 15.10 of Title 15 of the DCC.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

32. **No permission to install helicopter landing zone (helipad) at the Resort is given or implied by this decision.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

33. **The Resort shall, in the first phase, provide for the following:**

A. **At least 150 separate rentable units for visitor-oriented lodging.**
B. **Visitor-oriented eating establishments for at least 100 persons and meeting rooms which provide eating for at least 100 persons.**
C. **The aggregate cost of developing the overnight lodging facilities and the eating establishments and meeting rooms required in DCC 10.113.060 (A) (1) and (2) shall be at least $2,000,000 (in 1984 dollars).**
D. **At least $2,000,000 (in 1984 dollars) shall be spent on developed residential facilities.**
E. **The facilities and accommodations required by DCC 18.113.060 must be physically provided or financially assured pursuant to DCC 18.113.110 prior to closure of sales, rental or lease of any residential dwellings or lots.**

**FINDING:** This condition applies through Phase A. Accordingly, it is made a condition of FMP approval.

34. **Where construction disturbs native vegetation in open space areas that are to be retained in a substantially natural condition, Applicant shall restore the native vegetation. This requirement shall not apply to land that is improved for recreational uses, such as golf courses, hiking or nature trails or equestrian or bicycle paths.**

**FINDING:** This condition applies throughout the development process. Accordingly, it is made a condition of FMP approval.

35. **The contract with the owners of units that will be used for overnight lodging by the general public shall contain language to the following effect: "[Unit Owner] shall make the unit available to [Thornburgh Resort/booking agent] for overnight rental use by the general public at least 45 weeks per calendar year through a central reservation and check-in service."**

**FINDING:** The revised Rental Management Agreement between Thornburgh Resort Company and the owners of overnight lodging units contain the required wording. A condition of approval is imposed to ensure that it is implemented through the life of the project.

36. **Applicant shall coordinate with the Sheriff's Office and its designated representative to address all public safety needs associated with the resort and the development process.**

**FINDING:** A letter from the Deschutes County Sheriff's Office has been submitted at attachment F6. The applicant has coordinated public safety planning for the resort with the Sheriff's Office through the "Public Safety Protection Report for Thornburgh Destination Resort" attached as Exhibit F5.

37. **(COA #36 in *Gould III*) Applicant shall modify the Overnight and Density Calculations chart presented to the Board at the appeal hearing on December 20, 2005 by replacing it with the Overnight and Density Calculations chart included at page 25 in Applicant's final legal argument, dated January 3, 2006, as shown below. The 75 units of overnight lodging shown in the December 20, 2005 Overnight and Density Calculations table to be developed in Phase C will actually be developed in the Phase B, for a total of 150 units in Phase B. The Overnight and Density Calculations table will be corrected to show the 50 hotel units will be developed in Phase D, where the Phasing Plan, attached to the Memorandum of Applicant in Response to Public comments, Ex. 13, Revised B-1.8, already shows the hotel will be developed. Additionally the legend in the Phasing Plan will be corrected to show hotel and residential overnight lodging uses in Phase D. Applicant shall present the corrected Phasing Plan and Overnight and Density Calculations chart, consistent with this condition, during the Final Master Plan approval process.**

**FINDING:** The corrected Phasing Plan and Overnight and Density Calculations chart has been submitted as part of the FMP application. COA 37 is satisfied.

38. **(COA #37 on remand). Applicant shall demonstrate compliance with DCC 18.113.070 (D) by submitting a wildlife mitigation plan to the County as part of its application for Final Master Plan approval. The County shall consider the wildlife mitigation plan at a public hearing with the same participatory rights as those allowed in the CMP approval hearing.**

**FINDING:** In its CMP proposal, the applicant provided evidence regarding existing habitat, the types of animal species that inhabit the site, and provided documents from ODFW and the BLM that asserted that a plan to address fish and wildlife impacts could be crafted and implemented to the satisfaction of those agencies. The county relied on that evidence and testimony to conclude that DCC 18.113.070(D) could be satisfied with conditions that required the applicant to work with the state and federal agencies to provide appropriate mitigation, primarily on federal land. LUBA affirmed that conclusion in *Gould I*.

In *Gould II*, the Court of Appeals disagreed with the county and LUBA. The court noted that the county had relied on evidence that the applicant, its experts, the BLM and ODFW would work together to craft a plan to mitigate the impact of the development on fish and wildlife, but that the evidence showed that some of the mitigation alternatives proposed by the application were not acceptable to those agencies. The court held that the county's findings (1) were inadequate to describe what was needed to satisfy DCC 18.113.070(D); (2) lacked a sufficient description of the applicant's wildlife plan; and (3) lacked an explanation as to why the county believed DCC 18.113.070(D) had been met. Further, the court found that the county could not rely on conditions to satisfy the standard, because the particulars were based on a future negotiation among the agencies and applicant, and not a county hearing process. In the absence of findings explaining the applicant's proposal, and how conditions could be imposed to ensure that the mitigation measures were likely and reasonably certain to succeed, the court found that the conditions alone did not provide the opportunity for public review and comment required by the statutes and case law.

In its decision on remand, the BOCC deferred a finding of compliance with this standard to the FMP. *Gould III,* Condition 37, page 10. Thus, the meaning of the standard, and the sufficiency of the evidence to address it was the major focus of the parties in the FMP proceedings. The applicant provided a wildlife mitigation plan that had been reviewed by the BLM and ODFW, and both agencies endorse the applicant's identification of likely impacts on fish and wildlife, and conclude that the applicant's plan addresses the impact of the development on those resources such that the "no net loss" standard of DCC 18.113.070(D) is satisfied. The opponents challenge the approach used by the applicant to identify resources, the estimate impact the resort development will have on fish and wildlife, and the adequacy of the plan to mitigate the impacts on the identified resources.

**1. What is required to satisfy DCC 18.113.090(D)?**

The applicant argues that the standard requires a general assessment of the habitat on the site, the species that exist within those habitats, an identification of the impact of the development on the habitats and species, and a plan to ensure that fish and wildlife resources overall will not be degraded or lost. The applicant concedes that for some species, development on the site will eliminate or degrade their habitat, but argues that its proposal, overall, will provide habitat for new species, will improve terrestrial habitat in the area, and will protect fish species. The applicant notes that it has proposed to improve habitat on local public lands, will contribute financially to programs to measure and improve habitat quality and will participate in longitudinal studies to evaluate the effectiveness of the mitigation over time. Those proposals have been reviewed and accepted by the BLM and ODFW. The applicant argues that conditions can be imposed to require additional or alternative mitigation if the proposed mitigation is not sufficient to protect fish and wildlife.

The opponents argue that this standard requires a much more specific analysis of the animal species on the site, and a similarly specific program to mitigate the development's impact on those species. The opponents argue that the applicant's plan is seriously deficient because it relies on one on-site survey, and studies addressing property to the north (Eagle Crest III) and superficial assumptions about development on indicator species to identify the animals on the site and how the development will affect them. In addition, the opponents argue that the applicant's proposal is not sufficient to *completely* mitigate those impacts, in part because the final location for off-site mitigation has not yet been identified, and in part because it assumes public agencies and private land owners will commit to implementing the plan over time. Finally, opponents argue that the applicant's commitment to remedy deficiencies in the plan is not credible because the applicant and the agencies have yet to adopt a methodology to evaluate and quantify success/failure.

While the "no net loss" mitigation standard is difficult to quantify, given the range of species that could occupy the site and be affected by development, the hearings officer concludes that it does not require the on-site specificity and review that opponents suggest is necessary. The standard requires an analysis of species on the site, the likely impacts of development, and the applicant's plan to address those impacts. It does not require that each species be maintained or replaced with an equivalent species on a 1:1 or better ratio. Such a requirement would be

difficult, if not impossible to satisfy. In addition, to the extent that conditions of approval are necessary to ensure that the plan is implemented as proposed, conditions can provide both accountability and flexibility to address changes in habitat needs and approaches to mitigation over time.

Having explained what DCC 18.113.070(D) requires, the question turns to whether the applicant's evidence demonstrates that the standard is satisfied. The applicant's wildlife mitigation plan, the mitigation and monitoring plan and the proposed conditions of approval are adequate to demonstrate that the proposal is likely and reasonably certain to succeed.

**2. The applicant's wildlife mitigation plan[3]**

The site includes approximately 2,000 acres. Of that total, 426 acres will be devoted to residential development, 316 acres will be devoted to resort facilities, including roads, 589 acres will be developed with golf courses, and 45 acres will be developed with artificial watercourses, streams and lakes. According to the applicant, approximately 897 acres of native vegetation will be retained in yards, buffer areas, common areas, and golf course "rough" areas.

The applicant's wildlife expert identified three major existing habitat areas on the site: juniper woodland (1,715 acres); sagebrush steppe (215 acres) and juniper woodland/outcrop (35 acres.) There are no existing wetlands, water resources, or riparian areas on the site. Further, no threatened, endangered, or sensitive species (plant or animal) or habitats have been identified on site. While the site has been identified as a deer and elk winter range by the BLM, the county has not included the site in its Goal 5 winter range habitat inventory.

After development, the applicant estimates that 615 acres will be managed grassland, juniper shrub-steppe, or golf course. This includes approximately 159 acres of retained native vegetation, of which 61 acres will be temporarily disturbed and need re-vegetation and/or restoration. The remaining 98 acres will include mature juniper and native shrubs and herbs. The applicant proposes to improve habitat by removing invasive plant species and young junipers. Habitat within the residential areas will be maintained on approximately 170 acres, of which 43 acres will need re-vegetation and/or restoration. The remaining 127 acres of native vegetation will have young junipers removed and understory vegetation, consistent with "Fire-wise community" standards.[4] Approximately 568 acres will be retained in native condition, of which approximately 69 acres will need re-vegetation and restoration. The 69 acres will be restored by planting native grasses, herbs, shrubs and trees.

The applicant evaluated the impact of resort development on wildlife resources by using a modified Habitat Evaluation Procedures (HEP) analysis. The HEP analysis was developed by the US Fish and Wildlife Service in the early 1990s, and Central Oregon wildlife management

[3] The summary of the applicant's wildlife plan is based on MA 08-6, Ex. 12, the applicant's August 12, 2008 rebuttal evidence, and supplemental evidence provided by Tetra Tech, the applicant's wildlife consultant.

[4] "Fire-wise communities" are developments that conform to special fire suppression avoidance standards. According to the applicant, conformance with Fire-wise standards will also improve habitat quality by removing invasive underbrush.

agencies have used it to evaluate development impacts since 1993. The applicant explains the HEP analysis as follows:

> "HEP is an accounting method, in which the value of each habitat type for each of a series of evaluation species is expressed in terms of habitat units (HU). These are calculated as the number of acres of that habitat multiplied by an index of its quality, expressed as a number between 0 and 1, which is termed the Habitat Suitability Index (HSI). One HU is the equivalent of one acre of the best habitat available for a species. Two acres of habitat half as good would also equal one HU, and so on. In the HEP analysis, to make the process manageable, an 'evaluation species' is chosen to represent a number of species with similar lifestyles and habitat requirements." MA 08-6, Ex. 12 (L1), page 4 and August 12, 2008 rebuttal, Ex. B-10.

The applicant relied on a 2004 modified HEP analysis for Eagle Crest III (which is located to the north of the subject property) to estimate HSIs for baseline habitat quality and post-development habitat quality.[5] The applicant's experts coordinated with ODFW to identify the evaluation species for this site, which include: northern flicker, American kestrel, red-tailed hawk, mountain bluebird, small mammals (generic), western fence lizard, and mule deer. The modified HEP results were used to estimate the off-site acreage that would be required to fully mitigate development impacts and result in "no net loss" of the wildlife habitat on the site and within one mile of the site boundaries. The plan includes mitigation for the impact of increased traffic volumes to wildlife movement on Cline Falls Highway. A table summarizing the impacts is set out in MA 08-6, Ex. 12 (L1), page 6.

According to the HEP analysis, 8,474 off-site HUs would be needed to mitigate the impacts of development, resulting in an estimated $883,190.00 investment in off-site mitigation. The HUs would be located on public land managed by the BLM and would be established on an incremental basis to correspond with the phased development of the resort.

The applicant has agreed to restore 4,501 acres of juniper woodlands in the Cline Buttes sub-area to mitigate the loss of the 8,474 HUs.[6] The specific BLM land on which the restoration is subject to the adoption of the Cline Buttes Recreation Area Plan (CBRAP), and has yet to be finally identified. However, the applicant and BLM have identified three areas where wildlife and habitat restoration is likely to occur under the CBRAP: the Canyons Region, the Deep Canyons Region, and the Maston Allotment. Restoration includes weed management, vegetation enhancement, reduction of unauthorized off-road motor vehicle use, creation of wildlife water sources ("guzzlers") and traffic speed monitoring devices. The specific activities and monitoring program for the BLM land are identified in an "Off-Site Habitat Mitigation and Monitoring Plan for the Thornburgh Destination Resort Project" (Tetra Tech, August 2008), included in the applicant's August 12, 2008 rebuttal, Ex. B3.

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[5] The applicant's use of the Eagle Crest III HEP was suggested by ODFW staff.

[6] The applicant's modified HEP analysis concluded that approximately 4498.7 acres would be needed for off-site enhancement to satisfy the 8,474 HU requirement. Modified HEP analysis, August 5, 2008, page 8.

If, at the time of development, insufficient off-site areas are not available, the applicant proposes to provide funding for implementing mitigation in a dedicated fund for use by ODFW to use to improve or purchase mitigation sites within Deschutes County. After the mitigation is established, the applicant will provide continuing funding for the lifetime of the development through a real estate transfer fee.

### 3. The applicant's fish mitigation plan

The applicant obtained 2,129 acre-feet of water rights to support the proposed development year-round. The development's water supply is to be obtained from six wells that are proposed to be drilled on the property. The water rights were granted upon a finding that the applicant was responsible for providing 1,356 acre-feet of mitigation water.[7] The applicant proposes to obtain 836 acre-feet from Deep Canyon Creek irrigation rights that were granted to Big Falls Ranch. The remaining mitigation water is to be obtained from the Central Oregon Irrigation District (COID).

With respect to the Deep Canyon Creek water, irrigation rights involve water flowing for six months of the year (mid-April through mid-October). Based on average daily consumption for the resort, the applicant asserts that the proposal will result in more mitigation water flowing into the creek during the summer months, that the average daily consumption of water from the development. To address water temperatures that affect salmonid habitat, the applicant has entered into an agreement with Big Falls Ranch to remove two diversion dams from the creek. As a result, water will flow directly from cold water springs and seeps into the creek, rather than be impounded above ground.[8] In addition, the applicant proposes to abandon three on-site wells that pump approximately 3.65 acre-feet from the aquifer, and provide for thermal modeling on Whychus Creek. In the event the hearings officer concludes that the proposal will likely increase the creek water temperatures, the applicant provided evidence that it can purchase mitigation credits for 106 acre-feet of water from Three Sisters Irrigation District to increase instream water flows, and thereby mitigate the impact. The applicant asserts that the latter three measures have not been required by OWRD or ODFW, but are in addition to the required mitigation.

### 4. The Parties' Evidence

The applicant argues that the combination of on-site and off-site mitigation is sufficient to demonstrate that the proposal satisfies DCC 18.113.070(D), and continued compliance can be assured by the adoption of conditions that require continued monitoring of the habitat in the selected areas.

The opponents disagree. The opponents' evidence regarding impacts to wildlife can be reduced to three main points: (1) the applicant's use of the HEP analysis and choice of indicator species are inadequate to identify all of the impacts of development on fish and wildlife; (2) the applicant

[7] The Oregon Water Resources Department (OWRD) calculated the needed mitigation water based on a 60 percent consumptive use, meaning that 60 percent of the resort water supply will not be returned to the aquifer through golf course irrigation or other surface applications. The opponents dispute that ORWD used the appropriate consumption rate.

[8] The parties agree that surface water tends to be warmer than aquifer water during the summer months.

improperly identified the extent of impact of the proposed wells and underestimated its severity by assuming only 60 percent of the water used for the development would be consumed; and (3) the applicant has not adequately demonstrated that the proposed mitigation will compensate for the lost habitat or be successful in the long run. Further, the opponents argue that other alternatives, such as the purchase of impacted land and full restoration, are preferable to the more limited restoration efforts proposed for BLM land.

**a. Indicator Species/HEP analysis v. Extensive On-site Ground Surveys**

The opponents point out that the applicant heavily relied on species survey data from Eagle Crest III and on general habitat investigations performed in the area that were then evaluated in a modified HEP analysis. The opponents argue that these studies and the applicant's indicator species are inadequate to account for and address the complete biota on the site. They also contend that the applicant has failed to demonstrate that the modified HEP analysis adequately accounts for the impact of development on the site, suggesting that a full HEP analysis is the minimum necessary to address habitat impacts. They argue that the applicant's superficial survey is inadequate to provide essential baseline data from which to measure the success or failure of the applicant's mitigation plan. The opponents argue that at the very least, the applicant must provide a two-year survey of plant and animal specials, noting that a multi-year survey better accounts for the vast fluctuations in animal populations that can occur due to site conditions, weather and disease. Finally, opponents argue that even if the indicator species can adequately replicate habitat needs for a wider population, the applicant's studies do not address the cumulative impact of development in the Tumalo area.

The applicant concedes that indicator species will not fully account for all of the many and varied species on the site and the effect the development will have on them. However, the applicant argues that such specificity is not needed to satisfy DCC 18.113.070(D). The applicant asserts that its analysis has been subject to extensive review and comment from ODFW, and is more extensive than plans for other destination resort developments in the area. The applicant argues that its assumptions are reasonable, and the modified HEP analysis adequately quantifies the impacts, and provides a workable methodology to compensate for the impact. With respect to cumulative impacts, the applicant argues that it considered and addressed reasonably foreseeable cumulative impacts. *See* August 12, 2008 rebuttal, Ex. B-14. The hearings officer agrees.

**b. Adequacy of Fish Mitigation Plan**

Opponents argue (1) the Deep Canyon Creek water is already pledged to mitigate development on another property or has been abandoned;[9] (2) the amount of mitigation water required by

[9] Opponents argue that the acquisition of water rights is not evidence that water will actually be returned to the rivers and streams as alleged. According to opponents, water rights are merely paper representations of water quantities and do not mean that the cool water needed to maintain instream temperatures will be available. The hearings officer understands the limitations of the water rights process, but concludes that under Oregon water law, the only way to adequately account for water in the streams is through the ORWD administration. Therefore, the hearings officer concludes that evidence

OWRD is inadequate to assure that surface water flows will be maintained year-round, as fish need more water early in the spring season; and (3) the use of surface water will degrade existing conditions by taking cold water out of the aquifer where it seeps into Whychus Creek and replacing it with warmer surface water.

The applicant acknowledges that the proposal require the development of wells on the property that will affect basin water flows. However, the applicant argues that it has addressed those impacts by purchasing mitigation credits from COID, and by acquiring irrigation water rights that will return water to Deep Canyon Creek. They argue that both OWRD and ODFW have reviewed its proposal and have agreed that the proposal mitigates both water quantity and quality that will be removed from the aquifer due to the resort development. The applicant supplied a copy of an agreement between the owners of Deep Falls Ranch and the Daniels Group showing those owners have agreed to the removal of two dams that diverted flow from Deep Canyon Creek.[10] In response to testimony from opponents that the proposed mitigation does not adequately address increases in water temperature in Whychus Creek, the applicant argues its proposal will have little or no impact on water temperatures on the creek. Even if water temperatures in Whychus Creek do increase incrementally, the applicant asserts that the increase can be addressed by requiring the applicant to fund a water conservation project sponsored by the Three Sisters Irrigation District to return 106 acre-feet of water to instream uses.

The OWRD mitigation requirement adequately addresses water quantity; it does not fully address water habitat quality. Its assumptions regarding the benefits of replacing more water during the irrigation season than is consumed on an average daily basis by the resort does not account for the higher water consumption that will likely occur during the summer months. Therefore, the hearings officer concludes that the additional mitigation offered through the Three Sisters Irrigation District restoration program is necessary to assure that water temperatures in Whychus Creek are not affected by the proposed development.

### c. Adequacy and Likely Success of the Proposed Mitigation

The opponents generally dispute that the applicant's proposed mitigation plan will result in no net loss to fish and wildlife resources. The opponents argue that the plan assumes that terrestrial animals will adapt to the built environment on the site, or will be attracted to the improved habitat that is being provided off-site. The opponents argue that such assumptions do not take into account the fragmentation of habitat, or address species recovery from the changes in the habitat. Further, opponents argue that the proposal does little to address or combat the problem of invasive species, such as starlings, who are attracted to the environment

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regarding the location and volume of water rights is substantial evidence as to the likely location and volume of water in the identified streams.

[10] The Daniels Group owns a former strip mine that has recently been proposed to be redeveloped for residential uses. It is this entity that the opponents assert owns or has options to the Deep Canyon Creek water. However, the opponents have not provided evidence as to the nature and extent of the conflict. The hearings officer concludes there is substantial evidence in the record to support a finding that the applicant has the authority to use water from Deep Canyon Creek, and to remove dams that would impede flows from underground seeps and springs.

that will be developed on the property, and will compete for the limited habitat that remains on the site. With respect to long term habitat improvements, the opponents argue that the applicant is unreasonably optimistic about cheatgrass eradication, and CC&Rs that limit domestic animals to indoor or leashed pets. Finally, the opponents argue that the applicant's mitigation on BLM land does not adequately account for competing BLM priorities, such as grazing, off-road vehicle recreational use, that undermine the restorative goals of the mitigation plan.

The applicant responds that the HEP analysis considered habitat degradation, including habitat fragmentation and the introduction of new non-native species. As a result, the applicant proposes mitigation activities on approximately 4,500 acres to compensate for the loss of 1,000 acres of habitat on its site. Further, the applicant asserts that while it is not certain that the "if you build it, they will come" habitat restoration efforts will be completely effective, the academic evidence supports a finding that habitat improvements will attract species that are being squeezed out by development elsewhere. With respect to the success of its cheatgrass eradication program and competing BLM priorities, the applicant argues that it does not expect that cheatgrass will be fully eradicated, but has proposed a series of measures to minimize its growth and spread, including periodic chemical applications and the introduction of more acceptable competing plant species. In addition, the applicant concedes that the BLM may adopt programs that will cause the mitigation to be less successful than if the mitigation sites were completely off-limits to those competing uses, but argues that there is substantial evidence to support its reliance on the identification of special habitat restoration areas to compensate for those competing activities, and on its mitigation efforts within those areas, to compensate for the loss of habitat on this site. The applicant also notes that it has accounted for circumstances where the BLM mitigation land is not available, by funding replacement mitigation programs through ODFW.

While the applicant's mitigation plan does rely on its program to make general habitat improvements on BLM land, it also acknowledges that BLM management priorities may reduce the success of those efforts. Its plan includes monitoring and alternatives to provide replacement mitigation in the event the anticipated BLM improvements are not successful. The hearings officer concludes that the applicant has demonstrated that the mitigation plan, as conditioned is reasonably likely to success.

**d. Alternative Mitigation Plans**

The applicant's expert explained that the proposed mitigation is consistent with current wildlife habitat restoration practices, and that the opponents' alternatives, while potentially viable, are no more restorative than the applicant's proposal. The hearings officer has concluded that its plan is adequate to ensure that the impact of the development on fish and wildlife habitats results in no net loss. Therefore, the applicant need not address or consider alternatives that would work equally well or better.

For the reasons set forth above, the hearings officer concludes that, as conditioned, DCC 18.113.070(D) is satisfied.

## V. DECISION:

For the reasons set out above, the hearings officer concludes that the proposal satisfies all applicable criteria, or that it is feasible to satisfy the criteria through the implementation of conditions of approval. Accordingly, M 07-2/MA 08-6 are approved, subject to the following conditions. To provide consistency among the decisions, the hearings officer retains the numerical listings included in the BOCC's CMP decision, noting by the word "satisfied" those conditions that no longer apply.

1. Approval is based upon the submitted plan. Any substantial change to the approved plan will require a new application.

2. All development in the resort shall require tentative plat approval through Title 17 of the County Code, the county Subdivision/Partition Ordinance, and/or Site Plan Review through Title 18 of the County Code, the Subdivision Ordinance.

3. Satisfied.

4. Subject to US Department of the Interior-Bureau of Land Management (BLM) approval, any secondary emergency ingress/egress across the BLM-owned land or roadways shall be improved to a minimum width of 20 feet with all-weather surface capable of supporting a 60,000-lb. fire vehicle. Emergency secondary resort access roads shall be improved before any Final Plat approval or issuance of a building permit, whichever comes first.

5. The developer will design and construct the road system in accordance with DCC Title 17. Road improvement plans shall be approved by the Road Department prior to construction.

6. All easements of record or right-of-ways shall be shown on any final plat. Plans shall be approved by the Road Department prior to construction.

7. All new proposed road names must be reviewed and approved by the Property Address Coordinator prior to final plat approval.

8. Satisfied.

9. Satisfied.

10. Applicant shall provide, at the time of tentative plat/site plan review for each individual phase of the resort development, updated documentation for the state water right permit and an accounting of the full amount of mitigation, as required under the water right, for that individual phase.

11. Satisfied.

12. Commercial, cultural, entertainment or accessory uses provided as part of the destination resort shall be contained within the development and shall not be oriented to public roadways. Commercial, cultural and entertainment uses allowed within the destination resort shall be incidental to the resort itself. As such, these ancillary uses shall be permitted only at a scale suited to serve

visitors to the resort. Compliance with this requirement shall also be included as a condition of FMP approval.

13. Satisfied.

14. Applicant and it successors shall do the following to ensure that all open space used to assure the 50% open space requirement of Section 18.113.060 (D) (1) is maintained in perpetuity:

    A. Satisfied.

    B. Satisfied.

    C. All deeds conveying all or any part of the subject property shall include the following restriction:

       This property is part of the Thornburgh Resort and is subject to the provisions of the Final Master Plan for Thornburgh Resort and the Declaration of Covenants, Conditions and Restriction of Thornburgh Resort. The final Master Plan and the Declaration contain a delineation of open space areas that shall be maintained as open space areas in perpetuity.

    D. All open space areas shall be clearly delineated and labeled on the Final Plat.

    E. Any substantial change to the open space approved under this decision will require a new land use permit.

15. Satisfied.

16. All temporary structures shall be limited to a maximum of 18 months on the resort site.

17. All development within the proposed resort shall meet all fire protection requirements of the Redmond Fire Department. Fire protection requirements shall include all minimum emergency ingress/egress roadway improvements.

18. No development shall be allowed on slopes of 25% or more on the site.

19. Applicant shall implement a "Wildfire/Natural Hazard Protection Plan" for the resort, as identified in Ex. 15, B-29 of the CMP burden of proof statement. Prior to approval of each subdivision and site plan, Applicant shall coordinate its evacuation plans through that development phase with the Deschutes County Sheriff's Office and the Redmond Fire Department. At the same time, Applicant shall also coordinate its plans for the movement of evacuees over major transportation routes with the Oregon State Police and the Oregon Department of Transportation.

20. The cumulative density of the development at the end of any phase shall not exceed a maximum density of 0.72 dwelling units per acre (including residential dwelling units and excluding visitor-oriented overnight lodging).

21. Each phase of the development shall be constructed such that the number of overnight lodging units meets the 150 overnight lodging unit and 2:1 ratio of individually owned units to overnight lodging unit standards set out in DCC 18.113.060 (A) (1) and 18.113.060 (D) (2). Individually owned units shall be considered visitor oriented lodging if they are available for overnight rental use by the general public for at least 45 weeks per calendar year through one or more central reservation and check-in services. As required by ORS 197.445 (4) (b) (B), at least 50 units of overnight lodging must be constructed in the first phase of development, prior to the closure of sale of individual lots or units.

In addition to complying with the specific requirements of DCC 18.113.070 (U), 1-5, Applicant, its successors and assigns, shall at all times maintain (1) a registry of the individually owned units subject to deed restriction under DCC 18.113.070 (U) (2), requiring they be available for overnight lodging purposes; (2) an office in a location reasonable convenient to resort visitors as a reservation and cheek-in facility at the resort; and (3) a separate telephone reservation line and website in the name of "Thornburgh Resort", to be used by members of the public to make reservations. As an alternative to or in addition to (3), Applicant may enter into an agreement with a firm (booking agent) that specializes in the rental of time-sharing of resort property, providing that Applicant will share the information in the registry required by (1) and cooperate with the booking agent to solicit reservations for available overnight lodging at the resort. If Applicant contracts with a booking agent, Applicant and the booking agent shall cooperate to ensure compliance with the requirements of DCC 18.113.070 (U) (5), by filing a report on January 1 of each year with the Deschutes County Planning Division.

22. The final covenants, conditions and restrictions adopted by the developer and amendments thereto shall conform in all material respects to this decision and the requirements of the DCC.

23. No permission to use or improve Barr Road as access to the Resort is given or implied by this decision.

24. Satisfied.

25. Applicant shall submit a detailed erosion control plan with the first Tentative Plat or Site plan, whichever comes first.

26. Lot size, width (frontage), coverage, off-street parking and setbacks, including solar setbacks, are permitted as described in Applicant's Exhibit 8, B-24a in the Burden of Proof document, subject to review during the subdivision approval process to confirm that there will be safe vehicle access to each lot. Compliance with the dimensional standards shall be confirmed during subdivision approval for each development phase. All multi-family units, commercial structures, and other resort facilities are exempted from meeting the solar setback standards.

27. Road width shall be consistent with the requirements set forth in the County's subdivision ordinance, DCC Chapter 17.36.

28. See conditions #38 and #39.

29. Applicant shall abide at all times with the MOU with ODOT, regarding required improvements and contributions to improvements on ODOT administered roadways (Agreement Number 22759, dated 10/10/05).

30. Satisfied.

31. All exterior lighting must comply with the Deschutes County Covered Outdoor Lighting Ordinance per Section 15.10 of Title 15 of the DCC.

32. No permission to install helicopter landing zone (helipad) at the Resort is given or implied by this decision.

33. The Resort shall, in the first phase, provide for the following:

    A. At least 150 separate rentable units for visitor-oriented lodging.
    B. Visitor-oriented eating establishments for at least 100 persons and meeting rooms which provide eating for at least 100 persons.
    C. The aggregate cost of developing the overnight lodging facilities and the eating establishments and meeting rooms required in DCC 10.113.060 (A) (1) and (2) shall be at least $2,000,000 (in 1984 dollars).
    D. At least $2,000,000 (in 1984 dollars) shall be spent on developed residential facilities.
    E. The facilities and accommodations required by DCC 18.113.060 must be physically provided or financially assured pursuant to DCC 18.113.110 prior to closure of sales, rental or lease of any residential dwellings or lots.

34. Where construction disturbs native vegetation in open space areas that are to be retained in a substantially natural condition, Applicant shall restore the native vegetation. This requirement shall not apply to land that is improved for recreational uses, such as golf courses, hiking or nature trails or equestrian or bicycle paths.

35. The contract with the owners of units that will be used for overnight lodging by the general public shall contain language to the following effect: "[Unit Owner] shall make the unit available to [Thornburgh Resort/booking agent] for overnight rental use by the general public at least 45 weeks per calendar year through a central reservation and check-in service."

36. Applicant shall coordinate with the Sheriff's Office and its designated representative to address all public safety needs associated with the resort and the development process.

37. Satisfied.

38. The applicant shall abide by the April 2008 Wildlife Mitigation Plan, the August 2008 Supplement, and agreements with the BLM and ODFW for management of off-site mitigation efforts. Consistent with the plan, the applicant shall submit an annual report to the county detailing mitigation activities that have occurred over the previous year. The mitigation measures include removal of existing wells on the subject property, and coordination with ODFW to model stream temperatures in Whychus Creek.

39. The applicant shall provide funding to complete a conservation project by the Three Sisters Irrigation District to restore 106 acre-feet of instream water to mitigate potential increase in stream temperatures in Whychus Creek. The applicant shall provide a copy of an agreement with the irrigation district detailing funding agreement prior to the completion of Phase A.

Dated this 6th day of October, 2008.

Mailed this 8th day of October, 2008.

Anne Corcoran Briggs, Hearings Officer

**THIS DECISION IS FINAL UNLESS APPEALED IN ACCORDANCE WITH THE PROVISIONS OF DCC TITLE 22.**

RECEIVED
SEP 26 2008
Deschutes County CDD

**BEFORE THE HEARINGS OFFICER**
**FOR DESCHUTES COUNTY, OREGON**

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| **IN THE MATTER OF AN APPLICATION BY THORNBURGH RESORT COMPANY FOR FINAL MASTER PLAN APPROVAL FOR A DESTINATION RESORT** | ) ) ) ) ) | **FILE NOS. M-07-2 & MA-08-6** |

**SECOND ORDER ON REQUEST TO SUBMIT RESPONSIVE EVIDENCE AND TESTIMONY**

At the conclusion of the second evidentiary hearing on these applications, the hearings officer adopted a post-hearing submittal schedule. On August 18, 2008, the hearings officer issued an order revising submittal deadlines to accommodate new evidence to rebut post-hearing evidence submitted by the applicant on August 12, 2008. The schedule was revised as follows:

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|---|---|
| August 28, 2008 | Deadline for evidence by opponents responding to the applicant's August 12, 2008 submittal |
| September 11, 2008 | Deadline for response to opponents' submittal by applicant |
| September 18, 2008 | Deadline for final written legal argument pursuant to ORS 197.763(6) |
| October 6, 2008 | Deadline for issuance of hearings officer's decision |

On September 11, 2008, the applicant submitted rebuttal responses to opposition testimony. That rebuttal included comments from the City of Redmond Fire Department, responses from the applicant's wildlife biologist, and evidence regarding the transfer of water rights to mitigate the impact of the development on fish habitat.

On September 16, 2008, Paul Dewey, on behalf of Nunzie Gould, requested an opportunity to respond to "new evidence" presented in the September 11, 2008 rebuttal testimony. Mr. Dewey's letter included testimony from David S. Dobkin, Ph.D. critiquing the applicant's wildlife expert's September 11, 2008 response, and the evidence she relied on to support her assertion that the proposal will fully mitigate wildlife impacts, as is required by DCC 18.113.070(D). The applicant objects to Mr. Dewey's request and additional evidence, arguing that it is not timely.

Post-hearing written testimony may be accepted by the hearings officer in accordance with the review schedule set forth in ORS 197.763(6). In relevant

part, ORS 197.763(6)(c) permits a participant to file a written request for an opportunity to respond to new evidence during the period the record was left open, and if such a request is made, the hearings officer "shall" reopen the record. However, that right to re-open the record should not be understood to allow unlimited evidentiary submittals. *See Rice v. City of Monmouth*, 53 Or LUBA 55, 60 (2006)(ORS 197.763 does not permit an unlimited right to rebut rebuttal evidence.)

As noted above, on August 18, 2008, the record was re-opened in accordance with ORS 197.763(6)(c) to allow opponents an opportunity to respond to the applicant's wildlife evidence. The opponents' August 2008 written testimony focused on the limited nature of the applicant's on-site habitat and species surveys, its unreasonable reliance on irrigation water to mitigate for the loss of aquifer water, and on the lack of evidence that the applicant's proposal would fully mitigate the impacts of the extensive development proposed for the site.

The applicant responded to that evidence with additional evidence to support its position that its proposal satisfies the relevant criteria. The issues that the September 11, 2008 evidence addressed: (1) the adequacy of the applicant's wildlife mitigation plan; and (2) the adequacy and feasibility of maintaining adequate water volume and temperature to avoid impact to fisheries.

Mr. Dewey's September 16, 2008 submittal is, in essence, a request to have the last word with respect to the evidence, a right that opponents are not afforded under the statutory evidentiary submittal scheme. Accordingly, the hearings officer concludes that Mr. Dewey's response and evidence should be rejected because they were not submitted in accordance with the schedule laid out in the August 18, 2008 order.

The applicant submitted its final written legal argument on September 18, 2008. The record is now closed. The hearings officer's decision shall be issued on or before October 6, 2008.

Dated this 23rd day of September, 2008.

Anne Corcoran Briggs
Hearings Officer

# FINAL ARGUMENT OF THORNBURGH RESORT COMPANY, LLC IN SUPPORT OF FINAL MASTER PLAN APPLICATION

## DESCHUTES COUNTY PLANNING FILE NO. M-07-2

## I. INTRODUCTION

Applicant requests approval of a Final Master Plan ("FMP") application for the proposed resort. Applicant first filed the FMP application on August 1, 2007. When the Oregon Court of Appeals concluded that work done on a fish and wildlife plan required by Deschutes County Code ("DCC") 18.113.070(D) was insufficient to justify a finding that the standard is met, it permitted Deschutes County ("County") to "postpone determination of compliance with that standard until the final master plan approval step and infuse that process with the same participatory rights as those allowed in the [conceptual master plan] approval hearing." *Gould v. Deschutes County*, 216 Or App 150, 171 P3d 1017 (2007).[1] *See also: Gould III* (affirming County conceptual master plan ("CMP") decision on remand; concluding postponement of wildlife mitigation plan review to FMP process with public participation is proper). Applicant filed a modified FMP application on April 21, 2008, to provide a more comprehensive presentation of the proposed fish and wildlife plan.[2]

After two public hearings, on June 17 and July 15, 2008, and the submission of evidence by opponents on July 29, 2008 and August 28, 2008, and by Applicant on August 12, 2008 and September 11, 2008, Applicant now presents its final argument, as allowed by ORS 197.763(6)(e). Like the FMP BOP, this final argument is organized according to the applicable criteria. It augments the discussion in the BOP by acknowledging the questions raised by opponents and the Hearings Officer and responding to them.

## II. DCC 18.113.040, APPLICATION SUBMISSION

Pursuant to DCC 18.113.040, the authorization of a permit for a destination resort consists of three steps. The first step involves the issuance of a conditional use permit for a CMP. Applicant obtained final approval of the CMP for the Thornburgh resort on May 10, 2006 and April 9, 2008 (on remand). The second step – approval of a Final Master Plan – is described as follows in DCC 18.113.040(B):

> ***B. Final master plan. Applicant shall prepare a final master plan (FMP) which incorporates all requirements of the County approval for the CMP. The Planning Director shall review the FMP to determine if it complies with the approved CMP and all***

[1] There are now three *Gould v. Deschutes County* opinions: *Gould v. Deschutes County*, 54 Or LUBA 205, 212 (2007) ("*Gould I*"); *Gould v. Deschutes County*, 216 Or App 150, 171 P3d 1017 (2007) ("*Gould II*"); and *Gould v. Deschutes County*, ___ Or LUBA ___ (LUBA No. 2008-068, September 11, 2008) ("*Gould III*").

[2] The burden of proof statement ("BOP") in the April 21, 2008 modified FMP application supersedes the BOP in the August 1, 2007 original FMP. It is a revision of the earlier BOP and should be read without reference to it. The exhibits in the modified FMP application that are shown in **bold type** in the List of Exhibits either supersede or complement the exhibits in the original FMP application. Those exhibits that are shown in regular type on the List of Exhibits in the modified FMP application were not included in the modified FMP application. They are to be found in the original FMP application.

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***conditions of approval of the conditional use permit. The Planning Director shall have the authority to approve, deny or return the FMP to Applicant for additional information. When interpretations of the Planning Director involve issues which are discretionary, the FMP approval shall be treated as a land use permit in accordance with DCC Title 22.***

The County Planning Director concluded that certain conditions imposed as part of the CMP approval involve discretionary issues and that, therefore, the FMP approval must be treated as a land use permit. The decision of the Oregon Court of Appeals with respect to the fish and wildlife plan also requires full public hearings under DCC Title 22.

Opponent Annunziata Gould ("Gould") argues that the standards in DCC 18.113.060 and the approval criteria in DCC 18.113.070 "are to be applied for each land use approval for a destination resort. They are not limited to one stage of approval or another, such as DCC 18.113.090, which specifically applies only to FMP applications." Memorandum of Nunzie Gould in Opposition to the Proposed Development (6/17/08) ("Gould Memo 1"), p. 1.[3]

The argument must fail in light of DCC 18.113.040, which states that the "authorization of a permit for a destination resort shall consist of three steps." These steps are (1) Conceptual Master Plan and Conditional Use Permit for Destination Resort (DCC 18.113.040(A)), (2) Final Master Plan (DCC 18.113.040(B)) and (3) Site Plan Review (DCC 18.113.040(C)). It is clear from the code description of the steps that once the CMP approval is final, the FMP, which "incorporates all requirements of the County approval for the CMP," does not also require the re-application of the criteria that resulted in the approval of the CMP. The incorporated "requirements" are the conditions imposed as part of the CMP approval. To gain FMP approval, these requirements, together with the FMP criteria stated in DCC 18.113.090, must be satisfied.

To require a second showing of compliance with the CMP approval criteria in DCC 18.113.060 and DCC 18.113.070 would be to ignore that Applicant has already made the necessary showing, supported by substantial evidence, that these criteria are satisfied. It would be a collateral attack on the final land use approval of the CMP application.

DCC 22.36.010 establishes time limits on the duration of land use approvals, which prevent them and the evidence upon which they are based from becoming outdated. A land use approval is valid until it expires. The DCC does not require an applicant to update its evidence at each stage of a three-stage land use process. Besides, in this case, the modified FMP application was filed on April 21, 2008, within weeks of the County's April 9, 2008 approval of the CMP application on remand. The evidence found adequate to satisfy the CMP criteria need not be updated to satisfy the FMP criteria when the time between CMP approval and FMP application is so short.

[3] Gould submitted three additional memoranda: "Supplemental Memorandum of Nunzie Gould in Opposition to the Proposed Development (7/15/08), dated June 17, 2008 ("Gould Memo 2"); "Second Supplemental Memorandum of Nunzie Gould in Opposition to the Proposed Development, dated July 29, 2008 ("Gould Memo 3"); and Third Supplemental Memorandum of Nunzie Gould in Opposition to the Proposed Development, dated August 28, 2008 ("Gould Memo 4").

Gould argues generally that Applicant has not adequately identified changes made in the FMP that are inconsistent with the CMP. Gould Memo 1, p. 2. Applicant believes there have been no substantial changes. To the extent Gould points out changes, Gould Memo 2, p. 2, Applicant addresses her arguments in context.

As described below, this FMP complies with the approved CMP and DCC 18.113.090. Therefore, Applicant requests that the Hearings Officer approve the FMP.

## III. DCC 18.113.090, REQUIREMENTS FOR FINAL MASTER PLAN

Per DCC 18.113.090, the FMP must include text and graphics explaining and illustrating the following:

### *A. The use, location, size and design of all important natural features, open space, buffer areas and common areas;*

DCC 18.113.080 defines substantial change to an approved CMP to mean "an alteration in the type, scale, location, phasing or other characteristic of the proposed development such that findings of fact on which the original approval was based would be materially affected." County staff correctly found that there is no substantial change between the development approved by the County's CMP decision and the development proposed by this FMP application. Each of the refinements in the various maps was discussed with County staff and none were found to be "substantial changes."

In its decision on the CMP appeal, LUBA stated, "DCC 18.113 . . . clearly envisions that the CMP will be refined by the FMP which in turn will be further refined by site design and subdivision review decisions." *Gould I* at 212. What Applicant has done in the FMP is to refine the maps submitted and approved as part of the CMP as more specific information has become available about the site itself and the likely uses on the site. None of these relatively minor changes are significant enough to materially affect the CMP approval findings.

The language of this criterion – "use, location, size and design" – should be read generally, to avoid requiring more in the second stage of approval than is appropriate. That has been the case with past County FMP approval decisions. In the May 14, 2002 FMP approval for High Desert Development Partners LLC (Pronghorn) (M-02-1), for example, the Board of County Commissioners ("BOCC") found that the preliminary development plan showed "the required buffer areas and the general location of all open space areas." The BOCC found further, "The specific size, location, and design of the open space areas will be finalized during site plan and tentative plan reviews over the life of the project."

DCC 18.113.040 states, "Each element or development phase of the destination resort must receive additional approval through the required site plan review (DCC 18.124) or subdivision process (DCC Title 17)." Under DCC 18.124.040(D), a site plan must indicate the following: (1) Access to site from adjacent rights of way, streets and arterial; (2) Parking and circulation areas; (3) Location, dimensions (height and bulk) and design of buildings and signs; (4) Orientation of windows and doors; (5) Entrances and exits; (6) Private and shared outdoor recreation spaces; (7) Pedestrian circulation; (8) Public play areas; (9) Service areas for uses such as mail delivery, trash disposal, above ground utilities, loading and delivery; (10)Areas to be

landscaped; (11) Exterior lighting; (12) Special provisions for disabled persons; (13) Existing topography of the site at intervals appropriate to the site, but in no case having a contour interval greater than 10 feet; (14) Signs; (15) Public improvements; (16) Drainfield locations; (17) Bicycle parking facilities, with location of racks, signage, lighting, and showing the design of the shelter for long term parking facilities; (18) Any required bicycle commuter facilities; (19) Other site elements and information which will assist in the evaluation of site development. From the detailed list of requirements in DCC 18.124.040, it is clear that less precision is required at the FMP approval stage.

Applicant has consistently taken the position, adopted by the BOCC in the CMP decision, that there are no "important natural features" on the property itself. The FMP Open Space Plan, FMP Ex. A.1.1, shows three categories of open space: "Common" (530 acres); "Golf/water feature" (660 acres); and "Buffer" (91 acres). There is a total of 1,281 acres of open space, which comprise 66 percent of the total acreage of the resort. This is well in excess of the 50 percent open space requirement stated in DCC 18.113.060(D)(1).

The CMP Open Space Plan had the same categories of open space. As stated in the May 10, 2006 CMP approval ("2006 CMP Decision"), "The Open Space Plan (Revised), RM, Ex. 9, B-1.4 [CMP Rec. 4227], proposes approximately 1,358 acres as permanent open space. This projected acreage amount represents approximately 69 percent of the total site and therefore considerably exceeds the required 50 percent minimum."[4]

On both plans, the common open space is "natural" open space, in contrast with the golf courses and the buffer. The plan does not show "developed" open space, since open space, by definition, is land that is retained in a substantially natural condition or is improved for recreational uses. When placed side by side, RM Ex. 9, B-1.4 and FMP Ex. A.1.1 are essentially the same. The changes shown reflect the more careful location of the roads, an effort to avoid various natural configurations, and a greater awareness of the topography on the site. Gould Memo 3 has an Exhibit 2, which shows areas that were shown not to be developed in RM Ex. 9, B-1.4 but are now to be developed in FMP Ex. A.1.1. In response, Applicant submitted a marked version of the Open Space Phasing Plan, which shows areas that were shown to be developed in RM Ex. 9, B-1.4, but are now shown to be open space in FMP Ex. A.1.1. August 12, 2008 Rebuttal, Ex. F-4.

The total open space has been reduced by about three percent as a result of greater precision in delineating the specific areas, as Applicant has moved away from the "blobs" in the earlier exhibit. The 2006 CMP Decision, page 20, acknowledges that "the final location, acreage and dimensions of any open space area are subject to limited refinement during the process of developing a final master plan." The changes made are well within the scope of the term "limited refinement."

Similar refinements have been allowed by past FMP approvals. In the case of Eagle Crest Inc. (Eagle Crest III) (M-01-1), the BOCC found:

[4] As noted in the May CMP Decision, the legend on RM, Ex. 9, B-1.4, which shows the total to be 1,552 acres, is incorrect.

"The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate the use, location, size, and design of all important natural features, open space buffer areas, and common areas. Further detail will be provided as each phase of the expansion project is developed and site specific surveys are completed. . . . The specific size, location, and design of the open space areas will be finalized during preliminary plat review. Additional common/open space areas within the various phases of the project will also be identified during preliminary plat review."

In the case of Eagle Crest Partners, Ltd. (Eagle Crest II) (M-95-1), the hearings officer noted revisions "to accurately depict and exclude areas zoned flood plain from the open space calculations."

Gould objects that because the definition of "Common Area" in the CC&Rs, FMP Ex. 8, H4.1, p. 4, includes some areas that are developed, the "Open Space (Common)" shown in Ex. A.1.1 must also include developed areas. Gould Memo 3, p. 2. However, just because some common areas are not open space does not mean that the common open space is not open space. To state the obvious: The common areas that are not open space are different from the common areas that are open space.

The common areas within the resort will include the common open space areas (i.e., those that do not alter the existing or natural landscape, except as permitted by DCC 18.113.030(E)). Common areas within the resort will also include many of the amenities and facilities listed in the Amenities Description attached as revised Ex. A8d: the community center, amphitheater, game rooms, libraries, stables and equestrian facilities, swimming pools, sports fields, vista view points and a cultural and interpretive center. These amenities will be located in the areas depicted as "visitor oriented" and "recreational" on the revised Master Development Plan, FMP, Ex. A3.1.

***B. The use and general location of all buildings, other than residential dwellings and the proposed density of residential development by location;***

Gould objects that the FMP burden of proof does not supply sufficient detail to satisfy this criterion. However, as the BOCC's approval of the Pronghorn FMP illustrates, the FMP criteria should not be read to require something that is separately required in the third stage. Additional flexibility must be preserved to allow more precise calculations as actual development becomes a possibility.

In the Eagle Crest III decision, the BOCC found:

"The applicant also submitted a map entitled 'Final Subdivision Master Plan' which depicts examples of lot sizes for certain areas within the proposed resort expansion. The residential development will include either freestanding dwellings or multi-unit development, similar to what has already occurred at both Eagle Crest I and II. Note #13 on this map states, "The intent of the exhibit is to document the flexibility allowed in developing Eagle Crest 3 in a free enterprise

market. The final development plans for each area will be submitted for approval at the time of final platting. Density and total units will be tracked on a plat by plat basis.' The Board finds that since each development phase will require separate tentative plat and/or site plan review, the actual development phases can be reviewed for consistency with the overall plan and the zoning/subdivision ordinance requirements during future land use reviews."

The precise boundaries of each specific use, the use and location of buildings, the building elevations and the size and floor area of commercial uses are all details that are properly dealt with during site plan review. Showing the location of uses by category, as is done in FMP, Ex. 1, A.3.1, and providing a list of recreational amenities, as is done in FMP, Ex. 5, A.8.d.1, is consistent with this approach.

The Residential Development Plan, FMP, Ex. G.1.1b, shows where residential development will occur and what the range of lot sizes will be in each designated area. Newly prepared FMP, Ex. G.1.2 shows the estimated residential density in each area, delineated from least dense to most dense. The resort will include buildings associated with the significant recreational amenities provided. These structures will include: two golf clubhouses, a recreation center, a spa and fitness center, game rooms, libraries, a golf learning center, a pro-shop, tennis pro-shop and learning center, swimming pools and associated structures, and sports facilities. *See* revised FMP, Amenities Description, Ex. A-8d. The recreational structures will be located in the areas depicted as "recreational" on the revised Master Development Plan.

***C. Preliminary location of all sewer, water, storm drainage and other utility facilities and materials, and specifications and installation methods for water and waste water systems;***

The FMP BOP fully addresses this criterion. The information submitted is consistent with the CMP approval. Opponents make no substantial objection.

***D. Location and widths of all roads, streets, parking, pedestrian ways, equestrian trails and bike paths;***

The FMP BOP fully addresses this criterion. The information submitted is consistent with the CMP approval. Opponents make no substantial objection. The road system shown on the Residential Development Plan, FMP, Ex. 1, G.1.1b, is identical to the road system shown on the Access, Circulation and Trail Plan, FMP, Ex. 1, A.7.1. The absence of equestrian trails on the map indicates only that they are still under consideration. In the Eagle Crest III decision, the BOCC found, "[T]he application may satisfy this criterion by specifying the location of equestrian trails during future preliminary plat and/or site plan reviews." If Applicant decides to create equestrian trails, they can be reviewed in a subsequent stage of approval.

***E. Methods to be employed to buffer and mitigate potential adverse impacts on adjacent resource uses and property;***

The FMP BOP addresses this criterion. The information submitted is consistent with the CMP approval. Opponents make no substantial objection. Opponents do object that reference should not be made to the CMP decision or the CMP record, since it is not part of the FMP

application record. Since opponents made this objection, Applicant has requested that the CMP record be made part of the FMP application record.

> ***F. Building elevations of visitor-oriented accommodations, recreational facilities and commercial services sufficient to demonstrate the architectural character of the proposed development;***

The FMP BOP fully addresses this criterion. The information submitted is consistent with the CMP approval. Opponents make no substantial objection.

> ***G. A description of all commercial uses including approximate size and floor area;***

The FMP BOP fully addresses this criterion, which does not require a per-use breakdown of size and floor area. The information submitted is consistent with the CMP approval. It will be made more specific at the time of site plan review. Opponents make no substantial objection.

> ***H. The location of or distance to any emergency medical facilities and public safety facilities;***

The FMP BOP fully addresses this criterion. The information submitted is consistent with the CMP approval. The Emergency Services Map, FMP, Ex. 6, F.1, shows the location of emergency medical facilities and public safety facilities. That alone satisfies the criterion. Opponents object that the map does not give the distance to the facilities, but the criterion does not require location *and* distance, but location *or* distance. In any event, the map does include a scale, and so it is easy enough to calculate distances.

> ***I. When a phase includes a residential subdivision, a general layout of the subdivision shall include the number of lots, minimum and maximum lot sizes and approximate location of roadways.***

The FMP BOP fully addresses this criterion. The information submitted is consistent with the CMP approval, with some refinement. Opponents make no substantial objection.

> ***J. A description of measures taken, with copies of deed restrictions, CC&R's and rental contracts, to implement the measures identified in DCC 18.113 assuring that individually-owned lodging units considered to be overnight lodgings [will be available for rent] for at least 45 weeks per calendar year through a central reservation and check-in service.***

The FMP BOP fully addresses this criterion. The information submitted is consistent with the CMP approval. Opponents make no objection.

***K. A description of measures taken, with copies of deed restrictions and a final management plan, to implement the open space management plan required by DCC 18.113.***

The FMP BOP fully addresses this criterion. The information submitted is consistent with the CMP approval. Opponents make no objection.

***L. The status of all required off-site roadway improvements.***

Applicant has obtained a right-of-way grant from BLM authorizing a connection between Oregon Highway 126 and the northern resort access point in Section 17. A copy of the BLM grant is attached as Ex. 17 to the BOP. Applicant has constructed a northern access road within the boundaries of the BLM right-of-way grant. The roadway has been constructed in compliance with applicable County road standards and exceeds the requirements of CMP Condition 4, which is discussed in further detail below. The condition requires construction of 20-foot wide "all-weather surface capable of supporting a 60,000-lb fire vehicle."

Applicant has also applied to ODOT for an "approach road permit" authorizing a connection between the resort and Oregon Highway 126. A copy of this pending application is attached to the BOP as Ex. 11. Applicant's MOU with ODOT states, "[A]t the time ODOT issues an approach road permit to Applicant for an approach onto Highway 126 at Eagle Crest, Blvd., Applicant shall construct to ODOT standards a westbound left-turn lane and an eastbound right-turn lane at Eagle Crest Blvd." *See* Ex. 14. ODOT placed a similar condition in its agreement with the neighboring Eagle Crest Resort. Eagle Crest has constructed each of the turn lanes contemplated by this condition, and they are fully operational as of the date of this submission.

Applicant anticipates the construction of off-site roadway improvements that connect the northern and southern portions of the resort in the locations depicted on the Access, Circulation and Trail Plan Map, which is attached as Ex. A7. As of the date of this submission, these road connections have not been constructed. Applicant has received authorization to construct such improvements from the State of Oregon and BLM (when it still owned the land).

Applicant will also construct turn lanes on the Cline Falls Highway, at the southern resort entry point. As of the date of this submission, no construction has been initiated in this location. Details and specifications of such improvements will be incorporated in future subdivision and/or site plan approvals.

Gould argues that Applicant has not met the requirements of this section because Applicant and ODOT have not yet executed a final "Cooperative Improvement Agreement." Gould's assertion finds no support in DCC 18.113.090(L) or the County's decision approving the resort's Conceptual Master Plan application. DCC 18.113.090(L) requires a report on the status of "required off-site roadway improvements." It does not specify details that must be contained in an agreement between Applicant and ODOT.

As noted in response to DCC 18.113.090(M), below, the MOU with ODOT does not require execution of a Cooperative Improvement Agreement prior to approval of the FMP. Rather, the agreement requires that ODOT and Applicant be "jointly working to develop a

Cooperative Improvement Agreement that will further define the terms and timing of Applicant's proportionate share contribution" to infrastructure improvements at Highway 20 and Cook Avenue in Tumalo. August 12, 2008 Rebuttal, Ex. C-5 contains an email from ODOT requesting review of the agreement and placement of the item on the OTC agenda for fall 2008. August 12, 2008 Rebuttal, Ex. C-4 indicates that ODOT's planning efforts for the Highway 20/Cline Falls Highway interchange will begin in the fall of 2008.

Notwithstanding Gould's unfounded assertions to the contrary, Applicant has diligently complied with the terms of its agreement with ODOT and the terms of CMP Condition 29. In the extremely unlikely event that negotiations between the Applicant and ODOT were ever to reach an impasse, the MOU between Applicant and ODOT provides that the parties will initiate a collaborative mediation process as prescribed by the Oregon Consensus Program. DCC 18.113.090(L) does not require Applicant to execute a final Cooperative Improvement Agreement with ODOT prior to final master plan approval.

***M. Methods to be employed for managing automobile traffic demand.***

Applicant identified the methods it will employ to manage automobile traffic demand in its Response to the Hearings Officer's Questions, which was submitted on July 15, 2008. As previously noted, Applicant will manage automobile traffic demand through the following methods: (1) the construction and maintenance of an extensive system of internal roadways within the boundaries of the resort; (2) the construction and maintenance of access and connecting roads on publicly owned lands surrounding the resort; (3) the construction and maintenance of non-motorized/pedestrian and bicycle trails within the resort; (4) the construction of specified off-site roadway improvements; and (5) compliance with the terms of a negotiated agreement with ODOT.

In Gould Memo 3, Gould makes a number of arguments she claims are related to the above-stated approval criteria. First, she claims Applicant cannot show compliance with legal requirements because the Thornburgh Memorandum of Understanding ("MOU") with ODOT has not been "implemented." This argument is both legally and factually incorrect. DCC 18.113.090(M) does not contain any requirement or condition related to Applicant's agreement with ODOT. Rather, it is CMP Condition 29 that requires Applicant to "abide at all times with the MOU with ODOT." As stated in Applicant's responsive materials dated July 15, 2008, Applicant continues to work with ODOT to implement the terms of its MOU. The record indicates that Applicant and ODOT have reached agreement on the terms of a Cooperative Improvement Agreement that has been forwarded to the Attorney General and the Oregon Transportation Commission ("OTC") for review and approval. August 12, 2008 Rebuttal Ex. C-5 contains an email from ODOT requesting review of the agreement and placement of the item on the OTC agenda for fall 2008. August 12, 2008 Rebuttal Ex. C-4 indicates that ODOT's planning efforts for the Highway 20/Cline Falls Highway interchange will begin in fall of 2008. Despite Gould's unfounded assertions to the contrary, Applicant has diligently complied with the terms of its agreement with ODOT and the terms of CMP Condition 29.

Second, Gould appears to contend that Applicant is required to address and implement each of the specific transportation demand measures that are identified in Goal 12 and the

Division 12 Transportation Planning Rules (OAR 660-012-0000 through 0070). To support this argument, Gould references a citation to transportation demand measures contained in the Deschutes County Transportation System Plan ("County TSP"). DCC 23.64.240 references specific "transportation system management" ("TSM") and "transportation demand management" ("TDM") measures the County can utilize to preserve the function of major County roads and state highways. The County TSP specifies certain TSM improvements (minimizing access points, channelization of turning movements, creation of merging lanes, raised medians and signalization) that can be implemented to increase traffic flows on existing roadways. Similarly, the plan references specific TDM's (flexible work schedules, ridesharing, transit use, bikes and walking, parking management and telecommuting) that can be utilized to reduce demand on transportation infrastructure. Neither the plan nor any implementing regulations impose specific TSM or TDM requirements on a final master plan for a destination resort.

While DCC 23.64.240 does not impose any independent requirements on this application, many of the goals and policies of the plan have been applied to this development. For example, Applicant has limited access points to the resort and channelized resort access at the Cline Falls entry point to preserve travel speeds on the Cline Falls Highway. The applicant will also construct an integrated system of bicycle and pedestrian trails in an effort to promote non-motorized travel within the boundaries of the resort.

***N. A copy of a WPCF permit issued by DEQ consistent with the requirements of DCC 18.113.070(L).***

The BOP fully addresses this criterion. A copy of the WPCF permit issued by DEQ, which is consistent with the requirements of DCC 18.113.070(L) was attached as FMP Ex. J1. Gould asserts the FMP fails to meet this requirement or Condition 15, discussed below, because the WPCF permit requires a Reclaimed Water Use Plan that has not been submitted into the record, and because the 2007 permit was issued prior to changes in the sewer map. In fact, the WPCF permit does not require submission of the Reclaimed Water Use Plan until 90 days prior to start-up of the land application system. (FMP Ex J1, p.7). Changes to the sewer map do not affect the 2007 WPCF permit because the permit requires submission of detailed plans and specifications prior to construction. (FMP Ex J1, p.8).

## IV. COMPLIANCE WITH CONDITIONS OF CMP

The CMP decision contains the following 36 conditions of approval. Where appropriate, Applicant responds below to the objections and concerns of opponents.

***1. Approval is based upon the submitted plan. Any substantial change to the approved plan will require a new application.***

The FMP BOP fully addresses this condition. The information submitted is consistent with the CMP approval. Gould objects that the Applicant has failed to show what changes were made between the CMP and the FMP. Gould Memo 1, p. 6. In fact, the various maps do show

refinements to earlier maps. Applicant and planning staff agree that none of these refinements constitute substantial changes that would require the CMP approval be modified.

> ***8. Plan review and approval of water supply plans for phase 1 will be required by Oregon Department of Human Services-Drinking Water Program (DHS-DWP) prior to Final Master Plan approval.***

This condition has been satisfied. The type of DHS-DWP approval that applies at this early stage of the project is a water system "master plan" approval. Accordingly, Applicant commissioned Bussard Williams to prepare a Water System Master Plan, which is attached as Ex. K3 to the FMP. The plan satisfies applicable drinking water regulations in OAR 333-061-0060. FMP Ex. K1 is DHS-DWP's approval of the plan and approval of a plan review exemption for water main extensions constructed pursuant to the approved Water System Master Plan. These approvals pertain to water supply plans for Phase One and subsequent phases of the project. As described in FMP Ex. K1, the Water System Master Plan will remain in effect until 2018.

Additional approvals of plans for wells, reservoirs and water storage will be required prior to commencement of construction. Further approvals will require detailed construction plans that cannot be provided to DHS-DWP until after approval of the FMP and any required tentative plat approval and/or site plan review.

During the FMP hearing, Gould asserted the Applicant failed to provide evidence that the 2006 plan review exemption and Water Master Plan are current. Gould Memo 1, pp. 6-7. However, FMP Ex. K1 clearly shows that the Water Master Plan on file with DHS expires in 2018, and that the plan review exemption remains in effect "as long as the Water Master Plan remains current" and annual summaries of completed projects are submitted to DHS. On July 15, 2008, Applicant submitted into the record a copy of letter dated April 14, 2008, from DHS-DWP confirming the exemption status is renewed for 2008. FMP Ex. H, p. 14.

> ***10. Applicant shall comply with all applicable requirements of state water law as administered by OWRD for obtaining a state water right permit and shall provide documentation of approval of its application for a water right permit prior to approval of the final master plan. Applicant shall provide, at the time of tentative plat/site plan review for each individual phase of the resort development, updated documentation of the state water right permit and an accounting of the full amount of mitigation, as required under the water right, for that individual phase.***

This condition has been satisfied. Applicant's FMP application included a copy of the Final Order issued by Oregon Water Resources Department (OWRD) documenting approval of the water right application. FMP Ex. K2. The Final Order incorporates a Settlement Agreement, dated March 22, 2007, which resolved all protests to the water right application. The time period for any further appeals of the Final Order expired 60 days following issuance of the Final Order, and no appeals were filed.

In public comments, Gould and others asserted the condition had not been satisfied because OWRD has not yet issued a water right "permit" for the project. See Gould Memo 1, pp.6-7. However, these comments reflect both a misreading of the wording of the CMP condition, and an apparent misunderstanding of the OWRD process for approving applications for new ground water use in the Deschutes Basin. Upon completion of the 60-day appeal period required under the ORS 183.484(2), the Final Order issued by OWRD on March 22, 2007 became final, with no further avenue for appeal. On page 4, the Final Order summarizes its findings, stating "Application G-16385 therefore is approved. . . ." The Final Order includes, as an attachment, a "Draft Permit," and provides that a permit consistent with the draft will be issued upon submission of the required amount of mitigation.

The Final Order constitutes final approval of Thornburgh's water right application. In order to obtain its water right permit, Thornburgh must provide evidence of mitigation within five years. The CMP condition does not require the issuance of water right *permit* at this stage of the land use process. The CMP condition was deliberately worded to recognize the bifurcated process by which OWRD approves ground water applications in the Deschutes Basin, pursuant to the Deschutes Basin Ground Water Mitigation Rules. OAR 690-505-0630. In this case, Thornburgh has obtained final approval of the water right *application* as required in the first sentence of the condition. At the time of tentative plat/site plan review, Thornburgh must provide updated documentation of the state water right *permit*, which will be issued after Thornburgh provides evidence of the amount of mitigation required for at least its first phase of development under the water right. In the BOP, Thornburgh noted that it will provide the required permit documentation and will account for incremental mitigation at the time of tentative plat/site plan review for each individual phase.

> ***11. At the time of submission for Final Master Plan (FMP) approval, Applicant shall include a written plan for entering into cooperative agreements with owners of existing wells within a two-mile radius of Applicant's wells. The plan shall include a description of how Applicant will provide notice to affected well owners and of the terms and conditions of an option for well owners to enter into a written agreement with Applicant under which Applicant will provide indemnification to well owners in the event of actual well interference as a result of Applicants water use. The plan shall remain in effect for a period of five years following full water development by Applicant. Specific terms and conditions of the plan shall be developed in cooperation with County staff and the Oregon Water Resources Department.***

This condition has been satisfied. Thornburgh submitted the required the written plan for entering into cooperative agreements with well owners as FMP Ex. C1.1. The plan describes how Applicant will provide notice to affected well owners, including the terms and conditions under which well owners may enter into an indemnification agreement with Applicant in the event of actual interference as a result of Applicant's water use.

Applicant's BOP describes in detail the process by which Applicant developed specific terms and conditions of the plan in cooperation with County staff and OWRD. BOP, pp. 12-13.

At BOP, pp. 12-13, the County staff report also confirms, "The specific terms and conditions of the plan were developed in cooperation with County staff and [OWRD]."

Several public comments criticized the well indemnification plan. At least one person stated that the plan should include wells beyond the two-mile radius specified in the permit condition. Gould stated the plan was "inadequate" for the reasons explained in separate comments dated June 13, 2008 from Mark Yinger. Gould Memo 1, p.7. The Yinger letter, in turn, states, "No justification is given to support a two-mile radius limit." Yinger asserts the radius should be increased to three miles, and the plan should be extended to 10 years past completion of development. Yinger June 13, 2008 letter, June 17, 2008 Hearing, Ex. E, p. 5. In fact, both the two-mile radius for participation in the voluntary well indemnification plan, and the five-year limit to the plan are prescribed in the CMP approval condition and are not subject to change at this stage of the proceedings.

> ***13. Applicant shall specify all recreational facilities within the proposed resort as part of final master plan submittal.***

Gould objects that Applicant has inadequately "specified" all recreational facilities by giving a list of contemplated recreational facilities. In fact, Applicant has, on various maps and plans, specified the location of the three golf courses, which are by far the most significant recreational facilities; the hotel; the hiking paths and the bicycle trails. These comprise almost all of the amenities listed on the Recreation, Visitor, Commercial Amenities Plan, FMP Ex. 5, A.8.d.1. Any further detail, such as the precise location of the tennis courts, can (and will) be furnished at the time of site plan review.

> ***14. Applicant and its successors shall do the following to ensure that all open space used to assure the 50% open space requirements of Section 18.113.060(D)(1) is maintained in perpetuity:***
>
> > ***A. Applicant shall submit for approval, as part of the Final Master Plan, a delineation of the Open Space that is substantially similar to the area shown in the Open Space Plan submitted as Ex. 9, B-14 to the "Memorandum of Applicant, in response to public comments dated September 28, 2005, Open Space shall be used and maintained as "open space areas" as that term is used in DCC 18.113.030(E).***

As explained above, this has been done.

> ***15. Applicant shall obtain an approved Water Pollution Control Facility (WPCF) permit (as described in DCC 18.113.070(L)) prior to application for Final Master Plan.***

This condition has been satisfied. Applicant's WPCF permit was issued by DEQ on February 14, 2007 and a copy of the permit was included with the BOP as Ex. J1.

As described above, Gould asserts the condition has not been satisfied because the WPCF permit requires a Reclaimed Water Use Plan that was not also submitted into the record, and because the 2007 permit was issued prior to changes in the sewer map. Gould Memo 1, pp. 6-7. In fact, the WPCF permit does not require submission of the Reclaimed Water Use Plan until 90 days prior to beginning use of reclaimed water for the land application system. FMP Ex. J1, p.8. The WPCF permit also confirms on its face that changes to the sewer map do not affect the 2007 permit because the permit requires submission of detailed plans and specifications prior to construction. Id.

Gould also noted that the WPCF permit approves treatment of 326,000 gallons per day ("gpd"), not 625,000 gpd as originally described in Applicant's CMP. Gould Memo 2, pp. 4, 6-9). This discrepancy is addressed in a letter from Bussard Williams, Applicant's technical consultant, explaining that 326,000 gpd is sufficient for the proposed resort. Applicant's August 12, 2008 Rebuttal, Ex. F.3. The letter states "The flow rates used for the CMP were conservative and overestimated the projected sewage flows. The flow rates used for the WPCF permit are consistent with similar resorts found in Central Oregon and are based on standard practice for engineering wastewater treatment facilities."

> ***17. All development within the proposed resort shall meet all fire protection requirements of the Redmond Fire Department. Fire protection requirements shall include all minimum emergency ingress/egress roadway improvements.***

Applicant has complied with this condition throughout the FMP process and will continue to do so throughout all stages of the resort development. Applicant has worked closely with the Redmond Fire Department and Deschutes County Rural Fire Protection District No. 1 ("Rural Fire District") through all phases of the land use process to develop the Wildfire Plan and Evacuation Plan that accompany the FMP. The applicant has also worked jointly with the fire agencies to develop the "Fire Evacuation Route Map," which is attached, in a revised form, as August 12, 2008 Rebuttal Ex. C-2 (also labeled "Ex. F.7.1").

Gould incorrectly characterizes the resort's primary and secondary access points and argues that the access facilities do not comply with the terms of the Oregon Fire Code. Gould Memo 3, p. 1. Gould measures the distance between the two access points on the Cline Falls Highway and contends they do not meet the separation requirements of the Oregon Fire Code.[5] Gould's argument completely ignores the secondary fire access road that will be constructed as part of the resorts "Phase A" development. A copy of the revised "Fire Evacuation Route Map" is attached as August 12, 2008 Rebuttal Ex. C-2. Ex. C-2 depicts (in orange) the fire access routes that will be constructed in Phase A of the development. The Phase A fire evacuation routes include the two Cline Falls access points (referenced by Gould) and the alternative route that provides direct access to Oregon Highway 126. The evacuation routes depicted on Ex.C-2

[5] Gould references what she calls the "Oregon Fire Code," but quotes a road separation requirement that appears in Section D104.3 of the International Fire Code.

fully comply with the separation requirements of the International Fire Code, which is the applicable legal standard. August 12, 2008 Rebuttal Ex. C-3 provides an analysis of Section D104.3 of the International Fire Code and demonstrates that the northern and southern access connections meet the separation requirements of the code. The resort's secondary access route to the Cline Falls Highway (in Section 28) will provide an alternative route in the case of fire or emergency, but this is not required under the International Fire Code.

> ***19. Applicant shall implement a "Wildfire/Natural Hazard Protection Plan" for the resort, as identified in Ex. 15, B-29 of the BOP. Prior to approval of the Final Master Plan and each subdivision and site plan, Applicant shall coordinate its evacuation plans through the development phase with the Deschutes County Sheriff's Office and the Redmond Fire Department. At the same time, Applicant shall also coordinate its plans for the movement of evacuees over major transportation routes with the Oregon State Police and the Oregon Department of Transportation.***

The applicant has developed the Wildfire/Natural Protection Plan for the Thornburgh Destination Resort ("Wildfire Plan"). A copy of the Wildfire Plan is contained in the original FMP application as Ex. F2. In compliance with the above criteria, the report was developed in close coordination with Redmond Fire, the Rural Fire District and the Deschutes County Sheriff's Office. The applicant has also prepared the Evacuation and Emergency Preparedness Planning document ("Evacuation Plan") that is contained in the original FMP application as Ex. F3 and the Public Safety Protection Report for the Thornburgh Resort, which is attached as Ex. F5. In addition, Applicant has worked with Redmond Fire and the Rural Fire district to create the Fire Evacuation Route Map, which is attached as August 12, 2008 Rebuttal Ex. C-2. As referenced in the Evacuation Plan at page 8, the movement of any evacuees over major transportation routes must be directly coordinated with the Oregon State Police and the Oregon Department of Transportation. Both the Wildfire Plan and the Evacuation Plan contemplate further ongoing coordination with Redmond Fire, the Rural Fire District and the Sheriff's Office as individual phases of the resort are developed. In accordance with Applicant's annexation plan, the evacuation plan and fire evacuation route map were submitted to Redmond Fire and the Rural Fire District. Fire Chief Tim Moor has submitted a letter dated March 25, 2008, FMP Ex. F8, which states the Thornburgh Evacuation Plan provides "an adequate framework to address the overall evacuation planning needs for this proposed resort" and promises additional review as Applicant submits individual subdivision plans and site plans.

Gould argues there are inconsistencies between the phasing and construction of emergency access routes and the resort's internal system of paved roadways. Gould Memo 3, p. 4. Gould correctly notes that fire access roads will be constructed in a somewhat different sequence than the system of improved roadways that are designed to serve residential, recreational and commercial amenities within the boundaries of the resort. The Fire Evacuation Route Map, August 12, 2008 Rebuttal Ex. C-2, depicts the location of fire evacuation roads and the timing of route construction. As noted above, the Fire Evacuation Route Map requires the construction of a secondary fire access road as part of Phase A construction, to provide a direct link to Oregon Highway 126 that can be utilized in the event of a fire or other emergency. CMP

Condition 4 requires this roadway to be improved "to a minimum width of 20-feet with an all-weather surface capable of supporting a 60,000-lb fire vehicle." This route must be "improved before any Final Plat approval or the issuance of a building permit, whichever comes first." In addition, CMP Condition 17 requires that the development adhere to all minimum emergency ingress/egress roadway improvements that are mandated by the Redmond Fire Department.

In contrast, the CMP Phasing Plan depicts the location of the improved roadway system that will serve resort development and the timing of road construction in relation to resort phasing. A revision of the Phasing Plan is attached as August 12, 2008 Rebuttal Ex. D-1. Ex. D-1 illustrates the timing of road system improvements to provide access to the different phases of resort development. CMP Condition 5 requires the developer to design and construct the internal resort road system in accordance with Title 17 of the Deschutes County Code, with road improvement plans approved by the County Road Department prior to any construction. The applicant acknowledges that it will need to build and maintain certain fire access routes before fully improving and paving such routes to serve phased resort development. The applicant is prepared to accept a condition of FMP approval that requires the construction and maintenance of fire evacuation routes consistent with the phasing outlined in Ex. C-2 and any construction requirements imposed by Redmond Fire. Consequently, any inconsistencies between the Fire Evacuation Route Map and the CMP Phasing Plan are immaterial. The record contains a letter from the City of Redmond Fire Department (dated September 10, 2008) stating that they have reviewed the Fire Evacuation Route Map submitted as August 12, 2008 Rebuttal Exhibit C-2. The department notes that this map is consistent with prior evacuation planning maps reviewed by the fire department. To the extent this map differs from any prior versions of the maps, the Fire Department expressly states that it "will not affect fire or public safety issues within the resort project". *See Applicant's September 11, 2008 Final Rebuttal Documents.*

Gould points to minor differences in specific roadway alignments in an attempt to demonstrate inconsistencies between the CMP and FMP. Applicant acknowledges that the general roadway alignments depicted in the access and circulation plan that accompanied the CMP (CMP Ex. A-1.6) do not reflect the detailed topography and alignment data that has been incorporated in the Access, Circulation and Trail Plan submitted as FMP Ex. A-7.1. The roadway alignments illustrated on FMP Ex. A-7.1 are a further refinement of the CMP work that was facilitated by the additional site work and analysis conducted on the subject property after CMP approval. The roadway alignments in FMP Ex. A-7.1 are also reflected in the Fire Evacuation Route Map and other exhibits that are part of the FMP. The refinement of roadway alignments, consistent with topographic and other site data, is the type of fine tuning that is contemplated by the County's three-stage resort approval process. Further refinement of road alignments will undoubtedly occur at the time of the subdivision and site plan process.

***24. Applicant shall complete annexation of the property in any area of development into Deschutes County Rural Fire Protection District No. 1 before commencing combustible construction in the area.***

The entire subject property has been annexed into the boundaries of Deschutes County Rural Fire Protection District No. 1. A transmittal letter from Deschutes County Legal Counsel to the Oregon Department of Revenue is attached as Attachment 10 of Applicant's July 15, 2008

submission to the Hearings Officer. Attachment 10 contains a certified copy of the County Commissioner's Order Approving the Thornburgh Resort Annexation request (Order No. 2008-44). While no combustible construction will be authorized through the FMP process, Applicant has already satisfied this condition.

> ***29. Applicant shall abide at all times with the MOU with ODOT, regarding required improvements and contributions to improvements on ODOT administered roadways (Agreement Number 22759, dated 10/10/05).***

As stated in response to DCC 18.113.090(L) (above) and in its July 15, 2008 Response to the Hearings Officer, Applicant continues to abide by the terms of its MOU with ODOT, regarding improvements and contributions on ODOT administered roadways. The applicant has worked directly with ODOT and developed a "Cooperative Improvement Agreement" that defines the timing and scope of Applicant's contributions to the infrastructure improvements specified in the MOU. The record contains email correspondence from ODOT that illustrates the level of ongoing cooperation and coordination between Applicant and the agency. An email from Mark DeVoney, (ODOT's Region 4 Program and Planning Manager), which is Attachment 12 to Applicant's July 15, 2008 submission, states:

> "I am writing to confirm that I support the general terms of the most recent draft Cooperative Improvement Agreement we have worked on together. I have worked closely with our Region Manager and he also supports these terms. We appreciate Thornburgh's willingness to substantially increase the level of its financial contribution to reflect the increased costs of infrastructure improvements in this location."

Since the email, the agreement has been forwarded to the Attorney General's Office and the Oregon Transportation Commission for review and approval. August 12, 2008 Rebuttal Ex. C-5 contains an email from ODOT requesting review of the agreement and placement of the item on the OTC agenda for fall 2008. August 12, 2008 Rebuttal, Ex. C-4 indicates that ODOT's planning efforts for the Highway 20/Cline Falls Highway interchange will begin in the fall of 2008.

Contrary to Gould's baseless allegations, Applicant has diligently complied with the terms of its agreement with ODOT. In the unlikely event that negotiations between Applicant and ODOT were ever to reach an impasse in the future, the MOU provides that the parties will initiate a collaborative mediation process, as prescribed by the Oregon Consensus Program. Doing so would be another form of compliance with the MOU, but no one expects mediation to be necessary. In sum, Thornburgh continues to abide by the terms of the MOU, and the record contains no evidence to the contrary.

In connection with this criterion, Gould attempts to incorporate the CMP approval standards of DCC 18.113.070(G) and to require Applicant to complete a new traffic analysis for the project. Gould references an email from Applicant's traffic engineers that was provided in response to a question that concerned the impact of traffic on wildlife resources. Gould Memo 2, p. 5. Gould contends the email demonstrates a significant change in traffic conditions that

warrants a completely updated traffic study for the resort. Gould's underlying factual analysis is incorrect, and, as discussed above in connection with Gould's effort to reapply the CMP criteria to this FMP application, no further traffic analysis should be required in this instance. Moreover, the FMP approval criteria, DCC 18.113.090(A)-(N), do not require an analysis of traffic impacts at the final master plan stage of development, because the impacts of resort development were analyzed and addressed with the CMP.

August 12, 2008 Rebuttal Ex. C-1 is a technical letter from Traffic Engineer, Christopher Clemow, addressing Gould's claim that traffic impacts have changed. Clemow explains that Gould has improperly compared "average daily traffic" ("ADT") numbers from a year 2005 field count, on the one hand, with traffic projections made for year 2015, on the other hand. Clemow adds that the ADT numbers referenced in connection with the wildlife analysis are consistent with the numbers used in Applicant's underlying Traffic Impact Analysis ("TIA"), when these are increased to reflect the appropriate time frame. The wildlife analysis simply utilized the projected ADT numbers for 2015; none of the underlying assumptions from the traffic report have changed. Clemow explains:

> "Resort development assumptions, including impacts for the northern and southern areas have not changed from those contemplated in the CMP TIA. Further, area background growth has been consistent with TIA estimates." August 12, 2008 Rebuttal Ex. C-1, p.2.

In her Third Supplemental Opposition Memorandum, Gould incorrectly argues that an additional roadway connection between the northern and southern portions of the resort will provide "quicker access" and thus impact traffic distribution from the resort. This argument is contradicted by the September 11, 2008, analysis submitted by traffic engineer, Chris Clemow. *See Applicant's September 11, 2008 Final Rebuttal Documents.* Clemow explains that an additional internal road connection will not alter trip distribution from the resort. Clemow further explains that an additional road connection will not result in more traffic distributed to Tumalo and that the Traffic Impact analysis submitted with the CMP continues to reflect anticipated traffic impacts associated with the resort development.

***30. Applicant shall submit a detailed traffic circulation plan, delineating resort access roads, resort internal circulation roads and resort secondary emergency ingress/egress roads, prior to Final Master Plan approval.***

A detailed "Access, Circulation and Trail Plan" is at FMP, Ex. 1, A7.1. The plan delineates the two primary resort access points that are located at the northern and southern ends of the property, together with an additional road connection to the Cline Falls Highway in Section 28. This exhibit also outlines the resort's internal circulation roads. The specific roadway alignments have been refined since the CMP process based on additional site and topographic data obtained by Applicant. August 12, 2008 Rebuttal Ex. C-2 illustrates the location and phasing of the fire evacuation roads that will be utilized as emergency ingress/egress roads. The plan also outlines the resort's internal circulation roads as well

***33. The Resort shall, in the first phase, provide for the following:***

***A. At least 150 separate rentable units for visitor-oriented lodging.***

***B. Visitor-oriented eating establishments for at least 100 persons and meeting rooms which provide eating for at least 100 persons.***

***C. The aggregate cost of developing the overnight lodging facilities and the eating establishments and meeting rooms required in DCC 18.113.060(A)(1) and (2) shall be at least $2,000,000 (in 1984 dollars).***

***D. At least $2,000,000 (in 1984 dollars) shall be spent on developed recreational facilities.***

***E. The facilities and accommodations required by DCC 18.113.060 must be physically provided or financially assured pursuant to DCC 18.113.110 prior to closure of sales, rental or least of any residential dwellings or lots.***

Gould objects that "the Applicant apparently does not identify the location of the 150 units that are supposedly in the first phase." Gould Memo 1, p. 9. The location of the first phase ("Phase A") is shown on the Revised Phasing Plan, which is included in Applicant's August 12, 2008 Rebuttal, Ex. D.1. The Overnight and Density Calculations chart, which is included in the CMP approval on remand (Condition 36) and which is presented by Applicant during the FMP approval process, shows that there will be 150 units of residential overnight lodging in Phase A.

***34. Where construction disturbs native vegetation in open space areas that are to be retained in a substantially natural condition, Applicant shall restore the native vegetation. This requirement shall not apply to land that is improved for recreational uses, such as golf courses, hiking or nature trails or equestrian or bicycle paths.***

Gould objects that Applicant fails to identify open space areas that are to be retained in a substantially natural condition or other open space areas that protect other open space values. This objection is addressed above (under DCC 18.113.090(A)).

***37. (Condition 36 on remand) Applicant shall modify the Overnight and Density Calculations chart presented to the Board at the appeal hearing on December 20, 2005 by replacing it with the Overnight and Density Calculations chart included at page***

***25 in Applicant's final legal argument, dated January 3, 2006, as shown below. The 75 units of overnight lodging shown in the December 20, 2005 Overnight and Density Calculations table to be developed in Phase C will actually be developed in Phase B, for a total of 150 units in Phase B. The Overnight and Density Calculations table will be corrected to show the 50 hotel units will be developed in Phase D, where the Phasing Plan, attached to the Memorandum of Applicant in Response to Public Comments, Ex. 13, Revised B-1.8, already shows the hotel will be developed. Additionally, the legend in the Phasing Plan will be corrected to show hotel and residential overnight lodging uses in Phase D.***

Gould objects that Applicant has not submitted a revised phasing plan. The Revised Phasing Plan, which shows overnight lodging in Phase D, Pod 30, is included in August 12, 2008 Rebuttal Submission, Ex. D.1. The corrected Overnight and Density Calculations chart, which is included in the CMP approval on remand (Condition 36), which was presented by Applicant in its final argument to the BOCC on January 3, 2006, and which is presented by Applicant during this FMP approval process, shows that there will be 150 units of residential overnight lodging in Phase A.[6]

***38. (Condition 37 on remand) Applicant shall demonstrate compliance with DCC 18.113.070(D) by submitting a wildlife mitigation plan to the County as part of its application for Final master plan approval. The County shall consider the wildlife mitigation plan at a public hearing with the same participatory rights as those allowed in the CMP approval hearing.***

*Introduction*

In *Gould II*, the Oregon Court of Appeals remanded the 2006 CMP Decision to the BOCC, which then imposed the above condition. The Court of Appeals stated:

"LUBA's opinion and order was unlawful in substance for the reasons that follow. First, the county's findings were inadequate to establish the necessary and likely content of any wildlife impact mitigation plan. Without knowing the

[6] For the Hearings Officer's convenience, the Overnight and Density Calculations Table is reproduced below:

| ITEM | Phase A | Phase B | Phase C | Phase D | Phase E | Phase F | Phase G | Totals |
|---|---|---|---|---|---|---|---|---|
| Residential Single Family (RSF) | 300 | 150 | 150 | 125 | 125 | 50 | 50 | 950 |
| Hotel Overnight | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 50 |
| Residential Overnight | 150 | 150 | 0 | 63 | 62 | 0 | 0 | 425 |
| Net Overnight | 150 | 150 | 0 | 113 | 62 | 0 | 0 | 475 |
| Cumulative RSF | 300 | 450 | 600 | 725 | 850 | 900 | 950 | 950 |
| Cumulative Overnight | 150 | 300 | 300 | 413 | 475 | 475 | 475 | 475 |
| RATIO-RSF/Overnight | 2.00 | 1.50 | 2.00 | 1.76 | 1.79 | 1.89 | 2.00 | 2.00 |

specifics of any required mitigation measures, there can be no effective evaluation of whether the project's effects on fish and wildlife resources will be 'completely mitigated,' as required by DCC 18.113.070(D). ORS 215.416(9) requires that the county's decision approving the CMP explain 'the justification for the decision based on the criteria, standards and facts set forth in the decision.' The county's decision is inconsistent with ORS 215.416(9) because the decision lacks a sufficient description of the wildlife mitigation plan, and justification of that plan based on the standards in DCC 18.113.070(D). Second, that code provision requires that the content of the mitigation plan be based on 'substantial evidence in the record,' not evidence outside the CMP record. In this case, the particulars of the mitigation plan were to be based on a future negotiation, and not a county hearing process. Because LUBA's opinion and order concluded that the county's justification was adequate despite those deficiencies, the board's decision was 'unlawful in substance.'" 216 Or App at 159-60.

In summary, the court required Applicant to supply first, the specifics of any required mitigation measures and provide a sufficient description of the wildlife mitigation plan and justification of that plan; and second, place substantial evidence in the record to support the plan. Contrary to the claims of some resort opponents, the court did not make the standard stricter. Instead, its decision addressed the timing of the plan's presentation. In response to the court's decision and the above condition, Applicant has addressed wildlife mitigation in two plans: one for terrestrial wildlife mitigation and one for fish mitigation. Applicant's wildlife mitigation plans address DCC 18.113.070(D), which requires that "Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource."

In her July 7, 2008 memorandum to the parties and in statements at the hearings, the Hearings Officer invited the parties to explain the actual meaning of the standard and expressed concerns about whether any adopted wildlife mitigation plan would truly be implemented.

Applicant understands "the resources" to mean fish and wildlife resources as a whole. To "completely mitigate," a proper mitigation plan must avoid "net loss or net degradation of the resource," meaning that while there may be some loss to one species or habitat location, it will be compensated for by an equivalent gain to another or others. The best way to achieve mitigation, and the way that has been approved by the County and the Oregon Department of Fish and Wildlife ("ODFW") in all previous destination resort applications, is to calculate damage to habitat as a result of development and then work on habitat improvement on- and off-site. This approach, which is standard in both federal and state mitigation plans, is intended to use habitat improvement to increase the opportunities for wildlife by an amount commensurate to the lost opportunities resulting from development. That way there will be no net loss or net degradation of the resource.

The evidence supporting the terrestrial and fish components of Applicant's wildlife mitigation plan responds to different technical questions posed by opponents. Both components have been endorsed by ODFW. In a letter dated June 13, 2008, which was included (with the emails discussed below) in Applicant's June 17, 2008 submission as Exhibit B ("ODFW Letter"), ODFW notes:

"The wildlife habitat impact assessment (WHIA) submitted by the Resort [Applicant] in their Final Master Plan is the most complete WHIA conducted for the siting of a destination resort in central Oregon. ODFW recommended the Resort use a modified Habitat Evaluation Procedures (HEP) methodology to assess projected impacts on the wildlife resource. ODFW has recommended the use of a modified HEP to all proposed destination resort sitings in Central Oregon since 1994."

In a subsequent email, dated June 16, 2008, Steven George of ODFW commented further: "[T]he wildlife habitat mitigation plan, if followed as outlined, should address the mitigation requirements for Deschutes County." Glen Ardt of ODFW supplemented that comment in a June 17, 2008 email, in which he stated, "The intent of the wildlife mitigation section was to point out that implementation of the mitigation plan, if followed as outlined, *should address the mitigation requirements for Deschutes County.*[7] (Emphasis added.) Likewise, the plan is conceptual until implemented, yet there are checks in the plan to help assure implementation will be implemented as intended."

While addressing aquatic wildlife, ODFW comments, "Under state law the Thornburgh Resort LLC has fully met its mitigation requirements for offsetting its groundwater use in the Deschutes Groundwater Study Area." ODFW Letter, p. 2. The letter then focuses on the requirements of DCC 18.113.070(D), as it applies to the effect of groundwater pumping within the study area on local springs. After some discussion, ODFW concludes, "[P]roviding the proposed mitigation outlined above should mitigate for potential impacts on springs and seeps and provide a net benefit to the [aquatic] resource."

When deciding past destination resort applications, and, in particular, in determining if DCC 18.113.070(D) has been satisfied, the County has given great weight to the opinion of ODFW, as the agency charged with giving advice to the County on wildlife issues:

- In a May 23, 2001 decision, the BOCC deciding the Eagle Crest, Inc. (Eagle Crest III) application (CU-99-85) stated simply, "The Board finds that it is appropriate for the Board to rely on the opinion of ODFW in assessing the adequacy of Applicant's Mitigation Plan."

- In a January 4, 2005 decision, the County hearings officer deciding the Cascade Highlands L.L.C. (Arrowood) application (CU-04-94) noted that the applicant had submitted a wildlife plan and "indicated that the revised plan, dated November 2004, is satisfactory to ODFW staff." The hearings officer then imposed a condition that "the applicant provide evidence that ODFW supports the mitigation outlined in the applicant's November 2004 wildlife plan."

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[7] Gould disputes that ODFW has concluded the Applicant's wildlife plan meets the requirements of DCC 18.113.070(D), but instead only meets ODFW's own mitigation requirements. Gould Memo 3, p. 11. To agree with Gould would require verbal sophistry at the same level as the famous Clinton statement: "It depends what the meaning of the word 'is' is." (Anyway, Clinton argued, Bennett was speaking in the present tense. "It all depends," said the president, "on what the meaning of the word 'is' is. If the -- if he -- if 'is' means is and never has been, that is not -- that is one thing. If it means there is none, that was a completely true statement . . .")

- In a March 5, 2001 decision, the County hearings officer deciding the High Desert Development Partners LLC (Pronghorn) application (CU-00-118) stated, "The Hearings Officer is not a wildlife biologist. Therefore, as in previous land use matters, I must rely to a considerable extent on the opinions of experts, including the applicant's consultants and ODFW biologists." She then noted ODFW's support for the application and imposed a condition of approval essentially relying on ODFW's finding that the plan will satisfy the "no net loss standard."[8]

- In an August 22, 1995 decision, the County hearings officer deciding the Eagle Crest Partners, Ltd. (Eagle Crest II) application (M-95-1) noted, "ODFW agreed that proposed plan will mitigate all wildlife impacts," proceeded to find compliance with DCC 18.113.070(D) on that basis, and imposed a "continuing condition of approval, to be enforced at the time of platting of each phase of development."

While it is the County, not ODFW, which has the ultimate responsibility to apply DCC 18.113.070(D), ODFW is an impartial voice. It is the agency charged (by OAR 635-415-0015) with making recommendations to local agencies regarding development actions for which mitigation for impacts to fish and wildlife habitat is authorized by land use regulations. A fair reading of its submissions indicates that ODFW has concluded that both the terrestrial/wildlife and the aquatic/fish components of Applicant's wildlife mitigation plan meet the requirements of DCC 18.113.070(D). Indeed, ODFW played a major role in developing Applicant's wildlife mitigation plan before concluding that the plan, "if followed as outlined, should address the mitigation requirements for Deschutes County."

*Terrestrial/Wildlife Plan*

A. Applicant's Mitigation Plan

As explained in earlier submissions by Thornburgh's counsel,[9] ODFW directed Applicant's preparation of a terrestrial wildlife mitigation plan. ODFW states, "Since November 2004, ODFW has invested hundreds of hours providing recommendations to the Resort and Deschutes County regarding assessed projected Resort impacts on fish and wildlife resources and measures the Resort could implement those projected impacts." ODFW Letter, p. 1.

The plan itself is presented in two documents: "Thornburgh Resort Wildlife Mitigation Plan for Thornburgh Resort" ("WMP"), April 15, 2008, which is FMP, Ex. 12, L2, and "Off-Site Habitat Mitigation and Monitoring Plan for the Thornburgh Destination Resort Project" ("MM

[8] After the Oregon Court of Appeals decision in *Gould*, it is not possible to delay presentation of a final plan until after CMP approval. However, the purpose of this discussion is not to demonstrate that it is enough to substitute ODFW's approval for the presentation of a plan, but that ODFW's approval has been used to justify the County's approval of the plan.

[9] *See* FMP Ex. 12, L2; Applicant's June 17, 2008 submission, Exs. A and B; Applicant's July 17, 2008 submission, Exs. G/H (Items 1, pp. 6-12; 5; 6; 7; 8; and 9); Applicant's August 12, 2008 Rebuttal, Sections A and B; and Applicant's September 11, 2008 Rebuttal, Tetra Tech materials.

Plan"), which is August 12, 2008 Rebuttal, Ex. B-3. In addition to these documents, Applicant has submitted third-party documents describing and endorsing the plan, including the following:

- Letter and emails from ODFW, discussed above, submitted on June 17, 2008;
- Letters and emails from the United States Department of the Interior, Bureau of Land Management ("BLM"), including August 12, 2008 Rebuttal, Ex. B-2 and B-9;
- A Memorandum from applicant's expert, Lynn Sharp, at Tetra Tech to the Hearings Officer called "Response to Wildlife Mitigation Plan Questions 2-5 dated July 7, 2008," which was submitted on July 15, 2008;
- An August 12, 2008 letter from Sharp, in question and answer format, addressing specific arguments raised by opponents, August 12, 2008 Rebuttal, Ex. B-13;
- The Shepherds' Flat Wind Farm Revegetation Plan and Habitat Mitigation Plan, August 12, 2008 Rebuttal, Ex. B-6;
- An excerpt from a United States Fish and Wildlife Service ("USFWS") Publication, called "Habitat as a Basis for Environmental Assessment," August 12, 2008 Rebuttal, Ex. B-10;
- A BLM publication called "Ecological Site Inventory," August 12, 2008 Rebuttal, Ex. B-11;
- The "Thornburgh Cumulative Impacts Assessment," prepared by Tetra Tech, August 12, 2008 Rebuttal, Ex. B-14;
- Tetra Tech responses to Gould Memo 4, September 11, 2008 Rebuttal.

The plan will be implemented in part on-site and in part-off site, on BLM land. Its goal is to avoid a net loss in wildlife habitat value occurring within the resort boundary and an area within one mile of the resort property. WMP, p. 2. The proposed development will include (1) 615 acres of managed grassland and juniper shrub-steppe (i.e., golf course);[10] (2) 426 acres of

[10] The number in the text of the WMP (611 acres), which was shown in Table E-2, has been adjusted to 615 acres to harmonize with the Revised Open Space Plan, BOP Ex. 1, A1.1, which shows the sum of the golf course acreage plus the water features acreage to be 660 acres. The 615-acre figure is now shown on revised WMP Table E-2, which was submitted on August 25, 2008. The acreage number for resort facilities was accordingly adjusted down, from 320 acres to 316 acres. These minor adjustments have no impact on the analysis in the WMP; if anything, they increase the number of post-mitigation habitat units ("HUs") slightly. For the rest of this discussion of the WMP, the original numbers are used, since they are found in the text of the WMP and making constant adjustments is potentially confusing.

Table E-2 was revised slightly to respond to the objections of opponents who focused on minor discrepancies between different exhibits. These discrepancies are insignificant and can be worked out in subsequent development phases.

residential use; (3) 316 acres of resort facilities; (4) 45 acres of golf course water features, streams and lakes; (5) 568 acres in native condition. WMP, pp. 3-4.

As noted above, ODFW suggested a habitat modeling approach that uses a modification of the USFWS Habitat Evaluation Procedures ("HEP") analysis. With ODFW's backing, this approach has been taken in connection with other Deschutes County destination resort approvals, including, most recently, Eagle Crest III. A full description of the habitat modeling approach is included at WMP, pp. 4-6. As explained there, HEP is an accounting method that looks at conditions before and after development, using HUs as a measurement of habitat quality. At the suggestion of ODFW, Applicant selected seven evaluation species, which were the same (with one exception) as those used in the Eagle Crest III HEP analysis. Then, as explained in the WMP, the HUs for each species were calculated (1) before development; (2) after development; and (3) after development and mitigation. In order to compare the impacts of development and enhancement, Tetra Tech estimated Habitat Suitability Indices ("HSIs") for each species, sub-area (i.e., undeveloped, residential, facilities, golf course and lakes), and stage of development. The HSIs were multiplied by the acreages associated with the sub-areas, as shown in Table E-2, to come up with HUs for each species. The pre- and post-development HSIs were determined collaboratively with ODFW, using best professional judgment. WMP, p. 5.

The WMP includes a discussion of the mitigation techniques that will be implemented onsite and offsite. WMP, pp. 6-13. The onsite mitigation will reduce the loss of HUs to 6,414 onsite. Approximately 8,474 HUs (6,414 HUs onsite plus 2,060 HUs in the area within one mile offsite) must be mitigated through the offsite mitigation process. As explained at WMP, p. 12, the mitigation ratio for the property will be approximately 2.3 acres of mitigation per acre of habitat developed. As illustrated in WMP Table 2, WMP, p. 15, the anticipated cost of mitigation will be a total of $863,190, plus an additional $20,000 for mitigation of traffic impacts, for a grand total of $883,190 (in 2009 dollars). As described in the WMP, pp. 13-14, the funding will be provided in phases to meet the no-net-loss and no-net degradation standard on the resort property. A property transfer fee shall be collected in perpetuity and used to fund ongoing mitigation. By making an annual report to Deschutes County, BLM and ODFW by December 31 of each year, Applicant can demonstrate compliance with the mitigation requirement. Approval of the FMP application can be conditioned on Applicant's following the steps described in the WMP.

The MM Plan complements the WMP by clarifying how offsite mitigation will be implemented on whatever BLM land is ultimately decided upon as the receiving site for mitigation. As explained, the object of the MM Plan is to:

> "1) outline the methods that will be used to characterize existing habitat conditions in the area proposed for mitigation; 2) specify the types of habitat treatments used to enhance habitat for wildlife, and 3) develop a monitoring plan that will monitor the effectiveness of the habitat treatments through either direct or indirect means. The methods used in this Plan have been structured such that they could be applicable to any parcel of land within the Cline Buttes Recreation Area (CBRA) that the BLM is suitable for mitigation once the [Cline Buttes Recreation Area Plan] CBRAP has been finalized." MM Plan, p. 1.

The MM Plan provides a clear path for successful mitigation even though, because the CBRAP still has not been finalized, it is not yet possible to identify the exact site where mitigation will occur. The MM Plan does not substitute BLM priorities for those of the County as expressed through the WMP. Rather, it acknowledges the effect the BLM priorities will have on the sites on which mitigation will occur. Because offsite mitigation will occur on BLM land, it is essential that the BLM approve of that mitigation. The letter from Molly M. Brown, BLM Field Manager for the Deschutes Resource Area (signed by a representative), August 12, 2008 Rebuttal, Ex. B-2, indicates that the proposed mitigation "would meet the wildlife and habitat resource objectives of the UDRMP, and would help to ensure successful implementation of the CBRAP." Better yet, the BLM "anticipates the possibility that any support of funding provided for mitigation actions [i.e., Applicant's contribution to mitigation] may be used as a match for additional grant funding, to allow larger scale benefits for public land management in the area." Id. These benefits would be in addition to the mitigation required of Applicant by DCC 18.113.070(D). Three areas are identified for possible mitigation: The Maston Allotment (Primary Wildlife Emphasis Area), Canyons Region (Secondary Wildlife Emphasis Area); and the Deep Canyon Region (General Wildlife Emphasis Area). MM Plan, p. 3.

Consistent with the WMP, a baseline survey will be conducted to select the appropriate treatments within the area chosen for mitigation. The general methods used to collect baseline habitat conditions will follow methods used by the BLM to perform Ecological Site Inventory assessments but will be altered, based on site-specific conditions. MM Plan, p. 3. This will be a substantial effort: Applicant has submitted an example of such an Ecological Site Inventory as August 12, 2008 Rebuttal, Ex. B 11.

Then the mitigation techniques described in Section 4.0 of the MM Plan, which are consistent with the less specific discussion of approaches discussed in the WMP, will be selectively employed. Finally, an annual monitoring plan, as described in Section 5.0 of the MM Plan, will be implemented to determine the effectives of the habitat treatments and to monitor progress. "Adaptive management," as defined in the MM Plan, p. 13, will be used to ensure the desired outcomes are reached. In layperson's terms, this means that if a particular strategy requires amendment because of unsatisfactory results, the strategy will be amended until it works.

B. Response to Public Comment

Gould employed two consultants to object to the WMP: David Dobkin and Bret Michalski. Their objections, stated in letters submitted addressed to Gould's attorney, Paul Dewey, prior to or at the June 17, 2008 hearing, are not restated in full here. Their focus is not on habitat remediation but on precision in counting individual species to establish a baseline as a means to measure mitigation success and criticism of various details and perceived uncertainties in the WMP. Following the hearing, the Hearings Officer provided written questions to Applicant. Those questions pertaining to wildlife are thoroughly addressed in materials submitted by Sharp at Tetra Tech in a July 15, 2008 Memorandum. Sharp emphatically disputes the assumption by Dobkin and Michalski that the modified HEP approach taken in the WMP is less reliable than the animal population studies they favor. She points out that the HEP methodology used in this case was designed by the USFWS specifically to quantitatively document baseline habitat values, to define impacts, and therefore to define mitigation needs.

She explains the choice of sample species used in Applicant's HEP analysis. She furnishes an "iterative chart," which covers several years (September 2004 to April 2008), and describes how ODFW and she worked together, essentially following ODFW's plan, to arrive at the WMP.

Sharp also addresses the Hearings Officer's concerns about cumulative impacts, pointing out that they were considered in the modified HEP analysis. She notes that development of the resort will not block movement of animals because the proposed resort is surrounded by BLM-managed land on three sides.

Sharp explains how mitigation payments were determined and rebuts opponents' contentions that the "Firewise" development standards could inhibit maintenance or restoration of on-site habitat. She notes that these development standards actually result in vegetative structure and species composition that is closer to the original old growth juniper vegetation of the area than current conditions, where settlement and fire suppression have resulted in the invasion of young junipers and invasive herbaceous species, such as cheatgrass.

Sharp also included a section in her memorandum where she responded to the specific issues raised by Dobkin and Michalski. She attached various emails and file notes to show that ODFW and BLM were full participants in the development of the WMP and that their suggestions and concerns were heeded.

In subsequent letters to Dewey, which were entered into the record on July 29, 2008, Dobkin and Michalski responded to Sharp and Tetra Tech by restating their objections and arguing once more that their species-based approach to data collection would produce a superior result to the HEP analysis approach taken by Tetra Tech, ODFW and BLM. In response, Sharp submitted a letter addressing each of the opponents' arguments. August 12, 2008 Rebuttal, Ex. B-13. Sharp also created a "Thornburgh Cumulative Impacts Assessment"; this expands on her earlier assessment of the likely impact of the resort on wildlife in the area. August 12, 2008 Rebuttal, Ex. B-14.

Applicant has submitted a number of rebuttal exhibits intended to address the "Sky is falling!" claims of opponents. One is an email from Glenn Ardt, at ODFW, to Dewey, explaining why ODFW did not "request a full HEP with models and field measurements" from Applicant because of its experience with the Running Y Resort in Klamath County. There, ODFW "worked with the developer on a full HEP, resulting in the collaborative group tweaking the models and results until we got numbers that made sense." Ardt goes on to say, "The Delphi method was used to adjust the models until the group obtained results that made sense. Each evaluation species model weighs different habitat characteristics based on overall importance to the species, hence the tweaking until it made sense." August 12, 2008 Rebuttal, Ex. B-1. This makes clear that the clamoring by opponents for more data would not produce more certainty. The data would still be subject to interpretation and "tweaking until it made sense."

To establish the soundness of the HEP approach to wildlife habitat mitigation, Applicant submitted a USFWS publication dated September 15, 1980, which describes the use of habitat as a basis for environmental assessment. August 12, 2008 Rebuttal, Ex. B-10. The publication notes, "Prior to the 1980 edition of HEP, this was done subjectively based on the professional judgment of a team of scientists." It is clear that opponents are wrong when they reject

professional judgment as unreliable and they are equally wrong when they portray a HEP analysis as inherently flawed because it relies on professional judgment.

History as context is important in deciding how to apply DCC 18.113.070(D). Besides a large number of County destination resort approval decisions, which demonstrate the important role ODFW has played in the County's consideration of DCC 18.113.070(D), August 12, 2008 Rebuttal, Ex. B-12, Applicant has submitted the Shepherd's Flat Wind Farm: Revegetation Plan and the Shepherd's Flat Wind Farm: Habitat Mitigation Plan. August 12, 2008 Rebuttal, Ex. B-6 and B-7. Both plans are intended to fully mitigate for impacts on wildlife and vegetation. Both are good examples of acceptable plans that are in some ways similar to the WMP submitted with this application.

In response to August 12, 2008 Rebuttal materials, Gould submitted an additional letter from Dobkin, dated August 27, 2008. Dobkin disputes some of Sharp's contentions and restates his objections to the WMP. Sharp responded to Gould's (and Dobkin's) contentions in her letter dated September 11, 2008. September 11, 2008 Rebuttal. She also submitted two studies: Blake et al, "Annual Variation in Bird Populations of Mixed Conifer – Northern Hardwood Forests (1994)," and de Lucas et al, "A bird and small mammal BACI and IG design studies in a wind farm in Malpica (Spain) (2005). These show that surveys of the type desired by Dobkin and Michalski would have such high variance due to small sample size that replication of these surveys after mitigation would probably not show statistically significant differences. As explained by Sharp, "What this means is that the data that would be obtained in these kinds of surveys will be so variable that comparison of the pre-project and post-project/mitigation survey results will not accurately demonstrate whether the DCC standard is met or not." Sharp letter, September 11, 2008 Rebuttal, p. 3.

It is clear that a classic battle of experts is occurring, where neither side can persuade the other. Opponents are asking County decision makers to discard their entirely appropriate reliance on ODFW, the agency charged with addressing wildlife issues and advising the County, and instead become independent experts on wildlife habitat mitigation. They argue that the HEP approach taken to mitigation in the past, an approach that is standard for both federal and state agencies, should be abandoned for their approach, which is attractive to them because it makes mitigation impossible. By now it should be obvious that no matter how many species Applicant considers, no matter how many studies Applicant performs, and no matter how strong a commitment Applicant makes to habitat mitigation, the opponents cannot be appeased. It is impossible to eliminate subjective professional judgment from wildlife mitigation analysis. That does not mean it is impossible to satisfy DCC 18.113.070(D).

C. Gould's Arguments

Gould has now filed four memoranda in opposition to the FMP application. Some of her arguments have already been discussed. This discussion is organized by moving from the first memorandum through to the fourth.

As discussed above, Gould's contention that "there must be mitigation for what is being lost, not just for wildlife habitat in general," Gould Memo 2, p. 8, either guided or echoes the approach taken by Dobkin and Michalski. Apparently, "what is being lost" is a reference to a

particular number of a particular species. This approach is inconsistent with ODFW's recommendations and with the County's past practice. As stated above, the premise of mitigation is that habitat will be improved so that impacts on wildlife resources will be mitigated.

Gould also makes a number of bald, unsupported assertions. For example, she worries, "Thornburgh is closing its lands to ORV use. The impact of displaced ORVs which will now go on BLM lands is not addressed." Gould Memo 2, p. 8. This treats ORVs like a natural species whose habitat is ruined by development and that, once displaced, is compelled to find a new habitat on BLM lands. It assumes that BLM lands are not regulated. It is not supported by evidence. Neither Applicant nor the County has the obligation to answer such unelaborated contentions or to create findings addressing them. *Gould III*, p. 18. The other statements in Gould 2 (Section III, B.2), p. 8, pertaining to the WMP are also unsupported and unelaborated and do not require response.

Gould objects that the WMP is not a "plan" but rather a "procedure" and "possibilities." Gould Memo 3, p. 4. Webster's Ninth New Collegiate Dictionary defines "plan" as, as relevant, to be:

> "**2 a:** a method for achieving an end. **b.** an often customary method of doing something : PROCEDURE **c :** a detailed formulation of a program of action **d** : GOAL, AIM. **3.** an orderly arrangement of parts of an overall design or objective. **4. :** a detailed program (as for payment or the provision of some service)"

This definition makes clear that there isn't much difference between a "plan" and a "procedure." The WMP is a "plan." It is highly specific, it has a definite objective, and it is comparable to other plans adopted in similar circumstances and approved by the USFWS and ODFW. When the Court of Appeals decided *Gould II*, there was no wildlife mitigation plan in the record. As explained by LUBA in *Gould III*:

> "First, the specifics of the mitigation measures must be known at the time the county finds the proposal complies with DCC 18.113.070(D), and those specifics are lacking here [in the record prior to the CMP remand decision of approval but not including the FMP record]. Second, because the needed mitigation plan would be completed after the county found the CMP complied with DCC 18.113.070(D), its decision was based on evidence outside the CMP record. In reversing LUBA's decision [in *Gould I*], we understand the Court of Appeals to have concluded that the standard set forth in DCC 18.113.070(D) requires that the specifics of any mitigation plan or plans that are proposed to comply with DCC 18.113.070(D) must be known to the county so that it may make a finding that the mitigation plan or plans completely mitigate any impacts, and that finding must be supported by substantial evidence." *Gould III*, p. 9.

The WMP contains the appropriate "specifics" to show that it will completely mitigate the impacts of development on wildlife resources. It satisfies the standard set forth in *Meyer v. City of Portland,* 67 Or App 274, 678 P2d 741, *rev den* 297 Or 82 (1984): It is "possible, likely and reasonably certain to succeed." Every assurance possible has been given by BLM that an

appropriate area will be available for offsite mitigation. As a group, ODFW, BLM and the County will have advisory opportunities and monitoring and enforcement authority, and can be expected to perform their responsibilities. WMP, p. 14. *See Sanders v. Yamhill County*, 34 Or LUBA 69, 88, *aff'd* 154 Or App 448 (1998). The County's enforcement authority derives from its ability to enforce conditions. Applicant encourages the Hearings Officer to condition approval of the FMP on the implementation of the WMP.

Gould contends that instead of meeting the criteria of DCC 18.113.070(D), Applicant has shifted to meeting BLM procedures and standards. Gould Memo 4, pp. 4-5. This is simply untrue. As explained by Sharp, and as discussed above, the WMP will meet the County standards and any applicable BLM requirements, but meeting the BLM requirements is not viewed as meeting the County criterion.

Gould takes issue with many of the arguments and conclusions contained in Tetra Tech's August 12, 2008 letter to the hearings officer, August 12, 2008 Rebuttal, Ex. B-13. Gould Memo 4, pp. 6-8. Sharp has responded to these arguments in her letter dated September 11, 2008, contained in the September 11, 2008 Rebuttal.

*Aquatic/Fish Plan*

A. Applicant's Mitigation Plan

The water-related component of Applicant's mitigation plan is described in a document entitled "Thornburgh Resort Fish and Wildlife Mitigation Plan Addendum Relating to Potential Impacts of Ground Water Withdrawals on Fish Habitat," dated April 21, 2008 ("Addendum"). Developed by Newton Consultants Inc. (NCI) in consultation with ODFW, the Addendum focuses on two key factors that could affect fish habitat: 1) the potential for reduction in the quantity of surface water flow as a result of ground water use by the project, and 2) the potential for a related increase in surface water temperature as a result of reduced ground water discharge to surface water. In addition to the Addendum, Thornburgh provided a supplemental technical report entitled "Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat (May 2008)" ("Evaluation Report"), prepared by an interdisciplinary team of consultants from Tetra Tech EC, Inc. (Tetra Tech). Together, these documents comprise Thornburgh's fish mitigation plan. The Addendum provides background about the hydraulic connection between surface water and ground water and describes the specific mitigation measures proposed by Thornburgh. The Tetra Tech Evaluation Report provides additional biological background and analysis about the fish species and habitat potentially affected by the project.

The starting point for Thornburgh's plan was the mitigation already required by the Oregon Water Resources Department ("OWRD") in connection with approval of Thornburgh's water right application. This process identified total annual ground water use of 2,129 acre-feet, with "consumptive use" of 1356 acre-feet of ground water at full build-out of the resort and required Thornburgh to provide an equal amount of "mitigation water." Addendum, Ex. 1, p. 2 (OWRD Final Order). Tetra Tech determined this annual volume of consumptive use would result in an average daily flow impact of 1.87 cfs year-round. Evaluation Report, p. 13.

As described in the Addendum, Thornburgh will address the OWRD mitigation requirements by acquiring existing water rights for surface water irrigation and converting them to "instream water rights" that will be protected in perpetuity for public purposes. The sources of mitigation water identified by Thornburgh in its water right application included irrigation water rights held by Big Falls Ranch, Inc. (Big Falls) and by Central Oregon Irrigation District (COID). Addendum, p. 4-7. As addressed in great detail during the Conceptual Master Plan ("CMP") portion of the Thornburgh application process, the OWRD mitigation program is designed to require full mitigation for potential impacts to surface water flows as a result of ground water pumping. These proposed actions are therefore relied upon by the Applicant to address ODFW concerns relating to the potential impacts to the quantity of surface water flow.

The Applicant's mitigation plan next focused on addressing the additional concern relating to temperature impacts due to possible loss of cold water flows contributed by ground water-fed seeps and springs. To address this issue, the mitigation plan confirms Applicant's commitment to obtain a significant portion of the total amount of mitigation water from Big Falls Ranch, which holds water rights for use of Deep Canyon Creek, a spring-fed system tributary to the Deschutes River. At full build-out, the Big Falls Ranch water rights to be acquired by Thornburgh will contribute 836.82 acre-feet of surface water/mitigation flow per year, at an average rate of 1.97 cubic feet per second (cfs) during the irrigation season. Addendum, p. 6. ODFW Letter, p.3. As described further below, this quantity of replacement flow from Deep Canyon Creek will fully offset the projected impact to seeps and springs identified in the ODFW letter. As part of the mitigation measures to address temperature concerns, Thornburgh will also arrange for removal of an existing impoundment on Deep Canyon Creek that is used by Big Falls Ranch in connection with diversion of the water rights for irrigation use, as well as another small impoundment on property immediately upstream of Big Falls Ranch. Addendum, p. 9; August 12, 2008 Rebuttal, A.3. Removal of the impoundments will result in unimpeded spring flow through Deep Canyon Creek and will thereby "facilitate necessary habitat functions." ODFW Letter, p. 3.

The proposed mitigation plan also includes two additional actions to help demonstrate a net benefit to the resource: First, Thornburgh will abandon three existing domestic wells on the resort property. Addendum, p. 9-10. This action will restore approximately 3.65 acre-feet per year in excess of the amount previously required by OWRD. Second, Thornburgh will contribute funding for thermal modeling on Whychus Creek to assist with efforts to better understand potential impacts of ground water pumping in the basin. Addendum, p. 10.

Following the Applicant's submission of the mitigation plan, County staff requested comments from ODFW. In a letter to the County dated June 13, 2008, ODFW confirmed its review of the Thornburgh mitigation plan, and made specific findings related to potential impacts of ground water withdrawals on fish habitat. ("ODFW Letter") The letter explains that primary impacts to surface water flows that may be caused by ground water use are addressed by the Deschutes Basin Groundwater Mitigation Rules administered by OWRD and concludes: "Under state law the Thornburgh Resort LLC has fully met its mitigation requirements of offsetting its groundwater use in the Deschutes Groundwater Study Area." However, ODFW notes there may be additional impacts to ground water-fed seeps and springs that are not fully addressed by the OWRD program and that must be addressed under the separate county mitigation standard in DCC 18.113.070. The letter states:

> Springs and seeps are important groundwater dependent ecosystems in the Deschutes Groundwater Study Area providing unique habitat for a number of plant and animal species including fish. Springs provide a natural relative constancy of water temperature. Spring and seep flows especially in the summer and fall, are typically cooler than the water flowing in the main stream. This cooler water provides thermal refugee [*sic*] for salmonid which thrive in cooler water.
>
> ODFW Letter, p. 2

ODFW then provides a detailed description of elements of the Thornburgh plan that are intended to address the potential impacts to seeps and springs, including a table showing the amount of mitigation water that will be provided from irrigation water rights to be acquired from the Central Oregon Irrigation District (COID) and from Big Falls Ranch, Inc. (Big Falls). ODFW notes that the Big Falls water rights are for use of Deep Canyon Creek, a spring-fed system. "During the irrigation season when ODFW is most concerned about impacts to springs and flows in the Deschutes River, the mitigation water from the springs in Deep Canyon Creek exceeds the flows needed to mitigate for potential spring and seep impacts from the development (1.97 cfs v 1.87 cfs). Flows from COID during the irrigation season provide a net benefit in instream flows for the Deschutes River." Although ODFW identifies a potential "net deficit" of 1.87 cfs to springs and seeps between November 1st and March 31st because mitigation water is provided only during the irrigation season, the letter states "ODFW does not believe there will be an adverse impact to the fish and wildlife habitat during this time period." The letter explains that stream flows are higher and stream temperature lower during this time period. ODFW also identifies the planned removal of two existing dams on Deep Canyon Creek as significant elements of the mitigation plan to help address temperature concerns.

Following this analysis, the letter concludes: "ODFW has determined that providing the proposed mitigation outlined above should mitigate for potential impacts on springs and seeps and provide a net benefit to the resource."

In addition to the ODFW letter, Thornburgh provided the Tetra Tech Evaluation concerning the expected mitigation results. The highly qualified team from Tetra Tech reviewed the proposed fish habitat mitigation measures and provided detailed analysis of flow quantity and temperature impacts. Evaluation Report, 26-30. Tetra Tech concluded that implementation of the OWRD-approved plan should result in a net increase of habitat quantity (due to flow replacement measures) and will not likely result in a net loss of quality during the irrigation season (due to temperature benefits from the cold water supplied by the Big Falls water rights.) TetraTech, like ODFW, also found that there should be no adverse impact to fish during the non-irrigation season because the overall changes are very slight and habitat conditions are not a limiting factor to fish during that time period. *Id.*

The conclusions of ODFW and TetraTech confirm that Thornburgh's proposed measures will ensure that any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource. As noted by ODFW, the mitigation measures are also expected to result in a net benefit to the resource.

B. Response to Public Comment

During the public hearing process, project opponents stated numerous objections to the adequacy of the fish mitigation plan. Water-related objections were raised primarily through testimony and documentary evidence that was submitted by Mark Yinger, Yinger and Associates ("Yinger"), in cooperation with Northwest Land and Water, Inc. ("NWLW"), on behalf of project opponents Steve Munson and Sandy Lonsdale, Vulcan Power Company. The Yinger and NWLW report, entitled "A Case Study: Thornburgh Resort Water Resources Impact Evaluation" (February, 2008) (the "Yinger Report") was also specifically relied upon by project opponent Gould and others who offered comments in the public hearing on June 17, 2008 and July 15, 2008, and in rebuttal on August 28, 2008.

As observed by the Hearing Officer at the June 17 hearing, the conflicting evidence presented on behalf of the Applicant and project opponents in the Yinger Report set the stage for what appeared to be a "battle of the experts." To avoid this potential stand-off, Thornburgh provided additional evidence to demonstrate that complete mitigation of any potential negative impacts to fish would be provided even if the conclusions from the Yinger Report were assumed to be correct. (July 15, 2008 Evidence, Ex. 1 and 5-8).

In response to a specific question from the Hearing Officer, Thornburgh compared the methodology used by Yinger and the Applicant in determining potential impacts to surface water resources, as the basis for determining mitigation requirements. See Applicant's Response to the Hearings Officer's Questions (July 15, 2008 Evidence, Ex. 1, p.7-11) and Tetra Tech Memorandum, July 8, 2008 (July 15, 2008 Evidence, Ex. 6). The analysis identifies two key differences between the Applicant's approach and the project opponents' approach, as described by the Yinger report and testimony: First, the Yinger approach uses the United States Geological Survey (USGS) model to determine site-specific impacts for the Thornburgh project, while the Applicant, OWRD and ODFW rely on a site specific assessment by an OWRD hydro-geologist that is based on the USGS study and modeling results on a *regional* basis coupled with staff experience and project-specific information. August 12, 2008 Rebuttal, A.4. Second, the Applicant, OWRD and ODFW determined the quantity of potential impact on surface waters based on the project's estimated annual consumptive use of ground water, while the Yinger approach assumes all ground water pumped for project purposes is consumed and no portion of the water appropriated from the ground returns to the ground water system. Additional technical analysis regarding the different approaches was provided in memoranda from Tetra Tech (July 15, 2008 Evidence, Ex. 5, 6 and 7) and Newton Consultants Inc. (July 15, 2008 Evidence, Ex. 8).

The issue regarding the most appropriate use of the model was most persuasively addressed in testimony by Kyle Gorman, Region Manager of OWRD, during the public hearing on July 15, 2008 (Transcript provided in August 12, 2008 Rebuttal, A4). Mr. Gorman stated that OWRD does not run the model for individual water right applications. Instead, OWRD relies on the ground water mapping and regional simulation developed by USGS coupled with other site-specific information to evaluate individual water right applications. Mr. Gorman reported that the OWRD staff person who reviews the applications is one of the authors of the USGS Study, and explained:

> "...a model is a model; it's only as good as what you put into it. If someone were to do surgery we wouldn't want a machine doing the surgery but we'd rather have a human doing surgery. Ken Lite is that human doing surgery on reviewing groundwater

applications, so I think that there's even a higher level of review and consideration for impacts in the basin when actually our department personnel is reviewing those applications." (Transcript of Testimony, August 12, 2008 Rebuttal, A4)

In contrast, the Yinger Report is based on the results of running the USGS model for the Thornburgh project, using project-specific data and assumptions inputted by Mr. Yinger himself. As documented in Applicant's evidence on July 15, one of the significant assumptions made by Mr. Yinger relates to the issue of consumptive use. In running the USGS model for Thornburgh, Yinger assumed 100% consumptive use. Letter from Mark Yinger to Steve Munson, dated July 14, 2008, p. 3-4 (July 15 Hearing Ex. E). However, in his testimony at the July 15, 2008 hearing, Mr. Gorman confirmed that this assumption is contrary to the approach taken in the OWRD Deschutes Basin Ground Water Mitigation Program. Testimony of Kyle Gorman, August 12, 2008 Rebuttal, A4. *See also* OAR 690-505-0050(2) and OAR 690-505-0610(5). Mr. Gorman also explained the comprehensive process by which consumptive use estimates were derived for the OWRD mitigation program in general, as well as the additional scrutiny applied to the specific determination of consumptive use for Thornburg as a result of protests to the water right application.

The record shows that the differences in approach by Mr.Yinger and the Applicant resulted in different findings regarding key issues of the location and quantity of potential project impacts:

1. Location of Impact

To determine the location of impact for mitigation purposes, the Applicant and ODFW relied on findings from the "Public Interest Review for Ground Water Applications" conducted by OWRD in connection with the Thornburgh water right application. A copy of the OWRD Review is attached to the Applicant's mitigation plan Addendum as Ex. 2. This approach reflects the generalized nature and intent of the USGS model, as stated by the USGS 2004 report:

> "The model is intended to simulate the regional ground-water flow system and is most useful at regional scales. The model accurately simulated hydrologic conditions in specific local areas (usually corresponding to areas where data were plentiful); however, there are also areas where the model does not accurately simulate local or small-scale conditions. Simulation results must be evaluated within the context of overall hydrologic knowledge of the area."

Accordingly, the Applicant's approach relies on the individual ground water report prepared for the Thornburgh project by OWRD as described in Mr. Gorman's testimony. The OWRD report determined the nearest location of ground water discharge from the project to be on the Deschutes Main Stem approximately five to eight miles north of the project and identified the "zone of impact" to be the "general zone" of the Deschutes River. Addendum, Ex. 2, p.1 and 7. The OWRD report does not identify a potential impact to Whychus Creek. *Id.* The OWRD analysis was based on known, peer-reviewed conclusions about the regional ground water flow system demonstrated by the use of the USGS model on a large-scale basis, coupled with the experience of the OWRD staff in reviewing similar applications in the area and compared with

known information about the proposed well and surrounding wells. Testimony of Kyle Gorman, August 12, 2008 Rebuttal, A.4.

The Yinger report estimated the location of impact by conducting a "run" of the USGS model with data inputs he provided for the Thornburgh project. The report shows primary potential impact in the Deschutes River, but also identifies a substantially lesser potential impact in Whychus Creek. However, as noted above, Mr. Yinger assumed 100% consumptive use for the model in a departure from standard practice by OWRD and USGS when using the model. By doing so, the Yinger Report over-estimates ground water use and thereby results in suspect model outputs. There is no other evidence the record to support a finding of impact on Whychus Creek.

2. Quantity of Impact

The Applicant, ODFW and OWRD also determined a total quantity of impact – expressed in terms of annual volume and daily rate of flow – that is different from the Yinger Report.

a. Annual Volume of Impact

OWRD, ODFW and the Applicant determined the annual volume of impact by applying the approach used in the OWRD mitigation rules. As noted above, the rules equate annual impact to the annual volume of consumptive use. OAR 690-505-0610(5). This policy in the rules reflects the fact that not all ground water pumped for an appropriative use is permanently removed from the hydrologic system. Some quantity of the water is expected to return to the system. The formula for quantifying the specific consumptive use amount for Thornburgh is described in detail in the Final Order approving the water right application and was described in testimony from Mr. Gorman. Using these consumptive use factors, the volume of impact was estimated at 1,356 acre-feet/year, based on total pumping volume of 2,129 acre-feet/year. ODFW accepted and relied upon this approach in its input to the Applicant in developing the mitigation plan, and in its comments to the County on the final plan. ODFW Letter, p. 2-3.

The Yinger Report estimates the volume of impact at 2,219 acre-feet /year based on an assumption of 100% consumptive use with no adjustment for seepage or return flows. As noted above with respect to Mr. Yinger's findings regarding the location of use, the assumption of 100% consumptive use as a model input results in an over-estimate of actual impact that directly affects the model's output.

b. Daily Flow Rate Impact

The Applicant and ODFW calculated the potential rate of flow impact by applying a standard formula to convert the annual volume of ground water pumping (2,129 acre-feet) into an average daily rate. For this calculation, the Applicant and ODFW could not rely on findings contained in the OWRD Final Order because the OWRD mitigation program is based on an annual volume of use and does not include calculation of average daily rates. July 15, 2008 Evidence, Ex. 1, p. 10 and Ex. 8, p. 3. However, ODFW and Applicant calculated the rate of flow in order to assess potential impacts to fish habitat in connection with the county approval standard. The flow rate impact was identified as 1.87 cfs year round. ODFW Letter, p. 2. This

amount was determined by converting the total volume in acre-feet per year, to a rate in cubic feet per second: 1 cfs = 1.98 AF/day; 1356 AF/year divided by 365 days/year = 3.715 AF/day divided by 1.98 = 1.87 cfs. The resulting constant year-round rate is consistent with data indicating that natural ground water discharge to surface waters in the Deschutes Basin occurs on a steady basis; even though pumping rates may vary from day to day it does not change the discharge rate from the regional aquifer to the surface water system. The parties do not disagree on this aspect of the analysis. Both the Yinger Report and Applicant's plan quantify surface water impact on the basis of a constant year-round average daily rate.

However, Mr. Yinger estimated the rate of flow impact at 3.25 cfs year round based on total annual volume of 2,355 acre-feet/year. Yinger Report, p. 41. Although Yinger and Applicant used the same mathematical formula to determine the rate of impact, the results are different because, again, Mr. Yinger assumes 100% consumptive use while Applicant and agencies adjust for consumptive use. This approach is contrary to the state's approach as reflected in the OWRD rules and to conclusions stated in the USGS study. It is also important to note that the annual volume amount of 2,355 used by Mr. Yinger in the model run and his report is incorrect. The final annual volume approved for Thornburgh in the OWRD Final Order issued in March, 2007 was 2,129. If Mr. Yinger's approach based on 100% consumptive use were applied to the correct final maximum pumping volume of 2,129, the calculation results in flow impact of 2.945 cfs. July 15, 2008 Evidence, Ex. 1, p. 10.

3. Adequacy of Thornburgh Mitigation Plan -- Regardless of Approach

The above differences in approach used by the Applicant and project opponents are important to help clarify the essence of objections to the Thornburgh mitigation plan that were expressed in the public comment process, and to evaluate the weight that should be given to conclusions expressed in the Yinger Report. Such an evaluation clearly reveals that the approach used by Thornburgh, ODFW and OWRD for quantifying potential project impacts is more credible and persuasive. The Thornburgh approach is consistent with state policy and programs and was used by ODFW in evaluating the mitigation plan.

However, in order to avoid a battle of the experts, Thornburgh provided evidence showing that the mitigation plan results in complete mitigation of impacts even when the Yinger conclusions are used regarding the volume, rate, and location of impact, the Thornburgh plan provides for complete mitigation as required under the county standard. July 15, 2008 Evidence, Ex. 5, p. 3 (Tetra Tech Memo), Ex. 6, p. 4 (Tetra Tech Memo) and Ex. 8 (Newton Letter); August 12, 2008 Rebuttal, A.6, p. 4 (Newton Letter) and A.8, p. 3 (Tetra Tech Memo). The mitigation actions proposed by Thornburgh will result in flow restoration of 3.19 cfs (1.97 cfs from Big Falls Ranch water rights conversion to instream flow and 1.22 cfs from COID water rights conversion to instream flow). This amount exceeds the full rate impact even at 100% consumptive use, using the Yinger approach. Although the Yinger Report states a flow rate impact of 3.25 cfs, that amount was based on an incorrect volume of annual pumping of 2355 acre-feet. When the correct volume of 2,129 acre-feet/year is used (as specified in the OWRD Final Order), the rate of impact drops to 2.945 cfs on an assumption of full consumptive use. The Applicant's plan provides total mitigation flow of 3.19 cfs during the irrigation season.

The Yinger report also differs from Applicant and agencies' conclusions regarding the location of impact. Yinger estimates an impact of 106 Acre-feet/year on Whychus Creek that is not specifically addressed in Applicant's plan. However, as confirmed by ODFW, the potential loss of 1.87 cfs/day of cool water associated with the proposed pumping will be fully mitigated by the Big Falls Ranch water rights which will result in replacement of similarly cool, spring-fed waters. ODFW Letter, p. 2-3. No evidence has been offered to suggest there are unique habitat conditions or species in the lower Whychus Creek reach that could not be adequately mitigated by provided replacement of cool water in the Deschutes River system, generally. As noted by ODFW, the general habitat values of springs and seeps are effectively mitigated by the Big Falls Ranch water rights, which will result in replacement flow of 1.97 cfs of spring-fed water during the irrigation season, when fish habitat may be affected by temperature. ODFW further states that it does not believe there will be an adverse impact to fish and wildlife habitat during the non-irrigation season because flows are higher and stream temperatures are lower during this time period. *Id* at 3. The Tetra Tech analysis provides additional specific analysis demonstrating that that potential temperature impacts to Whychus Creek are minor when using the Yinger estimate of 106 acre-feet/year and would not be expected to cause a negative impact on fish that would require mitigation under the County standard. Evaluation Report, p. 29-30.

Finally, if the Hearing Officer were to determine that additional mitigation is needed to offset impacts specific to Whychus Creek, Thornburgh has provided evidence of the feasibility of obtaining 106 acre-feet of water for instream flow restoration by providing funding for completion of a conservation project with the Three Sisters Irrigation District. August 12, 2008 Rebuttal, A.9. The letter confirms that the District plans to proceed in 2009-2010 with the final stage of conservation measures that have already resulted in 3000 acre-feet of instream flow restoration with state approval under the Allocation of Conserved Water Program. Therefore, if the Hearings Officer determines additional mitigation is required on Whychus Creek, the FMP can be approved subject to a condition that the Applicant be required to provide additional mitigation in Whychus Creek. ORS 197.522. Applicant strongly disagrees with the need for such a condition. As shown above, regardless of whether the Yinger approach or Applicant and state agency approach is used to determine potential impacts, the Thornburgh mitigation plan provides complete mitigation for any negative impacts so there is no net loss or net degradation of the resource.

C. The above discussion addresses key issues raised in public comment process. Because of the substantial number of specific comments regarding the fish component of the mitigation plan, Applicant has provided an additional table showing specific comments and responses. Attachment 1 ("Water Related Comments, Final Master Plan").

D. Conclusion

The weight of evidence clearly demonstrates that the Thornburgh fish mitigation plan satisfies the requirements of the county approval standard by providing complete mitigation for any negative impacts resource so that there is no net loss or degradation of the resource. The plan is based on input from OWRD and ODFW in determining the protected resource to be fish habitat in the Deschutes Basin, as described in the plan. The projected location of impact is based on findings in the OWRD Final Order approving the water right and is consistent with OWRD practice in administering the Deschutes Basin Ground Water Mitigation Program. Similarly, the

annual volume of impact is determined on the basis of consumptive use, as provided under the OWRD mitigation rules and reflected in the OWRD Final Order. The annual rate of potential flow impact for the county mitigation plan was determined in the same manner as the Yinger Report submitted by project opponents, but is also based on the OWRD determinations of annual consumptive use rather than on the maximum volume of water authorized for pumping used by project opponents citing the Yinger Report.

The Yinger Report uses the USGS model as the basis for a customized analysis of the Thornburgh project with input data determined only by Mr. Yinger, including his assumption of 100% consumptive use. Both the use of the model and input of 100% consumptive use are contrary to state practice in assessing the impacts of ground water use for an individual project. On the basis of this analysis, Mr. Yinger calculates an impact of 106 acre-feet flow reduction in Whychus Creek which project opponents suggest will result in catastrophic impacts to fish due to decreased flow and increased temperature. However, these exaggerated claims are not supported with evidence and appear to be based on an analysis that equates *any* impact with negative impact. In fact, the record shows that even assuming Mr. Yinger's conclusions to be correct, the potential impacts to Whychus Creek will be slight and will not result in negative impacts to fish and wildlife habitat that are not otherwise completely mitigated by the Thornburgh plan.

Under either approach for estimating potential project impacts, the record shows the Thornburgh plan provides complete mitigation for annual volume, flow rate and temperature impacts, resulting in no net loss or net degradation of the resource. As a result, the condition has been satisfied.

**Credibility of Resort Opponents Gould/Guild and Munson**

Resort opponents Annunziata Gould and husband James Guild have provided strenuous opposition to the Thornburgh Resort since the inception of the project. Gould/Guild have objected to nearly every facet of the resort and have appealed the project to the Deschutes County Commission, the Oregon Land Use Board of Appeals and the Oregon Court of Appeals. The record demonstrates that Gould/Guild are in the development business and collectively own more than $4,600,000.00 in Deschutes County real estate (based on assessed values). *See Ex. 19, Thornburgh Submission dated July 15, 2008.* County property records state that their substantial real estate holdings include: (1) a lot at the Pronghorn Resort-$623,040 assessed value; (2) a home at the Deschutes River Ranch Development-$1,002,500 assessed value; (3) a home on JW Brown Road-$1,177,480 assessed value; (4) industrial land in Redmond-$410,730 assessed value; (5) property on Gerking Market Road-$603,620 assessed value; (6) 232 NW Congress in Bend-$439,250 assessed value; (7) 254 NW Congress in Bend-$286,840 assessed value; and (8) property in Sisters-$136,250 assessed value. As Central Oregon developers and potentially competitors to the project, Gould/Guild would not benefit from the additional residential inventory provided by the Thornburgh Resort.

Steve Munson has also opposed the Thornburgh resort since its inception, filing appeals and appearing on numerous occasions in opposition to the development. Munson is affiliated with Vulcan Power, a company that develops geothermal power. Munson cites repeated concerns with wildlife and other values he believes would be compromised by the resort development. The record indicates that Munson once resided on the Thornburgh resort property.

The record also contains letters from Sharon Gambrel (Rebuttal Ex. E-1) and Craig Gambrel (Rebuttal Ex. E-2) who long operated mining claims in the vicinity of the resort property. The Gambrel's recite instances where Munson threatened and harassed persons to keep them off the Thornburgh property and away from its resources. These reports are corroborated by the Munson criminal records attached as Rebuttal Ex. E-3. Sharon and Craig Gambrel both state they believe Munson is opposing the resort because he would like to develop the geothermal resources of the area.

## V. CONCLUSION

For the reasons set forth above, Applicant respectfully requests that the Hearings Officer approve the FMP for the Thornburgh Resort.

# Thornburgh Final Argument
## Table of Abbreviated Citations for Frequently-Cited Documents

| Date of Submission | County Exhibit No. (if applicable) | Description/Title of Document | Abbreviated Citation |
|---|---|---|---|
| 4/21/08 and 8/1/08 | -- | Final Master Plan Application and Burden of Proof Statement - Modification of Application | FMP |
| 4/21/08 | -- | "Thornburgh Resort Fish and Wildlife Mitigation Plan Addendum Relating to Potential Impacts of Ground Water Withdrawals on Fish Habitat (April 21, 2008)" by Newton Consultants, Inc. | Addendum |
| 5/08 | -- | "Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat" by Tetra Tech EC, Inc. (May, 2008) | Evaluation Report |
| 6/17/08 | A | Letter from Martha Pagel to the Hearings Officer, dated June 17, 2008 | Pagel Letter |
| 6/17/08 | B | Letter from Tetra Tech EC, Inc. to the Hearings Officer, dated June 17, 2008 | Tetra Tech Letter |
| 6/17/08 | B | Letter from ODFW to Deschutes County re: Thornburgh Final Master Plan Approval, dated June 13, 2008 | ODFW Letter |
| 6/17/08 | C | Memorandum of Nunzie Gould in Opposition (Paul Dewey) | Gould 1 |
| 6/17/08 | D (and Ex. F & J, 7/15/08 hearing) | "A Case Study: Thornburgh Resort Water Resources Impact Evaluation" by Mark Yinger Associates and Northwest Land & Water, Inc. (February, 2008) | Yinger Report |
| 7/15/08 | G, H | Applicant's Evidence Submitted July 15, 2008 | July 15, 2008 Evidence |
| 7/15/08 | I | Supplemental Memorandum of Nunzie Gould in Opposition (Paul Dewey) | Gould 2 |

| Date of Submission | County Exhibit No. (if applicable) | Description/Title of Document | Abbreviated Citation |
|---|---|---|---|
| 7/29/08 | -- | Second Supplemental Memorandum of Nunzie Gould in Opposition (Paul Dewey) | Gould 3 |
| 8/12/08 | -- | Thornburgh Rebuttal Submission for 8/12/08 | August 12, 2008 Rebuttal |
| 8/28/08 | -- | Second Supplemental Memorandum of Nunzie Gould in Opposition (Paul Dewey) | Gould 4 |
| 9/11/08 | -- | Applicant's Final Rebuttal – FMP, dated September 11, 2008 | September 11, 2008 Rebuttal |

# APPLICANT'S SUMMARY OF WATER-RELATED COMMENTS RESPONSE AND ARGUMENT FINAL MASTER PLAN

*This matrix supplements Applicant's Final Argument and provides a summary of water-related public comments on the Final Master Plan along with Applicant's brief response and argument.*

**Hearing June 17, 2008**

| Commenter | Exhibit-Page | Comments / Response |
|---|---|---|
| Paul Dewey -- Nunzie Gould | C-3 (Gould 1) | **Comment:** Applicant provided a "revised" sewer map and water system map, but gave no explanation of the reason for the revisions or how the revised maps differ from the approved CMP maps.<br><br>**Response:** The changes are apparent by comparing CMP and FMP maps. The changes are not significant for purposes of legal sufficiency of the FMP and require no further explanation or reasons. |
| | C-6 and C-7 | **Comment:** The FMP does not satisfy DCC 18.113.090(N) or CMP Condition 15, because the WPCF permit requires a Reclaimed Water Use Plan that has not been submitted into the record, and because the 2007 permit was issued prior to changes in the sewer map.<br><br>**Response:** The WPCF permit does not require submission of the Reclaimed Water Use Plan until 90 days prior to start-up of the land application system. (FMP Ex. J1, p.7). Changes to the sewer map do not affect the 2007 WPCF permit because the permit requires submission of detailed plans and specifications prior to construction. (FMP Ex. J1, p.8) |
| | C-6 | **Comment:** Regarding CMP Condition 8 (which requires plan review and approval by the state drinking water program), the FMP does not comply with the condition, because the FMP does not show that the 2006 plan review exemption and Thornburgh Water Master Plan are current.<br><br>**Response:** FMP Exhibit K1 clearly shows that the Current Master Plan on file with DHS expires in 2018, and plan review exemption remains in effect "as long as the Water Master Plan remains current" and annual summaries of completed projects are submitted to DHS. Applicant's submission of July 15, 2008 includes a letter from DHS-DWP to Hickman Williams confirming |



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| | | renewal for 2008. (Note: the letter is mistakenly labeled in applicant's table of contents (item 14) as "DEQ" Letter rather than "DHS" letter.) |
| | C-6 and C-7 | **Comment:** A copy of the OWRD final order does not satisfy CMP Condition 10, which requires Thornburgh to "provide documentation of approval of its application for a water right permit prior to approval of the final master plan."<br><br>**Response:** The OWRD final order clearly documents approval of Thornburgh's "application," as required by the condition. (FMP Ex. K2) The CMP condition requires that documentation of the "permit" be provided "at the time of tentative plat/site plan review for each individual phase of the resort development..." See Applicant's Final Argument for additional discussion. |
| | C-7 | **Comment:** The plan for cooperative well monitoring agreements is inadequate for reasons explained in the June 17, 2008 letter by Mark Yinger. The Yinger letter, in turn, states that the indemnification plan should cover wells within a radius of 3 miles rather than 2 miles, and that the plan should be in effect for 10 years instead of 5 years.<br><br>**Response:** CMP Condition 11 requires Thornburgh to submit a "written plan for entering into cooperative agreements with owners of existing wells within a two-mile radius of Applicant's wells." The condition further limits the plan to a period of five years after full development of the Thornburgh wells. The condition includes additional requirements that the plan be developed in coordination with the county and OWRD. Thornburgh submitted a written plan (FMP Ex. C1.1) that fully complies with these requirements. County staff has confirmed that the plan is adequate and meets the requirements of the condition. We note as well that the concept of an indemnification plan was voluntary and was proposed by Thornburgh to help alleviate concerns of neighboring landowners despite clear findings in the CMP that Thornburgh's proposed use of ground water would not cause interference with other ground water uses. |
| | C-9 to C-11 | **Comment:** The fish and wildlife mitigation plan does not comply with DCC 18.113.070(D) for reasons stated in the February, 2008 Yinger report and in the June 17, 2008 Yinger letter.<br><br>**Response:** Detailed response provided below in response to Yinger comments, and in Final Argument. |

| Commenter | Exhibit-Page | Comments / Response |
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| | C-10 and C-11 | **Comment:** The fish and wildlife mitigation plan does not comply with DCC 18.113.070(D), because there is no evidence that the water rights to be transferred instream have been used or that they are currently valid. There is evidence that they have not been used on some of the property with water rights, according to aerial photos and the attached Daniels Group LLC Burden of Proof Statement.<br><br>**Response:** The comment is unfounded and the alleged "evidence" does not in any way demonstrate that the water rights are not valid. The comment refers to water rights to be acquired from Big Falls Ranch, Inc. for mitigation purposes. Thornburgh has previously submitted evidence of its option agreement to acquire the water rights. At the continued hearing on July 15, Rex Barber, President of Big Falls Ranch, Inc. testified that the water rights are valid and provided a written statement to that effect. In rebuttal materials submitted on August 12, 2008, Applicant included a copy of the "due diligence" evaluation conducted by Newton Consultants Inc. for Thornburgh prior to entering into the option agreement to purchase the Big Falls water rights. (Ex. A.2, Applicant's Rebuttal) The report documents the validity of the water rights and their eligibility to be transferred instream to create mitigation credits under the OWRD mitigation program. |
| | C-11 | **Comment:** The fish and wildlife mitigation plan does not comply with DCC 18.113.070(D), because the dam and pond to be removed are not located on Thornburgh's property, but on property owned by Nolan and Weigand.<br><br>**Response:** The request by ODFW for Thornburgh to remove a dam located upstream of the Big Falls Ranch water rights was made after Thornburgh submitted its fish and wildlife mitigation plan. However, Thornburgh has agreed to remove the additional dam as part of its plan to help restore natural spring and creek conditions on Deep Canyon Creek. (Ex. A.3., Applicant's Rebuttal.) Thornburgh has also provided an agreement with the affected landowners (Riemenschneider, Nolan and Wiegand), and The Daniels Group (owners of development rights for the property), to authorize dam removal. (Ex. A.1, Applicant's Rebuttal) |
| | C-11 and C-12 | **Comment:** DCC 18.113.070(K) applies to the FMP application and has not been addressed. It requires a showing that adequate water will be available. The Yinger Report casts doubt on availability.<br><br>**Response:** Thornburgh demonstrated compliance with DCC 18.113.070(K) relating to water |



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| | | availability as part of the CMP process. No further findings on this standard are required for FMP approval. Yinger asserts the Thornburgh project will have impacts on ground water and surface water resources that are different from those found by the County during CMP review. Yinger's assertions are contrary to evidence in the CMP proceedings and are not relevant on the issue of water availability at this stage of the FMP review process. Even if relevant, nothing in the Yinger report or comments casts doubt on water "availability" – the Yinger comments question the extent of impacts and level of mitigation that may be required to offset impacts. (See additional comments below in response to Yinger comments.) |
| Mark Yinger | D | **Comment:** The February, 2008 "A Case Study: Thornburgh Resort Water Resources Impact Evaluation" (the "Yinger Report") concludes generally that ground water development by Thornburgh will result in impacts outside the "General Zone" of impact as determined by OWRD, will cause existing surrounding wells to decline, and will result in increased stream temperatures.<br><br>**Response:** As noted above, the findings of the Yinger case study are not relevant to the issue of water availability, which has already been decided through the CMP process. These comments were not raised in the CMP hearings or on appeal of the CMP decision, nor were they raised as protests to the OWRD water right application. Similarly, Yinger's conclusions regarding potential impacts to surrounding wells are contrary to the findings of the CMP and not relevant to the FMP proceedings. At this stage, the Yinger case study is relevant only to a discussion of the sufficiency of Thornburgh's Fish and Wildlife Mitigation Plan. Specific responses to the Yinger findings in that context are provided in separate documentation and evidence submitted by Thornburgh at the hearing on July 15, 2008 (Ex. 1– Response to Hearing Officers Questions, Ex. 5 – Summary of Thornburgh Mitigation Plan Assuming Yinger's Conclusions, Ex. 6 – Information regarding the Two Methodologies Used by Applicant and Opponents, Ex. 7 – Evaluation of Lower Whychus Creek Assuming Yinger's Conclusions, Ex. 8 – NCI Questions of Hearings Officer); and the Applicant's Rebuttal, A.6 – 8 (Ex. A.6 –NCI Letter regarding Impacts to Whychus Creek, A.7 – NCI Letter regarding Response to Yinger/Munson Comments, A.8 – Tetra Tech Memo regarding Response to Rebuttal Letter.)<br><br>In summary, Applicant has provided explanation regarding the difference in approach and input data used by the OWRD, ODFW and the Applicant as contrasted with Yinger and has provided evidence confirming OWRD and ODFW agree the Applicant has provided full mitigation to meet |



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| | | both OWRD mitigation requirements and the county mitigation requirement. In addition, Applicant has provided evidence showing the mitigation requirement is met even assuming Yinger's conclusions are correct regarding the location and quantity of impact. Although Yinger did not attempt to quantify potential impacts to temperature, Applicant's technical consultants used Yinger's conclusions regarding quantity to estimate impacts to quality/temperature and again concluded that the impacts would be fully mitigated by the measures in Applicant's plan. |
| Mark Yinger | E | **Comment:** This June 13, 2008 letter to Steve Munson contains a detailed rebuttal to the Thornburgh fish and wildlife mitigation plan and well indemnification plan. Many of the points are addressed above in response to the Yinger Report.<br><br>**Response regarding Mitigation Plan:** Generally, Yinger asserts that the Thornburgh mitigation plan fails to address impacts to Whychus Creek and impacts to temperature. Thornburgh disagrees with the contention that ground water pumping for the resort will cause impact to Whychus Creek, based on findings by OWRD and Newton Consultants Inc. Nevertheless, even if Mr. Yinger's conclusions are accepted as correct, the Thornburgh proposal will completely mitigate for impacts on both flow and temperature, as described in analysis provided by Tetra Tech and Newton Consultants, Inc. The Tetra Tech analysis demonstrates that temperature impacts in the Deschutes River will be fully mitigated by conversion of the Big Falls Ranch water rights on Deep Canyon Creek to instream water rights. The asserted loss of flow in Whychus Creek of 106 acre-feet per year is shown to be biologically insignificant to fish habitat in comparison to identified average flows in Whychus Creek. With respect to temperature, Yinger asserts an increase in temperature but provides no quantification of the increase. Thornburgh's consultants have determined that the potential impact to stream temperature from Thornburgh pumping that would result if Yinger's assumptions are correct is so small that it would not adversely affect fish habitat. (See Thornburgh materials submitted in response to the Hearing Officer's questions regarding mitigation.) In contrast, ODFW has concluded the Thornburgh mitigation plan complies with the county approval standard. (June 13, 2008 Letter from ODFW to County (Exhibit B, June 17, 2008 hearing)).<br><br>**Response regarding Big Falls Water Rights:** Mr. Yinger's comments regarding the validity of Big Falls Ranch water rights are addressed in evidence submitted by Rex Barber, President of Big Falls Ranch, and Newton Consultants showing the location of water rights, and in a copy of the due diligence water right evaluation Thornburgh obtained prior to entering into its option. |



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| | | **Response regarding Well Indemnification Plan:** Mr. Yinger asserts that ground water use by Thornburgh will interfere with nearby wells; that there is no justification for the two-mile radius required for Thornburgh's well indemnification plan; and that indemnification agreements should be for a term longer than five years. Mr. Yinger's findings regarding the probability of interference are contrary to findings made by the County during the CMP process that the Thornburgh wells are not expected to interfere with other existing wells. This finding was based on evidence of conclusions by OWRD in connection with the Thornburgh water right application; by Newton Consultants in a hydrology report prepared for Thornburgh, and in a separate report submitted by a consultant engaged by project opponents. The FMP condition specifically prescribes the two-mile radius and five-year timeframe for Thornburgh's well indemnification plan. As noted in the plan submitted by Thornburgh, the FMP condition was not required to satisfy any county approval standard but was voluntarily suggested by Thornburgh as a means of addressing lingering public concerns. (FMP Ex. C.1) |
| Laura Strauss | F | **Comment:** This is a rebuttal to comments on the Yinger Report contained within Tetra Tech's "Evaluation of the Proposed Thornburgh Resort Project Impact on hydrology and Fish Habitat."<br><br>**Response:** The letter takes issue with Tetra Tech findings, but nothing in the letter provides additional evidence regarding the adequacy of the Thornburgh mitigation plan. Tetra Tech responds to specific comments in a rebuttal memorandum (Applicant's Rebuttal, A.8 – Memorandum from Tetra Tech). Additional discussion of the mitigation plan and Yinger/Strauss findings is provided in TetraTech and NCI documents submitted by Thornburgh in response to the hearing officer's questions and rebuttal. (See Applicant's Evidence, July 15, 2008). |
| Sandy Lonsdale | G | These comments relate to the issue of impacts on Whychus Creek, based on the Yinger Case Study findings. The comments state that Whychus Creek is a "Category 1" stream, so no impacts should be allowed (see page 2). They also assert that a "judge" upheld WaterWatch's protest of the OWRD water right application, which forced an increase in the OWRD mitigation obligation. Mr. Lonsdale asserts the increased mitigation obligation is not reflected in the Tetra Tech report. The comments include several bullet points discussing fish, flow and temperature impacts that must be completely mitigated, including impacts on Bull Trout, Redband Trout, and on efforts to restore anadromous species above the Pelton project dams. The comments assert that temperature impacts must be mitigated with water of the same temperature, in the same place, |

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| | | and at the same time, or mitigation is not achieved.<br><br>**Response:** These comments are similar to those raised by Yinger and others, and are addressed in more detail in Applicant's main Final Argument and above response to Yinger. Additionally, Thornburgh notes that ODFW has concluded the habitat potentially affected by Thornburgh's ground water pumping is "Category 2" (under the ODFW Habitat Mitigation Policy), not "Category 1." (ODFW Letter; Ex. B, June 17 Hearing). Mr. Lonsdale is incorrect in stating that a judge upheld the WaterWatch protest to Thornburgh's water right application. In fact, Thornburgh entered into voluntary negotiations with WaterWatch to fully resolve the protest and the matter was never presented to a judge. Nevertheless, the negotiations did result in increased mitigation requirements to reflect the various components within the general category of "quasi-municipal" use. This higher mitigation level is included in the Final Order approving the Thornburgh water right application, and is reflected in the Thornburgh Fish and Wildlife Mitigation Plan submitted with the FMP application. A copy of the OWRD Final Order is included in the FMP Application and as an attachment to the Addendum to Thornburgh's mitigation plan. ODFW has determined the Thornburgh plan meets the county approval standard requiring complete mitigation of impacts so there is no net loss of habitat quality or quantity. (ODFW Letter; Ex. B, June 17 Hearing). Mr. Lonsdale provides no evidence to contradict the ODFW findings. |
| Merry Ann Moore | H | **Comment:** Ms. Moore asserts that impacts to Whychus Creek (stream temperature and flows) will jeopardize the success of reintroducing anadromous fish, and that Thornburgh pumping might violate the ESA by threatening listed spring steelhead and bull trout. ORS 197.460 requires habitat of threatened or endangered species "to be retained," which means cold water must be maintained at all times to meet species' requirements. The resort would violate Goal 8 by exceeding the "carrying capacity" of water resources, which includes fish species in Whychus Creek and the Deschutes River.<br><br>**Response:** Thornburgh has provided expert analysis confirming the potential impact to stream flow or temperature in Whychus Creek – even assuming the degree of impact asserted by Yinger – will not result in negative impacts to the affected fish species with mitigation measures proposed by Thornburgh. (Ex. 1 and 5-7, Applicant's Evidence (July 15, 2008)). |
| Tom Davis | I | **Comment:** Mr. Davis asserts that resort run-off will impact Whychus Creek and the Deschutes |



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| | | River, whether by surface water run-off or by seepage to groundwater that flows into these streams; that wastewater discharge will carry nutrients to streams; and that Thornburgh's statement that all storm water will be infiltrated or evaporated on the project site is "an amazing assertion, and not possible".<br><br>**Response:** Mr. Davis's assertions are not supported by evidence and are contrary to the findings of DEQ, OWRD, and ODFW with respect to Thornburgh's proposed water, storm water and sewage treatment plans as reflected in the CMP and in materials submitted for the FMP. A specific response to Mr. Davis' comments was included in the Applicant's evidence submitted on July 15, 2008 (H. 15 – NCI Rebuttal regarding waste water; H.16 – NCI Rebuttal regarding storm water; and H.17 – WRG Letter regarding storm water.) |
| Nunzie Gould | J | **Note:** There are no written comments by Gould, only a series of exhibits without any explanation of their relevance. The water-related comments are listed below: |
| | J – Exhibit 5 | **Comment:** An e-mail string referring to an instream flow project by the Deschutes River Conservancy (DRC) and Eagle Crest.<br><br>**Response:** No apparent relevance. Gould appears to assert that the Thornburgh pumping will interfere with other on-going instream flow restoration efforts but provides no clear statement or evidence to support the contention. Moreover, such a contention is contradicted by evidence showing the potential impacts to surface water will be fully mitigated. It should be noted that neither the Deschutes River Conservancy nor Eagle Crest submitted comments in opposition to the application. |
| | J – Exhibit 13 | **Comment:** Memorandum of Agreement between Eagle Crest, ODFW and DRC regarding instream flow mitigation.<br><br>**Response:** Same as above for Exhibit J-5. |
| | J- Exhibit 17 | Copy of Deschutes County approval of Eagle Crest project. Includes findings and conditions concerning fish and wildlife mitigation required for that project.<br><br>**Response:** The Eagle Crest plan has no direct relevance to the Thornburgh application except to the extent that it demonstrates the Thornburgh mitigation plan is substantially more |



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| | | comprehensive. |
| | J- Exhibit 19 | **Comment:** Letter from ODFW to Deschutes County re Eagle Crest's efforts to restore instream flows. Mitigation plan for water attached to letter.<br><br>**Response:** Nothing in the Thornburgh mitigation plan will interfere with or affect efforts by Eagle Crest. Additionally, as noted above, the Thornburgh mitigation proposal is substantially more comprehensive. |

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| Lewis Bennett | Exhibit A | **Comment:** Local water district fears interference with its wells due to wasteful water use at the resort, including evaporation of large amounts of water from open ponds.<br><br>**Response:** The County has previously determined that the Thornburgh wells are not expected to cause interference with other ground water uses. This was based on substantial evidence from the CMP hearing process, including findings by the Oregon Water Resources Department (OWRD) in reviewing the Thornburgh water right application. (*See* CMP approval and specific findings regarding ground water impacts.) If the water district wells are within a two-mile radius of the Thornburgh wells, the district will have an opportunity to participate in the well indemnification plan required of Thornburgh under Condition 11. The condition requires Thornburgh to offer well indemnification under a plan to be submitted with the FMP, but was included in the CMP approval at the suggestion of Thornburgh, as a voluntary measure to provide greater reassurance to nearby well owners. |
| Don and Beverly Southern | Exhibit B, at 2 | **Comment:** Central Oregon has a limited water supply and the Eagle Crest development has caused local water declines and the need for lowering wells.<br><br>**Response:** See response to Bennett comment, above. |



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| Katy Yoder | Exhibit C, at 1 | **Comment:** Thornburgh will take a substantial amount of water from the aquifer.<br><br>**Response:** The comment does not provide any new evidence of the potential impacts on the aquifer that are relevant to the FMP proceedings. The issue of ground water impacts was addressed in the CMP decision. |
| Patrick Hodge | Exhibit D, at 1-2 | **Comment:** Thornburgh well pumping may adversely affect surrounding wells. Nearby wells should be monitored to determine impacts.<br><br>**Response:** See response to above comments; the well indemnification plan is available to well owners within a two-mile radius. |
| Mark Yinger | Exhibit E, 1-5 | **Comment:** Mr. Yinger responds to the Hearings Officer's question regarding the methodologies used for calculating the likely impacts of Thornburgh pumping. His comments include the following:<br><br>• The USGS model more accurately predicts the impacts than Tetra Tech's methodology. (pages 1-2)<br><br>**Response:** Specific response is contained in the Applicant's submission on July 15, including memoranda from Tetra Tech regarding the differences in methodologies. (Applicant's Evidence, Ex. 5, 6). The USGS Study and OWRD conclude that the model is best used for drawing conclusions at a regional level. As a result, OWRD relies on general information taken from the USGS study coupled with individual analysis by staff hydro-geologists to evaluate individual project impacts. Applicant's Rebuttal, A-4 (Transcript of Kyle Gorman Testimony, July 15, 2008).<br><br>• Challenges Thornburgh's description of consumptive use and recharge to the aquifer (pages 3-4)<br><br>**Response:** Thornburgh's estimate of consumptive use was based on the OWRD conclusions in the final approval of Thornburgh's water right application, and on the OWRD mitigation rules. Applicant's Rebuttal, A-4 (Transcript of Gorman Testimony); Applicant's Evidence, Ex. 1 (Applicant's Response to Questions of the Hearing Officer). |



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| | | • Identifies other alleged problems with Tetra Tech's evaluation (pages 4-5)<br><br>**Response:** See, Tetra Tech memoranda in Applicant's submission on July 15 (Applicant's Evidence, Ex. 5 and 6) |
| | Exhibit F | **Comment:** Copy of the Yinger Report<br><br>**Response:** See above responses to Yinger Comments. |
| Paul Dewey – Nunzie Gould | Exhibit I, at 4 and 6-9<br><br>(Gould 2) | **Comment:** Response to Hearings Officer's questions:<br><br>• Regarding the consistency of the FMP and CMP, the comments state that the WPCF permit calls for treatment of 326,000 gallons per day (gpd), a different amount than the 625,000 gpd described in the CMP.<br><br>**Response:** This issue is addressed in the Final Argument. Applicant has provided evidence explaining the discrepancy and confirming the adequacy of the revised determination of daily treatment requirements. Applicant's Rebuttal, F.3.<br><br>• Regarding the hearings officer's question about how to evaluate cumulative impacts, the comments assert that a review of undeveloped water rights in the area should be undertaken.<br><br>**Response:** See Applicant's Response to Questions of Hearings Officer regarding the issue of cumulative impacts. (Applicant's Evidence, Ex. 1). Additionally, it should be noted that all previously approved water rights – both developed and undeveloped – are considered by OWRD in evaluating a new water right application. The specific findings of OWRD regarding water availability, and mitigation requirements, are contained in the Final Order approving Thornburgh's water right application. A copy of the Final Order is attached to Thornburgh's mitigation plan Addendum.<br><br>**Comments on other issues:** (pages 6-9) |

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| | | • Applicant's consumptive use numbers are wrong (page 6)<br><br>**Response:** The Applicant's estimate of consumptive use is the amount required by OWRD and accepted by ODFW for the mitigation plan.<br><br>• Mitigation must be for each fish resource (page 7)<br><br>**Response:** ODFW has agreed that mitigation is appropriately based on habitat, rather than on specific species. Moreover, there is no evidence in the record suggesting any direct, negative impact to any particular species of fish.<br><br>• Impacts to Whychus Creek must be addressed (page 7)<br><br>**Response:** Impacts to Whychus Creek are asserted by Yinger on the basis of his own data inputs to run the USGS model. Mr. Yinger assumed full consumptive use by Thornburgh, which is contrary to the recommendations and approach used by USGS and OWRD in developing and running the model. Despite the serious question regarding Mr. Yinger's data inputs, assuming his model run to be correct, the potential impact to Whychus Creek is 106 acre-feet per year. Thornburgh has provided technical analysis addressing this potential level of impact and concluding that the impacts will be fully mitigated by the proposed mitigation measures. (Applicant's Evidence, Ex. 1 and 5-8). Additionally, if the hearing officer concludes additional mitigation is required for Whychus Creek, Thornburgh has provided rebuttal evidence showing the feasibility of acquiring additional instream flow on Whychus Creek through the Three Sisters Irrigation District. (Applicant's Rebuttal, A.3 and A.9).<br><br>• ODFW's determination is not binding with respect to compliance with the county's mitigation requirements (page 7)<br><br>**Response:** The Board of County Commissioners has previously determined that it is appropriate to rely on findings of ODFW in determining compliance with the county's mitigation standard. (See Final Argument.)<br><br>• Need more information on Deep Canyon Creek<br><br>**Response:** Thornburgh has provided additional information about the Deep Canyon Creek |



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| | | water rights and mitigation plans. (Applicant's Rebuttal, A.1, A.2; Applicant's Evidence, Ex. 1, 5 and 7.)<br><br>• Contribution of water by COID needs further explanation (page 8)<br><br>**Response:** The use of COID water is fully addressed in Applicant's mitigation plan (Fish and Wildlife Mitigation Plan Addendum (April 21, 2008), pp. 4-7 and 10-11), technical memoranda provided by TetraTech and Applicant's Rebuttal, A.5.<br><br>• State Scenic Waterway protections apply (page 8)<br><br>**Response:** The requirements of the State Scenic Waterway statutes are satisfied by the OWRD mitigation plan. ORS 390.835, OAR 690-505-0600 *et seq;* Final Order approving Thornburgh water right application.<br><br>• Stream flow and temperature degradation will impair wilderness values in the Whychus area (page 8-9)<br><br>**Response:** Potential impacts to Whychus Creek, if any, will be fully mitigated by the Thornburgh plan as described in the Evaluation Report and subsequent memoranda submitted by Tetra Tech. The comment offers no specific evidence of unmitigated impacts that will impair wilderness values, nor are such interests relevant to consideration of the county mitigation standard which address potential impacts to fish and wildlife resources. |
| Charles Huntington | Exhibit K, at 7-14 | (General background discussion of area streams and fish habitat needs -- pages 1-6)<br><br>• **Comment:** Tetra Tech's identification and analysis of the impact zone excludes lower Whychus Creek (page 7)<br><br>**Response:** The Tetra Tech memoranda submitted into the record on July 15, and as part of Applicant's Rebuttal on August 12 provide further analysis of impacts to lower Whychus Creek assuming quantities of impact projected by Yinger and conclude the impacts will be fully |

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| | | mitigated.<br><br>• **Comment:** Newton report, 2008, describes mitigation measures, but "no actual assessment of the probable effectiveness of these measures at mitigating project impacts on habitat for fish native to the area is provided." (pages 7-8)<br><br>**Response:** The Newton report (Addendum) was supplemented by additional information on impacts to fish and habitat prepared by Tetra Tech. (Evaluation of the proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat, and subsequent memoranda.)<br><br>• **Comment:** Newton report, 2008, does not provide evidence to support Newton's statement that "Thornburgh water use is not projected to impact Whychus Creek based on OWRD analysis." OWRD form attached to Newton report as Exhibit 2 does not support the statement. (page 8)<br><br>**Response:** Exhibit 2, attached to the "Newton report, 2008" (Addendum) is the ground water report prepared by OWRD. Page 1 of the report states groundwater flow is toward the Deschutes River with the nearest point of discharge at 5.8 to 8 miles. The report does not identify potential impact to Whychus Creek. Additionally, the Final Order attached to the Newton report (Addendum) identifies the location of impact for the Thornburgh water right application as the Deschutes General Zone and does not include Whychus Creek.<br><br>• **Comment:** Tetra Tech's 2008 analysis of impacts on habitat quantity does not address the amount of coldwater habitat available along the river during summer. Based on Tetra Tech's assumption (that direct ground water inputs would be reduced by 0.6%) it would seem reasonable to assume that such a reduction would diminish thermal refugia to a similar degree. (pages 9-10)<br><br>**Response:** Tetra Tech evaluates impacts to temperature and coldwater habitat in memoranda submitted into the record at the July 15 hearing (Applicant's Evidence) and in Applicant's Rebuttal submitted August 12. The evaluation concludes the very slight changes in temperature that would occur assuming the Yinger conclusions are correct are so small that they would not result in a negative impact to fish.<br><br>• **Comment:** Tetra Tech's 2008 analysis of habitat quality suggests 0.1°C increases near |



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| | | Steelhead Falls. This suggests project "could incrementally increase peak summer temperatures and reduce slightly the quality of thermal conditions along most of the river section used by bull trout and to which steelhead and salmon are being reintroduced." It is unclear from Tetra Tech's report how the proposed mitigation measures will offset the slightly negative effects of such temp increases on fish. Projected impacts are slight, but negative. (pages 10-11)<br><br>**Response:** See above response.<br><br>• **Comment:** Newton and Tetra Tech 2008 reports do not clearly indicate how impacts to Whychus Creek will be determined or mitigated. (page 11)<br><br>**Response:** The methodology and conclusions of Tetra Tech and Newton are explained in documents that apparently were not available to Mr. Huntington at the time his comment letter was prepared for the July 15 hearing. The Applicant's submission on July 15 and Applicant's Rebuttal include additional technical comments from both Tetra Tech and Newton that explain their analysis of potential impacts to Whychus Creek, and support the conclusion that any such impacts will be fully mitigated.<br><br>• **Comment:** Small reductions in ground water inputs in lower Whychus Creek would cause incremental decreases in the quantity and quality of fish habitat in that area. The area accounted for most of the spring Chinook spawning in the upper mainstem Deschutes and Whychus Creek before completion of the Pelton-Round Butte project, so it is likely to play an important role in reestablishing a run of fish in the area. (page 12-13)<br><br>**Response:** Both Yinger and Huntington have acknowledged that any potential impact attributable to the Thornburgh project will be slight. Nevertheless, Thornburgh has demonstrated through additional technical evidence that any such impacts will be fully mitigated. The potential for cumulative impacts due to other projects is not relevant to a determination of compliance with the county mitigation standard. The county standard is specific to the impacts of the project under consideration.<br><br>• **Comment:** The Tetra Tech analysis suggests that Thornburgh may have slight negative effects temperature and fish habitat in the mainstem Deschutes downstream of Big Falls. Any small impacts on Whychus Creek "will apparently go unmitigated on that stream." |



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| | | (page 14 – Conclusions)<br><br>**Response:** See above responses. |
| Sandy Lonsdale | Exhibit N, at 1 | **Comment:** Thornburgh must comply with the BLM's Upper Deschutes Resource Management Plan, which states that the area of Alder Springs in Whychus Creek is protected as a Wilderness Study Area. The area cannot be permanently altered in the manner that Thornburgh will alter Whychus Creek.<br><br>**Response:** Thornburgh has worked directly with the BLM in developing its Wildlife Mitigation Plan. BLM has not asserted any lack of compliance with the Upper Deschutes Resource Management Plan. |

**Rebuttal Evidence – July 29, 2008**

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| Charles Huntington | Technical Memo, 7/15/08 (revised memo submitted 7/18/08), at 7-14 | **Comment:** This technical memo is a slightly revised version of the memo submitted by Huntington at the July 15, 2008 hearing (changes are outlined on the July 18, 2008 cover letter by Paul Dewey).<br><br>**Response:** This revised version of the July 15, 2008 memo is identical in all materials respects to the memo submitted at the July 15 hearing. See the above response to the memo offered at the hearing. |
| Paul Dewey/ Nunzie Gould | Second Supplemental Memo, at 7-8<br><br>(Gould 3) | **Comment:** Thornburgh wrongly identifies the "location of impact" as 5 to 8 miles north of the project. OWRD did not identify that as the location of impact, but merely the nearest point where ground water meets surface water.<br><br>**Response:** The purpose of the OWRD Public Interest Review for Ground Water Applications is to identify the potential impacts for purposes of determining compliance with OWRD requirements for new water rights, and for mitigation within the Deschutes Basin. The report identifies the location of discharge as 5 to 8 miles north of the project. This is appropriately interpreted as the location of impact. The report concludes the location of impact for purposes of mitigation is the "General |



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| | | Zone" of the Deschutes River. The OWRD report does not identify any potential impacts on Whychus Creek or Alder Springs. |
| | Second Supplemental Memo, at 8 | **Comment:** Yinger's run of the USGS model is consistent with what OWRD would find as far as the location of impacts if OWRD ran the model (citing Kyle Gorman testimony to that effect).<br><br>**Response:** The comment is correct as far as it goes. Although Mr. Gorman stated OWRD would find similar results if it ran the model, he went on to state that OWRD does not use the model to determine impacts of individual projects or applications because "a model is a model – it's only as good as what you put into it." Mr. Gorman explained OWRD relies on review of each application by OWRD staff with extensive experience with the model as well as with actual impacts in the basin. Mr. Gorman stated, "If someone were to do surgery we wouldn't want a machine doing the surgery but we'd rather have a human doing surgery. Ken Lite is that human doing surgery on reviewing ground water applications so I think that there's even a higher level of review and consideration for impacts in the basin when actually our department personnel is reviewing those applications." (Testimony of Kyle Gorman, Applicant's Rebuttal, A.4) |
| | Second Supplemental Memo, at 8-9 | **Comment:** OWRD's consumptive use calculation does not control because Newton's underlying assumption of groundwater recharge from the septic and sewer system is incorrect.<br><br>**Response:** The OWRD determination of consumptive use was not based on Newton's assumption of groundwater recharge from the septic and sewer system. The determination was based on OWRD consumptive use "factors", modified by a specific look at proposed water uses for the Thornburgh project in response to a protest filed by Water Watch of Oregon. (*See* Testimony of Kyle Gorman, Applicant's Rebuttal, A.4). |
| | Second Supplemental Memo, at 9 | **Comment:** Deep Canyon Creek spring water does not mitigate impacts on Whychus Creek. Mitigation must ensure no net loss to "the resource" that is impacted (i.e. the same creek, the same population of fish, etc.)<br><br>**Response:** In the first place, potential impacts to Whychus Creek have not been demonstrated. The Yinger report suggests an impact of 106 acre-feet per year, but the conclusion is based on a suspect application of the USGS model using an assumption of 100% consumptive use. OWRD and ODFW did not identify a specific impact on Whychus Creek. Even if the Yinger assumptions are assumed to be correct – which Applicant clearly does not concede – the evidence shows any such |

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| | | impacts "are unlikely to have an adverse effect on fish habitat quantity or quality, or to result in a net loss or net degradation of the resource." Tetra Tech Memorandum dated July 14, 2008 (Applicant's Evidence, Ex. 7, at p. 4) Moreover nothing in the county standard requires the interpretation suggested by Mr. Dewey. In this case, ODFW has concluded the "resource" to be protected is habitat for specified species of fish. ODFW Letter, June 13, 2008. Project opponents have not provided any technical evidence to suggest that the potential impacts to habitat in Whychus Creek cannot be mitigated for with cold water added to the Deschutes River system from Deep Canyon Creek and ODFW has indicated that the mitigation is appropriate.<br><br>If the Hearing Officer concludes that mitigation specific to Whychus Creek is required, Thornburgh has provided rebuttal evidence showing it is feasible to acquire 106 acre-feet of instream flow restoration water on Whychus Creek through participation in a conservation project of the Three Sisters Irrigation District. If necessary, approval of the FMP can be conditioned on providing such additional flow restoration to Whychus Creek. (Applicant's Rebuttal, A.9) Applicant does not agree that such additional mitigation should be required. The most credible and persuasive evidence in the record supports a conclusion that the Thornburgh mitigation plan is sufficient to meet the county mitigation standard, as confirmed by ODFW. |
| | Second Supplemental Memo, at 9 | **Comment:** Thornburgh apparently admits that there will be a volume impact (reduction in flow) to Whychus Creek, but no mitigation is being proposed for Whychus Creek.<br><br>**Response:** Thornburgh does not admit there will be an impact to Whychus Creek. For purposes of rebuttal, Thornburgh provided evidence demonstrating that even if project opponent's conclusions regarding impacts to Whychus Creek were assumed, such impacts are fully mitigated by the proposed mitigation plan. See responses above. |
| | Second Supplemental Memo, at 9 | **Comment:** Huntington reports show loss of existing cool habitat patches (0.6% in mainstem Deschutes). This impact has not been mitigated.<br><br>**Response:** The findings of ODFW and Tetra Tech conclude that temperature impacts are fully mitigated by the Deep Canyon Creek water rights. ODFW Letter, June 13, 2008; Tetra Tech Evaluation Report. |
| Charles Huntington | Technical Memo, 7/25/08, | **Comment:** Flow data provided by Tetra Tech keeps changing (Table 1 on page 2 of the comments |



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| | at 1-2 | shows changes over time).<br><br>**Response:** Clarification of the flow data is provided in rebuttal evidence. (Applicant's Rebuttal, A.5.) |
| | Technical Memo, 7/25/08, at 2 | **Comment:** The Tetra Tech mass-balance analysis shows small, but negative thermal impacts on Whychus Creek, even with the proposed mitigation efforts.<br><br>**Response:** See response above to similar Dewey and Huntington comments. |
| | Technical Memo, 7/25/08, at 2-3 | **Comment:** The Tetra Tech mass-balance analysis does not account for localized consequences of reduced ground water inputs.<br><br>**Response:** The Tetra Tech analysis is based on assumptions of impact from the Yinger report. Although Thornburgh does not accept the Yinger assumptions, Tetra Tech evaluated the potential impact in order to demonstrate the adequacy of Thornburgh's mitigation plan. |
| | Technical Memo, 7/25/08, at 3 | **Comment:** Thornburgh's proposed mitigation does not include measures to offset the small reductions of cool habitat patches that are likely to occur in the main stem Deschutes below Big Falls and in lower Whychus Creek as a consequence of reduced ground water inputs.<br><br>**Response:** See above responses. |
| Sandy Lonsdale | Additional Comments, 7/28/08, at 1 | **Comment:** Thornburgh says reduced flows in Lower Deschutes are insignificant. This is not true. Thornburgh must have no impacts on Deschutes flows during any time of the year in order to meet the county standard.<br><br>**Response:** The county standard does not require "no impacts", but rather requires that any negative impacts be fully mitigated. The above responses demonstrate that the Thornburgh plan will provide for complete mitigation and comply with the county standard. |
| | Additional Comments, 7/28/08, at 2-3 | **Comment:** There is no evidence in the record that Barber water rights for mitigation are valid, no evidence of the flow in Deep Canyon Creek and no evidence of the temperature of the creek. He says the maps attached to the comments prove that the Deep Canyon Creek water is "phantom |



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| | | water, not fully proven, and not available for use as mitigation."<br><br>**Response:** See Response to similar comments above regarding Big Falls water rights. |
| Mark Yinger | Rebuttal and comment, 7/23,2008, at 1-3 | **Comments:** Rebuttal to Thornburgh Memo, Exhibit G:<br><br>• Yinger correctly ran the USGS model and use of the model is appropriate for determining the impact of the Thornburgh pumping (page 1)<br><br>**Response:** Same response as above regarding use of the model for individual projects.<br><br>• There is no conflict between OWRD's determination of general zone impacts and Yinger's model results (page 1-2)<br><br>**Response:** Same response as above regarding General Zone versus Whychus Creek. The OWRD General Zone includes only the Deschutes River main stem and does not include impacts to Whychus Creek. OWRD did not find impacts to Whychus Creek and Yinger's use of the model, based on 100% consumptive use is inconsistent with OWRD practice and recommended use of the model as described in the USGS report.<br><br>• Site specific information used by OWRD and Yinger is the same. The information comes from Thornburgh's water right application (page 2)<br><br>**Response:** Although Yinger may have used information from the Thornburgh water right application, Mr. Yinger departed significantly from OWRD practice both in using the model for determining the impacts of an individual project and in assuming 100% consumptive use for the project. See above responses to similar comments.<br><br>• The USGS model is peer reviewed, so there is no need to peer review the modeling results. If Yinger is held to a peer review standard, then the work of applicant's consultants should also be held to that standard. (page 2)<br><br>**Response:** The point of concern with respect to Mr. Yinger's use of the model is with the lack of information regarding assumptions used. Mr. Yinger acknowledges he input 100% consumptive use for the project. This is inconsistent with OWRD practice and USGS |



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| | | recommendations.<br><br>• Yinger disagrees with the consumptive water volume of 1,356 acre-feet per year for several reasons (pages 2-3).<br><br>**Response:** See responses above to similar comments regarding consumptive use.<br><br>• Determination of consumptive use has nothing to do with the USGS model (page 3).<br><br>**Response:** See responses above to similar comments.<br><br>• The use of Big Falls Ranch water for mitigation will not mitigate the impacts on Whychus Creek (pages 3-4), and the ODFW letter of June 13, 2008 did not say that it would.<br><br>**Response:** See responses above to similar comments.<br><br>• Thornburgh is correct that Yinger did not quantify temperature impacts, but applicant's consultants have quantitatively confirmed such impacts. (page 4)<br><br>**Response:** The Tetra Tech evaluation does not confirm the quantity of impact asserted in the Yinger report. The Tetra Tech evaluation merely assumes the quantity of impact for the sake of argument and determines the related potential for impact on temperature. |
| | Rebuttal and comment, 7/23,2008, at 4 | **Comments:** Rebuttal to Tetra Tech memo of July 2, 2008:<br><br>• Impacts will include stream temperature increases in a reach of the Deschutes River that includes listed bull trout habitat<br><br>**Response:** Bull Trout were listed as a species of concern in the evaluation by ODFW and Tetra Tech.<br><br>• Impacts to Whychus Creek will not be mitigated by abandonment of three domestic wells and the funding of thermal modeling of Whychus Creek<br><br>**Response:** Abandonment of the wells and providing funding are not included in the mitigation plan |

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| | | for the purpose of mitigating for potential impacts to Whychus Creek. These measures are recognized by ODFW as additional actions contributing to a "net benefit" to the resource. |
| | Rebuttal and comment, 7/23,2008, at 4-6 | **Comment:** Rebuttal to Tetra Tech memo of July 8, 2008:<br>• Yinger provides several comments relating to use of the USGS model.<br>**Response:** See responses to above similar comments regarding the model. The credibility and usefulness of the USGS model is not at issue. Applicant and Yinger disagree regarding data inputs used by Yinger in running the model for the Thornburgh project. Applicant also relies on OWRD's determination that use of the model is not the most appropriate means to determine project-specific impacts. |
| | Rebuttal and comment, 7/23,2008, at 6-7 | **Comment:** Rebuttal to Tetra Tech memo of July 14, 2008:<br>Comments relating to Tetra Tech's discussion of Alder Springs flows and temperature impacts to Lower Whychus Creek<br>**Response:** Yinger challenges Tetra Tech's reliance on OWRD estimates of flow in Whychus Creek and Alder Springs but provides no further evidence to support his own assumptions. |
| | Rebuttal and comment, 7/23,2008, at 7 | **Comment:** Rebuttal to Newton July 15, 2008 Response Letter:<br>Challenges Newton's statement that much of the water used at the Resort will return to the ground through septic systems, sewage treatment systems and seepage.<br>**Response:** The Newton assumptions regarding consumptive use and seepage are consistent with OWRD practices and the conclusions reflected in the OWRD Final Order approving the water right application. |
| | Rebuttal and comment, 7/23,2008, at 7-8 | **Comment:** Response to Hearings Officer's question regarding cumulative impacts:<br>It is critical for Deschutes County to consider the cumulative impact of Thornburgh and other projects, including the impacts of future development of ground water permits already issued by |

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| | | OWRD.<br><br>**Response:** The county standard does not address cumulative impacts of other projects in connection with the mitigation requirements for an individual project. |
| Steve Munson | Additional Comments, 7/29/08, at 1-4 | **Comment:** Approval of Thornburgh will likely violate the Endangered Species Act, because it will adversely affect critical habitat for listed Bull Trout by reducing cold water spring refugia (the federal listing of Bull Trout critical habitat areas is attached to the comments). The County should withhold approval of the mitigation plan, because BLM improperly entered into an MOU that would adversely affect listed fish and wildlife species. Yinger's use of the USGS model was appropriate.<br><br>**Response:** Mr. Munson offers no evidence to support a contention that approval of the Thornburgh project will violate the federal Endangered Species Act or that the BLM improperly entered into an MOU. No state or federal agency, including ODFW, has raised such an issue. To the contrary, ODFW concluded the Thornburgh mitigation plan should meet the county requirement by mitigating for potential impacts to cold water springs.<br><br>Use of the model by Yinger has been addressed above. |

**Rebuttal Evidence – August 28, 2008**

| Commenter | Exhibit-Page | Comments / Response |
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| Paul Dewey | Third Supplemental Memorandum in Opposition, 8/28/08, at 1 | **Comment:** The Applicant's Newton Report Exhibit A-6 and TetraTech Exhibit A-8 acknowledge that there will be an increase in water temperature from the Thornburgh pumping. The Applicant has also consistently acknowledged impacts to Whychus Creek. Applicant's emphasis on the insignificance of impacts is not consistent with the Code's "no net loss" standard. In addition to impacts acknowledged by Applicant, Mr. Huntington has pointed out the losses associated with localized impacts and the loss of existing cool habitat patches (in the report attached to the Second |



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| | | Supplemental Memorandum, dated 7/29/08).<br><br>**Response:** Gould's assertions are wrong. Applicant acknowledges there is the potential for a slight increase in water temperature in the Deschutes River due to the proposed ground water use; however, applicant's evidence shows the potential temperature impact will be fully mitigated. The ODFW letter confirms that potential temperature impact during the summer/irrigation season will be mitigated by applicant's plan to obtain mitigation water from the Big Falls Ranch water rights on Deep Canyon Creek. (June 13 letter from ODFW). ODFW and the Applicant's experts also agree that potential temperature increases outside of the irrigation season do not require mitigation because temperature and flow are not limiting factors to fish habitat during that time period each year and the extent of potential impact is slight. Under the county approval standard, mitigation is required only for "negative" impacts. Because there is no negative impact during this time period, there is no need for additional mitigation. Applicant does not agree with opponent's assertion of negative impacts to Whychus Creek. For the sake of argument, Applicant instructed its experts to *assume* the potential impacts identified by project opponents. Even assuming the full amount of impact projected by Mr. Yinger, Applicant's evidence shows there is no negative impact to fish habitat that is not otherwise fully mitigated by the Applicant's mitigation plan. Gould is wrong in stating that the county code requires mitigation of all impacts, regardless of significance. The county code requires mitigation only for *negative* impacts so there is no net loss or degradation of the resource. Applicant has satisfied this requirement as demonstrated by the letter from ODFW and TetraTech reports described in Applicant's Final Argument.<br><br>The ODFW analysis specifically addresses potential impacts to seeps and springs in the river system. Gould offers no evidence to support a finding of unique habitat or species considerations identified with any particular seep or spring. |
| | Third Supplemental Memorandum in Opposition, 8/28/08, at 2-3 | **Comment:** The ODFW letters do not establish compliance with the mitigation requirements of DCC 18.113.070(D). ODFW's analysis is based on its own Fish and Wildlife Habitat Mitigation Policy, which contains different standards. ODFW did not specifically find compliance with the County criteria. Even if ODFW's statements could be read to include such a finding, it is up to the County to make that determination.<br><br>**Response:** Gould's assertions about the ODFW letters are wrong. The ODFW letter of June 13, 2008 clearly states that ODFW reviewed the Thornburgh application "relative to meeting Deschutes County Code 18.113.070(D)." The letter states that the mitigation water to be provided by |



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| | | Thornburgh during the irrigation season "exceeds the flows needed to mitigate for potential spring and seep impacts" and will provide "a net benefit in instream flows for the Deschutes River." (Letter, p. 2) The letter also states ODFW does not believe there will be an adverse impact to fish and wildlife habitat during the period from November 1 through March 31 and concludes: ODFW has determined that providing the proposed mitigation outlined above should mitigate for potential impacts on springs and seeps and provide a net benefit to the resource." Although the ODFW letter describes additional analysis under the state mitigation policy, the letter clearly communicates that it is intended to provide input to the county in evaluating the project under the county standard. |
| | Third Supplemental Memorandum in Opposition, 8/28/08, at 3 | **Comment:** Applicant's proposed addition of 106 acre-feet of water to Whychus Creek is not adequate to mitigate impacts on the creek; the proposal would compound the problem by increasing stream temperatures; adding warm surface water does not compensate for withdrawals of cold groundwater; evidence regarding the status of this mitigation water is unclear.<br><br>**Response:** First, Applicant reiterates that the option of securing additional mitigation water for Whychus Creek was offered only in the event that the hearing officer concludes such additional mitigation is needed. As described in the Final Arugment, the weight of evidence shows no negative impacts to Whychus Creek as a result of the project. The only evidence of impacts to Whychus Creek comes from the conclusions of the Yinger report, which is based on a run of the USGS Model. OWRD has discredited use of the model for determining site-specific project impacts. Additionally, Mr. Yinger's assumption of 100% consumptive use is contrary to OWRD practice. The ODFW letter confirms that the extent of potential negative temperature impact due to the resource will be fully mitigated by the Thornburgh plan to acquire the Big Falls water right as mitigation and to remove the existing dams on Deep Canyon Creek. Accordingly, there is no need for additional temperature mitigation in Whychus Creek.<br><br>If the hearing officer concludes additional flow mitigation is needed for Whychus Creek, the letter from Three Sisters Irrigation District confirms that it would be feasible for Thornburgh to obtain instream flow/mitigation water through the district's conservation project. The letter states the district plans to proceed with the project in 2009-2010 and that it would be feasible for Thornburgh to obtain mitigation from the conservation project. Therefore, FMP approval could be conditioned to require the additional mitigation if determined necessary. Gould does not provide any evidence to counter a finding that it would be feasible for Thornburgh to provide the additional mitigation through an agreement with Three Sisters Irrigation District. Additionally, the conservation project |



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| | | will not result in "adding warm surface water"; rather, the project will leave natural stream flow in place that is currently diverted for irrigation use. |
| | Third Supplemental Memorandum in Opposition, 8/28/08, at 3 | **Comment:** The OWRD determination of consumptive use is not controlling in this proceeding. In addition, the Newton Exhibit A-7 argues that sewer water is going to be recharging the aquifer. This argument is inconsistent with the permit, which only allows "controlled seepage."<br><br>**Response:** Applicant does not argue that the County *must* accept OWRD's determination of consumptive use; however, the OWRD determination is clearly the most authoritative and persuasive evidence of consumptive use in the record. Thornburgh and ODFW appropriately relied on the OWRD determination of consumptive use in connection with quantification of the expected impacts due to ground water pumping. Testimony from OWRD Region Manager Kyle Gorman confirmed that the OWRD determination of consumptive use within the Deschutes Basin was developed with "many, many hours of discussion about consumptive uses" and "the process was very public." He also explained that the Thornburgh water right application received extra scrutiny by OWRD following objections raised by WaterWatch of Oregon. Mr. Gorman's testimony demonstrates that OWRD has a high level of confidence in its estimates regarding consumptive use, and it relies on this process in implementing the state's ground water mitigation program. It is perfectly appropriate for ODFW and the County to also rely on the OWRD process in attempting to quantify potential impacts to surface water as a result of the Thornburgh project. Gould has not provided any alternative for determining consumptive use of the project, other than to rely on Mr. Yinger's approach of assuming 100% consumptive use. As described above, and in the Final Argument, there is no precedent or factual basis in the record for an assumption of 100% consumptive use and the approach is contrary to established procedures used by OWRD.<br><br>Gould's objections to consideration of recharge from the sewage treatment system are misplaced. As described in the Newton memo (Applicant's Rebuttal, A7), consideration of "controlled seepage" is not contradictory to an assumption that some quantity of water will be recharged as a result of that process. The memo confirms that the WPCF permit clearly allows for effluent to seep into the ground. |
| | Third Supplemental Memorandum in | **Comment:** The Yinger model is consistent with the USGS model; applicant is incorrect in arguing that Yinger's use of the model is inappropriate for addressing a particular development.<br><br>**Response:** The testimony of OWRD Region Manager Kyle Gorman clearly describes why OWRD |



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| | Opposition, 8/28/08, at 4 | does not use the USGS model for site specific analysis and provides more persuasive evidence in support of the approach used by Thornburgh and ODFW to evaluate potential impacts to fish habitat. |
| | Third Supplemental Memorandum in Opposition, 8/28/08, at 4 | **Comment:** The proposed dam removal has not been shown to be feasible or how it would in fact be accomplished; it is not clear that the dam removal agreement would be binding; it appears that necessary signatures may be missing; if the dam is already partially breached, it is not clear that its removal would have any significance as mitigation.<br><br>**Response:** The dam removal agreement demonstrates that it is feasible for Thornburgh to implement the mitigation plan with respect to removing the dam on property owned by third parties. No evidence in the record suggests that it would not be feasible to physically remove the structure. Prior public comments questioned whether Thornburgh had authorization to remove a dam on property not owned by Thornburgh, and the dam removal agreement was provided in rebuttal to demonstrate such authorization. There is no basis for Gould's assertion that necessary signatures are missing. The agreement shows the signature of an authorized representative of each entity that is party to the agreement and Gould provides no evidence to suggest otherwise.<br><br>Gould's suggestion that there is no evidence removing the dam would have any significance as mitigation is contradicted by the simple fact that ODFW requested Thornburgh to remove the dam. ODFW's letter of June 13, 2008 describes the expected benefit of the dam removal. The issue is further clarified in a follow-up letter from ODFW to the County dated June 16, 2008 (Ex. B., June 17 Hearing. ) Even though the dam was partially breached in the past, it is clear that the remaining structure still causes undesirable impoundment of water that will be eliminated by removing the structure completely. |
| | Third Supplemental Memorandum in Opposition, 8/28/08, at 4 | **Comment:** Gould asserts the Big Falls water rights are not what they are alleged to be and argues that questions regarding the Big Falls water rights have not been answered and that it is not clear why Applicant submitted the Newton due diligence report concerning the Big Falls water rights as part of its rebuttal evidence submission on August 12. Gould relies on conclusions about the Big Falls water rights in a report from Mr. James C. Crocker that is attached to the legal memorandum.<br><br>**Response:** Gould and other project opponents have made unsubstantiated allegations concerning the validity of the Big Falls water rights. No credible evidence has been offered in support of their assertions. In fact, questions about the water rights were specifically addressed by Mr. Rex Barber, |

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| | | President of Big Falls Ranch, Inc., in oral and written testimony provided at the hearing on July 15, 2008. Mr. Barber stated that the water rights are valid and not subject to forfeiture, and that there is adequate water supply to meet his water rights. Applicant also provided additional evidence of the status of the water rights in the form of a copy of the Due Diligence report prepared for Thornburgh prior to its purchase of the Big Falls water rights. The report was prepared for Thornburgh for the purpose of providing information about the validity and adequacy of the water rights for mitigation purposes in order to inform a decision about whether to acquire the water rights. The purpose of submitting the Due Diligence report in this hearing record was to document the detailed research and conclusions reached by Mr. Newton, a state-accredited Certified Water Rights Examiner. The report carries Mr. Newton's stamp as such. Additionally, and persuasively, ODFW reviewed the Big Falls water rights in connection with its review of the mitigation plan and raised no objection. ODFW believes conversion of the Big Falls water rights will provide important habitat benefits. ODFW Letter, p. 2-3.<br><br>In contrast, the report submitted by Mr. Crocker is a mystery. Mr. Crocker is not a Certified Water Rights Examiner and neither his letter nor resume suggest that he has any training or expertise with respect to water rights. In fact, his representations and conclusions about the Big Falls water rights suggest a serious misunderstanding of the nature and significance of the documents he reviewed. Mr. Crocker is flat wrong in stating that "the final transfer has not been issued." The transfer application was approved by OWRD under a final order issued January 11, 2000. A copy of the order was included with the due diligence report from Mr. Newton and in additional rebuttal submitted by Applicant on September 11. In 2001, Big Falls Ranch submitted a "Claim of Beneficial Use and Site Report" to OWRD, prepared by a certified water rights examiner (Mr. Darryl J. Anderson), confirming that the transfer had been fully implemented. After the report is reviewed and approved by OWRD, a new water right certificate will be issued confirming the change authorized by the transfer. Until that time, the change continues to be fully authorized under the transfer order. It is this Claim of Beneficial Use and Site Report which has not yet received final action by OWRD – a function of OWRD backlogs rather than any failure on the part of Big Falls Ranch. A copy of the report was included with Applicant's Final Rebuttal evidence on September 11.<br><br>Project opponents have made bald assertions challenging the validity of the |
| Mark Yinger | Rebuttal and | Response to Martha Pagel's letter, dated August 11, 2008: |

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| | comment, 8/28/08, at 1 | **Comment:** Thornburgh's proposed addition of 106 acre-feet of water to Whychus Creek would further harm lower Whychus Creek. The addition of warm water with cause an even greater stream temperature increase at Alder Springs.<br><br>**Response:** See response above to comments in Gould 3. |
| | Rebuttal and comment, 8/28/08, at 2 | Response to Richard Nichols letter, dated August 6, 2008, concerning stream impacts:<br><br>**Comment:** 1) The statement that Yinger's use of the total Thornburgh pumpage for groundwater modeling is not consistent with comments in the USGS report is unfounded. 2) Mr. Nichols' statement that the Yinger Report did not predict or quantify impact on stream temperature is incorrect because the report did predict an increase in stream temperature. 3) The comment characterizing the term "mixing zone" as a regulatory term under the Clean Water Act is irrelevant. 4) The conclusion that the mitigation plan fully mitigates impacts is incorrect, because the plan ignores impacts to Whychus Creek.<br><br>**Response:** 1) The USGS report referenced by Mr. Nichols addresses consumptive and non-consumptive uses and recognizes some level of return flow associated with almost all types of ground water uses. Testimony from Mr. Gorman of OWRD confirms that OWRD has established guidelines for determining consumptive use. In contrast, there is no evidence in the record supporting Mr. Yinger's assumption of 100% consumptive use as a data input for running the USGS model.<br><br>2) The Nichols letter correctly states that Yinger did not quantify the potential impact to stream temperature; the Yinger report merely asserts there will be an impact. Mr. Yinger and project opponents have used the bald prediction to suggest the impact will be significant. Evidence provided by Thornburgh demonstrates that even with Mr. Yinger's assumption of 100% consumptive use, the potential impact to temperature, due to the small quantity of water involved, would not be expected to have an adverse impact on fish or habitat. Further, ODFW confirmed that the Thornburgh mitigation plan adequately addresses temperature impact issues.<br><br>3) No response is required to the comment regarding mixing zones. |

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| | | 4) As described above, potential impacts to Whychus Creek are asserted only on the basis of Mr. Yinger's report, which contradicts the findings of OWRD. Even assuming the projected impact to Whychus Creek claimed by Mr. Yinger, the Thornburgh mitigation plan is adequate, as demonstrated by the TetraTech evaluation. (Applicant's Rebuttal, A-8.) |
| | Rebuttal and comment, 8/28/08, at 2 | Response to Richard Nichols letter, dated August 6, 2008, concerning sewage effluent:<br>**Comment:** The objective of the Water Pollution Control Facilities Permit is not to prevent seepage into the ground but to prevent seepage at a rate such that it gets by the plants and negatively impacts groundwater quality. Therefore, Thornburgh should not be counting sewage effluent as recharging groundwater and thereby reducing its mitigation obligation.<br>**Response:** Thornburgh and ODFW reasonably relied on the OWRD determination of consumptive use for the project, as a whole, in evaluating the potential project impacts on fish and related mitigation requirements. As explained in testimony by Kyle Gorman, the OWRD determination of consumptive use is based on extensive public review of the issue and the agency's own modeling. For Thornburgh, the evaluation of consumptive use was further reviewed and refined as a result of a protest by WaterWatch. |

**Paul D. Dewey** Attorney at Law

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September 16, 2008

RECEIVED
BY:
SEP 16 2008
DELIVERED BY:
Paul Dewey

Ms. Anne Corcoran Briggs
Deschutes County Hearings Officer
c/o Ruth Herzer
Community Development Dept.
117 NW Lafayette Ave.
Bend, OR 97701-1925

**Re: M-07-2, MA-08-6; Proposed Thornburgh Destination Resort;**
**ORS 197.763(6)(c) Request to Respond to New Evidence**

Dear Ms. Corcoran Briggs:

Once again, due to new evidence submitted by the Applicant, I am requesting on behalf of my client, Nunzie Gould, the opportunity to respond to the new evidence pursuant to ORS 197.763(6)(c). Due to the limited time left under the 150-day clock, we are submitting this and Dr. Dobkin's response with our request and are emailing/faxing the materials to the Applicant.

**TetraTech Letter of September 11, 2008**

We wish to respond to the following issues addressed in the TetraTech letter of September 11.

1. Reliance on BLM Standards.

As we have previously pointed out, BLM standards are not oriented toward achieving the criteria of DCC 18.113.070(D). BLM lands, where the future mitigation is supposedly to occur, have regulations to meet other objectives than fish and wildlife, including grazing, for example, which is contrary to wildlife mitigation. See Dr. Dobkin's report of August 27, page 1, where he explains that for the great majority of wildlife species dependent on juniper woodland or sagebrush shrubsteppe, any purported mitigation benefits will be reduced greatly or nullified completely by livestock grazing.

2. ODFW Standards and Review.

Contrary to TetraTech's representation that ODFW has said that TetraTech's plan "would meet the requirements of DCC 18.113.070(D)," ODFW was more cautious in its language, even in a supplemental e-mail of June 16 requested by Thornburgh, saying that the plan (if followed) "should address" the mitigation requirements.

As for new information submitted since the June ODFW letter, ODFW only acknowledges receipt of TetraTech's revised plan and does not address its adequacy or the comments and information presented by Dr. Dobkin or Mr. Michalski.

Ms. Sharp's reference to me attempting to persuade ODFW to alter its "support" for the Thornburgh plan is not accurate. I have not lobbied ODFW to alter its June letter and have not even provided ODFW with reports of Dr. Dobkin and Mr. Michalski.

3. "Field Work."

TetraTech's characterization of the minimal "field surveys" for Eagle Crest III as being "real-world data" was clearly refuted by Dr. Dobkin in his August 27 report, at pages 1-2:

> "Based on the materials now submitted, it is clear that the real-world data referred to repeatedly are comprised entirely of vegetation sampling that characterizes habitat physical structure on the Eagle Crest III site. What these 'real-world data' do not provide, however, is any quantitative (or even qualitative) information about either plant or wildlife species composition on the site to serve as baselines for evaluating the success or failure of mitigation efforts in order to demonstrate no net loss or net degradation of the wildlife resource. In fact, wildlife 'surveys' conducted for the Eagle Crest III assessment apparently consisted of cursory field visits in the dead of winter that produced sightings of three bird species, black-tailed jack rabbit, mule deer and tracks of potentially five other mammal species [page 3]. It should be noted that the vast majority of breeding bird species potentially on the site would be on their wintering grounds in the southwestern U.S., Mexico, and points further south at the time these wildlife 'surveys' were conducted." (footnotes omitted)

4. Use of Actual Surveys.

TetraTech argues that utilizing the survey techniques recommended by Dr. Dobkin would be inadequate and would fail to capture year-to-year variation. With all due respect to Ms. Sharp, Dr. Dobkin's expert opinion, with credentials far exceeding those of Ms. Sharp, is that this is the most appropriate method. See his attached response which is necessary to address the two new papers submitted by Ms. Sharp.[1]

5. Substitution of Species.

TetraTech at the top of page 5 in a paragraph numbered as "8" asserts that DCC 18.113.070(D) does not suggest or imply that substituting one species for another is unacceptable in wildlife mitigation.

This is a revealing argument of TetraTech and shows how inappropriate their approach is to mitigation under DCC 18.113.070(D). It would be fundamentally inconsistent with the strong

[1] There is no reason why TetraTech could not have submitted these papers in its previous rebuttal. Their late submittal now extends the need for more rebuttal.

language of the Code, as recognized by the Oregon Court of Appeals, to suggest that "completely" mitigating any impacts so that there is no net loss could be accomplished by substituting one species for another. The objective of the Code provision is to make sure that whatever wildlife resource is impacted by the Thornburgh Destination Resort be completely mitigated. TetraTech gives no explanation for how substituting one species for another meets the Code definition. It defies logic to suppose that Canada Geese attracted to water hazards on golf courses or that European Starlings and house sparrows attracted to artificial nestboxes can substitute for native bird species of juniper woodlands and sagebrush shrubsteppe as the wildlife resource in question under the Code.

TetraTech goes on to argue that it is not realistic to believe that the wildlife community at Thornburgh is completely static and will not change over time. Such an evaluation, however, is hardly comparable to the massive impact wrought by a destination resort the size of a small city.

6. Other Destination Resort Proposals.

TetraTech repeatedly refers to County and ODFW approval of other destination resort wildlife mitigation plans, but as we have pointed out previously, those plans were drawn up before the Court of Appeals addressed DCC 18.113.070(D) and pointed out its strict requirements. Those other destination resort proposals also apparently had little, if any, opposition that criticized the proposed plans.

7. Cumulative Effects Analysis.

TetraTech argues that there is no specific requirement for a cumulative effects analysis under DCC 18.113.070(D). However, where this Code provision clearly calls for complete mitigation for any impacts so that there is no net loss, it necessarily implies a consideration of cumulative effects. The one-page cumulative impacts analysis done by TetraTech is just a listing of potential projects and includes no "analysis."

8. Response to Dr. Dobkin's Comments.

Though TetraTech disputes Dr. Dobkin's statement that mitigation benefits will be reduced greatly or nullify completely by livestock grazing, TetraTech addresses only the Maston Allotment in that regard. The proposed mitigation measures may not even occur on the Maston Allotment and the other areas proposed by the BLM clearly provide for livestock grazing.

Dr. Dobkin observed that the USFWS HEP manual submitted into the Record by TetraTech actually states that a HEP assessment is directly applicable only to the evaluation species. In response, TetraTech cites a manual not in the Record and argues that it is appropriate to extrapolate to a larger segment of the wildlife community. But even the quoted statement in the manual explicitly states that this extrapolation "depends on careful species selection." Dr. Dobkin has repeatedly pointed out that in its species selection TetraTech did not even do the most fundamental survey of species at the site. (August 27 report, page 2)

Finally, TetraTech tellingly acknowledges that there is no data available on the Maston Allotment. That is the fundamental problem with TetraTech's approach here. There is simply inadequate data available either on the site of the proposed Thornburgh Resort or on the Maston Allotment or other potential mitigation sites or on effects of past mitigation efforts. There is a lack of substantial evidence on which to conclude that the proposed mitigation plan will achieve the objectives of DCC 18.113.070(D).

9. Brett Michalski Comments.

TetraTech repeats its argument that there is no good reason to conclude that a wildlife-survey-based approach would provide better evidence that DCC 18.113.070(D) is met. To the contrary, the testimony of both Mr. Michalski and Dr. Dobkin is that a baseline wildlife survey is fundamental before any mitigation plan can be proposed for an area, not only to determine what kind of mitigation should be done, but also to determine whether or not the mitigation is effective so that any impacts are completely mitigated so that there is no net loss. The idea that the standards of the Code can be met without that baseline information is not consistent with such high standards.

TetraTech also asserts that Mr. Michalski neglects to mention that the proposed Thornburgh Resort site is in a location that is already highly fragmented. However, there is essentially no development at all currently on the site and it is surrounded by BLM land.

When TetraTech argues that the areas available for mitigation are identified as well as they can be the speculative nature of this mitigation plan is brought home. This is again a plan to do a plan with the BLM, ODFW and Thornburgh deciding at some point in the future (with the public not having the right to a County public hearing) which the Court of Appeals has already rejected. The Applicant's approach is entirely too speculative.

10. Water Rights Documents.

The water rights materials submitted by the Applicant on September 11 include a "Final Proof Map" that is also identified as COBU MAP # 0089. The predominant classification of irrigation rights is:

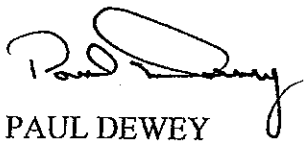
> "PRIMARY PERMIT 32049 APRIL 13, 1967, DEEP CANYON.
> SUPPLEMENTAL PERMIT G-13362 MAY 15, 1989, WELLS 1, 3, 4, AND 7.
> 464.9 ACRES."

All of the land from which irrigation rights are to be converted to mitigation as shown on Figure 3 of Applicant's Exhibit 12 (Ex. L2), which is the Addendum addressing fisheries issues, shows that all of that water is to come from the above designation on the FINAL PROOF MAP. Where the first page of the "ORDER APPROVING CHANGES IN USE, PLACES OF USE, ADDITIONAL POINTS OF APPROPRIATION, AND CANCELLATION OF WATER RIGHTS" identifies Permit 32049 as including 16.1 acres for Deep Canyon Creek and 304.3 acres of supplemental irrigation (wells 1, 3, 4 and 7), it is clear that the proposed mitigation water is <u>not</u> all coming from Deep Canyon Creek.

**Conclusion**

The Applicant's Final Master Plan should be denied for its failure to satisfy the burden of proof for the applicable Code criteria.

Very truly yours,



PAUL DEWEY

PD:ao

cc: Client

David S. Dobkin, Ph.D.
Ecological Research and Consultation
Bend, Oregon, USA

TO: Paul D. Dewey, Attorney
FROM: David S. Dobkin, Ph.D.
DATE: 15 September 2008
RE: Response to Thornburgh Rebuttal Materials: Letter from TetraTech to Deschutes County Hearings Officer, dated 11 September 2008, regarding Thornburgh Resort Wildlife Mitigation Plan

At your request, I am addressing the two papers from the scientific literature cited by Ms. Sharp in the recent submittal by TetraTech. The two papers submitted (Blake et al. 1994; De Lucas et al. 2005) are purported to show that annual variation in birds and small mammals "is so large that changes are very difficult or impossible to detect" and that the "methods and two-year time period for data collection" recommended by [Dr. Dobkin] could not account for the annual variation of those populations (TetraTech letter, dated 11 September 2008, Section III:D:1). A review of the two papers shows that Ms. Sharp's reliance on them is misplaced, and that they in fact provide clear support for the use of standard methods of multi-year (i.e., two or more years) bird surveys to demonstrate their efficacy in evaluating the effects of habitat alterations (Blake et al. 1994), and the failure of reliance on single-year surveys (pre-alteration and post-alteration) to provide adequate data (De Lucas et al. 2005).

The Blake et al. (1994) paper was published in *The Condor*, a highly respected scientific journal of avian biology for which I have been the Editor for eight years. Ms. Sharp's interpretation of the Blake et al. paper is incorrect relative to the situation in this case. The point of Blake et al. (1994) was to contrast bird population trends at local scales with patterns found at regional scales because "Trends observed in bird populations at a single study site [which would be analogous to the Thornburgh property] often differ from trends observed at larger, more regional scales [which would be analogous to all juniper/sagebrush lands in eastern Oregon and eastern Washington combined]" (page 382). In Blake et al. (1994), the regional scale consisted of aggregating the results of sampling birds from twenty separate 4.35 km transects, collected twice per breeding season, spread across three counties in northwestern Wisconsin and two counties in the Upper Peninsula of Michigan (a total area of about 2500 $km^2$).

In fact, the more local-scale study underlying Blake et al.'s regional comparisons is entirely analogous to what I proposed as appropriate sampling of plant and bird communities for Thornburgh. According to Blake et al. (1994), "Our study was originally designed to test for effects of the U.S. Navy's extremely low frequency (ELF) communications systems on bird populations" (page 382). They found no differences in bird abundances between treatment and control study sites (areas adjacent to the antenna versus areas several kms from the antenna) that could not be attributed to local ecological conditions of the sites, and they did not detect any differences in annual trends in bird populations between treatment and control sites. Hence, they concluded that observed changes in bird populations among years were not due to antenna operations (page 382). This is functionally analogous to comparisons before treatment and after treatment on two local-level sites: the Thornburgh property and the off-site mitigation site,

compared before treatment (development of Thornburgh; pre-mitigation of off-site locale) and after treatment (post-development of Thornburgh; post-mitigation efforts on the off-site locale).

In discussing the differences found between local and regional comparisons, Blake et al. (1994) concluded that "Much of the annual variation in bird abundances observed during this study likely occurred in response to altered conditions on the breeding grounds" (page 392), lending further support to our contention that differences (whether positive or negative) found in bird species composition or abundances in comparisons of pre-treatment and post-treatment surveys are most likely to be attributable to changes in the ecological conditions of those breeding sites.

The Blake et. al. paper also did not state that two years of pre- and post-treatment sampling in this situation is inappropriate. In fact, it is because of the background annual variation in populations that one needs to do a minimum of two years of sampling, as I have previously explicitly noted: "Such surveys should be conducted for two years prior to the start of significant changes to the habitats in order to capture at least a minimum of the between-year background variation in numbers driven by variation in precipitation, food resources, etc." (Dobkin, D.S., Review of Thornburgh Resort Wildlife Mitigation Plan, 16 June 2008). In fact, Dr. Blake's most recent peer-reviewed scientific publication on bird populations appears in the August 2008 issue of *The Condor*, and is based on only two years of field-collected data, but with well-designed, adequate survey samples (Diversity Patterns of Bird Assemblages in Arid Zones of Northern Venezuela by Adriana Rodríguez-Ferraro and John G. Blake, *Condor* volume 110, doi:10.1525/cond.2008.8521).

The second paper cited by TetraTech (De Lucas et al. 2005) also does not support their arguments, and in fact provides an excellent example of why data need to be collected for at least two years pre- and post-treatment. Aside from the fact that this work was done in the northwest corner of Spain comparing two sites adjacent to the ocean (a more different environment from Central Oregon juniper woodlands would be hard to find), the method for sampling bird populations involved walking a single 2.6 kilometer transect only once each year for three years: the year before installation of wind turbines, the year of construction, and the year following construction (pages 3293-3294).

The design of the De Lucas et al. (2005) study is extremely poor both in duration and in its gross inadequacy of sampling effort for bird populations. Ms. Sharp cites their results as evidence that "...the amount of year to year variation is so large that changes are very difficult or impossible to detect. For example, in DeLucas et al. (2005), Tables 1 and 3 show that not all species were even present as nesters or non-nesters among years." (TetraTech letter, dated 11 September 2008, Section III:D:1). In fact, what Ms. Sharp is really pointing out is the woeful inadequacy of the sampling effort: a single relatively short transect walked once per year, and for only a single year pre- and post-treatment. The reality of the data in these two tables indicates that the sites being compared are highly disturbed (the study area included agricultural row crops [pages 3292-3293]), and that the bird community is overwhelmingly populated by species that are ecological generalists that do well in human-disturbed habitats. For example, the two widespread nuisance species, Carrion Crow and Yellow-legged Gull, are the only species in all of Table 3 that were recorded at densities of at least one bird per km of transect surveyed (the gull is an invasive species that is rapidly becoming widespread along European coasts; I characterize the crow as "common and widespread across Europe and Asia" in the comprehensive field guide for European birds [Ehrlich, P.R., D.S. Dobkin, D. Wheye, and S.L.

Pimm. The Birdwatcher's Handbook, A Field Guide to the Natural History of the Birds of Britain and Europe, Oxford University Press, 1994]). All the other species in Table 3 appear to occur erratically across years and at extremely low densities, but this is largely an artifact of grossly inadequate sampling effort.

David S. Dobkin, Ph.D.
15 September 2008

SCHWABE, WILLIAMSON & WYATT
ATTORNEYS AT LAW

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September 11, 2008

**BY HAND DELIVERY**

Ruth Herzer
Associate Planner
Deschutes County Community Development
117 NW Lafayette Ave
Bend, OR 97701-1925

Re: Thornburgh Final Master Plan Application

Dear Ruth:

Attached are two copies of the final rebuttal documents submitted on behalf of the Thornburgh Resort Company. Please call if you have any questions. Thank you.

Sincerely,

Myles A. Conway

MCO:pia

SCANNED
SEP 23 2008

CITY OF REDMOND
Fire Department

341 NW Dogwood
Redmond, OR 97756-0100

**(541) 504-5000**
Fax: (541) 548-5512
info@redmondfireandrescue.org
www.redmondfireandrescue.org

September 10, 2008

Hearings Officer
Deschutes County Planning Division
117 NW Lafayette
Bend, OR 97701

RE: Thornburgh Resort Final Master Plan Application

Dear Hearings Officer:

We are writing in regard to the Final Master Plan Application filed by the Thornburgh Resort Company. Redmond Fire & Rescue and the Deschutes County Rural Fire Protection District No.1, DCRFPD#1, have worked directly with the resort to address fire and related issues since the inception of the development project in 2005. During that time, DCRFPD#1 has completed the annexation of the remaining portion of the resort property. DCRFPD#1 has carefully reviewed fire safety and evacuation plans for the development. In this process, we have reviewed and evaluated a number of different fire evacuation plans designed to insure that fire safety issues are properly addressed by the development.

We recently reviewed the most recent map entitled, "Fire Evacuation Routes" that was submitted to the Deschutes County Planning Department as "Rebuttal Exhibit C-2". The evacuation routes and phasing that is depicted on this map is consistent with our prior discussions with the resort. The extent this map differs from any prior route maps evaluated by Redmond Fire & Rescue will not affect fire or public safety issues within the resort project. In the first phase of development, Thornburgh will be required to construct evacuation routes that provide access to both Oregon Highway 126 and the Cline Falls Highway. These routes will provide the multiple points of access needed for the development to proceed.

Redmond Fire & Rescue will have continued oversight over the project as the resort proceeds with its building and development plans. The department will be actively involved as the resort seeks to obtain subdivision and site plan approvals. In this process, the department will require compliance with the International Fire Code and related access and development requirements.

Thank you for the opportunity to comment on the application.

Sincerely,

Tim Moor, Fire Chief
Redmond Fire and Rescue

Traci Cooper, Fire Marshal
Redmond Fire and Rescue

GROUP MACKENZIE

September 11, 2008

Ms. Anne Corcoran Briggs
Hearings Officer
c/o Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, Oregon 97701

Re: **Thornburgh Resort Development**
*Technical Response #11*
*Response to Public Comments*
Project Number 2040342.01

Dear Ms. Briggs:

This technical letter addresses transportation issues identified in materials submitted into the public record. Specifically, this includes issues identified by Paul D. Dewey in a document titled Third Supplemental Memorandum of Nunzie Gould in Opposition to the Proposed Development (8/28/08) (p. 9). The following are more specifically addressed:

1. Proposed Roadway Connection and Resulting Trip Distribution
2. Summary

## 1. PROPOSED ROADWAY CONNECTION AND RESULTING TRIP DISTRIBUTION

Page 9 of the Third Supplemental Memorandum dated August 28, 2008, presents *"IV Traffic Related Materials – A. Exhibit C.1 Group Mackenzie Letter"*. Materials contained in this section claim that a proposed new road between the Pinnacle and Tribute portions of the resort is *"intended to provide quicker access"* than the previously proposed roadway. Materials further contend this results in more traffic using Cline Falls Highway and travelling to Tumalo.

This claim is incorrect because external origins/destinations dictate off-site trip distribution. In other words, traffic with an origin/destination to the west (Sisters and further west) will continue to use ORE 126, and traffic with an origin/destination to the south (Tumalo, Bend and further south) will continue to use Cline Falls Highway.

The only potential difference created by this roadway is for traffic with an origin/destination to the east/north (Redmond and further north). With an improved internal roadway connection, more resort traffic may use Cline Falls Highway and travel to/from the north (not to Tumalo) rather than using ORE 126. Any 'shift' in traffic from one resort access to another is anticipated to be small and will not negatively impact operations of study intersections to the east and north – and will certainly not increase the amount of traffic with an origin/destination to the south.

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## 2. SUMMARY

This letter addresses transportation related issues raised in the Third Supplemental Memorandum submitted into the record by Paul Dewey on behalf of Annunziata Gould. The following conclusions and recommendations are made based in findings contained in this letter:

- Any 'shift' in traffic from one resort access to another is anticipated to be small and will not negatively impact operations of study intersections to the east and north – and will certainly not increase the amount of traffic with an origin/destination to the south.
- The proposed "new" road will not result in more traffic using Cline Falls Highway and travelling to Tumalo.
- The CMP TIA accurately reflects anticipated impacts and revision is not necessary.

Sincerely,

Christopher M. Clemow, P.E., P.T.O.E.
Transportation Engineer

c: Ruth Herzer — Deschutes County, Community Development Department
Kameron DeLashmutt — Thornburgh Resort
Peter Livingston — Schwabe Williamson & Wyatt
Myles Conway — Schwabe Williamson & Wyatt

TETRA TECH EC, INC.

September 11, 2008 TTEC-PTLD-2008-227

Anne Corcoran-Briggs, Hearings Officer
Deschutes County, Oregon

In this letter we are providing responses to the wildlife issues discussion in the "Third Supplemental Memorandum of Nunzie Gould in Opposition to the Proposed Development (8/28/08)" (Gould's Third Memo), which was submitted by Paul D. Dewey in connection with the proposed Thornburgh Resort Final Master Plan. Gould's arguments are summarized in bold type and the responses are in regular type.

## III. WILDLIFE-RELATED MATERIALS

### A. Reliance on BLM procedures and standards is not appropriate.

**There has been a fundamental shift in the Applicant's approach to the mitigation plan which relies on BLM standards instead of the County criteria of DCC 18.113.070(D).**

There has been no such shift in the mitigation plan approach. The June 2088 Wildlife Mitigation Plan ("WMP") always was and still is designed to meet the County criterion of DCC 18.113.070(D). Because the off-site mitigation is intended to be located on BLM land as outlined in a Memorandum of Understanding between BLM and Thornburgh dated September 28, 2005, the activities there must be consistent with land management guidelines outlined in the draft Cline Buttes Recreation Area Plan (CBRAP). In other words, it is not necessary for the County criterion of DCC 18.113.070(D) to be formally incorporated into the BLM's CBRAP standards and provisions in order for the mitigation to be implemented on BLM lands; the WMP must meet both County and BLM standards.

### B. The ODFW standards and its review of the Tetra Tech plan are misrepresented.

ODFW's June 13, 2008 letter confirms that ODFW recommended that Applicant use the HEP methodology for the mitigation plan. ODFW believed the plan as developed ("the most complete [Wildlife Habitat Impact Assessment] conducted for the siting of a destination resort in central Oregon") would meet the requirements of DCC 18.113.070(D). In his June 16, 2008 email, ODFW's Deschutes District Wildlife Biologist, Steven George, stated as "a clarification concerning the mitigation plan and to what level it would mitigate for impacts," that "the wildlife mitigation plan, if followed as outlined, should address the mitigation requirements for

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Deschutes County." In a June 17, 2008 email, Glenn Ardt, ODFW's Wildlife Habitat Biologist, stated, "The intent of the wildlife mitigation section was to point out that implementation of the mitigation plan, if followed as outlined, should address the mitigation requirements for Deschutes County. Likewise, the plan is conceptual until implemented, yet there are checks in the plan to help assure implementation will be implemented as intended." In discussions with TetraTech on several occasions, ODFW representatives made it clear that they believed DCC 18.113.070(D) would be met through the WMP.

Gould objects, "It should also be noted that TetraTech's wildlife mitigation plan has changed since the version that ODFW saw back in June." This is presumably a reference to the "Off-Site Habitat Mitigation and Monitoring Plan" ("M&M Plan"), which was submitted in August. The M&M Plan is an elaboration of the WMP. It was created in response to Gould's demands that more detail about monitoring be furnished. It does not alter the mitigation provisions of the WMP. As the attached August 21, 2008 email from Glen Ardt at ODFW makes clear, ODFW was well aware of the August submission.

Gould makes some additional legal arguments that are not addressed here.

**C. References to "field work" are overstated.**

The opponents' own submissions are self-contradictory. Gould's Third Memo refers to "field surveys conducted in the dead of winter in February of 1999," collected for the HEP analysis for Eagle Crest III, and then states there is no evidence that these "real-world data" were collected. However, the August 27, 2008 letter from Dr. David Dobkin (Dobkin August Letter), which is attached to Gould's Third Memo, states (page 1, paragraph 3, 2nd sentence), "Based on the materials now submitted, it is clear that the real-world data referred to repeatedly are comprised entirely of vegetation sampling that characterizes habitat physical structure on the Eagle Crest III site."

Gould's Third Memo complains that Tetra Tech "apparently relies solely on analyses of 'habitat' rather than wildlife as being required to determine whether or not the Code criteria can be met." As we have stated in previous submittals (and as was suggested by ODFW very early in this process), using habitat to determine that the DCC 18.113.070(D) is met is scientifically sound strongly preferred by ODFWand has been acceptable to the County in other proceedings.

**D. Other issues raised by Tetra Tech in Exhibit B-13 need correction.**

Our responses to the numbered issues presented by Dewey are provided and identified by the same number.

1. Our reference to other types of large projects, including wind projects, was meant to provide some context for the current proposal and the standard to which it is held. DCC 18.113.070(D) does not specify a procedure to use to determine that there is no net loss or net degradation of the resource. Gould suggests that additional studies could have been performed in the years prior to submission of the Final Master Plan application. However, neither ODFW nor Tetra Tech believed additional studies were necessary. Tetra Tech worked cooperatively for several years with ODFW to develop a plan that meets the County standard. During this time, a habitat-based technique was developed in order to measure on-site habitat characteristics to determine the amount of habitat needed for mitigation that would represent no net loss or degradation. The methods and two-year time period for data collection and the methods the opponents experts recommend to collect wildlife data have serious inherent flaws. The two-year period would not account for seasonal variation in groups such as songbirds or small mammals whose populations are influenced by stochastic events such as rainfall that may influence population abundance and distribution. If such surveys were conducted, their quantitative results would have such high variance due to small sample size that replication of these surveys after implementation of the mitigation is very unlikely to show statistically significant differences, especially for birds and small mammals (see Blake et al. 1994, DeLucas et al 2005, attached). To summarize what the three studies cited show, and many others reveal, particularly for birds and small mammals, the amount of year to year variation is so large that changes are very difficult or impossible to detect. For example, in DeLucas et al. (2005), Tables 1 and 3 show that not all species were even present as nesters or non-nesters among years; and Blake et al.'s (1994) study depicts the very large variability observed in songbirds between years. What this means is that the data that would be obtained in these kinds of surveys will be so variable that comparison of the pre-project and post-project/mitigation survey results will not accurately demonstrate whether the DCC standard is met or not. That is exactly the reason that habitat was chosen as the measure of wildlife habitat because habitat does not change as unpredictably and radically from year to year.

2. In his June 16, 2008 letter, Dr. Dobkin stated (page 1, paragraph 4):

> "There are standard, well-established, basic survey methods for documenting the species composition and densities of breeding birds, resident small mammals, and some reptiles (point-count transects for breeding birds, live-trap grids or transects for small rodents, pitfall grids or transects for shrews, standard equipment for acoustic surveys of bats, line-transect surveys for lizards, etc.). These survey methods are well-established standard protocols for sampling wildlife populations, and they are designed to provide basic quantitative data necessary for analyses to establish baselines and detect changes through time."

If such surveys were conducted, the results have serious inherent flaws in terms of actually demonstrating or not demonstrating compliance with DCC (see response to 1. immediately above).

3. Tetra Tech was not attempting to minimize the importance of deer winter range, but was only responding to Gould's allegation that the area was "important" winter range. The BLM classifies the area as low use winter range and, as such, it is assumed to be less important than the winter range areas designated by ODFW and protected under Goal 5. The BLM's FEIS on the UDRMP (2005) designates the area around the Thornburgh property as a "General" wildlife emphasis area. This is the lowest-rated category. (The other, higher designations are "primary" and "secondary.").

4. Since the resort will be fenced to exclude deer and elk, roads within the resort need not be considered in determining impacts on mule deer. Deer will be largely excluded from the resort and will not be impacted by internal roads. The $20,000 is dedicated to acquisition of interactive signs that inform drivers of their speed. ODFW suggested the signs as an appropriate mitigation measure, since high speed is the major factor in vehicle-deer/elk collisions.

5. We assume that the term "Cars" is a typographic error and that Mr. Dewey intended to refer to the resort's proposed conditions, covenants and restrictions (CC&Rs). The CC&Rs do require residents to leash their pets when outdoors at the resort. What happens on land outside the resort could happen there whether or not the resort is developed. It seems unlikely that resort residents and visitors would carry or walk their leashed cats and dogs to the resort boundary and then release them.

6. The cost estimate of the proposed mitigation is based on the best information available at this time. The result of the adaptive management process could marginally increase or decrease the cost of mitigation, monitoring, and maintenance activities. Since the actual cost of the activities proposed is reasonably certain, we do not anticipate that they will change much. Provisions have been made for continued funding to support off-site mitigation measures as outlined in the Thornburgh Mitigation Report (April 8, 2008, Page 14, Section D). Provisions under this section state fees will be collected during real estate transactions in perpetuity and applied to mitigation actions as needed to fulfill mitigation obligation

7. ODFW has been provided the testimony of Dobkin and Michalski and has chosen not to alter its support for the Thornburgh plan, although Gould (through Mr. Dewey) has attempted to persuade them to do so. We strongly suggest that the County rely on ODFW's judgment, as the state wildlife agency, as it has in the past in relation to destination resorts.

8. The DCC 18.113.070(D) does not suggest or imply that substituting one species for another is unacceptable in wildlife mitigation. Wildlife communities are dynamic and change in response to changes in the environment, whether that change is a fire, habitat management, new roads, dwellings, or quarries, for example. To believe that the current wildlife community at Thornburgh is completely static and will not change over time, or vary from year to year, or that community changes automatically equate to "no net loss or degradation" is not realistic.

9. Current resort proposals being evaluated by ODFW use the same habitat-based approach as has been taken here.

10. The type of fencing to be used was not specified in the WMP. In March 2008, Thornburgh and ODFW discussed fencing. Ultimately, it was decided that Thornburgh would not use "wildlife friendly" fencing. As a trade-off, the use of wildlife-friendly fencing was not considered as a mitigation strategy and was not factored in as mitigation.

**E. The Exhibit B-14 cumulative effects analysis is inadequate.**

First of all, there is no specific requirement for a cumulative effects analysis under DCC.18.113. The modified HEP baseline and impact assessment specifically included OHV use and existing Eagle Crest development. In addition, Figures E-1 through E-3 show the zones of current impacts, and Figures E-4 through E-6 show predicted future impacts of the proposed development within1 mile of the proposed resort. The effects of other developments in the area, such as the Eagle Crest expansion and a possible gravel pit, will not have any impact on the mitigation proposed for the Thornburgh project. The cumulative impacts analysis did address anticipated changes to recreational use of public land managed by BLM, as well as could be predicted at the time, based on draft materials on the CBRAP provided by BLM to Tetra Tech in August of 2008.

**Dr. David S. Dobkin Comments**

The following is numbered according to the paragraphs in the Dobkin August Letter:

1. Dobkin repeats statements, made in earlier submittals, that quantitative data on wildlife species composition are necessary to determine the success of the mitigation efforts. As the mitigation plan is habitat-based using a method developed by the U.S. Fish and Wildlife Service, and its use recommended by ODFW, we continue to disagree with this statement. Please refer to our response under D.1 in this letter regarding well-documented concerns about the efficacy of the methods proposed.

2. The off-site mitigation and monitoring plan cite four quantitative methods for sampling vegetation, which will be determined in consultation with BLM and ODFW at each mitigation area. Dobkin's conclusion that "extensive use of non-native seeding likely will be used" is not supported. Although Appendices D and F in the mitigation plan show options for including non-natives in seed mixtures, Thornburgh will not be forced by the BLM to use non-native species and we anticipate that little to no non-native plantings will be made for the Thornburgh mitigation. The BLM's stated purpose of using non-natives is as a temporary measure to out-compete invasive species such as cheatgrass and to give natives a chance to grow afterwards. Seeding will be done only to enhance the native juniper woodland and shrub-steppe communities. Dobkin's final statement that mitigation benefits will be reduced greatly or nullified completely by livestock grazing is incorrect. BLM manages the Maston Allotment and habitat conditions there range from good to excellent, with the exception of damage from unauthorized OHV use.

3. For our response to Dr. Dobkins' third paragraph we refer you to our response to the first paragraph, above. Since the proposed mitigation is habitat-based, the monitoring will be focused on vegetation and habitat.

4. In the fourth paragraph, Dr. Dobkins' quote from the USFWS HEP manual is correct, but taken out of context. One of the other principles behind HEP is the use of evaluation species. Such species

> "can be a single species, a group of species, species life stage, or a species life requisite. Evaluation species are used in HEP to quantify habitat suitability and determine changes in the number of available HU's. Therefore, a HEP assessment is directly applicable only to the evaluation species selected. The degree to which predicted impacts for these species can be extrapolated to a larger segment of the wildlife community depends on careful species selection." (U.S. Fish and Wildlife Service 1980, Habitat Evaluation Procedures (HEP) ESM 102, page 102-ESM-3-2)).

Tetra Tech and ODFW worked diligently to choose a suite of evaluation species to represent the local wildlife community, emphasizing those species that are somewhat sensitive to human disturbance, and from which extrapolations could be made. More specifically;

- northern flicker - woodpeckers and other primary cavity nesters (those species that excavate their own cavities and including downy and hairy woodpeckers and pygmy nuthatches) that forage on the ground, snags or trees;

- American kestrel – smaller raptors, including smaller cavity-nesting owls that forage in open woodlands and shrub-steppe, such as the long-eared owl and western screech owl;
- Red-tailed hawk – larger, tree- and cliff-nesting raptors that forage in open woodlands and shrub steppe, also including the great horned owl, Swainson's hawk, and golden eagle;
- mountain bluebird – songbirds nesting in cavities, trees, and the ground and foraging in these same habitats, such as American robin, Townsend's solitaire, yellow-rumped warbler, chipping sparrow, song sparrow, and dark-eyed junco;
- small mammals – a generic group including all small mammals that dig burrows or make dens in trees, brush piles, down woody materials, or rock outcrops and including species such as the deer mouse, great basin pocket mouse, and pinyon mouse;
- western fence lizard – representing the reptiles likely to occur, which use burrows or cavities in trees, downed wood, or rock outcrop areas, including snakes such as the western rattlesnake, gopher snake, racer, and western skink;
- mule deer – also representing elk and to some extent, their predators, the larger carnivores sensitive to human disturbance and all other species having large home ranges.

As to the fifth paragraph, of course data on the Maston Allotment would be relevant but these data are not available. We again suggest that Dr. Dobkin visit the Maston Allotment to view the quality of the habitat there.

**Bret Michalski Comments**

In the second paragraph of his letter dated August 28, 2008, Michalski repeats earlier-expressed concerns about no net loss or degradation, translated into population numbers, stating that he is not aware of any body of literature that shows that improvement of the Habitat Suitability Index (HSI) for a particular species would translate into the exact same number of animals lost from a developed site. The U.S. Fish and Wildlife Service has published over 50 HSI models for various species and these models were validated by extensive field work and literature review. While these species models do not always show direct linear relationships in terms of population density, it is highly unlikely that the types of quantitative surveys recommended by the opponents, conducted pre- and post-construction, would have low enough variance to reveal a statistically significant relationship, given the year-to-year variability that these species undergo in terms of populations for smaller birds and mammals, and in use for larger mammals that range widely. Such relationships can only be revealed through large sample sizes and long-term

studies. Again, that is why a habitat-based approach was used. There is no good reason to conclude that a wildlife-survey-based approach would provide better evidence that DCC 18.113.070(D) is met.

In connection with fragmentation, Michalski neglects to mention that the proposed Thornburgh resort site is in a location that is already highly fragmented. This is clearly addressed in WMP, included in the modified HEP analysis, and depicted graphically in Figures E-1 through E-6. It is clearly stated in the impact analysis in the April mitigation plan and shown in the modified HEP calculations that there will be impacts to wildlife as a result of the resort. The offsite areas available for mitigation are identified as well as they can be by the BLM, which is in the process of preparing the CBRAP, which includes management of several larger blocks of habitat for primary or secondary wildlife use. These larger blocks are part of the connection between the Cascades to the west and the Deschutes River to the east.

In response to the last paragraph of Michalski's letter, we reiterate our quotation from his undated June letter in which he suggests that "an area of non-habitat, already in some other land use……". The use of the term "non-habitat" typically means an area with no habitat value for wildlife. Since the old-growth junipers on site are likely hundreds of years old, it would take that long to regrow that habitat and that seems impractical when there are thousands of acres of habitat containing old-growth junipers that could benefit greatly from the mitigation actions included in the proposed mitigation plan.

Tetra Tech EC, Inc.

Lynn Sharp

Lynn Sharp, Senior Ecologist

"Glen Ardt"
<Glen.T.Ardt@state.or.us>
08/21/2008 08:47 AM

To -<Lynn.Sharp@tteci.com>
cc
bcc
Subject RE: Thornburgh mitigation/monitoring plan

History: This message has been replied to and forwarded.

Thanks Lynn

Glen Ardt - ODFW
Wildlife Habitat Biologist
61374 Parrell Road
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541-388-6049 fax

-----Original Message-----
From: Lynn.Sharp@tteci.com [mailto:Lynn.Sharp@tteci.com]
Sent: Wednesday, August 20, 2008 3:26 PM
To: ARDT Glen T; bill_dean@or.blm.gov
Cc: plivingston@schwabe.com
Subject: Thornburgh mitigation/monitoring plan

For your use, here's the final mitigation/monitoring plan we submitted to the Hearings Officer on August 12, 2008.

(See attached file: Thornburgh_Off-site Habitat Mitigation and Monitoring Plan_081208FIN.pdf)

Lynn Sharp | Senior Ecologist and Project Manager
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·Lynn Sharp/CEPM/CSQ
08/20/2008 03:26 PM

To Glen.T.Ardt@STATE.OR.US, bill_dean@or.blm.gov
cc plivingston@schwabe.com
bcc
Subject Thornburgh mitigation/monitoring plan

For your use, here's the final mitigation/monitoring plan we submitted to the Hearings Officer on August 12, 2008.

Thornburgh_Off-site Habitat Mitigation and Monitoring Plan_081208FIN.pdf

**Lynn Sharp | Senior Ecologist and Project Manager**
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# ANNUAL VARIATION IN BIRD POPULATIONS OF MIXED CONIFER-NORTHERN HARDWOOD FORESTS[1]

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*Abstract.* We examined annual variation in breeding bird populations at sites in northwestern Wisconsin and in the Upper Peninsula of Michigan from 1986 to 1992 to determine (1) the extent to which different bird species vary in abundance over time and (2) whether or not patterns of variation differ when viewed at local and regional spatial scales. Total abundance of long-distance migrants (species that winter in the tropics) declined during the first few years in both states but subsequent increases returned abundance to levels close to those that occurred at the start of the study. Short-distance migrants (species that winter in temperate regions) showed the greatest similarity between states in the extent and direction of variation in abundance among years; abundance reached a low in both states during 1990. Unlike migrant groups, abundance of permanent residents was not correlated between states. Permanent residents declined in abundance from 1987 to 1988 in Michigan, for example, but increased in abundance in Wisconsin. Fluctuations in abundance generally were poorly correlated among groups within a state. Repeated-measures analysis of variance (one-way) revealed that abundances of 13 and 21 (62%) common, long-distance migrants, 13 of 16 (81%) short-distance migrants, and 7 of 9 (78%) permanent residents varied significantly among years in one or both states. Fluctuations in abundance likely occurred in response to events on the breeding grounds. Factors likely to have affected populations include severe drought, particularly during 1987 and 1988, as well as successional changes in habitat. It is unlikely that events on tropical wintering grounds caused population fluctuations observed in neotropical migrants. Two-way ANOVA indicated that patterns of variation differed between the two study regions (significant interaction effects) for a number of species, particularly permanent residents. Results of this study thus illustrate the importance of considering temporal variation in abundance at more than one spatial scale.

*Key words: Annual variation; bird populations; forest birds; northern hardwoods; migrants; population declines; spatial scale.*

## INTRODUCTION

Fluctuations in abundance of bird populations are common (e.g., Järvinen 1979; Loiselle 1988; Wiens 1989; Droege and Sauer 1990; Blake and Loiselle 1991; Loiselle and Blake 1991, 1992; Virkkala 1991; Järvinen and Rajasärkkä 1992) and occur in response to variations in resource abundance, habitat, weather, and population processes (e.g., recruitment) (Järvinen and Väisänen 1978, Grant 1986, Holmes et al. 1986, Holmes and Sherry 1988, Hutto 1989, DeSante 1990, Arcese et al. 1992, Blake et al. 1992, Marzluff and Balda 1992, Loiselle and Blake 1993). Although fluctuations in abundance are a natural component of the population dynamics of many species, recent concern has focused on apparent declines of many species during the past few decades. Species showing declines include primarily migratory species that breed in temperate habitats and winter in tropical habitats (Lack 1989, Robbins et al. 1989, Terborgh 1989, Askins et al. 1990, papers in Hagan and Johnston 1992) but also include many species that do not winter in tropical habitats (Droege and Sauer 1990, Finch 1991, Hagan et al. 1992, Witham and Hunter 1992).

Although declines in bird populations are evident in some areas, agreement has not been reached regarding the extent or causes of such changes (e.g., see Hagan and Johnston 1992). Differences in patterns of year-to-year variation in abundance between migratory groups have led some to suggest that declines in abundance of long-distance migrants are tied to events on the wintering grounds (e.g., Robbins et al. 1989) whereas others attribute population declines to

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breeding ground effects (e.g., Böhning-Gaese et al. 1993). Part of the disagreement may stem from the scale at which studies are conducted (Sauer and Droege 1992). Trends observed in bird populations at a single study site often differ from trends observed at larger, more regional scales (Holmes and Sherry 1988, Witham and Hunter 1992). Similarly, changes observed in one part of a species' range are not always evident in other regions, indicating that population trends are not spatially uniform (James et al. 1992).

Regional variation in population processes may have important consequences for species as a whole. Populations experiencing low reproductive success may be maintained by immigrants from other regions where reproductive success is greater ("source vs. sink"; Pulliam 1988, Temple and Cary 1988, Robinson 1992). Differences in habitat may influence reproductive success and thereby influence the extent of variation shown by a species inhabiting a particular region; apparent trends in abundance may reflect or depend on the habitat(s) studied. Various studies have addressed annual variation in bird populations in North America, but much of the northern hardwoods and southern boreal forest habitats of north-central US and adjoining Canada has received little attention (Robbins et al. 1986, Hunter 1992). Yet, this region is an important breeding area for many species, including many neotropical migrants (e.g., Parulinae) and may, consequently, serve as a source of individuals for other areas (Temple and Cary 1988). Thus, it is an important region to consider when discussing annual changes in breeding bird populations.

In this paper, we examine annual variation in abundances of birds breeding in mixed conifer-northern hardwoods forest habitats of northwestern Wisconsin and the Upper Peninsula of Michigan over a seven-year period (1986–1992). We ask the following questions. (1) What is the extent of annual variation in abundance of birds breeding in these regions? (2) Does the direction (increase or decrease) and extent of variation differ among species or groups of species defined on the basis of migratory strategy? (3) Are trends in one state similar to those observed in the other; that is, are populations affected over broad geographical scales or are they responding to more localized events?

Our study was originally designed to test for effects of the US Navy's extremely low frequency (ELF) communications systems on bird populations. We do not discuss potential effects of the antenna system here (see Hanowski et al. 1993, Helle et al. 1993 for details), but it is important to note the following. First, we have not detected any differences in bird abundances between treatment (areas adjacent to the antenna) and control (areas >10 km from the antenna) study sites that could not be attributed to inherent differences in habitat. Second, we have not detected any differences in annual trends in bird populations between treatment and control sites. Hence, observed changes in bird populations among years can not be attributed to antenna operations.

## STUDY AREAS AND METHODS

### STUDY AREAS

Bird abundances were sampled in northwestern Wisconsin (Chequamegon National Forest: Ashland, Bayfield, and Sawyer counties) and in the Upper Peninsula of Michigan (Copper Country and Escanaba River state forests: Dickinson and Marquette counties), at sites approximately 240 km apart. The two study regions were sufficiently far apart to be independent with respect to bird populations, local alterations in habitat, and local weather patterns. The areas were, however, characterized by similar habitats (Table 1) and affected by similar climatic patterns. Dominant tree species present on study sites included sugar maple (*Acer saccharum*), red maple (*A. rubrum*), balsam fir (*Abies balsamea*), birch (*Betula papyrifera, B. lutea*), black ash (*Fraxinus nigra*), aspen (*Populus tremuloides, P. grandidentata*), black spruce (*Picea mariana*), cedar (*Thuja occidentalis*), and red pine (*Pinus resinosa*).

We established 20, randomly selected 4.35-km transects: 10 in Michigan and 10 in Wisconsin. Detailed descriptions of selection procedures are in Hanowski et al. (1990, 1993). Transects were distributed over approximately 860 km² in Wisconsin and 1,500 km² in Michigan. By sampling a series of plots within each region we avoid scale problems associated with "chance reshufflings of territories" (Rotenberry and Wiens 1980; see also Wiens 1981, 1989). That is, patterns of variation are viewed at a large enough scale that plot effects do not predominate. Similarly, by comparing results between regions separated by over 200 km, we are better able to evaluate regional trends in populations.

Each 4.35-km transect consisted of eight 500-m

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segments arrayed in a single line, with segments separated by a 50-m buffer. Throughout this paper, "sample unit" or "segment" refers to a single 500-m segment; "transect" refers to the eight contiguous segments. In an ideal experimental design, locations of each sample unit would be randomly selected. Logistically this would be impractical; too few sites could be sampled in a single day. As a compromise between statistics and field work, we grouped eight sample units (500-m segments), each separated by 50 m. Certainly, individual birds may move from one segment to an adjacent segment and could potentially be counted on more than one segment. We reduced this probability (of double-counting) by noting on field maps the position and direction of movement (if any) of all individuals. It also is possible that results (i.e., bird occurrences) from one segment might be correlated with results from adjacent segments because of similarities in habitat between adjacent segments. This problem was reduced somewhat by the fact that the study region was naturally and anthropogenically fragmented by frequent, often abrupt habitat discontinuities (e.g., bogs, clearcuts). This patchiness tended to reduce habitat similarity between adjacent segments. The 50-m buffer between segments was introduced to reduce autocorrelation (i.e., caused by movement of birds or similarities in habitat) between adjacent sample units. We used Moran's I statistic (Sokal and Oden 1978) to test spatial autocorrelation of adjacent segments with respect to bird distribution patterns. Results indicated that a 50-m buffer eliminated autocorrelation between 99% (831 of 840 tests) of adjacent segments (Hanowski et al. 1990).

TABLE 1. Percentage of study sites in northwestern Wisconsin and Upper Peninsula Michigan covered by different habitats. Habitats were characterized every 25 m along the center line of each transect; percentages are calculated from those data.

| Habitat type | Michigan | Wisconin |
|---|---|---|
| Upland, mixed conifer-deciduous | 19.4 | 32.2 |
| Upland, deciduous | 19.9 | 19.5 |
| Upland, conifer | 3.2 | 5.0 |
| Lowland, mixed conifer-deciduous | 6.8 | 15.7 |
| Lowland, deciduous | 7.0 | 9.3 |
| Lowland, conifer | 19.4 | 9.3 |
| Young clearcut | 7.0 | 1.3 |
| Older clearcut | 11.0 | 2.0 |
| Forest opening | 4.6 | 2.2 |
| Water, marsh, cattail | 1.8 | 3.7 |

## BIRD COUNTS

We counted birds along each 500-m segment (80/state) twice each year during the breeding season: mid-May through early July, 1986 through 1992. (An earlier paper [Blake et al. 1992] that considered variation from 1985 through 1989 was based on a single sample per transect because all transects were sampled only once in 1985; 1985 data are not included here.) Counts started approximately one half hour before sunrise and lasted up to approximately four hours after sunrise on days with little wind (<15 km/hr) and little or no precipitation. Observers walked at a rate of 30 min/500 m segment and recorded the identity and location of all birds seen or heard within 100 m of the segment center line. Two transects were sampled simultaneously by two observers. We randomly selected observers for the first count on each transect and randomly selected the daily order in which transects (groups of eight segments) were sampled; observers switched transects for the second count so that each segment was sampled by each observer. Two observers conducted most (80%) of the counts in both states; all observers were thoroughly familiar (by sight and sound) with birds of the region.

Various factors influence the probability that individual birds will be detected during a count: observers often differ in abilities to detect certain species; species often differ in period of peak song production; species differ in spring arrival dates; and weather often affects song production and sound propagation. To account, at least partially, for these effects we combined results of the two counts from each segment by taking the higher of the two counts for each species (i.e., the maximum number of individuals recorded for each species; numbers were based on individuals recorded, not on estimated numbers of pairs) and summing across all species to arrive at total numbers of individuals and species. The higher of the two counts for each species was taken as an indication of the minimum number of individuals of that species known to occur on that segment during the breeding season. Even this is likely an underestimate as some individuals probably were not detected on either sampling date.

We used the actual number of individuals recorded for our analyses rather than attempting to calculate a density value (see Verner 1985, Hilden and Järvinen 1989). Density theoretically could be calculated with any one of a variety of

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formulae (e.g., Järvinen and Väisänen 1975, Burnham et al. 1981) but there are several assumptions that must be met before these methods can be used. A critical assumption is that distances are measured accurately; such measurements are difficult or impossible to obtain when birds are heard but not seen, as is frequently true during counts in forests and other dense habitats (e.g., Scott et al. 1981, Blake 1992). Without accurate distance estimates, density estimates simply provide an index that may be no better than the original count (Wilson and Bart 1985). Here, we assumed only that number of birds recorded was related to density and probability of detection of birds in the area being sampled (Raphael 1987).

Birds were classified by migratory status (long-distance migrant: generally winters in the tropics; short-distance migrant: generally winters south of the study region, with most (but not all) individuals wintering north of the tropics; permanent resident: individuals are present in study region throughout the year) based on published information (e.g., Terres 1982, American Ornithologists' Union 1983, Ehrlich et al. 1988) and personal observations.

### ANALYSES

Based on an analysis of hourly variation in bird detections (Blake et al. 1991), we eliminated the 7th and 8th segments of each transect from our analyses. Hourly declines in bird detections, when significant, generally occurred during the last hour of sampling. We also eliminated from all analyses those segments where logging affected at least 20% of the length of the segment (seven in Wisconsin; nine in Michigan), leaving sample sizes of 53 segments for Wisconsin and 51 for Michigan. For analyses of individual species, we eliminated from consideration all segments on which the species was not recorded in any year, assuming that such segments represented unsuitable habitat for those species. Thus, sample sizes (number of segments) differ among species.

We used repeated-measures analysis of variance (ANOVA) (univariate or multivariate) to examine year-to-year variation in abundance of birds. Time (year) represents a quantitative factor whose effects can be examined in a repeated-measures analysis through polynomial contrasts (Freund et al. 1986). A significant first degree (linear) polynomial would indicate a significant linear relationship between bird abundance and year (e.g., consistent increase or decrease in abundance over time). A significant second degree (quadratic) polynomial contrast would indicate a significant curvilinear relationship (e.g., increase followed by decrease). Higher level polynomials (cubic, etc.) indicate more complex effects of time.

Annual variation in abundance of migratory groups was based on the sum of individuals within that group. We also examined annual variation after standardizing abundances of species (standardized abundance for a species in one year = [abundance in that year − mean abundance for that species]/standard deviation of abundance of that species) within each migratory group. Standardization eliminated effects of very abundant species (i.e., so that no species carried more weight in the analyses than any other). Results based on standardized data did not differ in any substantial way from unstandardized data (i.e., no change in significance) and we only report results based on the actual abundances.

Data were examined for normality (Wilk-Shapiro test) and homogeneity of variances (Bartlett's test). Transformations (logarithmic, square root, rank) were used when data did not meet assumptions. Univariate repeated measures tests assume compound symmetry; we tested this assumption with a sphericity test and used the more conservative multivariate test when that assumption was not met. We used one-way analyses to examine variation within each state separately and two-way analyses to examine regional variation in population trends. A significant interaction (state-by-year) effect indicated that annual trends in populations for that species or group differed between states.

## RESULTS

### TOTAL INDIVIDUALS AND SPECIES

We recorded 104 species during this study, including 99 in Michigan and 98 in Wisconsin (Appendix 1). Of these species, 53 were present in Michigan during all years of the study; 55 were recorded in Wisconsin during all years. Species varied in their occurrence among 500-m segments; 20 species in Michigan and 21 in Wisconsin were recorded on at least 75% of all segments, whereas 24 species in Michigan and 26 in Wisconsin occurred on < 10% of all segments.

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TABLE 2. Species showing significant differences among years in mean number of birds detected per 500-m segment (see text) based on repeated measures ANOVA. Polynomial contrast (PC; see Methods for description) showing greatest significance is indicated by number (1 to 6).

| Species | Michigan | | | Wisconsin | | |
|---|---|---|---|---|---|---|
| | Tr.[a] | *F* | PC | Tr.[a] | *F* | PC |
| Permanent residents | root | 8.39*** | 3 | ln | 3.31** | 2 |
| Ruffed Grouse | | | | ln | 2.58* | 3 |
| Downy Woodpecker | rank | 3.77** | 1 | | | |
| Blue Jay | rank | 5.65*** | 3 | rank | 11.28*** | 1 |
| Black-capped Chickadee | root | 4.52*** | 1, 3 | root | 3.80*** | 1 |
| Red-breasted Nuthatch | rank | 6.45*** | 3 | rank[b] | 12.02*** | 2, 3 |
| White-breasted Nuthatch | rank[b] | 12.14*** | 4 | | | |
| Cedar Waxwing | | | | rank[b] | 9.53*** | 1, 6 |
| Short-distance migrants | ln[b] | 4.56*** | 1 | rank | 9.64*** | 3 |
| Northern Flicker | rank | 3.02** | 1 | rank | 2.62* | 1 |
| Brown Creeper | rank[b] | 5.26*** | 3 | rank | 4.96*** | 3 |
| Winter Wren | ln | 2.54* | — | ln | 4.17*** | 6 |
| Golden-crowned Kinglet | ln | 2.72* | 4 | root | 3.94*** | 2 |
| Ruby-crowned Kinglet | | | | rank | 2.81* | 6 |
| Hermit Thrush | root | 2.46* | — | root | 2.26* | — |
| American Robin | rank | 3.26** | 1 | rank | 5.56*** | 1 |
| Common Yellowthroat | ln[b] | 3.13* | 6 | ln[b] | 3.70** | 3 |
| Chipping Sparrow | root[b] | 2.85* | 1 | rank[b] | 3.77** | 1 |
| Song Sparrow | rank | 2.78* | — | root | 3.41** | 1, 3 |
| Swamp Sparrow | ln[b] | 6.95* | 4 | ln | 2.83* | — |
| White-throated Sparrow | ln | 6.74*** | 1 | root[b] | 10.48*** | 1, 4 |
| Brown-headed Cowbird | rank[b] | 5.00** | 1 | | | |
| Long-distance migrants | —[b] | 7.84*** | 2 | —[b] | 26.22*** | 2, 5 |
| Yellow-bellied Flycatcher | rank | 2.62* | 2 | | | |
| Veery | ln | 2.98** | 3 | | | |
| Wood Thrush | rank[b] | 53.87*** | 1 | rank | 8.12*** | 1 |
| Red-eyed Vireo | root | 7.23*** | 2 | root[b] | 7.08*** | 2, 6 |
| Golden-winged Warbler | root | 2.72* | 4 | ln[b] | 15.33*** | 2 |
| Nashville Warbler | | | | root | 19.67*** | 2 |
| Northern Parula | | | | ln | 2.29* | 5 |
| Chestnut-sided Warbler | ln | 2.53* | 2 | | | |
| Black-throated Green Warbler | root | 3.66** | 2 | root | 2.95** | 2 |
| Ovenbird | root | 7.64*** | 2 | root[b] | 5.05*** | 2 |
| Canada Warbler | rank | 2.47* | 6 | | | |
| Rose-breasted Grosbeak | ln[b] | 4.43** | 5 | rank | 2.64* | 5 |
| Indigo Bunting | | | | rank[b] | 3.37* | 3 |

[a] Transformations used include rank, square root (root), and natural log (ln).
[b] Multivarate repeated measures test used (see text).
* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Mean number of individuals and species present on 500-m segments varied among years in both states (Tables 2, 3).

## MIGRATORY GROUPS

Long-distance migrants comprised the largest proportion of species and individuals recorded in boths states, followed by short-distance migrants and permanent residents. Mean number of individuals varied among years within each state for all three groups (Fig. 1, Table 2) but patterns of variation differed among groups within each state (Kendall's coefficient of concordance, Michigan: $\chi^2 = 5.32$, $W = 0.32$, $0.50 > P > 0.10$; Wisconsin: $\chi^2 = 2.2$, $W = 0.12$, $0.9 > P > 0.50$).

Long-distance migrants showed sharp declines in abundance from 1987 to 1988 in both states. Subsequent increases returned population levels approximately to levels before 1988. (Michigan had experienced a previous decline from 1985 to 1986; 1992 levels were not back to 1985 levels [see Blake et al. 1992].) This decrease and subsequent increase in abundance is reflected in the

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TABLE 3. Results (F values and significance levels) of two-way repeated measures ANOVA, testing for effects of time (annual variation), state (Michigan, Wisconsin), and time by state interaction. Polynomial contrast (PC) showing greatest significance for time effect is indicated by number (1 to 6).

| Species | Trs.[a] | Time | State | Time × State | PC |
|---|---|---|---|---|---|
| Permanent residents | root | 5.52*** | 6.25* | 4.17*** | 3 |
| Ruffed Grouse | ln | 2.36* | 2.30 | 0.05 | 3 |
| Downy Woodpecker | rank | 3.53** | 3.58 | 0.4 | 1 |
| Blue Jay | root | 11.11*** | 0.66 | 3.11* | 1, 3 |
| Black-capped Chickadee | ln | 5.42*** | 14.22*** | 3.15** | 1 |
| Red-breasted Nuthatch | rank[b] | 18.42*** | 2.36 | 6.68*** | 3, 2 |
| Cedar Waxwing | rank | 4.58*** | 4.18* | 0.63 | 1, 4 |
| Short-distance migrants | rank[b] | 12.08*** | 0.0 | 2.11 | 1, 3 |
| Yellow-bellied Sapsucker | ln | 1.55 | 0.95 | 2.32* | — |
| Northern Flicker | ln | 3.87*** | 5.91* | 2.53* | 1 |
| Brown Creeper | rank | 6.71*** | 1.46 | 2.13* | 3, 1 |
| Winter Wren | root | 5.45*** | 0.71 | 1.83 | 6 |
| Golden-crowned Kinglet | ln | 5.13*** | 1.05 | 1.48 | 4 |
| Ruby-crowned Kinglet | rank[b] | 4.07** | 1.09 | 1.35 | 6 |
| Hermit Thrush | root | 4.36*** | 11.30** | 0.41 | 1 |
| American Robin | rank | 6.87*** | 7.16** | 1.75 | 1 |
| Yellow-rumped Warbler | root | 2.78* | 0.27 | 0.23 | 4, 3 |
| Common Yellowthroat | ln[b] | 4.30** | 0.06 | 2.44* | 4 |
| Chipping Sparrow | rank[b] | 6.12*** | 0.0 | 0.20 | 1 |
| Song Sparrow | rank | 5.04*** | 0.64 | 0.82 | 1, 3 |
| Swamp Sparrow | ln | 2.50* | 0.87 | 2.09 | 2, 4 |
| White-throated Sparrow | ln | 14.75*** | 1.17 | 5.13*** | 1 |
| Brown-headed Cowbird | ln | 1.39 | 2.25 | 2.15* | 2 |
| Purple Finch | rank | 3.05** | 0.07 | 0.55 | 1 |
| Long-distance migrants | —[b] | 29.09*** | 15.24*** | 4.74*** | 2, 6 |
| Great Crested Flycatcher | rank | 2.18* | 6.66* | 0.36 | 1 |
| Veery | ln | 2.03 | 8.23** | 1.13 | 3 |
| Wood Thrush | rank[b] | 35.93*** | 0.18 | 1.23 | 1 |
| Solitary Vireo | ln | 4.09*** | 1.25 | 0.78 | 1 |
| Red-eyed Vireo | root[b] | 10.04*** | 0.01 | 2.34* | 2, 6 |
| Golden-winged Warbler | ln[b] | 21.99*** | 0.03 | 1.58 | 1, 2 |
| Nashville Warbler | root[b] | 13.03*** | 0.67 | 7.21*** | 2 |
| Northern Parula | ln | 2.03 | 10.26** | 2.55* | 5 |
| Chestnut-sided Warbler | root | 3.51** | 3.58 | 0.52 | 1 |
| Black-throated Green Warbler | root | 5.72*** | 5.57* | 0.85 | 2 |
| Blackburnian Warbler | ln | 2.08 | 11.08** | 1.32 | — |
| Black-and-white Warbler | root | 1.63 | 6.72* | 1.74 | — |
| Ovenbird | root | 11.21*** | 2.03 | 2.18* | 2, 6 |
| Canada Warbler | rank[b] | 3.11* | 3.78 | 0.57 | 6 |
| Rose-breasted Grosbeak | rank[b] | 0.52 | 10.14** | 6.70*** | — |
| Indigo Bunting | rank[b] | 3.67** | 4.42* | 0.89 | 3 |

[a] Transformations used include rank, square root (root), and natural log (ln).
[b] Multivarate repeated measures test used (see text).
* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

significant second degree (quadratic) polynomial in the repeated-measures analyses of variance (ANOVA) (Table 2). Patterns of variation nonetheless differed between regions as seen by the significant interaction effect in the two-way ANOVA results (Table 3).

Short-distance migrants also varied in abundance among years in both states (Fig. 1, Table 2) but there was no difference in abundance between states and no significant interaction effect (Table 3), indicating that patterns of variation were comparable in both areas. Declines in abundance were apparently more consistent, however, in Michigan (significant linear contrast) than in Wisconsin (significant cubic contrast). Abundances of long-distance and short-distance migrants were not well correlated in either state (Michigan, $r = 0.53$; Wisconsin, $r = 0.42$).

Trends in abundance of permanent residents (Fig. 1) differed somewhat between states (Tables

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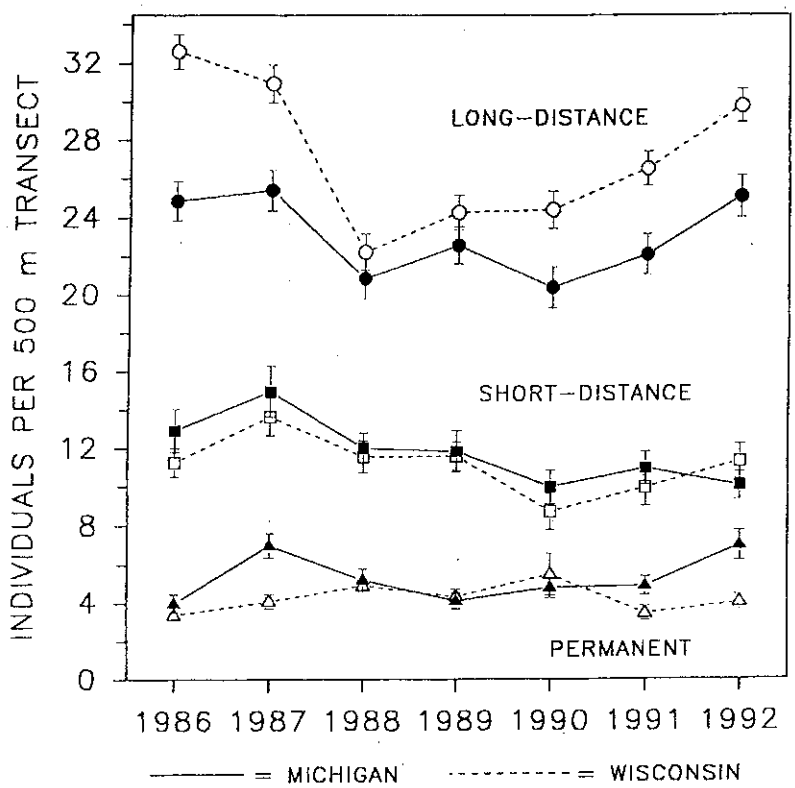


FIGURE 1. Mean (and SE) number of long-distance migrant, short-distance migrant, and permanent resident birds recorded per 500-m segment on study sites in Michigan and Wisconsin, 1986–1992.

2, 3). Permanent residents declined in abundance from 1987 to 1988 in Michigan, paralleling changes in migrant abundance, but increased in abundance in Wisconsin during the same period (Fig. 1). Abundance of permanent residents was poorly or negatively correlated with abundance of migrants (Michigan: $r = 0.48$ with long-distance and $r = 0.28$ with short-distance migrants; Wisconsin: $r = -0.74$ with long-distance and $r = -0.13$ with short-distance migrants).

## INDIVIDUAL SPECIES

Ten of 21 (48%) long-distance migrants in Michigan and 9 of 20 (45%) in Wisconsin (Figs. 2, 3) varied in abundance among years (Table 2), including four that varied only in Michigan, three that varied only in Wisconsin, and six that varied in abundance among years in both states. Several species varied in similar ways among years between states (e.g., Great Crested Flycatcher, $r = 0.96$ [scientific names are in Appendix 1]) whereas others displayed very different patterns between states (e.g., Rose-breasted Grosbeak, $r = -0.77$). Overall, trends in abundance of most species did not differ significantly between states; only Nashville Warbler and Rose-breasted Grosbeak showed highly significant interaction effects and three others showed weaker effects (Table 3). Most long-distance migrants that varied in abundance among years declined in abundance, particularly from 1987 to 1988. Species showing particularly strong declines during this period included Red-eyed Vireo, Nashville Warbler, and Ovenbird (Fig. 3). Declines in abundance were followed by increases for many species although patterns of increase varied among species and between states (e.g., compare Red-eyed Vireo and Ovenbird). In some cases, declines have not been followed by increases (e.g., Wood Thrush, Mourning Warbler, Chesnut-sided Warbler). Whereas most species declined in abundance during the middle part of this study, Golden-winged Warbler increased sharply in abundance from 1986 to 1987–1989 and then sharply declined. Overall, the complex nature of year-to-year variation is seen in the significance of higher

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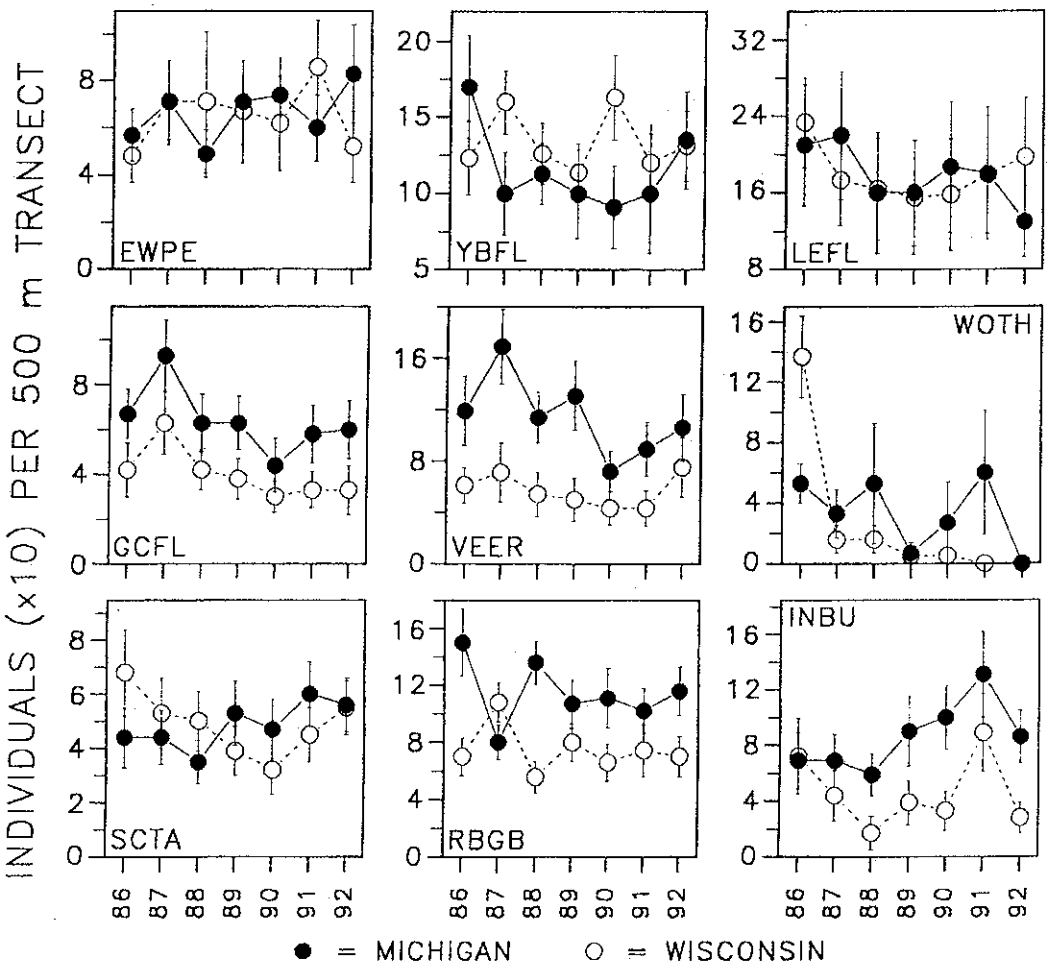


FIGURE 2. Mean (and SE) number of individuals of nine common long-distance migrants recorded on study sites in Michigan and Wisconsin, 1986–1992. EWPE = Eastern Wood-Pewee; YBFL = Yellow-bellied Flycatcher; LEFL = Least Flycatcher; GCFL = Great Crested Flycatcher; VEER = Veery; WOTH = Wood Thrush; SCTA = Scarlet Tanager; RBGB = Rose-breasted Grosbeak; INBU = Indigo Bunting.

level contrasts shown by many species (Tables 2, 3).

Of 16 short-distance migrants examined (Fig. 4), only Yellow-bellied Sapsucker, Yellow-rumped Warbler, and Purple Finch showed no significant variation in abundance from year-to-year within either state (Table 2) when states were examined separately. Patterns of variation were relatively similar between states for many species (e.g., Chipping Sparrow, $r = 0.98$) but were dissimilar for others (e.g., Ruby-crowned Kinglet, $r = -0.27$; Fig. 4). Between-state comparisons demonstrated few interaction effects, including only one strong effect (White-throated Sparrow, Table 3) reflecting the overall similarity between states in trends in abundance of short-distance migrants. In comparison with long-distance migrants, analyses demonstrated significant linear effects for many short-distance migrants, reflecting the general decrease in abundance for these species (Fig. 1).

Nine permanent residents were examined for annual variation in abundance (Fig. 5). Five species varied significantly among years in Michigan, five varied in Wisconsin, and three species varied in abundance among years in both states (Tables 2, 3). The extent to which variation in one state paralleled that in the other differed con-

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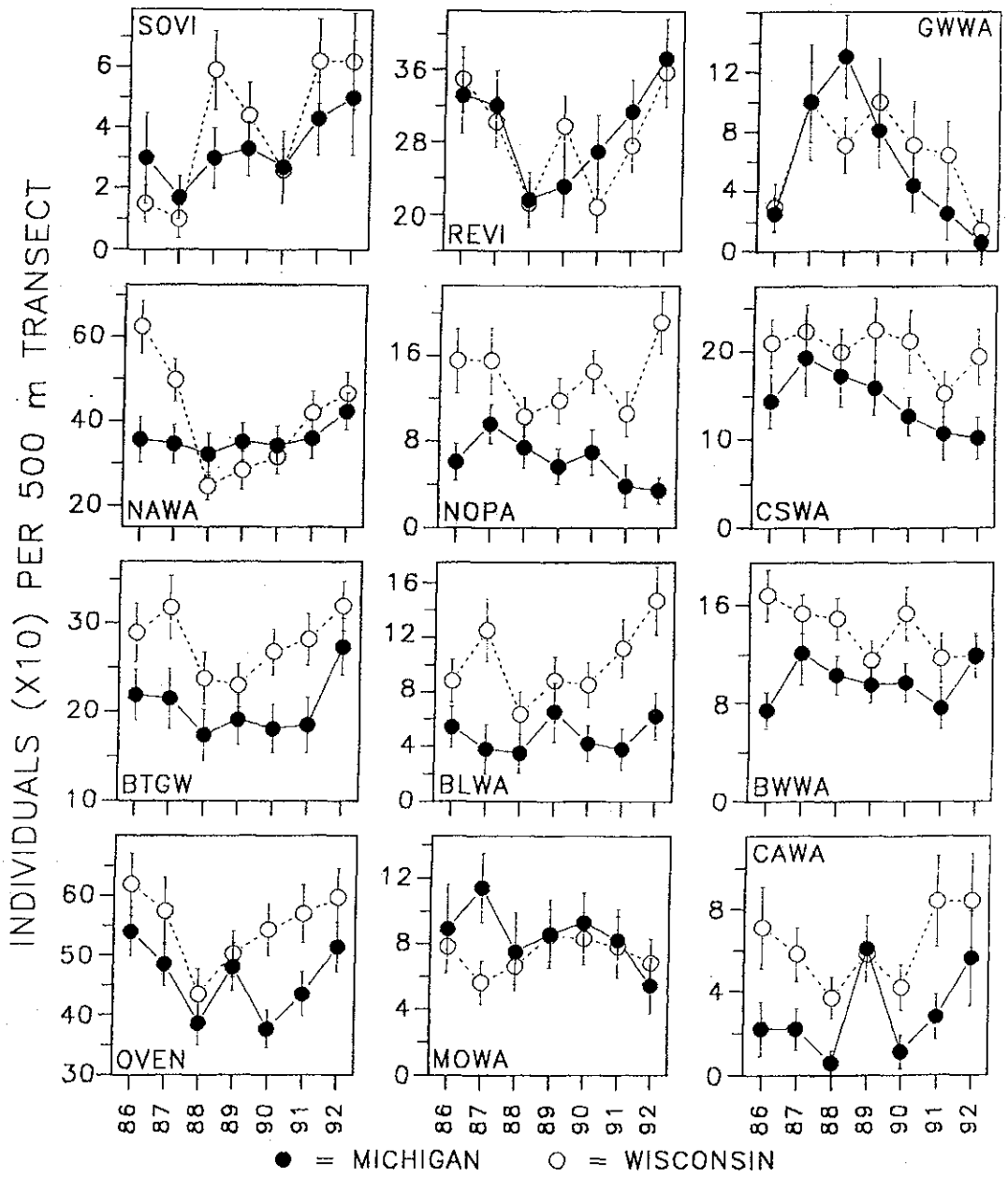


FIGURE 3. Mean (and SE) number of individuals of 12 common long-distance migrants (vireos and warblers) recorded on study sites in Michigan and Wisconsin, 1986–1992. SOVI = Solitary Vireo; REVI = Red-eyed Vireo; GWWA = Golden-winged Warbler; NAWA = Nashville Warbler; NOPA = Northern Parula; CSWA = Chestnut-sided Warbler; BTGW = Black-throated Green Warbler; BLWA = Blackburnian Warbler; BWWA = Black-and-white Warbler; OVEN = Ovenbird; MOWA = Mourning Warbler; CAWA = Canada Warbler.

siderably among species. Downy Woodpeckers, for example, showed a similar decline in abundance in both states (Fig. 5, $r = 0.84$); two-way ANOVA indicated a strong year effect but no interaction effect (Table 3). Red-breasted Nuthatches, in contrast, showed a strong interaction effect (Table 3, Fig. 5). Overall, three of six permanent resident species showed significnt inter-

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actions between state and year, suggesting that patterns of annual variation often differed between the two regions. That species showed little similarity in patterns of variation helps account for the fact that permanent residents, as a group (Fig. 1), showed few consistent changes in abundance among years.

In summary, of 46 species tested in Michigan, 27 showed year-to-year variation at a probability level of $P < 0.05$, 16 species at $P < 0.01$, and 9 at $P < 0.001$. Similar numbers for the 44 species tested in Wisconsin were 26, 18, and 14. The number of significant results is significantly greater than might be expected by chance, given the number of tests performed.

## DISCUSSION

Populations of many bird species breeding in northwestern Wisconsin and Upper Peninsula Michigan varied in abundance from 1986 through 1992. All groups (long-distance migrants, short-distance migrants, permanent residents) varied in abundance among years but patterns of variation often differed among groups and between states. Population trends of short-distance migrants were remarkably similar between sites in Wisconsin and Michigan but greater differences were noted between states for long-distance migrants and permanent residents. Thus, although changes in total abundance of birds were comparable between states, considerable variation in local vs. regional patterns existed when changes in abundance were viewed at migratory group or individual species levels.

The extent to which groups within and between regions differ in temporal patterns of abundance is an important consideration when attempting to understand conservation implications of observed population changes. As this and various other studies (e.g., James et al. 1992, Sauer and Droege 1992, and others in Hagan and Johnston 1992) have made clear, population fluctuations of migrant and non-migrant species often differ markedly both within and among regions. Given the current level of concern regarding population declines of many species, it is important to bear in mind that our perceptions of population change depend on the scale, both temporal (number of years) and spatial, at which those fluctuations are observed. Further, differences in trends between migratory groups (i.e., combining species by migratory status) may not reflect simple breeding versus wintering ground effects. Declines in abundance of long-distance migrants that were not matched by permanent residents during the early part of this study might, for example, have suggested wintering ground effects (e.g., habitat loss in the tropics). The subsequent increase in abundance of many long-distance migrants tends to refute that possibility.

Lack of similarity among groups and between regions in patterns of annual variation reflect the fact that species differ in their response to factors (e.g., resource abundance, habitat change, weather) that influence populations. Among migrant species, some of the most dramatic fluctuations in this study were seen in numbers of Red-eyed Vireos, Nashville Warblers, and Ovenbirds. Although fluctuations in abundance in one state sometimes closely tracked that in the other state (e.g., Red-eyed Vireo from 1986 to 1988), there were substantial differences in other cases (e.g., Nashville Warbler). Permanent residents, whose numbers often are primarily affected by events and conditions during winter (e.g., Holmes et al. 1986, Sauer and Droege 1990, Arcese et al. 1992), varied in different ways between states, suggesting that conditions differed between the two study regions. Further, changes in abundance of permanent residents did not closely parallel those shown by either migratory group in either state, again suggesting that different factors influence different groups or that different groups and species respond in different ways to the same factor (see Brown and Heske 1990). In contrast, Johnston and Hagan (1992) found that population trends of permanent residents and migrants often were positively correlated; they suggested that both groups might be responding to the same factor(s). Differences in population trends ob-

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FIGURE 4. Mean (and SE) number of individuals of 16 common short-distance migrants recorded on study sites in Michigan and Wisconsin, 1986–1992. YBSA = Yellow-bellied Sapsucker; NOFL = Northern Flicker; BRCR = Brown Creeper; WIWR = Winter Wren; GCKI = Golden-crowned Kinglet; RCKI = Ruby-crowned Kinglet; HETH = Hermit Thrush; AMRO = American Robin; YRWA = Yellow-rumped Warbler; COYE = Common Yellowthroat; CHSP = Chipping Sapprow; SOSP = Song Sparrow; SWSP = Swamp Sparrow; WTSP = White-throated Sparrow; BHCO = Brown-headed Cowbird; PUFI = Purple Finch.

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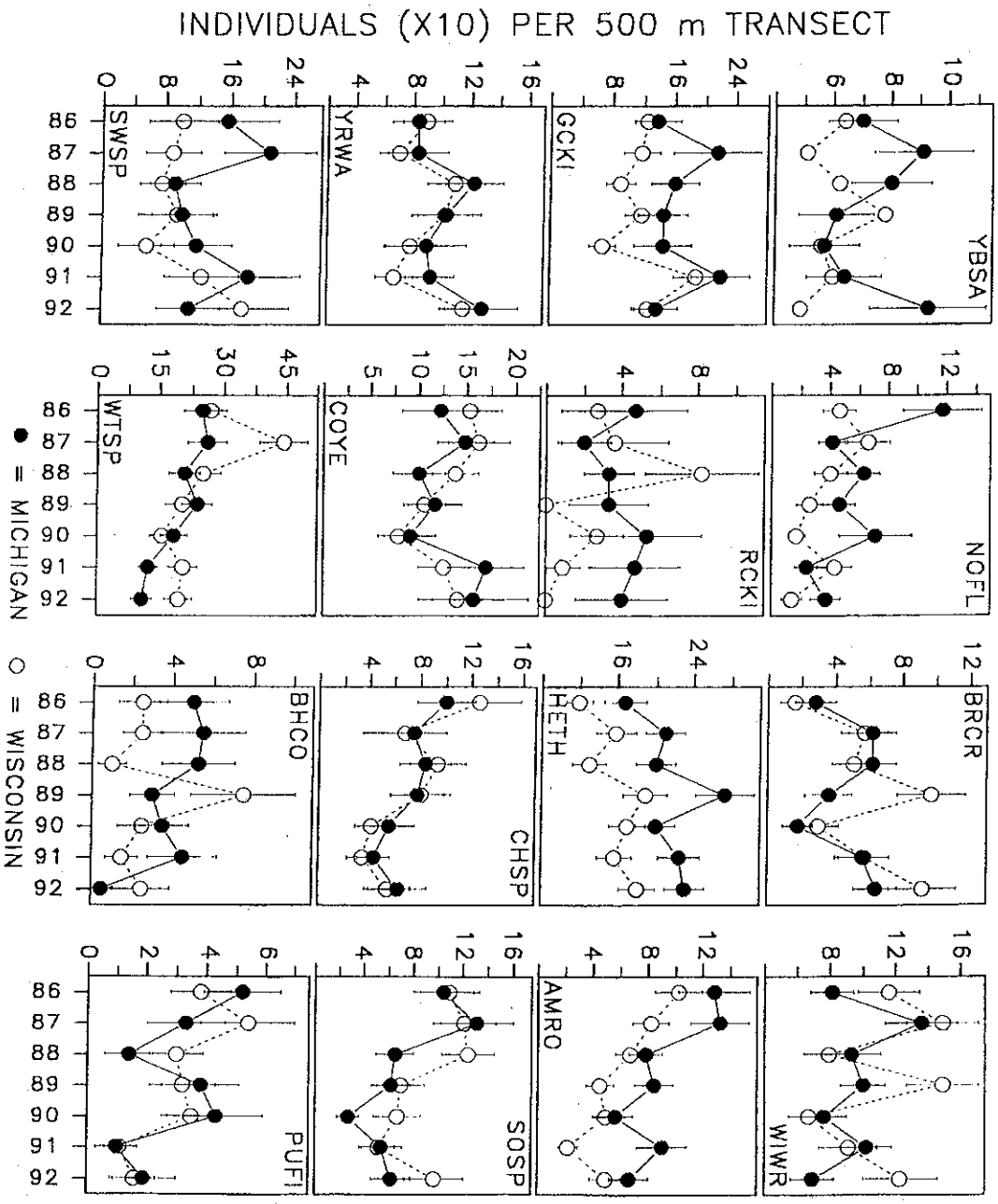
INDIVIDUALS (X10) PER 500 m TRANSECT
YBSA
GCKI
YRWA
SWSP
NOFL
RCKI
COYE
WTSP
BRCR
HETH
CHSP
BHCO
WIWR
AMRO
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PUFI
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● = MICHIGAN
○ = WISCONSIN

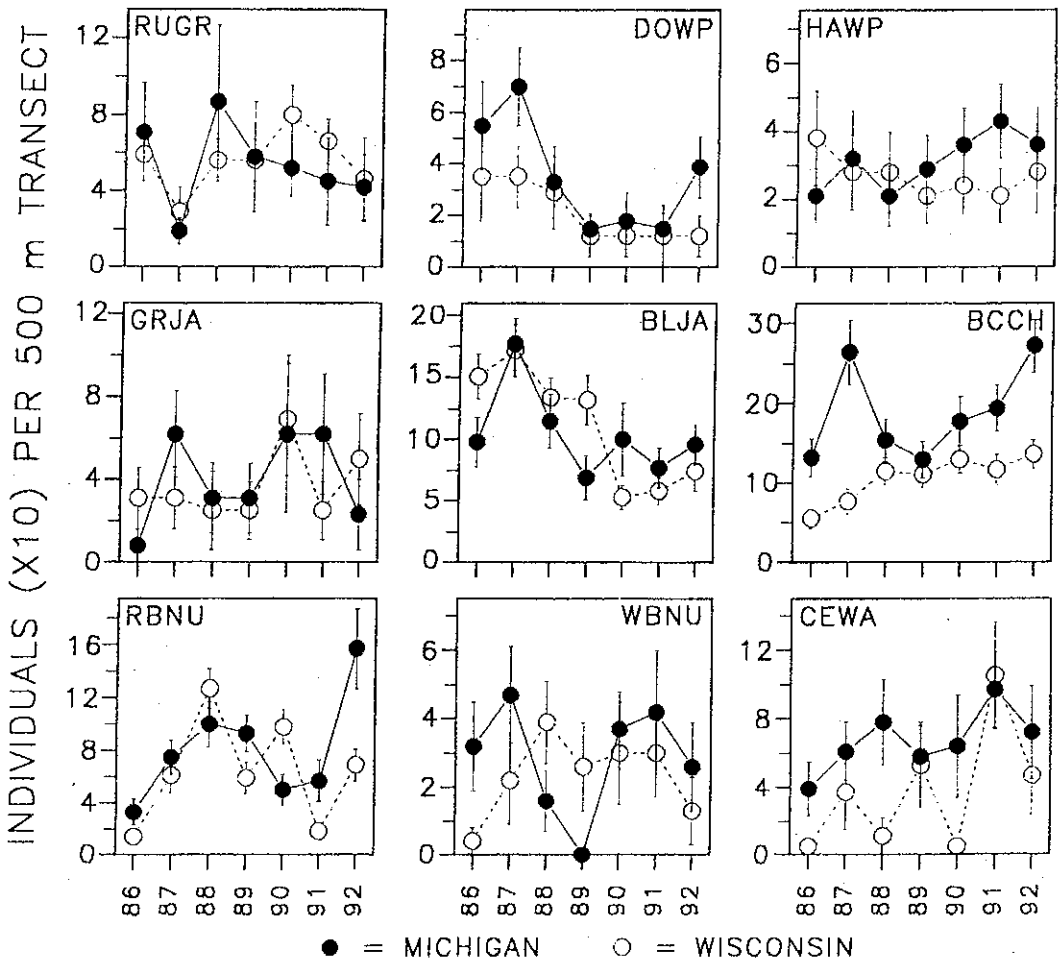


FIGURE 5. Mean (and SE) number of individuals of nine common permanent residents recorded on study sites in Michigan and Wisconsin, 1986–1992. RUGR = Ruffed Grouse; DOWP = Downy Woodpecker; HAWP = Hairy Woodpecker; GRJA = Gray Jay; BLJA = Blue Jay; BCCH = Black-capped Chickadee; RBNU = Red-breasted Nuthatch; WBNU = White-breasted Nuthatch; CEWA = Cedar Waxwing.

served in regions that support comparable habitats and that are relatively close geographically (i.e., as in this study), illustrate the spatial complexity of population variation. They further reinforce the need for comparative, concurrent studies if changes in abundance of species are to be properly evaluated. Changes occurring in one part of a species' range may not be representative of trends in other regions (James et al. 1992).

Population declines of breeding birds have been variously attributed to conditions and events that affect birds on breeding grounds, during migration, and/or on nonbreeding grounds (reviews in Askins et al. 1990, Finch 1991). Much of the annual variation in bird abundances observed during this study likely occurred in response to altered conditions on the breeding grounds (see also Holmes and Sherry 1988, Blake et al. 1992, Robinson 1992, Sherry and Holmes 1992, Böhning-Gaese et al. 1993). Large changes in abundance occurred over the span of one to several years; such a rapid change is unlikely to be caused by alterations in tropical, wintering habitats. In contrast, changes in weather can have dramatic and rapid consequences for bird populations (Robbins et al. 1986, Holmes and Sherry 1988, Virkkala 1991, Faaborg and Arendt 1992).

Declines in abundance that occurred during

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the first few years of this study likely were in response to a series of severe droughts that affected most of the upper midwest, including both regions where this study was conducted (Blake et al. 1992). Such a general response by many species, including both migratory and nonmigratory species, would not be likely to occur in response to conditions or events in tropical habitats. Abundances of many species reached low points in 1988, the year of the most severe drought. The fact that populations of many species have increased in abundance over the past few years, even reaching levels seen at the onset of this study, lends support to the argument that most species were affected by breeding ground effects, such as drought.

Although environmental conditions (e.g., drought, temperature) likely influenced population abundances, other factors, including successional changes in habitat, probably influenced abundance of several species, as has been noted by other studies (e.g., Holmes and Sherry 1988). The increase in abundance of Indigo Buntings in Michigan may have occurred, for example, in response to the clearing of the antenna right-of-way. The right-of-way was cleared in 1984 (and has been kept clear of tall vegetation since) and subsequent development of suitable breeding habitat has favored species such as the Indigo Bunting. Conversely, continued growth of early successional vegetation on previously logged areas may account for declines in abundance of several species (e.g., Song Sparrow, Chestnut-sided Warbler) associated with early regrowth. Declines in abundance of migrants that breed in brushy habitats appears, however, to be more than a local phenomenon as such changes have been noted by others as well (Hagan et al. 1992, Sauer and Droege 1992, Witham and Hunter 1992). Changes observed in our region may be a reflection of more widespread changes in populations of some species. Striking declines also were noted for the Wood Thrush, particularly in Wisconsin sites, which are near the northern limit of the Wood Thrush distribution (AOU 1983). Such fluctuations may reflect conditions elsewhere in the species range. Several studies have suggested that Wood Thrush populations may be seriously affected by loss of tropical (wintering) habitats (e.g., Rappole et al. 1992, Powell et al. 1992).

Conditions on breeding or wintering grounds receive the greatest attention when discussing causes of population variation; few studies consider events during migration. Yet, migratory species also must contend with factors that influence survival during movements to and from breeding grounds (Morse 1980, Moore and Simons 1992). Various examples of large-scale mortality during migration that have occurred as a result of severe weather in spring have been noted (see Morse 1980 for examples); such disasters can severely depress breeding bird densities for several years (Zumeta and Holmes 1978). A brief period of cold, wet weather during early May 1986 in Michigan had a severe negative effect on reproductive success of Tree Swallows (Beaver et al. 1988) and could have negatively affected populations of other species in the Michigan region as well. Abundance was, overall, considerably lower in June 1986 than in June 1985 in Michigan (Blake et al. 1992). Migration is an energetically expensive period so that if food supplies or opportunities for foraging are limited (i.e., loss of suitable habitats along migration routes) survival may be affected (Loria and Moore 1990; Moore and Young 1991; see also Stiles 1988; Loiselle and Blake 1991, 1992).

Long-term changes in abundance of breeding bird populations will reflect, in most cases, events and conditions that occur during both breeding and nonbreeding seasons. Short-term fluctuations (i.e., year to year) in migratory species are, by contrast, more likely to reflect breeding ground or migratory period influences. Separating the effects of breeding and nonbreeding season conditions is, however, difficult in many cases, particularly for migrants (Finch 1991). This study was designed to explore the extent of variation present among birds breeding in northern hardwoods forests. The causes of that variation were not directly investigated (i.e., there was no experimental manipulation of communities; demographics of populations were not investigated) so that our discussion of factors promoting population variation is necessarily speculative. For example, the mechanisms by which changed weather conditions might have affected populations of birds in our study regions are varied. Changes in resource (e.g., insect) abundance may affect reproductive success, altering patterns of present and future habitat use (i.e., if unsuccessful breeders do not return in subsequent years). Alternatively, changes in detection probability (i.e., rates of song production), if related to annual differences in weather patterns, might suggest variation in abundance when what is actu-

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ally being detected are changes in detection probability or frequency.

Holmes et al. (1986) described two basic approaches to investigations of population variation: (1) simultaneously sample birds on many plots representing different habitats; or (2) intensively sample birds on one to several plots for many years. Clearly, intensive study of many plots over many years would be ideal but not possible under most circumstances of time and money. Our approach falls somewhere between the two approaches described above: we sampled many plots representing various habitats over a moderately long period. Thus, this study was relatively extensive, rather than intensive; the area covered in each state was considerably larger than that covered in many studies on population trends but much smaller than the statewide or geographic region approach of others (e.g., Breeding Bird Survey; Robbins et al. 1986). Intensive, single-plot studies provide detailed data on the population changes at a local scale but such changes do not necessarily reflect population changes at more regional levels (Holmes and Sherry 1988, Witham and Hunter 1992). By comparing results from two geographically distant regions but with similar habitats, one can better assess the extent or generality of observed patterns of variation (James et al. 1992). Such larger scale studies are a necessary complement to more intensive studies.

Populations of birds typically fluctuate in abundance on various temporal scales. Separating shorter-term fluctuations in abundance that are a natural component of population dynamics from longer-term trends that suggest fundamental changes in a species' abundance is of critical importance for conservation. Migratory birds are a particularly challenging group because populations are influenced by conditions in both temperate and tropical regions. Local, breeding-ground effects often cause large changes in abundance from year to year, as seen in this study. Similarly, substantial annual fluctuations in abundance may occur among populations on wintering (tropical) grounds (Blake and Loiselle 1992). Such fluctuations may mask more subtle, longer-term changes in populations. Gradual loss of breeding or nonbreeding habitat may result in chronic declines in populations that become apparent only after many years. A further problem arises because wintering sites for specific breeding populations largely are unknown. Studies are urgently needed that link specific breeding and wintering populations if dynamics of migratory birds are to be understood.

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APPENDIX 1. Mean number individuals per 500 m segment (rounded to nearest 0.1) for species recorded on at least five segments (i.e., ≈10% of total) in Michigan and Wisconsin, 1986–1992. Additional (rare) species are listed at the end. $n$ = total number of separate segments the species was recorded on during at least one year. Taxonomic sequence follows American Ornithologists' Union (1983, and supplements). Letter codes are given for species mentioned in text. + = <0.05 birds/segment.

| English name, code | Scientific name | Michigan ($n$ = 51) | | | | | | | | Wisconsin ($n$ = 53) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $n$ | 86 | 87 | 88 | 89 | 90 | 91 | 92 | $n$ | 86 | 87 | 88 | 89 | 90 | 91 | 92 |
| Sharp-shinned Hawk | *Accipiter striatus* | 10 | | | 0.1 | 0.2 | 0.2 | 0.2 | 0.4 | 2 | | | 0.5 | | | | 0.5 |
| Broad-winged Hawk | *Buteo platypterus* | 14 | 0.2 | 0.1 | | 0.2 | 0.3 | 0.2 | 0.2 | 12 | 0.3 | 0.2 | 0.1 | 0.3 | 0.1 | 0.1 | 0.3 |
| Ruffed Grouse, RUGR | *Bonasa umbellus* | 31 | 0.7 | 0.2 | 0.9 | 0.6 | 0.5 | 0.5 | 0.4 | 41 | 0.6 | 0.3 | 0.6 | 0.6 | 0.8 | 0.7 | 0.5 |
| American Woodcock | *Scolopax minor* | 16 | 0.5 | 0.7 | 0.6 | 0.3 | 0.1 | 0.5 | 0.2 | 8 | | 0.5 | 0.1 | 0.4 | 0.3 | 0.3 | 0.4 |
| Black-billed Cuckoo | *Coccyzus erythrophthalmus* | 11 | | 0.2 | 0.5 | 0.1 | 0.1 | | 0.3 | 1 | | | | | 1.0 | | |
| Yellow-billed Cuckoo | *Coccyzus americanus* | 7 | | 0.3 | | 0.4 | 0.1 | | 0.1 | 1 | | | 1.0 | | | | |
| Barred Owl | *Strix varia* | 3 | | 0.7 | 0.3 | | | | | 7 | 0.2 | | 0.2 | 0.2 | 0.1 | 0.1 | 0.3 |
| Chimney Swift | *Chaetura pelagica* | 3 | | 0.3 | | 0.7 | | | 0.7 | 7 | | 1.7 | 0.3 | 0.3 | | 0.1 | |
| Ruby-throated Hummingbird | *Archilochus colubris* | 12 | | 0.4 | | 0.3 | 0.4 | 0.3 | 0.2 | 5 | | 0.2 | | 0.2 | 0.2 | | 0.4 |
| Yellow-bellied Sapsucker, YBSS | *Sphyrapicus varius* | 44 | 0.7 | 0.9 | 0.8 | 0.6 | 0.6 | 0.6 | 0.9 | 46 | 0.6 | 0.5 | 0.6 | 0.8 | 0.6 | 0.6 | 0.5 |
| Downy Woodpecker, DOWP | *Picoides pubescens* | 33 | 0.6 | 0.7 | 0.3 | 0.2 | 0.2 | 0.2 | 0.4 | 17 | 0.4 | 0.4 | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 |
| Hairy Woodpecker, HAWP | *Picoides villosus* | 28 | 0.2 | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 | 29 | 0.4 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 |
| Black-backed Woodpecker | *Picoides arcticus* | 5 | 0.2 | | | 0.6 | 0.4 | 0.2 | 0.4 | 4 | | | 1.0 | 1.0 | | | |
| Northern Flicker, NOFL | *Colaptes auratus* | 41 | 1.2 | 0.4 | 0.6 | 0.5 | 0.7 | 0.2 | 0.4 | 35 | 0.5 | 0.7 | 0.4 | 0.3 | 0.2 | 0.4 | 0.1 |
| Pileated Woodpecker | *Dryocopus pileatus* | 13 | 0.1 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 | 0.4 | 16 | 0.3 | 0.1 | 0.1 | 0.3 | 0.1 | 0.1 | 0.3 |
| Olive-sided Flycatcher | *Contopus borealis* | 12 | 0.3 | 0.8 | 0.1 | 0.1 | | | 0.2 | 9 | 0.2 | 0.1 | 0.3 | 0.6 | | | 0.2 |
| Eastern Wood-Pewee, EWPE | *Contopus virens* | 35 | 0.6 | 0.7 | 0.5 | 0.7 | 0.7 | 0.6 | 0.8 | 21 | 0.5 | 0.7 | 0.7 | 0.7 | 0.6 | 0.9 | 0.5 |
| Yellow-bellied Flycatcher, YBFL | *Empidonax flaviventris* | 23 | 1.7 | 1.0 | 1.1 | 1.0 | 0.9 | 1.0 | 1.4 | 35 | 1.2 | 1.6 | 1.3 | 1.1 | 1.6 | 1.2 | 1.3 |
| Least Flycatcher, LEFL | *Empidonax minimus* | 30 | 2.1 | 2.2 | 1.6 | 1.6 | 1.9 | 1.8 | 1.3 | 33 | 2.3 | 1.7 | 1.6 | 1.6 | 1.6 | 1.8 | 2.0 |
| Great Crested Flycatcher, GCFL | *Myiarchus crinitus* | 43 | 0.7 | 0.9 | 0.6 | 0.6 | 0.4 | 0.6 | 0.6 | 40 | 0.4 | 0.6 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 |
| Tree Swallow | *Tachycineta bicolor* | 10 | 0.2 | 1.2 | 0.2 | | 0.2 | | 0.1 | 11 | | 0.7 | 1.0 | 0.5 | 0.8 | 1.1 | 0.4 |
| Gray Jay, GRJA | *Perisoreus canadensis* | 13 | 0.1 | 0.6 | 0.3 | 0.3 | 0.6 | 0.6 | 0.2 | 16 | 0.3 | 0.3 | 0.3 | 0.3 | 0.7 | 0.3 | 0.5 |
| Blue Jay, BLJA | *Cyanocitta cristata* | 48 | 1.0 | 1.8 | 1.2 | 0.7 | 1.0 | 0.8 | 1.0 | 53 | 1.5 | 1.7 | 1.3 | 1.3 | 0.5 | 0.6 | 0.7 |
| American Crow | *Corvus brachyrhynchos* | 18 | 0.5 | 0.7 | 0.4 | 0.1 | | 0.1 | 0.2 | 8 | 0.4 | 0.1 | 0.9 | 0.3 | | | |
| Common Raven | *Corvus corax* | 27 | 0.1 | 0.6 | 0.1 | 0.2 | 0.3 | 0.1 | 0.3 | 9 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.2 | |
| Black-capped Chickadee, BCCH | *Parus atricapillus* | 50 | 1.3 | 2.6 | 1.5 | 1.3 | 1.8 | 1.9 | 2.7 | 53 | 0.6 | 0.8 | 1.2 | 1.1 | 1.3 | 1.2 | 1.4 |
| Boreal Chickadee | *Parus hudsonicus* | 11 | 0.3 | 0.1 | 0.4 | 0.3 | 0.2 | 0.4 | 0.8 | 5 | 0.2 | 0.4 | 0.4 | | | 0.4 | |
| Red-breasted Nuthatch, RBNU | *Sitta canadensis* | 40 | 0.3 | 0.8 | 1.0 | 0.9 | 0.5 | 0.6 | 1.6 | 49 | 0.1 | 0.6 | 1.3 | 0.6 | 1.0 | 0.2 | 0.7 |
| White-breasted Nuthatch WBNU | *Sitta carolinensis* | 19 | 0.3 | 0.5 | 0.2 | | 0.4 | 0.4 | 0.3 | 23 | + | 0.2 | 0.4 | 0.3 | 0.3 | 0.3 | 0.1 |
| Brown Creeper, BRCR | *Certhia americana* | 39 | 0.3 | 0.6 | 0.6 | 0.4 | 0.2 | 0.6 | 0.6 | 37 | 0.2 | 0.6 | 0.5 | 1.0 | 0.3 | 0.6 | 0.9 |
| Winter Wren, WIWR | *Troglodytes troglodytes* | 42 | 0.8 | 1.4 | 0.9 | 1.0 | 0.8 | 1.0 | 0.7 | 43 | 1.2 | 1.5 | 0.8 | 1.5 | 0.7 | 0.9 | 1.2 |
| Golden-crowned Kinglet, GCKI | *Regulus strapa* | 40 | 1.4 | 2.2 | 1.6 | 1.5 | 1.5 | 2.2 | 1.4 | 42 | 1.2 | 1.2 | 0.9 | 1.2 | 0.7 | 1.9 | 1.3 |
| Ruby-crowned Kinglet, RCKI | *Regulus calendula* | 15 | 0.5 | 0.2 | 0.3 | 0.3 | 0.5 | 0.5 | 0.4 | 11 | 0.3 | 0.4 | 0.8 | | 0.3 | 0.1 | |
| Eastern Bluebird | *Sialia sialis* | 6 | | 1.0 | 0.7 | 0.2 | | 0.5 | | 1 | | 2.0 | | | | | |
| Veery, VEER | *Catharus fuscescens* | 36 | 1.2 | 1.7 | 1.1 | 1.3 | 0.7 | 0.9 | 1.1 | 28 | 0.6 | 0.7 | 0.5 | 0.5 | 0.4 | 0.4 | 0.8 |

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APPENDIX 1. Continued.

| English name, code | Scientific name | Michigan ($n$ = 51) | | | | | | | | Wisconsin ($n$ = 53) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $n$ | 86 | 87 | 88 | 89 | 90 | 91 | 92 | $n$ | 86 | 87 | 88 | 89 | 90 | 91 | 92 |
| Hermit Thrush, HETH | *Catharus guttatus* | 51 | 1.7 | 2.1 | 2.0 | 2.7 | 2.0 | 2.3 | 2.3 | 53 | 1.2 | 1.6 | 1.3 | 1.9 | 1.7 | 1.6 | 1.8 |
| Wood Thrush, WOTH | *Hylocichla mustelina* | 15 | 0.5 | 0.3 | 0.5 | 0.1 | 0.3 | 0.6 | | 19 | 1.4 | 0.2 | 0.2 | 0.1 | 0.1 | | |
| American Robin, AMRO | *Turdus migratorius* | 50 | 1.3 | 1.3 | 0.8 | 0.8 | 0.6 | 0.9 | 0.7 | 51 | 1.0 | 0.8 | 0.7 | 0.5 | 0.5 | 0.2 | 0.5 |
| Gray Catbird | *Dumetella carolinensis* | 7 | 0.1 | 0.7 | | 0.1 | 0.1 | | | 6 | 0.5 | 0.5 | 0.2 | | | | |
| Brown Thrasher | *Toxostoma rufum* | 11 | 0.5 | 0.5 | 0.4 | 0.5 | 0.2 | 0.1 | | 5 | 0.4 | | 0.2 | 0.4 | | | |
| Cedar Waxwing, CEWA | *Bombycilla cedrorum* | 36 | 0.4 | 0.6 | 0.8 | 0.6 | 0.6 | 1.0 | 0.7 | 19 | 0.1 | 0.4 | 0.1 | 0.5 | 0.1 | 1.1 | 0.5 |
| European Starling | *Sturnus vulgaris* | 5 | 0.4 | 1.2 | | | 0.2 | | 0.2 | 1 | 1.0 | | | | | | |
| Solitary Vireo, SOVI | *Vireo solitarius* | 30 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0.4 | 0.5 | 39 | 0.2 | 0.1 | 0.6 | 0.4 | 0.3 | 0.6 | 0.6 |
| Yellow-throated Vireo | *Vireo flavifrons* | 11 | 0.2 | | 0.2 | 0.2 | | 0.5 | | 4 | 0.3 | 0.5 | 0.3 | | 0.3 | | 0.3 |
| Philadelphia Vireo | *Vireo philadelphicus* | 4 | 0.3 | | 0.3 | 0.3 | | | 0.3 | 5 | 0.2 | 0.2 | 0.2 | 0.2 | | | 0.2 |
| Red-eyed Vireo, REVI | *Vireo olivaceus* | 51 | 3.3 | 3.2 | 2.2 | 2.3 | 2.7 | 3.1 | 3.7 | 51 | 3.5 | 3.0 | 2.1 | 3.0 | 2.1 | 2.8 | 3.6 |
| Golden-winged Warbler, GWWA | *Vermivora chrysoptera* | 16 | 0.3 | 1.0 | 1.3 | 0.8 | 0.4 | 0.3 | 0.1 | 14 | 0.3 | 1.0 | 0.7 | 1.0 | 0.7 | 0.6 | 0.1 |
| Tennessee Warbler | *Vermivora peregrina* | 8 | 0.3 | 0.6 | 0.6 | 0.3 | | | | 32 | 1.0 | 0.4 | 0.2 | 0.2 | 0.1 | 0.1 | + |
| Nashville Warbler, NAWA | *Vermivora ruficapilla* | 46 | 3.6 | 3.5 | 3.2 | 3.5 | 3.4 | 3.6 | 4.2 | 51 | 6.3 | 5.0 | 2.5 | 2.9 | 3.2 | 4.2 | 4.7 |
| Northern Parula, NOPA | *Parula americana* | 23 | 0.6 | 1.0 | 0.7 | 0.6 | 0.7 | 0.4 | 0.4 | 33 | 1.6 | 1.6 | 1.0 | 1.2 | 1.5 | 1.1 | 1.9 |
| Yellow Warbler | *Dendroica petechia* | 5 | | 0.8 | 0.4 | 0.2 | | 1.0 | | 10 | 0.4 | 0.8 | 0.5 | 0.7 | 0.5 | 0.6 | 0.2 |
| Chestnut-sided Warbler, CSWA | *Dendroica pensylvanica* | 41 | 1.4 | 1.9 | 1.7 | 1.6 | 1.3 | 1.1 | 1.0 | 48 | 2.1 | 2.2 | 2.0 | 2.3 | 2.1 | 1.5 | 1.9 |
| Magnolia Warbler | *Dendroica magnolia* | 11 | 0.3 | | 0.2 | 0.3 | 0.2 | 0.4 | 0.5 | 24 | 0.3 | 0.2 | + | 0.3 | 0.4 | 0.3 | 0.5 |
| Cape May Warbler | *Dendroica tigrina* | 14 | 0.4 | 0.5 | 0.1 | | 0.1 | | 0.4 | 17 | 0.9 | 0.5 | 0.1 | | 0.1 | | 0.1 |
| Yellow-rumped Warbler, YRWA | *Dendroica coronata* | 36 | 0.8 | 0.8 | 1.2 | 1.0 | 0.9 | 0.9 | 1.3 | 46 | 0.9 | 0.7 | 1.1 | 1.0 | 0.8 | 0.7 | 1.2 |
| Black-throated Green Warbler, BTGW | *Dendroica virens* | 47 | 2.2 | 2.2 | 1.7 | 1.9 | 1.8 | 1.9 | 2.7 | 50 | 2.9 | 3.2 | 2.4 | 2.3 | 2.7 | 2.8 | 3.2 |
| Blackburnian Warbler, BLWA | *Dendroica fusca* | 26 | 0.5 | 0.4 | 0.4 | 0.7 | 0.4 | 0.4 | 0.6 | 40 | 0.9 | 1.3 | 0.6 | 0.9 | 0.9 | 1.1 | 1.5 |
| Pine Warbler | *Dendroica pinus* | 7 | | 0.7 | 0.4 | 0.1 | | | 0.1 | 10 | 0.5 | 0.5 | 0.3 | | 0.2 | 0.4 | |
| Palm Warbler | *Dendroica palmarum* | 3 | | 0.3 | | | | 1.3 | | 8 | 1.0 | 1.1 | 0.5 | 0.4 | 0.1 | 0.3 | 0.3 |
| Bay-breasted Warbler | *Dendroica castanea* | 2 | 1.0 | | | | | | 0.5 | 6 | | 0.8 | | 0.2 | | | 0.2 |
| Black-and-white Warbler, BWWA | *Mniotilta varia* | 38 | 0.7 | 1.2 | 1.0 | 1.0 | 1.0 | 0.8 | 1.2 | 47 | 1.7 | 1.5 | 1.5 | 1.2 | 1.5 | 1.2 | 1.2 |
| American Redstart | *Setophaga ruticilla* | 10 | 0.2 | 0.2 | 0.3 | 0.1 | 0.1 | | 0.3 | 16 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 |
| Ovenbird, OVEN | *Seiurus aurocapillus* | 51 | 5.4 | 4.8 | 3.9 | 4.8 | 3.8 | 4.4 | 5.1 | 53 | 6.2 | 5.7 | 4.3 | 5.0 | 5.4 | 5.7 | 6.0 |

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APPENDIX 1. Continued.

| English name, code | Scientific name | Michigan ($n$ = 51) | | | | | | | | Wisconsin ($n$ = 53) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $n$ | 86 | 87 | 88 | 89 | 90 | 91 | 92 | $n$ | 86 | 87 | 88 | 89 | 90 | 91 | 92 |
| Northern Waterthrush | *Seiurus noveboracensis* | 8 | 0.1 | 0.4 | 0.3 | 1.0 | 0.3 | | 0.1 | 18 | 0.3 | 0.3 | 0.2 | 0.3 | 0.4 | 0.6 | 0.8 |
| Connecticut Warbler | *Oporornis agilis* | 6 | 0.8 | 1.0 | 0.7 | 0.3 | 0.3 | | | 14 | 0.4 | 0.4 | 0.4 | 0.1 | 0.5 | 0.2 | |
| Mourning Warbler, MOWA | *Oporornis philadelphia* | 28 | 0.9 | 1.1 | 0.8 | 0.9 | 0.9 | 0.8 | 0.5 | 41 | 0.8 | 0.6 | 0.7 | 0.9 | 0.8 | 0.8 | 0.7 |
| Common Yellowthroat, COYE | *Geothlypis trichas* | 23 | 1.2 | 1.5 | 1.0 | 1.2 | 0.9 | 1.7 | 1.6 | 34 | 1.5 | 1.6 | 1.4 | 1.1 | 0.8 | 1.3 | 1.4 |
| Canada Warbler, CAWA | *Wilsonia canadensis* | 18 | 0.2 | 0.2 | 0.1 | 0.6 | 0.1 | 0.3 | 0.6 | 38 | 0.7 | 0.6 | 0.4 | 0.6 | 0.4 | 0.8 | 0.8 |
| Scarlet Tanager, SCTA | *Piranga olivacea* | 43 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.6 | 38 | 0.7 | 0.5 | 0.5 | 0.4 | 0.3 | 0.5 | 0.6 |
| Rose-breasted Grosbeak, RBGB | *Pheucticus ludovicianus* | 44 | 1.5 | 0.8 | 1.4 | 1.1 | 1.1 | 1.0 | 1.2 | 50 | 0.7 | 1.1 | 0.6 | 0.8 | 0.7 | 0.7 | 0.7 |
| Indigo Bunting, INBU | *Passerina cyanea* | 29 | 0.7 | 0.7 | 0.6 | 0.9 | 1.0 | 1.3 | 0.9 | 18 | 0.7 | 0.4 | 0.2 | 0.4 | 0.3 | 0.9 | 0.3 |
| Rufous-sided Towhee | *Pipilo erythrophthalmus* | 14 | 1.0 | 0.4 | 0.6 | 0.6 | 0.3 | 0.4 | 0.5 | 2 | | | | 0.5 | | | 0.5 |
| Chipping Sparrow, CHSP | *Spizella passerina* | 32 | 1.0 | 0.8 | 0.8 | 0.8 | 0.6 | 0.4 | 0.6 | 31 | 1.3 | 0.7 | 0.9 | 0.8 | 0.4 | 0.4 | 0.6 |
| Song Sparrow, SOSP | *Melospiza melodia* | 26 | 1.0 | 1.3 | 0.7 | 0.6 | 0.3 | 0.5 | 0.6 | 33 | 1.1 | 1.2 | 1.2 | 0.7 | 0.7 | 0.5 | 1.0 |
| Lincoln's Sparrow | *Melospiza lincolnii* | 2 | 1.0 | | | | | | | 8 | 0.3 | 1.0 | 0.1 | 0.1 | | 0.1 | 0.9 |
| Swamp Sparrow, SWSP | *Melospiza georgiana* | 11 | 1.6 | 2.1 | 0.9 | 1.0 | 1.2 | 1.8 | 1.1 | 16 | 1.0 | 0.9 | 0.8 | 0.9 | 0.6 | 1.3 | 1.8 |
| White-throated Sparrow, WTSP | *Zonotrichia albicollis* | 41 | 2.5 | 2.6 | 2.1 | 2.4 | 1.8 | 1.2 | 1.1 | 47 | 2.7 | 4.4 | 2.5 | 2.0 | 1.6 | 2.0 | 1.9 |
| Dark-eyed Junco | *Junco hyemalis* | 6 | 0.3 | 0.5 | 1.7 | 0.3 | 0.7 | 0.3 | 0.2 | 9 | | 0.6 | 0.3 | 0.8 | 0.2 | 0.4 | 0.2 |
| Common Grackle | *Quiscalus quiscula* | 11 | 1.2 | 1.8 | 0.4 | 0.6 | 0.5 | 0.9 | 0.4 | 8 | 0.8 | 1.4 | 2.4 | 0.8 | 0.5 | 1.4 | 1.1 |
| Brown-headed Cowbird, BHCO | *Molothrus ater* | 20 | 0.5 | 0.6 | 0.6 | 0.3 | 0.4 | 0.5 | 0.1 | 20 | 0.3 | 0.3 | 0.1 | 0.8 | 0.3 | 0.2 | 0.3 |
| Northern Oriole | *Icterus galbula* | 8 | 0.3 | 0.1 | 0.1 | 0.3 | 0.1 | 0.5 | 0.4 | 5 | 0.2 | 0.4 | 0.4 | | 0.2 | 0.6 | 0.2 |
| Purple Finch, PUFI | *Carpodacus purpureus* | 21 | 0.5 | 0.3 | 0.1 | 0.4 | 0.4 | 0.1 | 0.2 | 37 | 0.4 | 0.5 | 0.3 | 0.3 | 0.4 | 0.1 | 0.2 |
| White-winged Crossbill | *Loxia leucoptera* | 5 | | | | | 0.8 | | 3.0 | 2 | | | | | 2.0 | 0.5 | |
| Pine Siskin | *Carduelis pinus* | | | | | | | | | 10 | | 0.1 | 0.2 | 0.1 | 3.6 | | |
| American Goldfinch | *Carduelis tristis* | 23 | 0.2 | 0.5 | 0.1 | 0.2 | 0.5 | 0.1 | 0.3 | 30 | 0.1 | 0.2 | 0.5 | 0.5 | 0.3 | 0.2 | 0.3 |
| Evening Grosbeak | *Coccothraustes vespertinus* | 10 | | 0.4 | 0.4 | 0.4 | | 0.1 | 0.1 | 8 | 0.5 | 0.8 | | 0.4 | | 0.9 | 1.5 |
| Total species[a] | 104 | 99 | 79 | 82 | 81 | 79 | 76 | 73 | 76 | 98 | 75 | 83 | 82 | 77 | 75 | 71 | 71 |

[a] Includes rare species: Great Blue Heron, *Ardea herodias*; Wood Duck, *Aix sponsa*; Hooded Merganser, *Lophodytes cucullatus*; Red-breasted Merganser, *Mergus serrator*, Cooper's Hawk, *Accipiter cooperii*; Northern Goshawk, *Accipiter gentilis*; Red-tailed Hawk, *Buteo jamaicensis*; American Kestrel, *Falco sparverius*; Mourning Dove, *Zenaida macroura*; Whip-poor-will, *Caprimulgus vociferus*; Red-bellied Woodpecker, *Melanerpes carolinus*; Eastern Phoebe, *Sayornis phoebe*; House Wren, *Troglodytes aedon*; Gray-cheeked Thrush, *Catharus minimus*; Swainson's Thrush, *Catharus ustulatus*; Warbling Vireo, *Vireo gilvus*; Black-throated Blue Warbler, *Dendroica caerulescens*; Blackpoll Warbler, *Dendroica striata*.

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# A bird and small mammal BACI and IG design studies in a wind farm in Malpica (Spain)

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Key words: BACI design, Birds, IG design, Small mammals, Wind farm

Abstract. Wind farms have shown a spectacular growth during the last 10 years. As far as we know, this study is the first where the relationship between wind power and birds and small mammals have been considered. Before–after control impact (BACI) study design to birds and Impact Gradient (IG) study design to small mammals to test the null hypothesis of no impact of a wind farm were used. In the BACI model Windfarm Area and a Reference Area were considered. Distance from turbines was considered in the IG model. Windfarm installations did not clearly affect bird and small mammal populations. Flight height of nesting and no nesting birds did not show a clear tendency. Small mammals populations suffered high variations in numbers through times by intrinsic population factors. There are many practical problems of detection of human influence on abundances of populations so sampling in the long run can be suggested.

## Introduction

Wind farms are a relatively new form to obtain 'clean' energy by avoiding air pollution and other forms of environmental degradation associated with fossil fuel technologies (Nelson and Curry 1995) and have received strong public support as an alternative energy source (Leddy et al. 1999). Moreover, wind farms have shown a spectacular growth because they have reduced the costs of energy production and produced a clean energy. This phenomenon has generated a proliferation of wind farms around the world (Germany, Spain, United States, etc) (Osborn et al. 2000).

Most of studies about possible effects of wind power on wildlife animals have been focused on birds, specifically on avian activity, habitat use and bird mortality (Winkelman 1990; Orloff and Flannery 1992; Musters et al. 1996; Howell 1997; Dirksen et al. 1998; Morrison and Sinclair 1998; Strickland et al. 1998; Thelander and Rugge 1998; Osborn et al. 2000; Erickson et al. 2001; de Lucas et al. 2004). None have studied the effects of wind power on small mammal communities.

The Before-after control impact (BACI) design has been called the 'optimal impact study design' (Anderson et al. 1999). The aim of BACI studies is to compare environmental variables before and after a human activity (e.g. the

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construction of the windfarm) and between the area presumably affected by the development and a control area (Stewart-Oaten 1986; Guillemette et al. 1998). Use of reference areas increases the reliability of conclusions concerning quantification of impact (Underwood 1994).

We used bird abundance to assess the impact of a construction of a wind farm. Changes in the abundance of organisms is a good impact indicator, but abundance vary naturally through time, so any change observed in an assessment area between the pre- and post-impact periods could conceivably be unrelated to the treatment. In the analysis of impact the percentage of biological indicators that are significantly different (positive and negative) when tested at a given level of significance (Page et al. 1993; Stekoll et al. 1993) is used to determine the direction and magnitude of the impact. In this study rodents were also studied using an Impact-Gradient (IG) Design. This study design is used for impact quantification in relatively small assessment areas on homogeneous environments. The analysis was based on the relationship between the impact indicator and distance of rodent captures from the wind turbines.

We tested the null hypothesis of no effect of a wind farm on birds and small mammals in Malpica (A Coruña, Spain). We used a BACI design to analyse: (1) the possible impacts of the wind farm on nesting and no nesting bird communities, (2) flight behavioural of both nesting and no nesting birds resulting from the presence of a wind farm; and we used a IG design to analyse the possible impacts of the wind farm on rodents.

## Study area

The study area was conducted in Malpica (A Coruña), in the northwestern Spain (Figure 1) from June 1995 to June 1997. In this part of Spain high density of migrating and shore birds can be observed. Here, the shore birds arrive when the weather is bad. This area was swept away by strongest winds from Atlantic storm (Natural 1995a, b; Alonso 2002).

In this area 73 breeding passerine and raptor species can be found (see Table 1 and 3). Only Montagu's Harriers was classified like vulnerable in Spain by the Red Book (Blanco and González 1992) Colonies of breeding Yellow-legged Gulls *Larus cachinnans* were distributed along the coastline (Natural 1995a).

Small mammals community were composed by Western Hedgehog *Erinaceus europaeus*, Iberian Mole *Talpa occidentalis*, Common Shrew *Sorex araneus*, Pygmy Shrew *S. minutus*, Wood Mouse *Apodemus sylvaticus*, Miller's Water Shrew *Neomys anomalus*, Greater White-toothed Shrew *Crocidura russula*, and Lesser White-toothed Shrew *C. suaveolens* (Natural 1995b). Blanco and González (1992) had classified Iberian Mole like insufficient acquaintance.

The study was carried out in the Malpica Windfarm. This windfarm was 150–200 m above sea level and 160–200 m far from the coast. The wind farm

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consisted of 67 wind turbines Ecotècnia 28/225. This model has a tubular steel tower of 32 m and its rotor is 20 m in diameter. Rotor was orientated windward, and have three blades. The total power of wind farm was 15 MW. The turbines strings were aligned in 7 rows and they were orientated from North–West to South-East. Within strings, wind turbines were separated between 60 and 90 m. From now on, we will refer to this area as the WF Area (Windfarm).

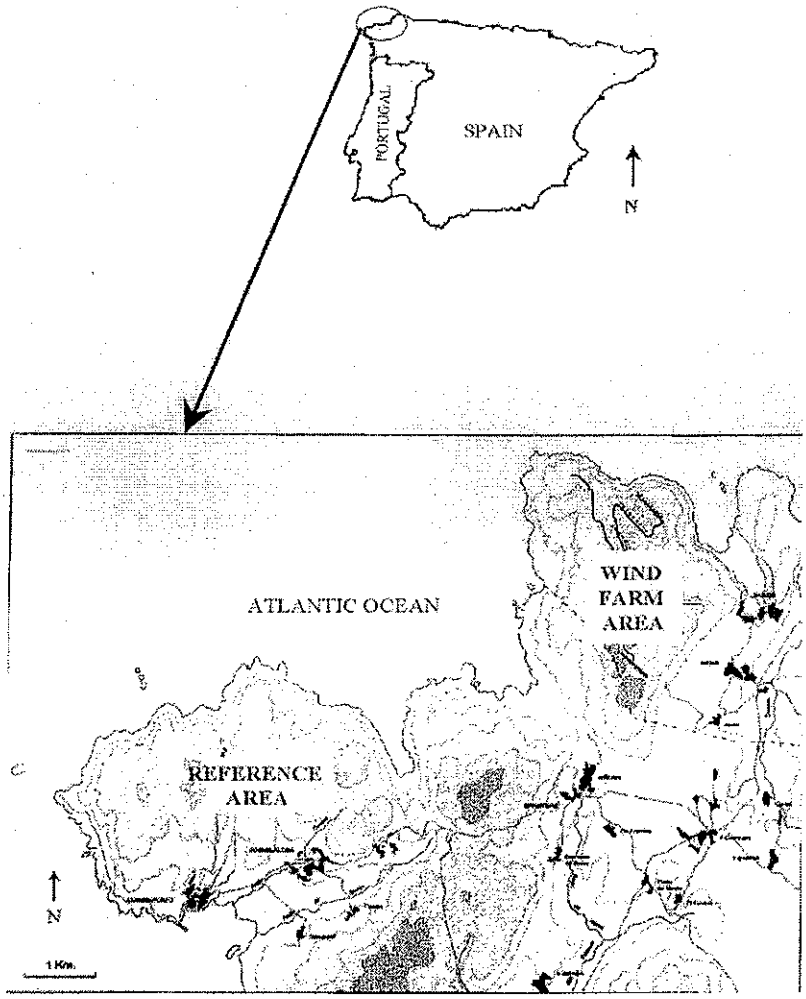


*Figure 1.* Map of the study areas in Malpica (Galicia Region, northwestern Spain).

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*Table 1.* Abundance (numbers of birds/km) of nesting bird species in the two study areas and in all study period.

| Nesting species | Wind farm area | | | Reference area | | |
|---|---|---|---|---|---|---|
| | 1995 | 1996 | 1997 | 1995 | 1996 | 1997 |
| *Alauda arvensis* (Skylark) | 1.54 | 1.46 | 1.99 | 0.34 | 0.19 | 0.00 |
| *Anthus trivialis* (Tree pipit) | 0.00 | 0.31 | 0.13 | 0.05 | 0.22 | 0.13 |
| *Carduelis cannabina* (Linnet) | 3.03 | 5.58 | 6.92 | 7.60 | 3.49 | 8.91 |
| *Carduelis carduelis* (Goldfinch) | 1.32 | 0.81 | 1.41 | 0.87 | 1.96 | 0.83 |
| *Carduelis chloris* (Greenfinch) | 0.81 | 1.31 | 1.35 | 0.77 | 0.83 | 0.51 |
| *Cisticola juncidis* (Fan-tailed warbler) | 0.00 | 0.00 | 0.00 | 0.00 | 0.32 | 0.06 |
| *Emberiza cirlus* (Cirl bunting) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 |
| *Erithacus rubecula* (Robin) | 0.04 | 0.00 | 0.06 | 0.00 | 0.13 | 0.13 |
| *Fringilla coelebs* (Chaffinch) | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| *Hyppolais polyglota* (Melodious warbler) | 0.00 | 0.04 | 0.00 | 0.00 | 0.13 | 0.00 |
| *Lullula arborea* (Woodlark) | 0.00 | 0.00 | 0.13 | 0.00 | 0.03 | 0.00 |
| *Muscicapa striata* (Spotted flycatcher) | 0.21 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 |
| *Parus ater* (Coal tit) | 0.00 | 0.23 | 0.00 | 0.29 | 0.26 | 0.06 |
| *Parus major* (Great tit) | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.26 |
| *Prunella modularis* (Dunnock) | 0.47 | 0.58 | 2.12 | 0.77 | 1.28 | 1.99 |
| *Saxicola torquata* (Stonechat) | 2.74 | 2.77 | 4.68 | 1.83 | 1.57 | 2.95 |
| *Sylvia atricapilla* (Blackcap) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 |
| *Sylvia conspicillata* (Spectacled warbler) | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.06 |
| *Sylvia undata* (Dartford warbler) | 0.00 | 1.96 | 2.63 | 2.12 | 0.64 | 1.03 |
| *Troglodytes troglodytes* (Wren) | 0.34 | 0.73 | 1.35 | 0.29 | 0.22 | 0.64 |
| *Turdus merula* (Blackbird) | 0.26 | 0.27 | 0.96 | 0.53 | 1.70 | 1.35 |
| Total | 10.94 | 16.04 | 23.97 | 15.48 | 13.33 | 19.23 |
| Birds/km | 256/23.4 | 417/26 | 374/15.6 | 322/20.8 | 416/31.2 | 300/15.6 |

*Table 2.* IKA index of nesting species between study areas and study periods were analysed with Wilcoxon Test.

| Years | Areas | Mean | SD | *n* | *Z* | *p* |
|---|---|---|---|---|---|---|
| 1995 (pre) | WF | 0.332 | 0.216 | 24 | 0.302 | 0.763 |
| | R | 0.349 | 0.168 | | | |
| 1996 (const) | WF | 0.337 | 0.225 | 32 | −2.348 | 0.019 |
| | R | 0.462 | 0.131 | | | |
| 1997 (post) | WF | 0.375 | 0.502 | 36 | −1.168 | 0.243 |
| | R | 0.305 | 0.364 | | | |

A near area without turbines was included in this study to be used as a reference area. This area and WF Area were separated by 6 km. The reference area was 100–150 m a.s.l. and 150–170 m far from the coast. From now on, we will refer to this area as the R Area (Reference).

The flora's species on both study areas were very similar, consisting in bush of *Ulex* sp. and small wood of Southern Blue-gum *Eucaliptus globulus* and Maritime pine *Pinus pinaster* (Rivas-Martinez 1987). Some area were cut by

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*Table 3.* Abundance (numbers of birds/km) of no nesting bird species in the two study areas and in all study period.

| No nesting species | Wind farm area | | | Reference area | | |
|---|---|---|---|---|---|---|
| | 1995 | 1996 | 1997 | 1995 | 1996 | 1997 |
| *Apus apus* (Swift) | 0.00 | 0.08 | 0.00 | 0.14 | 0.38 | 0.32 |
| *Buteo buteo* (Buzzard) | 0.26 | 0.27 | 0.06 | 0.24 | 0.06 | 0.06 |
| *Columba palumbus* (Woodpigeon) | 0.00 | 0.12 | 0.13 | 0.34 | 0.10 | 0.13 |
| *Corvus corax* (Raven) | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| *Corvus corone corone* (Carrion Crow) | 0.00 | 0.04 | 0.45 | 1.06 | 1.12 | 1.22 |
| *Corvus monedula* (Jackdaw) | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 |
| *Delichon urbica* (House martin) | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| *Dendrocopos major* (Great spotted woodpecker) | 0.09 | 0.04 | 0.00 | 0.00 | 0.06 | 0.06 |
| *Emberiza citrinella* (Yellowhammer) | 0.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| *Falco tinnunculus* (Common kestrel) | 0.13 | 0.04 | 0.06 | 0.05 | 0.00 | 0.00 |
| *Hirundo rustica* (Swallow) | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.00 |
| *Larus cachinnans* (Yellow-legged gull) | 2.52 | 2.54 | 0.77 | 7.16 | 2.85 | 1.99 |
| *Luscinia megarhynchos* (Nightingale) | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 |
| *Motacilla alba* (Pied wagtail) | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 |
| *Phoenicurus ochruros* (Black redstart) | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.00 |
| *Picus viridis* (Green woodpecker) | 0.00 | 0.12 | 0.13 | 0.05 | 0.10 | 0.00 |
| *Streptopelia turtur* (Turtle dove) | 0.00 | 0.08 | 0.00 | 0.10 | 0.77 | 0.83 |
| *Sturnus unicolor* (Spotless starling) | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.06 |
| Total | 3.59 | 3.35 | 3.33 | 9.23 | 5.45 | 5.58 |
| Birds/km | 84/23.4 | 87/26 | 52/15.6 | 192/20.8 | 170/31.2 | 87/15.6 |

farmers, then grazing land and heather proliferated. Also, in R Area some fields were sowed with corn *Zea mays* and wheat *Triticum* sp.

## Methodology

The study was carried out through three years (1995, 1996 and 1997), during the second fortnight of June. BACI and IG models were used for this study. Three periods were defined: pre-construction (June 1995), construction (June 1996) and post-construction (June 1997) of the wind farm.

We studied several variables concerning birds analysing for differences among study areas and study periods. Variables were recorded along fixed length transects in both areas. We also studied several variables concerning small mammals comparing study periods in WF Area only. Three groups of variables were recorded in this comparative study: (1) specific composition (number of species present), relative abundance (IKA: no. birds/km) and density (birds/km$^2$) of nesting and no nesting birds; (2) flight behavioural of nesting and no nesting birds (direction and flight height); and (3) specific composition (number of species present) and abundance of small mammals in WF Area.

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We distinguish between nesting birds and no nesting birds based in the following criteria: (1) nesting birds were all passerine birds (except corvids) which were in the study areas during reproductive period; (2) nesting birds were all those bird species whose breed in the study areas were known; and (3) nesting birds were all those bird species whose reproductive requirements were in the study areas.

Avian mortality was not studied because the windfarm had been operating as full potential only for a few months.

*Composition, abundance and density of birds*

The abundance, density and composition of bird's communities in both study areas were detected by transect method (Telleria 1986). In each study area, we selected a census' transect and recorded all visual contact with birds or flocks of birds walking to constant velocity. Both transects were circular and measured 2.6 km over the 3 year study (the second fortnight of June). A total of 32 h was dedicated to monitoring transects per year. In all cases, the census were executed at the first hours in the morning or at dusk.

When we observed a bird, several variables such as date, hour, species, number of birds, sex, age, climatic conditions (wind velocity and wind direction), habitat where birds were (rocks, bushes, trees and grazing land) and distance to transect were recorded. With this data, an index of avian abundance per km (IKA) and an avian density per $km^2$ in each study area were calculated (Ferry and Frochot 1958).

*Flight behaviour of birds*

Flight behaviour was recorded by direct observation from linear-transects by foot in each area (as above). When we observed birds the same variables as those mentioned for avian abundance and composition were recorded. Anemometer towers located in the wind farm measured climatic conditions (wind velocity and wind direction). These data were used in R Area too due to the proximity of both areas and their similar morphology characteristics.

Flight behaviour was described by flight altitude, flight direction, kind of flight and singing (if bird was singing or not). Flight altitude and flight direction were calculated by direct observations.

*Composition and abundance of small mammals*

The specific composition was detected with 'capture – marked – recapture' model using live trap with bate (Orrock et al. 2000). The traps measured 28 × 10 × 7 cm. Traps were checked twice at day: in the morning and in the

afternoon, every 10 study days per study period. When a small mammal was captured, several variables such as species, sex and reproductive condition were recorded. The captured small mammals were marked by cutting a lock.

The relative abundance were detected with footprint searches on specific gadgets. Therefore we used PVC tubes with 29 cm long and 7 cm in diameter with a white paper with a mixture of charcoal and oil inside. The small mammal's footprints were imprinted in these white papers when passing through the oil mixture.

The traps and tubes were distributed alternated and separated by 20 m along 4 line transects covering WF Area (Figure 2). The same points were used in all the study period. They were classified in four categories: less than 40 m to the turbines, between 40 and 80 m to the turbines, between 80 and 120 m to the turbines and more than 120 m to the turbines. The line transects were placed from the North to the South. Also, to each point several variables about landscape were recorded such as kind of morphological features and vegetation (rocks, bushes, pines and grassland), vegetation cover (open, middle and dense) and homogeneity of landscape (uniform and edge).

An index of captures in each study year was calculated dividing the number of captured small mammals by study days and by number of active traps.

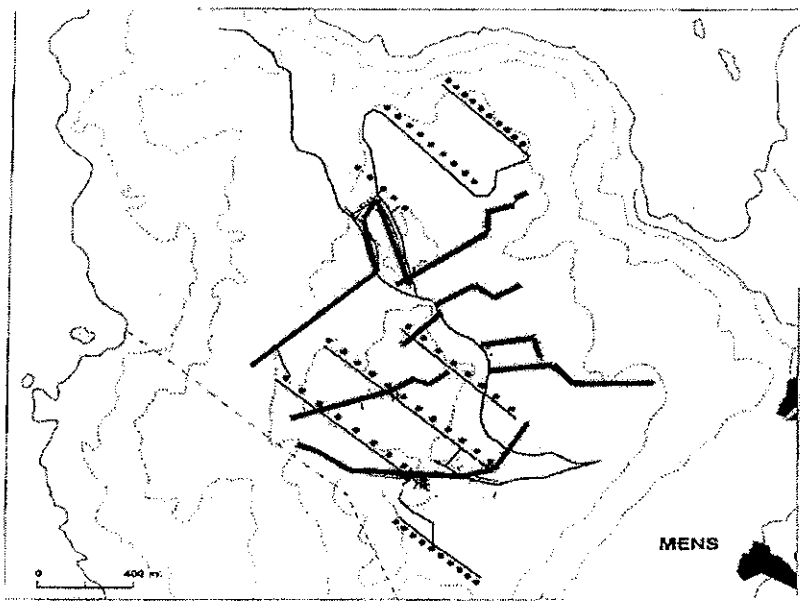


*Figure 2.* Map of the transects (dark lines) used to distributed all traps and tubes covering all WF Area.

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*Statistical methods*

Avian density (birds/km$^2$) according to distance of bird observation to the transect were calculated by DISTANCE 4.0 Beta 6 program (Thomas et al. 2002).

We used non-parametric statistics for those variables that were not normally distributed. We used the Wilcoxon Test to compare the IKA index of birds (birds/km) between areas. Kruskal–Wallis Test were used to compare the flight height between areas. When statistical differences appeared, *post hoc* comparisons were made with Mann–Whitney *U*-Test. Analysis of $\chi^2$ (goodness of fit) was used to analyse the predominated flight direction of birds between study area.

Kolmogorov–Smirnov Test was used to test normal distribution of bird's density. We used two ways ANOVA to analyse the density of birds through study periods and study areas.

Small-mammals are mainly caught one at each time in small traps. So, each capture can be recorded as an independent observation. Two forward stepwise logistic regression procedure were used to create the models of captures and signals, because this multivariate statistical technique permits the prediction of binary attributes such as presence/absence.

We used an alfa value of $p = 0.05$. SPSS 10.0 software statistical package was used to perform all statistical analyses.

## Results

*Composition, avian abundance and avian density*

*(1) Nesting birds*

A total of 2121 birds from 21 different species in the two study areas in all study period (total observation 32 h) were recorded. In 1995, 614 birds from 12 species were observed. In 1996, 833 birds from 16 species were observed. In 1997, 669 birds from 18 species were recorded (Table 1). Four species through study period were only detected in R Area: Fan-tailed Warbler, Cirl Bunting, Blackcap and Spectacled Warbler, and only one in WF Area: Greenfinch.

When comparing the IKA index of each species between study areas significant differences were observed only in 1996 (Table 2).

No significant differences were detected in IKA index between study periods neither in WF Area (Kruskal–Wallis Test, $X^2 = 1.027$, df $= 2$, $p = 0.599$), nor in *R* Area (Kruskal–Wallis Test, $X^2 = 0.106$, df $= 2$, $p = 0.948$).

No significant differences in bird's density were detected between both study areas among study years (two-way ANOVA, $F_{5,30} = 0.794$, $p = 0.565$).

*(2) No nesting birds*

A total of 672 birds from 18 different species were recorded in the two study areas in the whole study period (total observation 32 h) (Table 3). Five species were only detected in WF Area (Raven, House Martin, Yellowhammer,

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Swallow and Black Redstart) and Jackdaw, Nightingale and Pied Wagtail only in R Area.

When comparing the IKA index of each species between study areas no significant differences were detected (Table 4).

No significant differences in IKA index were detected between study years neither in WF Area (Kruskal–Wallis Test, $X^2 = 0.187$, df = 2, $p = 0.911$) nor in R Area (Kruskal–Wallis Test, $X^2 = 0.4296$, df = 2, $p = 0.808$).

Significant differences in bird's density were detected (two-way ANOVA, $F_{5,32} = 3.501$, $p = 0.016$) between both study areas ($F = 6.045$, $p = 0.022$) among study years ($F = 3.779$, $p = 0.037$). This variable showed higher values during 1995 in R Area.

*Flight behaviour of birds*

*(1) Nesting birds*

Only in 1996 significant differences were detected (WF Area rank = 376.74, R Area rank = 457.36; Mann–Whitney Test; $Z = -5.576$; $n = 833$; $p < 0.0001$) when the height flight of birds between study areas were analysed. Nesting birds flew higher in R Area than in WF Area. Significant differences in flight height were detected between study periods in R Area (Kruskal–Wallis Test, $X^2 = 53.056$, df = 2, $p < 0.0001$). Birds flew higher in 1996 (rank = 591.53) than 1995 (rank = 477.94; Mann–Whitney Test, $Z = -5.831$, $p < 0.0001$) and 1997 (rank = 464.23; Mann–Whitney Test, $Z = -6.253$, $p < 0.0001$). In WF Area flight height between study periods were not statistically different (Kruskal–Wallis Test, $X^2 = 5.426$, df = 2, $p = 0.066$).

*(2) No nesting birds*

Only in 1996 significant differences were detected when the flight height of birds between study areas were analysed (WF Area rank = 168.09, R Area rank = 108.99; Mann–Whitney Test, $Z = -6.092$, $n = 257$, $p < 0.0001$). Nesting birds flew higher in WF Area than in R Area. Significant differences in flight height were detected between study periods in R Area (Kruskal–Wallis Test, $X^2 = 13.809$, df = 2, $p = 0.001$). Birds flew higher in 1995 (rank = 217.56) than 1996 (rank = 251.06; Mann–Whitney Test, $Z = -2.642$,

*Table 4.* IKA index of no nesting species between study areas were analysed with Wilcoxon Test.

| Years | Areas | Mean | SD | *n* | *Z* | *p* |
|---|---|---|---|---|---|---|
| 1995 (pre) | WF | 0.239 | 0.310 | 18 | −1.025 | 0.305 |
| | R | 0.406 | 0.280 | | | |
| 1996 (const) | WF | 0.552 | 0.285 | 20 | −1.022 | 0.307 |
| | R | 0.433 | 0.324 | | | |
| 1997 (post) | WF | 0.334 | 0.265 | 32 | 0.000 | 1.000 |
| | R | 0.327 | 0.267 | | | |

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$p = 0.008$) and than 1997 (rank = 190.50; Mann–Whitney Test, $Z = -1.901$, $p = 0.057$). Also in WF Area significant differences in flight height were detected between study periods (Kruskal–Wallis Test, $X^2 = 64.036$, df = 2, $p < 0.0001$). Birds flew higher in 1996 (rank = 154.58) than 1995 (rank = 89.62; Mann–Whitney Test, $Z = -6.584$, $p < 0.0001$) and 1997 (rank = 76.91; Mann–Whitney Test, $Z = -6.965$, $p < 0.0001$).

In 1995 (northern directions = 54, eastern directions = 4, southern directions = 14 and western directions = 9; expected ratio 25% in each direction; $X^2 = 77.469$, df = 3, $p < 0.0001$), and 1996 Northern flight direction predominated when flight direction were analysed in WF Area.

Statistical differences R Area in 1995 were detected. However in WF Area no predominated flight direction were detected ($X^2 = 2.586$, df = 3, $p = 0.460$) in 1995.

In 1996 in R Area predominated northern flight direction was detected (northern directions = 39, eastern directions = 11, southern directions = 13 and western directions = 19; expected ratio 25% in each direction; $X^2 = 23.951$, df = 3, $p < 0.0001$), but not in WF Area ($X^2 = 3.895$, df = 3, $p = 0.273$).

In 1997 predominated eastern flight direction were detected in R Area (northern directions = 12, eastern directions = 18, southern directions = 3 and western directions = 7; expected ratio 25% in each direction; $X^2 = 12.6$, df = 3, $p = 0.006$). In WF Area flight directions not were statistical differences ($X^2 = 2.048$, df = 3, $p = 0.563$).

*Small mammals*

Through the day, no small mammals were captured. In 1995, total capture effort was 897 traps-night and 936 tubes. Index of captures was 0.0025 small mammals per study day and number of traps-night ($n = 13$). All were Wood Mouse *Apodemus sylvaticus* and there were placed all in bushes. In middle vegetation cover 69.2% of total captures were situated, and in uniform landscapes the same percentage were found. About 53.85% of captures were situated in the second category of distance (40–80 m). The index of small mammal signs was 0.003 signs of small mammals per study day and number of tubes ($n = 18$). About 38.9% of these were placed in grassland, 66.7% in open vegetation cover, 72.2% in edge landscape and 50% were in the second category of distance.

In 1996, total capture effort was 886 traps-night and 1842 tubes. Index of captures was 0.001 small mammals per study day and number of traps ($n = 7$). All of these were identified as Wood Mouse *Apodemus sylvaticus*. The 57% of these were placed in rocks, the 57% were in middle vegetation cover, 71.4% were in edge landscape and 71.4% were in the second category of distance. The index of small mammal signs was 0.0005 signs of small mammals per study day and number of tubes ($n = 24$). The 57% of these were placed in grassland,

71.4% were in dense vegetation cover, 71.4% were in edge landscape and 66.7% were in the third category of distance.

In 1997, total capture effort was 728 traps-night and 1442 tubes. Index of captures was 0.012 small mammals per study day and number of traps ($n = 59$). One small mammals was Greater White-toothed Shrew *Crocidura russula* and the others were Wood Mouse *Apodemus sylvaticus*. About 51.2% of these were in grassland, 44.2% were in middle vegetation cover, 51.2% were in edge landscape and 33.9% were in the second category of distance. The index of small mammals signs was 0.016 signs of small mammals per study day and number of tubes ($n = 118$). The 49.5% of these were in bushes, 58% were in middle vegetation cover, 84.12% were in edge landscape and 38.13% were in the second category of distance.

The logistic regression model quantified the linear combination of independent variables best discriminating between presence/absence of captures in traps only study year variable entered the model ($B = -0.191$, Wald $= 6.1$, df $= 1$, $p = 0.014$) and distance from turbines variable did not ($B = -0.201$, Wald $= 2.727$, df $= 1$, $p = 0.099$). Only study year entered into the logistic regression model in quantifying track signs in tubes ($B = 1.022$, Wald $= 55.865$, df $= 1$, $p < 0.0001$).This variable, in traps and tubes analysis, showed higher values in 1997.

## Discussion

Windfarm installations did not clearly affect bird and small mammal populations, so the presence of turbines seemed not to be a significant problem for these populations. Avian abundance and avian density in breeding does not differ by study years (pre windfarm, windfarm installation and post windfarm) and between areas (R and WF). Avian density in no breeding birds show a light tendency to decrease with time. In contrast, Lucas et al. (2004) detected more abundance of passerines in a control area than the others (another control and windfarm areas). Leddy et al. (1999) supported the hypothesis of those areas without turbines support higher densities of grassland birds than areas near the turbines, and also Larsen and Madsen (2000) detected that wind farms caused a habitat loss equivalent to 4% of the total field area around the turbines for pink-footed geese (*Anser brachyrhynchus*).

Flight height of nesting and no nesting birds did not show a clear tendency. No nesting birds flew higher in 1996 in WF Area. This effect could be related to the machines and personal working in the construction of the windfarm. However, this effect did not appear in flight height of nesting birds. In Lucas et al. (2004) soaring birds we detected a significantly higher flight height in WF Area than in the others control areas.

Flight of nesting birds had not been considered because their flight were local distances and between bushes (Rodewald and Yahner 2001). In no nesting birds the predominated flight direction in R Area suggest that birds flew mainly

in one direction (South–North), while in WF Area birds did not have a clear flight direction, changing often their direction of flight. Lucas et al. (2004) detected that 71.2% of soaring birds changed their flight direction when detecting the turbines on the top of the mountain, and Dirksen et al. (1998) also showed that birds changed their flight direction more often when the turbines were operating than when they were not. So turbine lines might act as flight path barriers.

Small-mammals populations suffered high variations in numbers through times by several factors (Snyder 1978). The higher index of captures and signs in 1997 could be assumed to (1) several factors affecting populations, (2) change in vegetation variables with the construction of windfarm (open landscape, less bushes) and (3) umbrella effects of small-mammals predators (Chase et al. 2000).

There was a spatial distribution on small-mammals captures. The strip of distance more used were 40–80 m in all study years. Because an increase of captures near turbines is expected through study years, the second hypothesis can not supported. The impact of the construction of turbines specially could be only in the immediate vicinity of the wind park. This contradicts findings of Guillemette and Larsen (2002) that the wind park did not influence the distribution of eiders because their experiments conducted at a small spatial scale (around the wind park) showed that wind turbines did not have a negative influence on the distribution and the abundance of small-flock common eiders when correcting food availability. The third hypothesis has not been out but avian community have not changed through study years.

In conclusion, our results do not support an important effect of the windfarm on birds and small-mammals populations. The BACI design we had used was criticised by Hurlbert (1984) on the basis that the control site would need to be very similar to the impact site in order to come up with a sound conclusion. Therefore our study areas (Reference and Windfarm) were chosen to be very similar in characteristic of landscape, vegetation and altitude.

*Management applications*

Our study may have important implications for the future development of wind farms. Bird and small-mammals populations might not affected by the presence of turbines. Soaring birds detected the turbines and change their flight direction and small-mammals seems not to be affected by the new constructed windfarm. These results could not be extrapolated to another areas with different avian community and sampling in the long run can be suggested.

Attention to the intricate relationship that may exist between the presence/absence of disturbance and the probability of collisions with turbines. Therefore, absence of disturbance may increase the probability of collisions (Guillemette and Larsen 2002). We did not study mortality because in the After

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period the windfarm had been operating as full potential only for a few months.

There are many practical problems of detection of human influence on abundances of populations, but two are paramount in designing sampling programs. First is the large temporal variance of many populations, so that their abundances are very 'noisy'. Second, many populations show a marked lack of concordance in their temporal trajectories from one place to another. This results in considerable statistical interaction between changes in mean abundance from time to time and differences from place to place (Underwood 1994).

Any difference in abundance between the impact and the control sites could be explained by a priori differences in the two sites and that no causal relationship of presence/absence of an impact could be derived from this design (Hurlbert 1984). So post-development experiences should be considered a complement to BACI studies rather than an alternative (Guillemette and Larsen 2002).

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**ORDER APPROVING CHANGES IN USE, PLACES OF USE, ADDITIONAL POINTS OF APPROPRIATION, AND CANCELLATION OF WATER RIGHTS**

Pursuant to ORS 540.510 to 540.530 and ORS 537.705, after notice was given and no objections were filed, and finding that no injury to existing water rights would result, this order approves, as conditioned or limited herein, TRANSFER 6854 submitted by

BIG FALLS RANCH COMPANY
PO BOX 434
TERREBONNE, OREGON 97760

This transfer requests modifications to portions of four water rights. The authorized uses and places of use, and the requested changes are shown in the following tables.

The first right to be modified, as evidenced by a portion of Certificate 44281, was perfected under Permit 32049, with a date of priority of APRIL 13, 1967. The right allows the use of DEEP CANYON CREEK, a tributary of the DESCHUTES RIVER, for IRRIGATION of 16.1 ACRES and SUPPLEMENTAL IRRIGATION of 304.3 ACRES. The amount of water to which this right is entitled is limited to an amount actually beneficially used and shall not exceed 5.5 cubic feet per second, provided the total quantity of water diverted under all rights perfected under Permit 32049 shall not exceed 5.5 cfs, if available at the authorized point of diversion: SW¼ SE¼, SECTION 9, T 14 S, R 12 E, W.M.; 4440 FEET SOUTH AND 3020 FEET EAST FROM THE NW CORNER, SECTION 9.

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for review must be filed within the 60 day time period specified by ORS 183.484(2).

Pursuant to ORS 536.075 and OAR 137-004-080 and OAR 690-01-005, you may either petition for judicial review or petition the Director for reconsideration of the order.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 14 | 12 | 9 | SESW | | | 9.1 | |
| 14 | 12 | 9 | NWSE | | | 4.2 | |
| 14 | 12 | 10 | NWNW | .4 | | | |
| 14 | 12 | 17 | NENE | | 33.0 | 33.0 | |
| 14 | 12 | 17 | NWNE | | | 27.2 | |
| 14 | 12 | 17 | SWNE | 13.2 | | | |
| 14 | 12 | 17 | SENE | | 31.1 | | |
| 14 | 12 | 17 | NENW | | | 6.0 | |
| 14 | 12 | 17 | NWNW | | | | 1.6 |
| 14 | 12 | 17 | SENW | 0.5 | | | |
| 14 | 12 | 17 | NESW | | 4.1 | | |
| 14 | 12 | 17 | SWSW | | | | 8.8 |
| 14 | 12 | 17 | NESE | | 12.0 | | |
| 14 | 12 | 17 | NWSE | | 28.5 | | |
| 14 | 12 | 18 | SESE | | | | 2.2 |
| | | | TOTAL | 16.1 | 304.3 | 307.8 | 12.6 |

The second right to be modified, as evidenced by a portion of Certificate 44283, was perfected under Permit 37392, with a date of priority of OCTOBER 23, 1973. The right allows the use of AN UNNAMED STREAM (McKENZIE CANYON), a tributary of THE DESCHUTES RIVER, for IRRIGATION OF 38.8 ACRES AND SUPPLEMENTAL IRRIGATION OF 167.8 ACRES. The amount of water to which this right is entitled is limited to an amount actually beneficially used and shall not exceed 4.5 cubic feet per second, provided the total quantity diverted by all right perfected under Permit 37392 does not exceed 4.5 cfs, if available at the authorized point of diversion: NW¼ SE¼, SECTION 4, T 14 S, R 12 E, W.M.; 1870 FEET NORTH AND 3700 FEET EAST FROM THE NW CORNER, SECTION 9.

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | 12 | 9 | NWSE | | 13.6 | |
| 14 | 12 | 17 | NWNE | | 27.2 | |
| 14 | 12 | 17 | SWNE | | | 16.1 |
| 14 | 12 | 17 | SENE | | | 32.7 |
| 14 | 12 | 17 | NENW | | 6.0 | |
| 14 | 12 | 17 | NWNW | | | 34.0 |
| 14 | 12 | 17 | SENW | | | 0.6 |
| 14 | 12 | 17 | NESW | | | 9.9 |
| 14 | 12 | 17 | SWSW | | | 1.5 |
| 14 | 12 | 17 | SESW | | | 25.8 |
| 14 | 12 | 17 | NESE | | | 15.9 |
| 14 | 12 | 17 | NWSE | | | 27.1 |
| 14 | 12 | 17 | SWSE | | | 6.8 |
| | | | TOTAL | 38.8 | 167.8 | 206.6 |

The third right to be modified, as evidenced by a PORTION of Certificate 75761, was perfected under Permit G-4974 with a date of priority of MARCH 13, 1972. The right allows the use of WELL 1, in the DESCHUTES RIVER BASIN, for IRRIGATION OF 58.0 ACRES. The amount of water to which this right is entitled to is limited to the amount actually benefically used and shall not exceed 0.73 cubic foot per second, if available at the original well: SW¼ SE¼, SECTION 18, T 14 S, R 12 E, W.M.; WELL 1 - 1050 FEET NORTH AND 6980 FEET WEST FROM THE SE CORNER, SECTION 17, or its equivalent in case of rotation, measured at the well.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, is limited to a diversion of ONE-EIGHTIETH of one cubic foot per second (or its equivalent) and 3.0 acre-feet for each acre irrigated during the irrigation season of each year.

TABLE 4
PERMIT G-4396

| | | | | AUTHORIZED LOCATION | | AUTHORIZED LOCATION |
|---|---|---|---|---|---|---|
| TWN (S) | RNG (E) | SEC. | Q/Q | PRI | SUPP | PRI |
| 14 | 12 | 17 | SWSW | 1.6 | 14.4 | 1.8 |
| 14 | 12 | 17 | SESW | | 5.8 | |
| 14 | 12 | 18 | SWSE | | 9.4 | 9.4 |
| 14 | 12 | 19 | NENE | 1.4 | | 29.6 |
| 14 | 12 | 19 | SWNE | | 7.9 | 2.0 |
| 14 | 12 | 19 | SENE | | 2.2 | 0.3 |
| 14 | 12 | 19 | SENW | | 0.4 | |
| | | | TOTAL | 3 | 40.1 | 43.1 |

The applicant proposes to add points of appropriation for all of the rights served by Well 1, as listed in TABLE 3 and TABLE 4. The additional points of appropriation are located:

WELL 3 SW¼ NE¼, SECTION 17, T 14 S, R 12 E, WM; 1900 FEET SOUTH AND 1500 FEET WEST FROM THE NE CORNER, SECTION 17.

WELL 4 NW¼ NW¼, SECTION 17, T 14 S, R 12 E, WM; 120 FEET SOUTH AND 60 FEET EAST FROM THE NW CORNER, SECTION 17.

WELL 7 NE¼ NW¼, SECTION 9, T 14 S, R 12 E, WM; 1220 FEET SOUTH AND 2540 FEET EAST FROM THE NW CORNER, SECTION 9.

Affidavits were received from BIG FALLS RANCH COMPANY, the owner of certain land and the water rights appurtenant to it. The water rights have been abandoned and are requested to be canceled.

THESE CHANGES TO EXISTING WATER RIGHTS MAY BE MADE PROVIDED THE FOLLOWING CONDITIONS ARE MET BY THE WATER USER:

1. The proposed changes shall be completed on or before October 1, 2001.

2. The quantity of water diverted at the new points of appropriation (wells), together with that diverted from the original point of appropriation, shall not exceed the quantity of water available from the original point of appropriation.

3. The water user shall install in-line flow meters or other suitable devices for measuring and recording the quantity of water used. The type and plans of the measuring devices must be approved by the Department prior to beginning construction and shall be installed under the general supervision of the Department.

4. Water shall be acquired from the same aquifer as the original point of appropriation.

5. The former places of use shall no longer be irrigated as part of these water rights.

The rights requested to be canceled herein are canceled. Certificates 44278, 44281, 44283, 65147, AND 74150 are canceled. New certificates will be issued to confirm those portions of the rights NOT involved in this transfer and cancellation proceeding. When satisfactory proof of the completed changes is received, new certificates confirming these water rights will be issued.

WITNESS the signature of the Water Resources Director, affixed JAN 11 2000.

For Martha O. Pagel, Director

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SALEM, OREGON

# CLAIM OF BENEFICIAL USE AND SITE REPORT FOR A PORTION OF TRANSFER APPLICATION T-6854 AND APPLICATION NO. G-11923 PLACE OF USE AND USE OF WATER LOCATED IN SECTIONS 8, 9, 17, 18, 19 AND 20 IN TOWNSHIP 14 SOUTH, RANGE 12 EAST, W.M. DESCHUTES COUNTY, OREGON

## GENERAL INFORMATION

Permit Holder: Big Falls Ranch Co.
PO Box 434
Terrebonne, Oregon 97760

## WATER SOURCE

4 wells and two surface water points of diversion as shown on the accompanying final proof survey map.

## USE OF WATER

Use of water is for irrigation of crops (alfalfa, grasses and cottonwood trees). Applicant is irrigating a total of 1067.1 acres in Sections 8, 9, 17, 18, 19 and 20 as shown on the accompanying Final Proof Map and allowed to irrigate 1067.1 acres as per: Permits 32049, 37392, G-13362, G-4947 AND G-4396. Applicant has the capacity to produce 17.410 C.F.S. (see attached: Final Proof Water System Configuration Map and Summery of Nozzle Flows) The configuration of the Place of Use, and Points of Appropriation are noted on the accompanying Final Proof Map.

## DESCRIPTION OF WATER DELIVERY SYSTEM

At the time of this inspection water was being used from points of diversions 1, 3, 4 and 5 as shown on the accompanying Final Proof Map.

Point of Diversion No. 1

Point of Diversion No. 1 is equipped with a High Thrust Centrifugal Pump, powered by a 150 HP, 3 phase, 1775 RPM U.S. Motors Pump Motor, Model 444TP, Serial No. 7322-M No. 6350 1 C1W349R11OR-8, the in-line psi gauge read 79 psi at the time of inspection.

Point of Diversion No. 2

Point of Diversion No. 2 has a concrete structure filled with water in place as shown, there is evidence of past use (signs of wear, statement of past use by Rex Barber, photographs supplied by Rex Barber, and partly in place transmission line from Point of Diversion No. 2 to the operating above ground transmission line as shown on the Final Proof Water System Configuration Map. The concrete structure was not equipped with a pump at the time of this inspection. As per Rex Barber a pump and 250 HP pump motor are available for this location.

Point of Diversion No. 3

Point of Diversion No. 3 is equipped with a High Thrust Centrifugal Pump, powered by a 200 HP, 3 phase, 1775 RPM Westinghouse Pump Motor, Style 680B678G55, Serial No. 7706, no visible in-line psi gauge at the time of inspection.

CLAIM OF BENEFICIAL USE AND SITE REPORT FOR
A PORTION OF TRANSFER APPLICATION T-6854 AND APPLICATION NO. G-11923
PLACE OF USE AND USE OF WATER
LOCATED IN SECTIONS 8, 9, 17, 18, 19 AND 20 IN TOWNSHIP 14 SOUTH, RANGE 12 EAST, W.M.
DESCHUTES COUNTY, OREGON

Point of Diversion No. 4

Point of Diversion No. 4 is equipped with a High Thrust Centrifugal Pump, powered by a 250 HP, 3 phase, 1770 RPM U.S. Motors Pump Motor (the Titan Line) frame 5006PH, ID No. CC3390263-351, no visible in-line psi gauge at the time of inspection.

Point of Diversion No. 5

Point of Diversion No. 5 is a concrete structure equipped with two High Thrust Centrifugal pumps, powered by a two 100 HP, 3 phase, 1800 RPM U.S. Motors Pump Motors Serial Numbers 1030115 and1030116. An in-line psi gauge was visible at the time of inspection, but the system was not in operation at the time.

Point of Diversion No. 7

Point of diversion No. 7 has a well incased and in place as shown, but no pump was attached at the time of this inspection. As per Rex Barber the Point of Diversion No. 7 has been used in the past and is presently ready for use as needed.

See attached: Final Proof Water System Configuration Map, Summery of Nozzle Flows and accompanying photographs.

**SURVEY TIE** Section lines were determined from found land survey monuments as noted on the accompanying Final Proof Map, and dimensions from record surveys made in the area.

**PHOTOGRAPHS**

Attached photographs show the crops, wells, wheel lines, hand lines, places of use and the irrigation system.



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**CLAIM OF BENEFICIAL USE AND SITE REPORT FOR**
**A PORTION OF TRANSFER APPLICATION T-6854 AND APPLICATION NO. G-11923**
**PLACE OF USE AND USE OF WATER**
**LOCATED IN SECTIONS 8, 9, 17, 18, 19 AND 20 IN TOWNSHIP 14 SOUTH, RANGE 12 EAST, W.M.**
**DESCHUTES COUNTY, OREGON**

## CERTIFICATION

The final proof survey and inspection of the use as found to be completed under the terms and conditions of Water Right Transfer Application T-6854 and Application G-11923 was completed on May 10, 2001 and the facts contained in this report and accompanying Final Proof Map are correct to the best of my knowledge.

8/29/01
Date

Darryl J. Anderson
Certified Water Right Examiner No. 005

I, Rex Barber of the Big Falls Ranch Company, agree to the findings of the CWRE and do submit this site report and map as my claim of beneficial use of the water as provided under the terms and conditions of Water Right Transfer Application T-6854 and Application G-11923 Place of Use and Use of Water.

Rex Barber

9/12/01
Date



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## SUMMARY OF NOZZLE FLOWS

BIG FALLS RANCH CO. TRANSFER T-6854, AND APPLICATION NO. G-11923

**FROM HAND LINES**

| # | NOZZLE SIZE | DIAMETER | PSI | FLOW (FT^3/S) | TOTAL (FT^3/SEC) | FLOW (GPM) | TOTAL FLOW (GPM) |
|---|---|---|---|---|---|---|---|
| 200 | 18 | 0.1406 | 40 | 0.008 | 1.663 | 3.73 | 746.45 |

**WHEEL LINES BREAKDOWN**

| WHEEL LINE | NO. NOZZLES | SIZE-DIAMETER |
|---|---|---|
| 2E | 32 | 0.1406 |
| 2W | 32 | 0.1406 |
| 5E | 32 | 0.1406 |
| 5W | 32 | 0.1406 |
| 6 | 19 | 0.1406 |
| 7 | 35 | 0.1406 |
| 8 | 21 | 0.1406 |
| 9 | 17 | 0.1406 |

**FROM WHEEL LINES**

| # | NOZZLE SIZE | DIAMETER | PSI | FLOW (FT^3/S) | TOTAL (FT^3/SEC) | FLOW (GPM) | TOTAL FLOW (GPM) |
|---|---|---|---|---|---|---|---|
| 220 | 18 | 0.1406 | 40 | 0.008 | 1.830 | 3.73 | 821.09 |

**PIVOT BREAKDOWN**

| PIVOT | G.P.M. | PSI | TOTAL (FT^3/SEC) |
|---|---|---|---|
| 1 | 800 | 45 | 1.782 |
| 1 1/2 | 350 | 55 | 0.780 |
| 2 | 560 | 45 | 1.248 |
| 3 | 950 | 76 | 2.117 |
| 4 | 900 | 40 | 2.005 |
| 5 | 1100 | 50 | 2.451 |
| 6 | 900 | 40 | 2.005 |
| 7 | 575 | 64 | 1.281 |
| 9 | 425 | 50 | 0.947 |
| TOTAL FROM PIVOTS | | | 14.616 |

PER ATTACHED SPRINKLER SET-UP CHARTS

COMPUTED SYSTEM TOTAL **18.108**

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PO BOX 28
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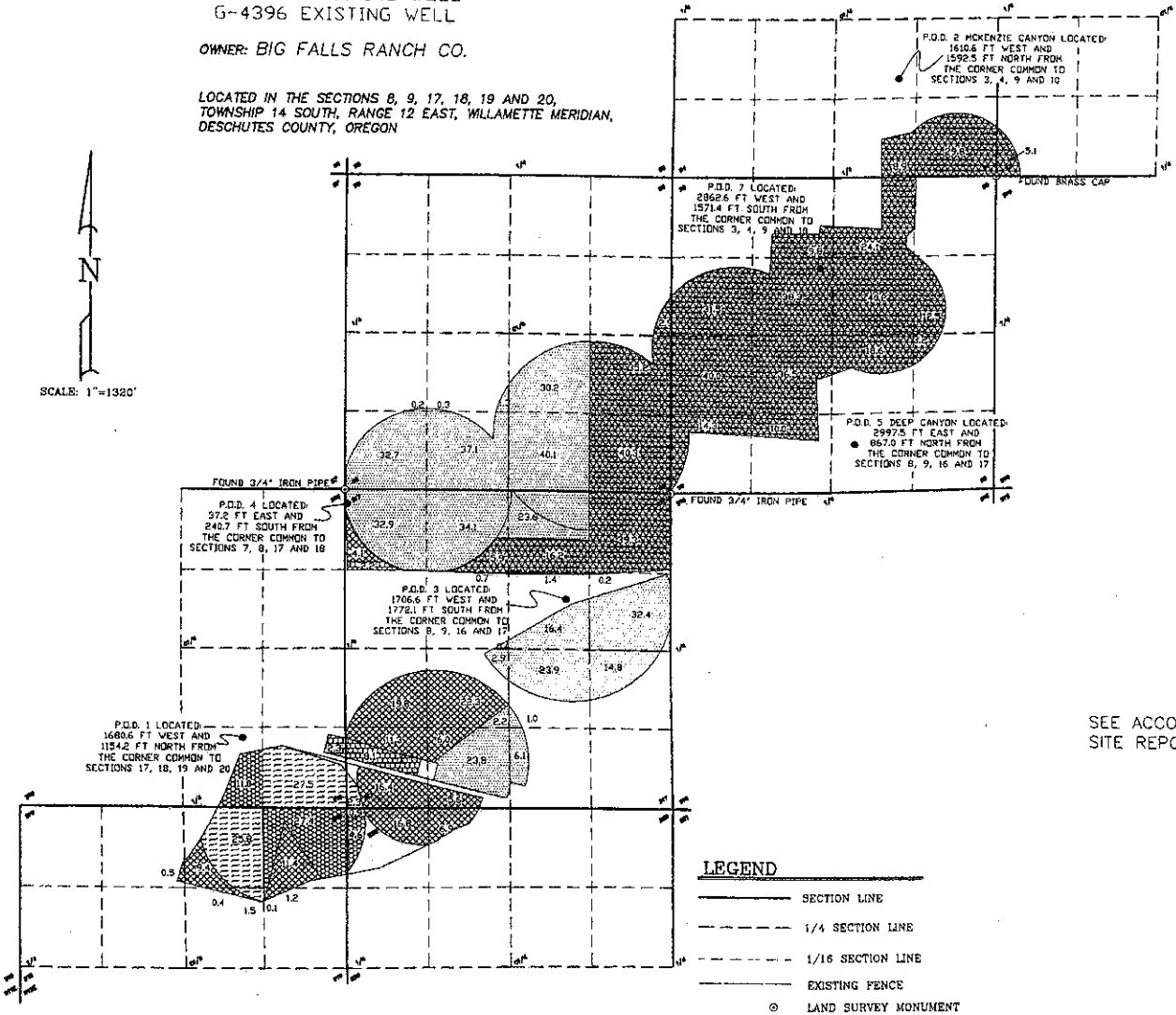
# FINAL PROOF MAP

FOR: TRANSFER APPLICATION NO. T-6854
AND APPLICATION NO. G-11923
EFFECTING PERMITS: 32049 APRIL 13, 1967 DEEP CANYON
37392 OCTOBER 23, 1973 MCKENZIE CANYON
G-13362 MAY 15, 1984 NEW WELLS
G-4974 EXISTING WELL
G-4396 EXISTING WELL

OWNER: BIG FALLS RANCH CO.

LOCATED IN THE SECTIONS 8, 9, 17, 18, 19 AND 20, TOWNSHIP 14 SOUTH, RANGE 12 EAST, WILLAMETTE MERIDIAN, DESCHUTES COUNTY, OREGON




PRIMARY PERMIT 32049 APRIL 13, 1967 DEEP CANYON
SUPPLEMENTAL PERMIT G-13362 MAY 15, 1989 WELLS 1, 3, 4, AND 7
464.9 ACRES

PRIMARY PERMIT G-13362 MAY 15, 1984 NEW WELLS 1, 3, 4, AND 7
SUPPLEMENTAL PERMIT 37392 OCTOBER 23, 1973 MCKENZIE CANYON
356.4 ACRES

PRIMARY PERMIT G-4396, TRANSFER T-6854
EXISTING AND NEW WELLS 1, 3, 4, AND 7
43.1 ACRES

PRIMARY PERMIT G-4974 TRANSFER T-6854
EXISTING AND NEW WELLS 1, 3, 4, AND 7
38.0 ACRES

PRIMARY PERMIT G-13362 MAY 15, 1984 NEW WELLS 1, 3, 4, AND 7
SUPPLEMENTAL PERMIT 32049 APRIL 13, 1967 DEEP CANYON TRANSFER T-6854
12.6 ACRES

PRIMARY PERMIT G-13362 MAY 15, 1984 NEW WELLS 1, 3, 4, AND 7
132.1 ACRES

SEE ACCOMPANYING SITE REPORT

Certified Water Right Examiner # 006
Barry J. Anderson
Nov.10, 1987
STATE OF OREGON
RENEWAL 12/31/2001

SEP 14 2001

LEGEND

- SECTION LINE
- 1/4 SECTION LINE
- 1/16 SECTION LINE
- EXISTING FENCE
- ⊙ LAND SURVEY MONUMENT
- ● POINT OF DIVERSION AS SHOWN

NOTE: PREPARATION OF THIS MAP IS FOR IDENTIFYING PROPOSED WATER RIGHTS ONLY. IT HAS NO INTENT TO PROVIDE LOCATIONS OR DIMENSIONS OF PROPERTY BOUNDARIES.

PREPARED FOR:
BIG FALLS RANCH CO.
P.O. BOX 434
TERREBONNE, OREGON 97760
(641) 548-8854


PREPARED BY:
ANDERSON ENGINEERING & SURVEYING, INC.
P.O. BOX 28 — LAKEVIEW, OREGON 97630 — (541) 947-4407 — FAX 947-2321
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| DATE: 6/25/01 | DWG. FILE:90-05R |
|---|---|
| JOB NO.:90-05R | SHEET 1 OF 1 |

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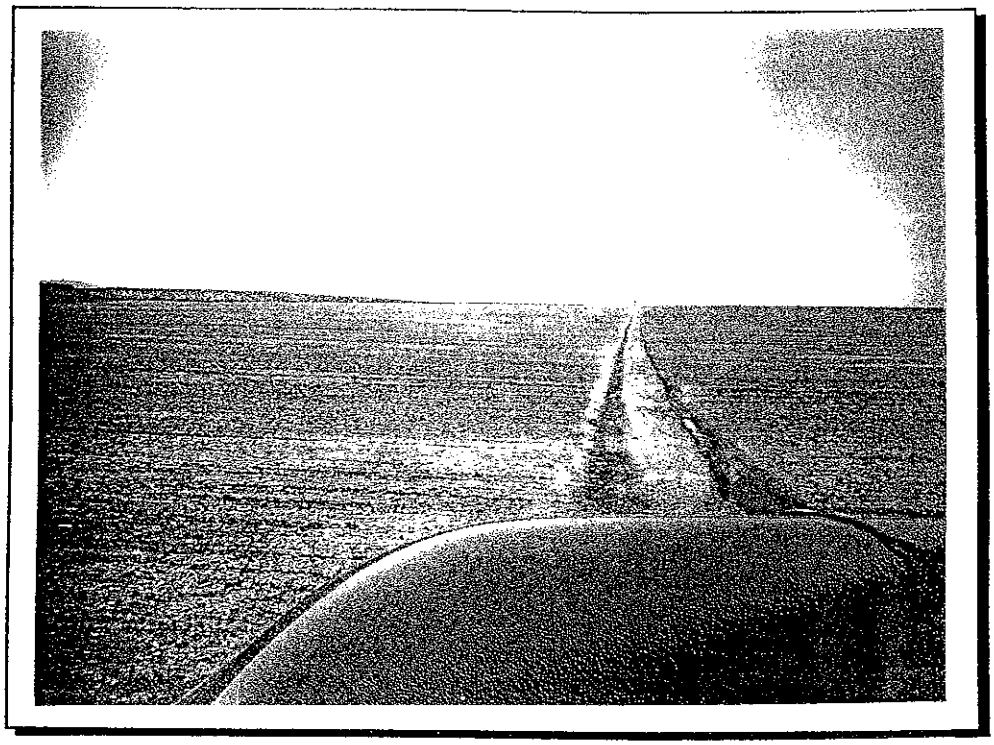
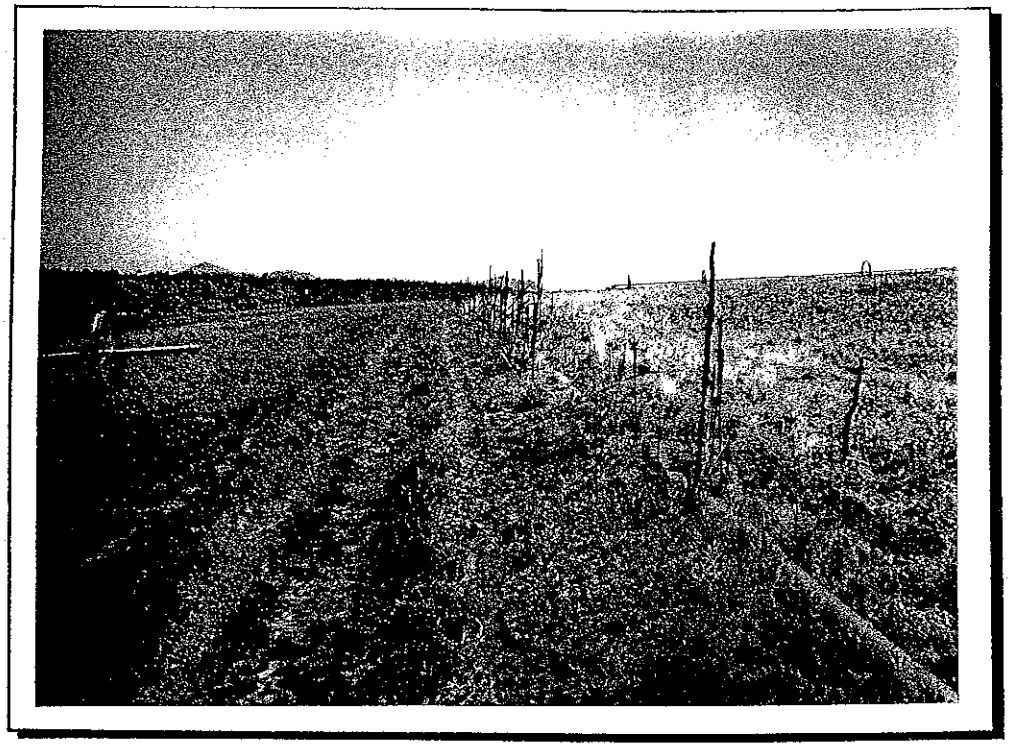
COBU MAP # 089

# BIG FALLS RANCH – FINAL PROOF



*LOOKING WEST FROM A POINT NEAR THE CENTER OF SECTION 9*



***LOOKING SOUTH** FROM A POINT NEAR WHERE THE CROP LINE INTERSECTS THE SOUTH LINE OF SECTION 4*


## ANDERSON ENGINEERING AND SURVEYING, INC.

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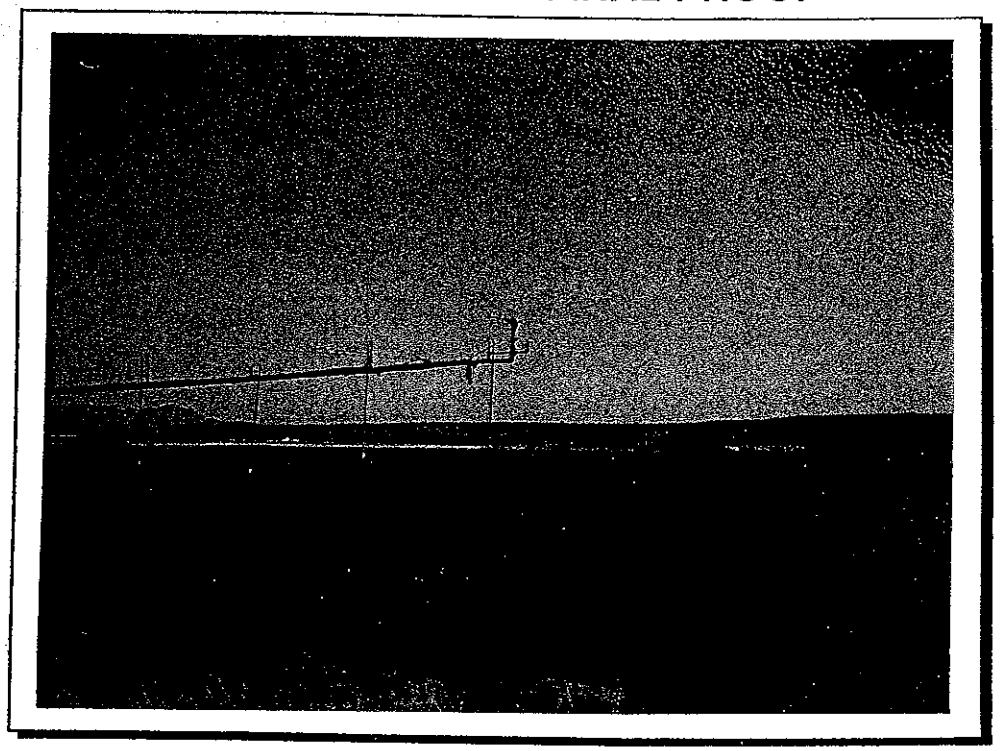
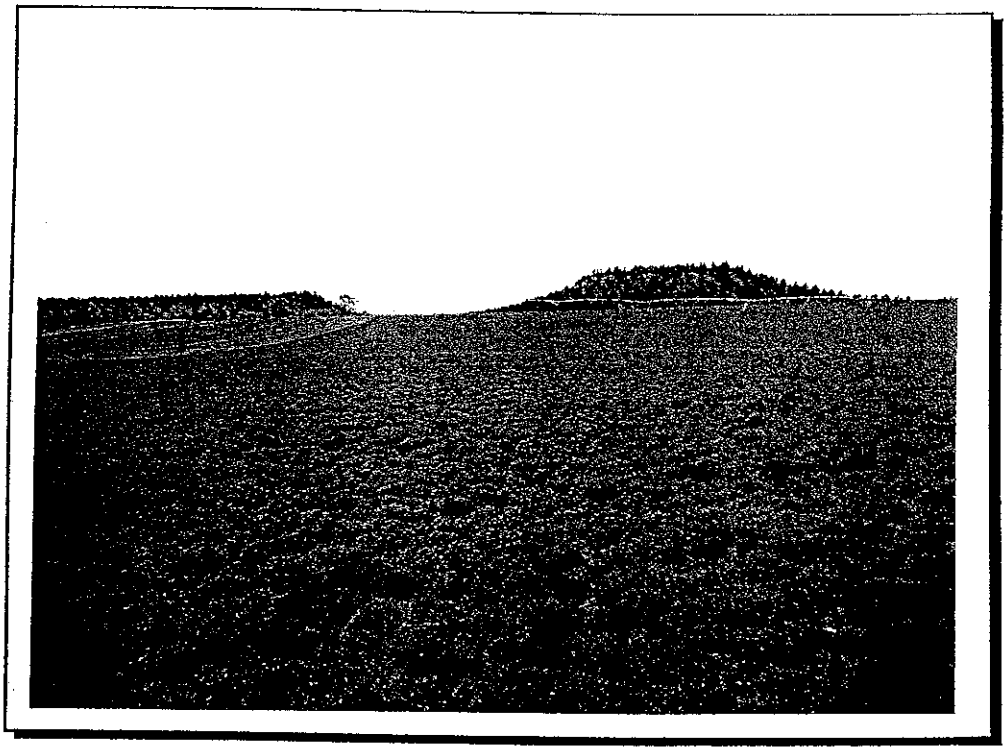
00180

# BIG FALLS RANCH – FINAL PROOF



CLOSE UP OF THE NOZZLES



CLOSE UP OF THE ALFALFA CROP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HC 64 Box 24, Lakeview, Oregon 97630
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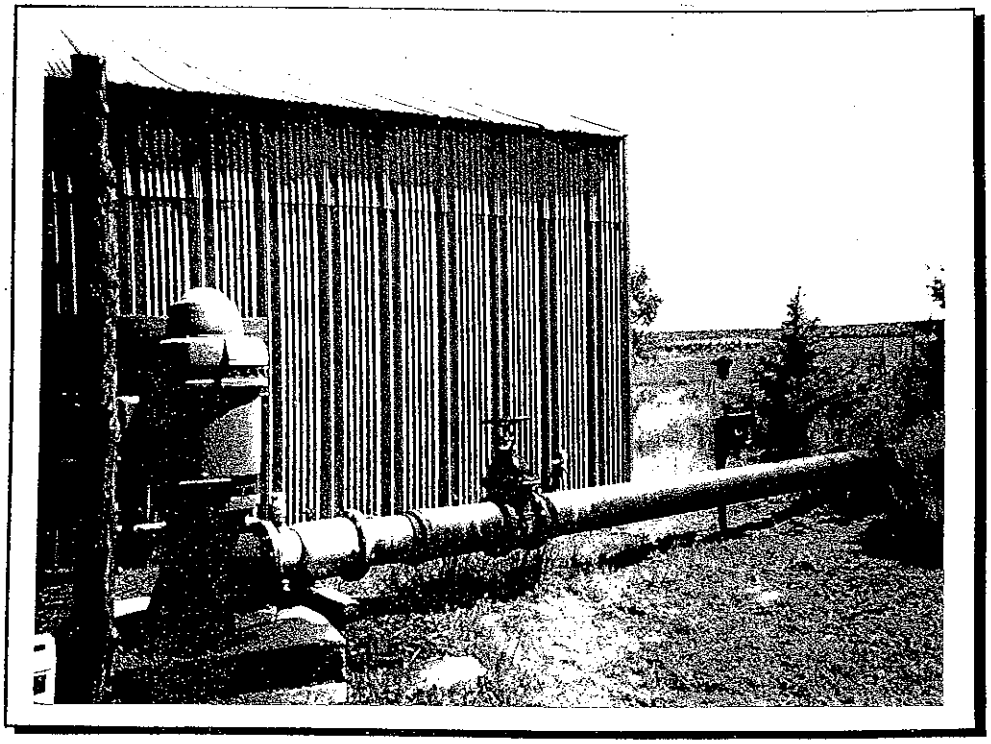
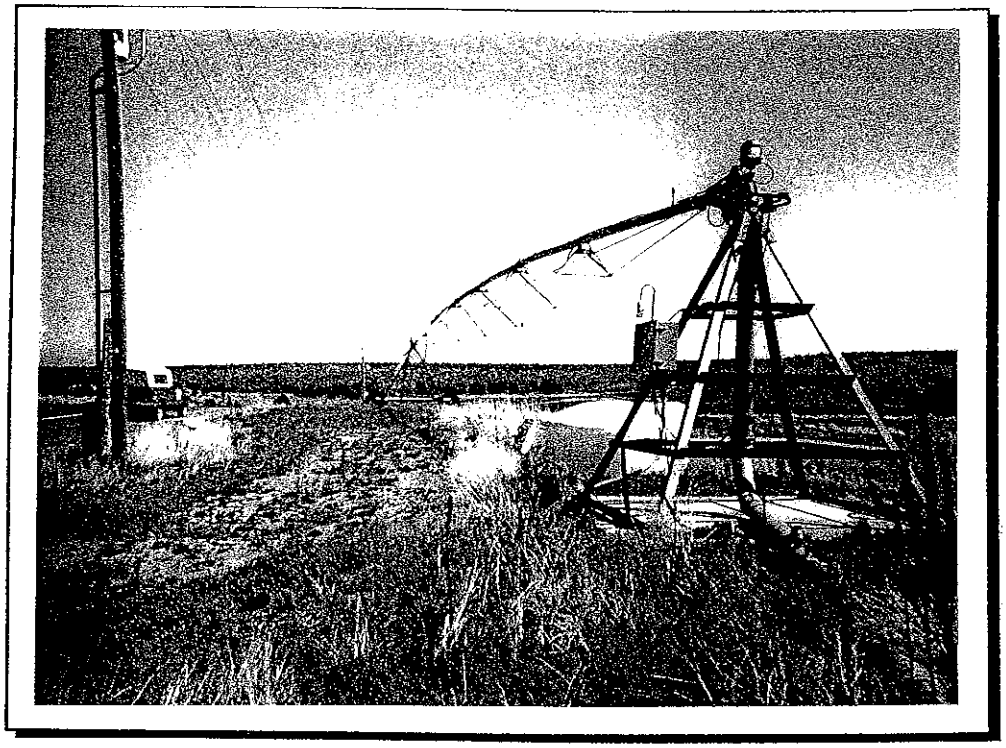
SEP 14 2001

WATER RESOURCES DEPT.
SALEM, OREGON

# BIG FALLS RANCH – FINAL PROOF



*LOOKING SOUTHEAST AT WELL NO. 1*



***LOOKING SOUTHEAST ALONG THE SOUTH RIGHT OF WAY OF LOWER BRIDGE ROAD AT THE IRRIGATION PIVOT CENTER IN THE SW ¼ SW ¼ SEC. 17***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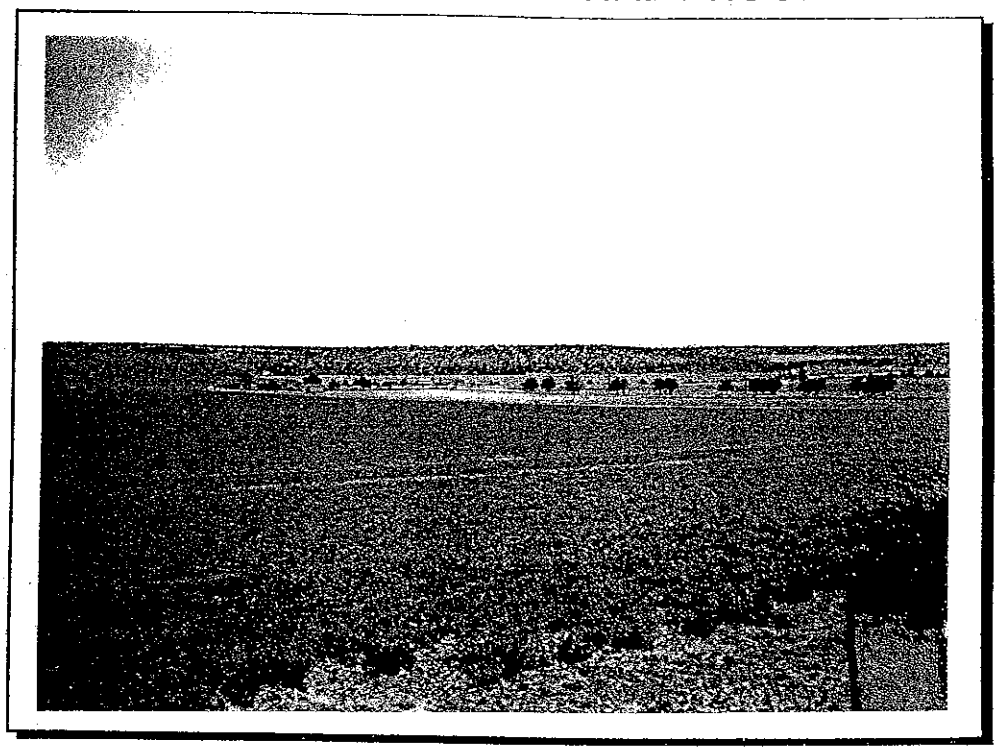
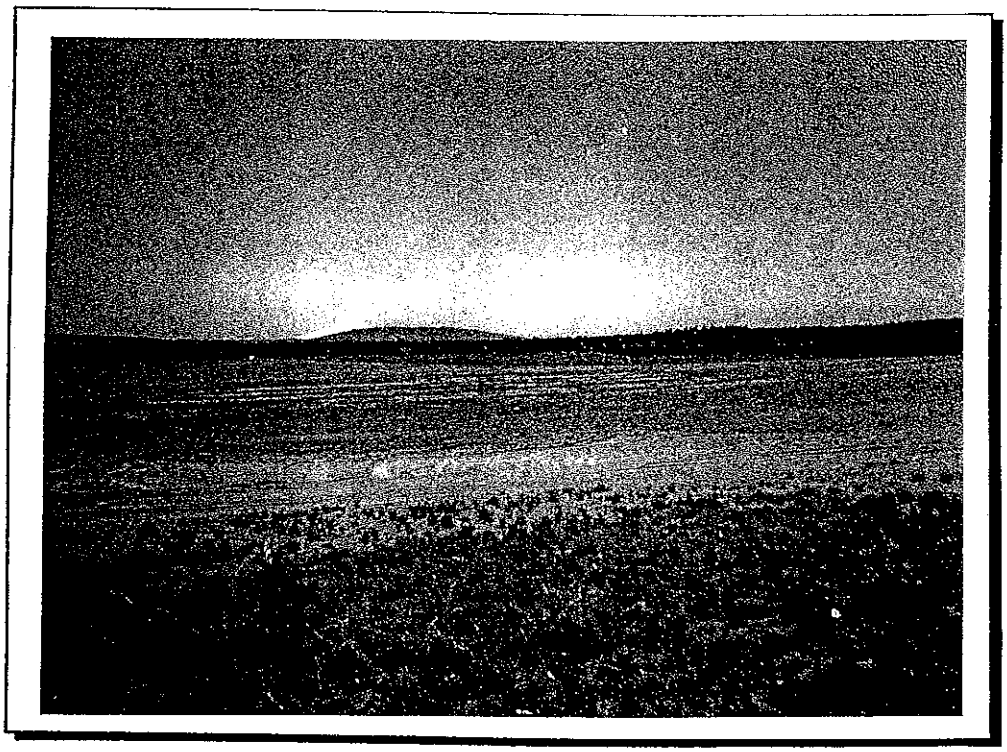
# BIG FALLS RANCH – FINAL PROOF



***LOOKING SOUTHEAST** FROM A POINT NEAR THE S 1/16 CORNER COMMON TO SECTIONS 17 & 18*



***LOOKING NORTHWEST** FROM THE CORNER COMMON TO SECTIONS 8, 9, 16, AND 17*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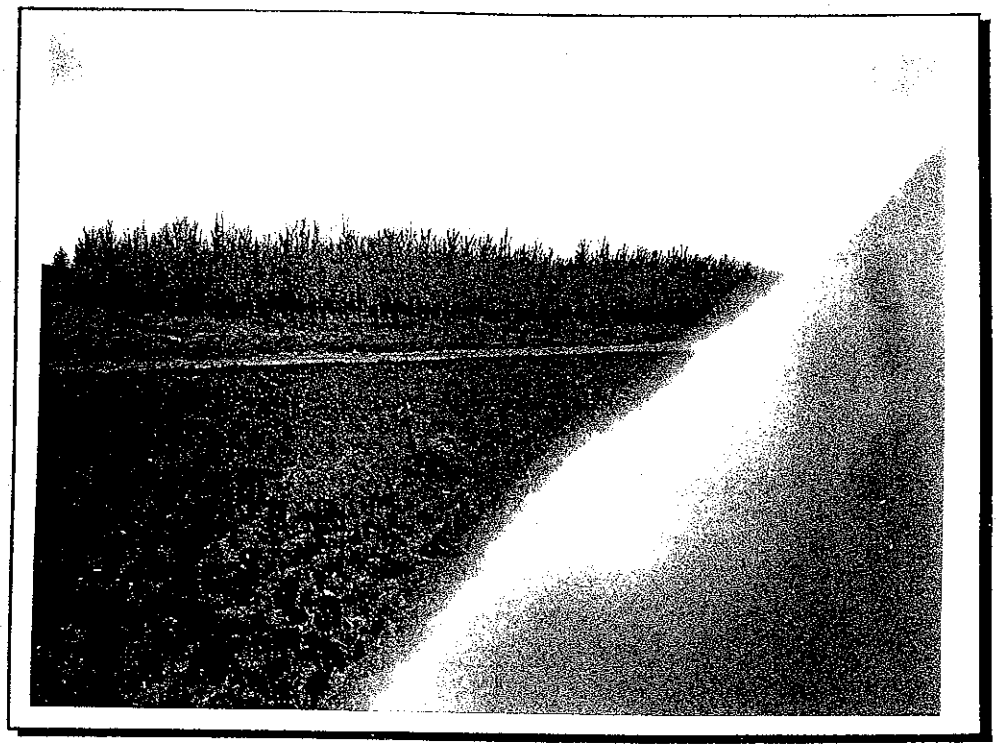
# BIG FALLS RANCH – FINAL PROOF



*LOOKING SOUTH FROM THE CORNER COMMON TO SECTIONS 8, 9, 16, AND 17*

*LOOKING SOUTHEAST FROM A POINT NEAR THE CROP LINE AT THE PIVOT IRRIGATION SYSTEM CENTERED IN THE NE ¼ NE ¼ SECTION 19*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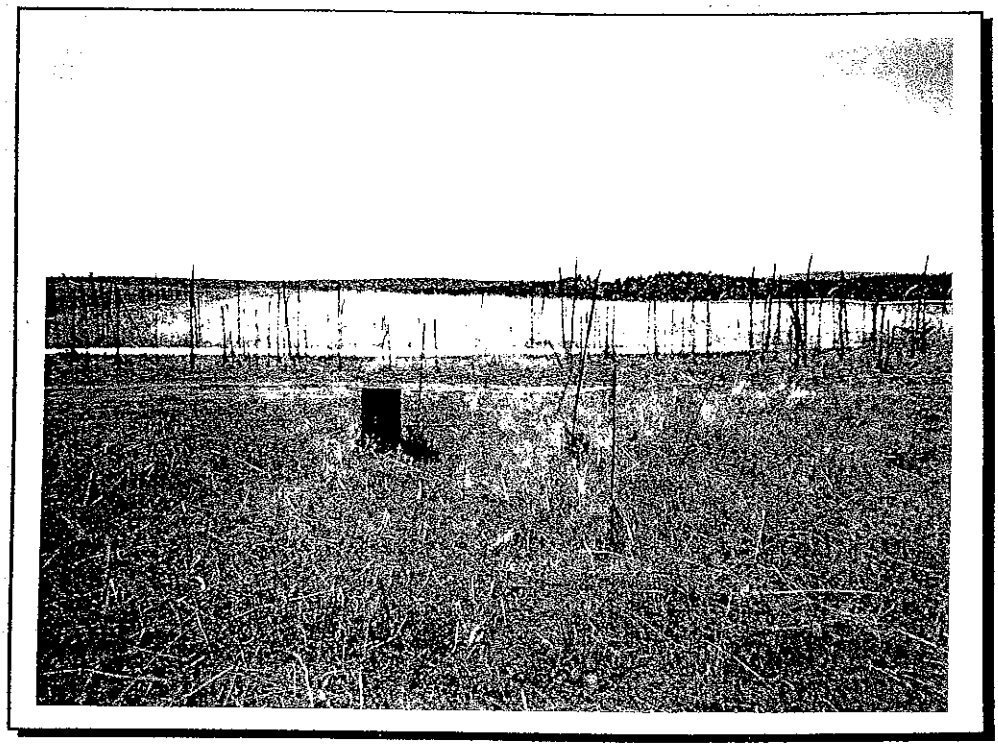
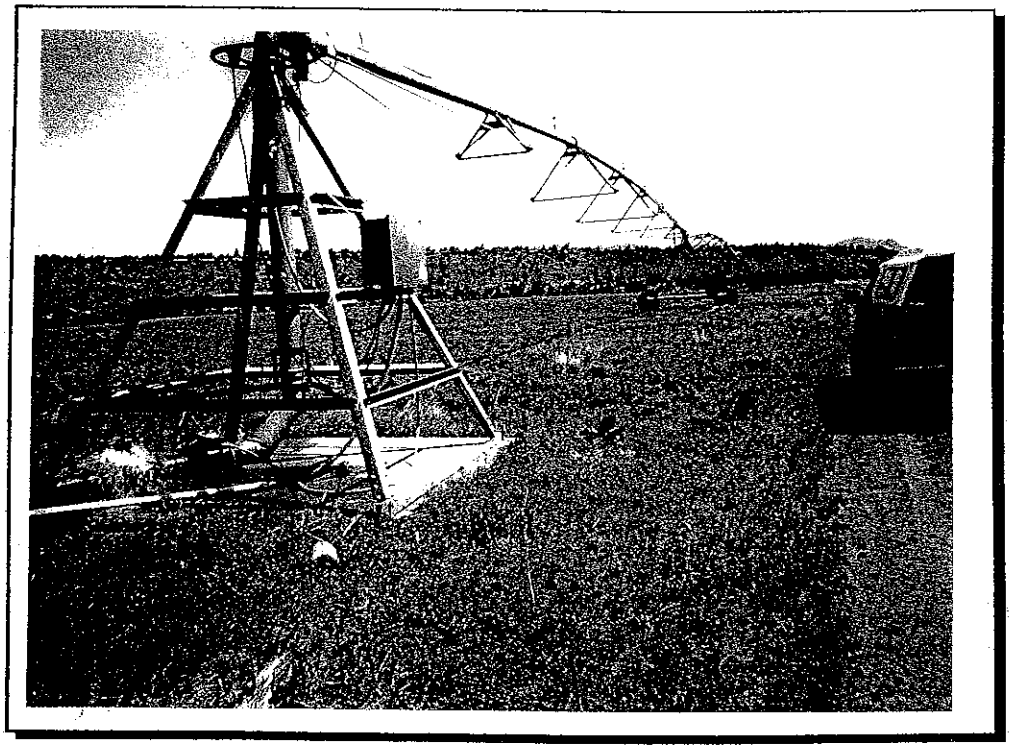
# BIG FALLS RANCH – FINAL PROOF



*LOOKING WEST AT WELL NO. 7, NO PUMP ATTACHED AT THE TIME, NOTE THE TRANSMISSION AND WHEEL LINES IN THE DISTANCE*



*LOOKING EAST AT THE PIVOT CENTER IN THE SE ¼ SE ¼ OF SECTION 4*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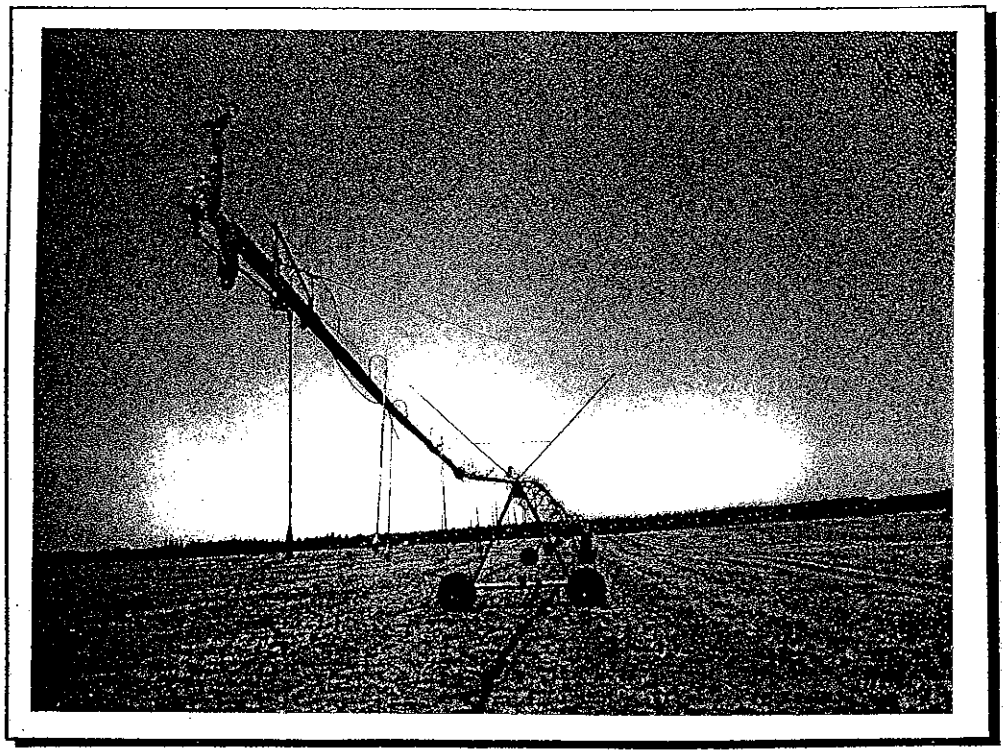
# BIG FALLS RANCH – FINAL PROOF

***LOOKING WEST FROM A POINT NEAR THE W 1/16 CORNER BETWEEN SECTION 16 & 17 – NOTE THE WHEEL LINES TO THE N & THE PIVOT CENTER IN THE DISTANCE TO THE S***



***CLOSE UP OF THE END GUN ON THE IRRIGATION PIVOT CENTERED NEAR THE W 1/16 CORNER BETWEEN SECTIONS 8 & 17***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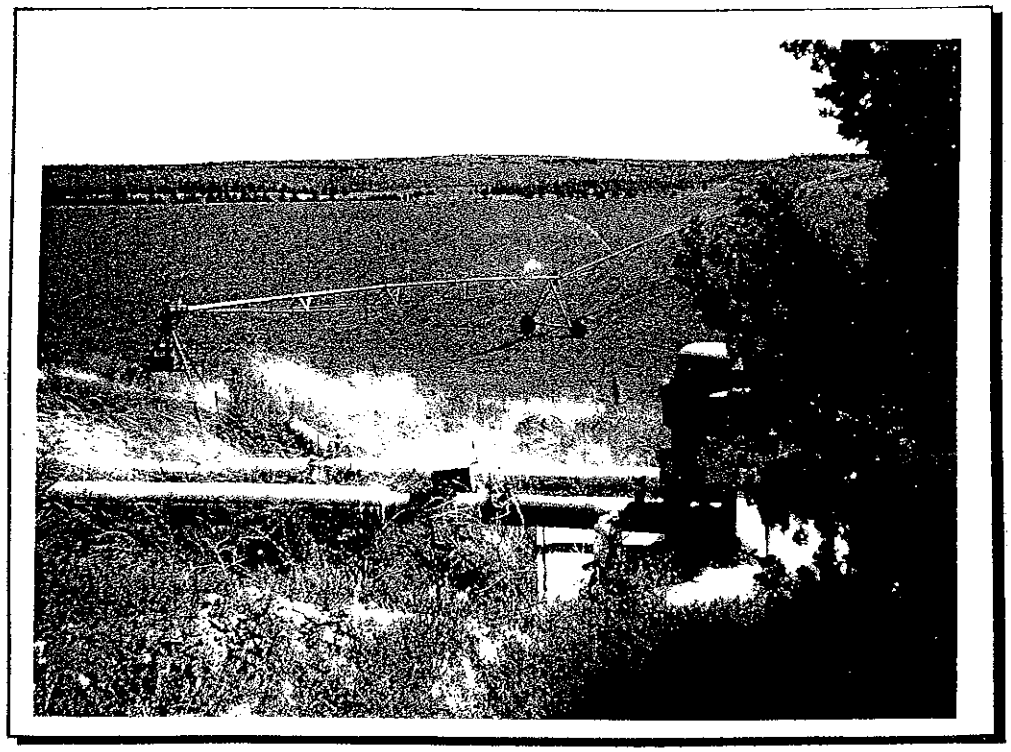
LUBA #2008-203
00186

# BIG FALLS RANCH – FINAL PROOF

***LOOKING EAST** AT WELL NO. 4 – NOTE: HAND LINE RUNNING TO THE SOUTH AND THE PIVOT CENTER IN THE DISTANCE*



***LOOKING SOUTH** AT WELL NO. 3, THE TRANSMISSION LINE CONFIGURATION, THE PIVOT IRRIGATION SYSTEM, AND THE CROP*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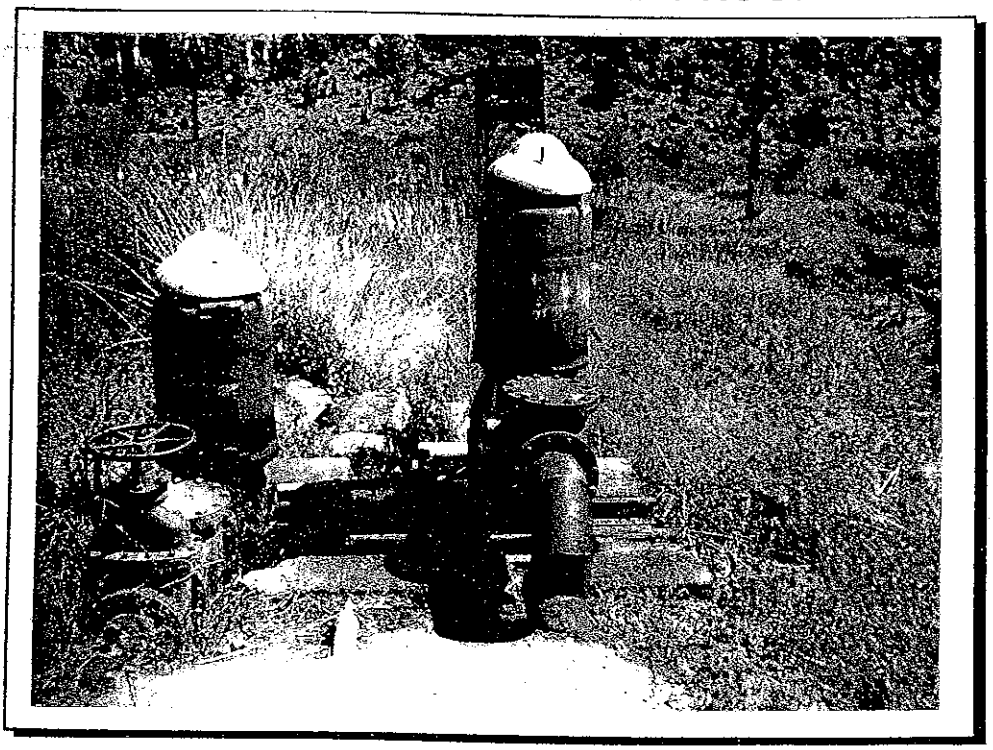
# BIG FALLS RANCH – FINAL PROOF



*LOOKING EAST AT THE PUMPS FOR DEEP CANYON WELL POD NO. 5*

***LOOKING NORTHEAST AT THE STRUCTURE AND PUMPS FOR DEEP CANYON WELL POD NO. 5***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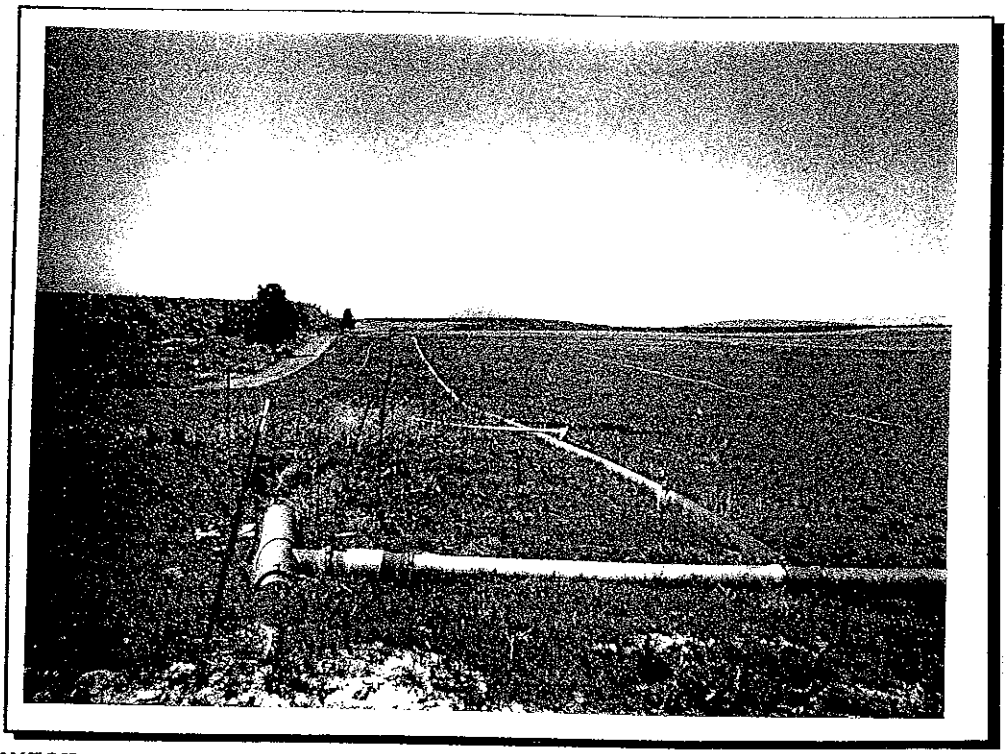
# BIG FALLS RANCH – FINAL PROOF

***LOOKING** WEST AT THE PUMPS FOR DEEP CANYON WELL POD NO. 5*



***LOOKING WEST** FROM THE SOUTHEAST CROP CORNER IN THE SE ¼ OF THE SW ¼ **OF SEC.** 9 AT THE TRANSMISSION LINE CONFIGURATION*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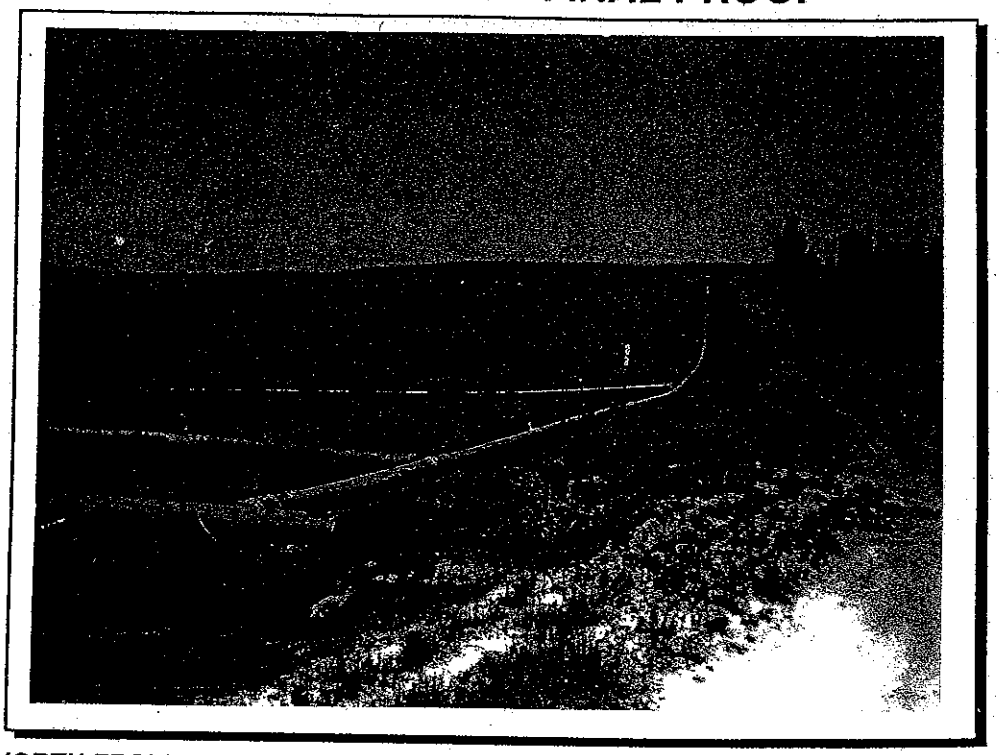
SALEM, OREGON

# BIG FALLS RANCH – FINAL PROOF



*LOOKING NORTH FROM THE SOUTHEAST CROP CORNER IN THE SE ¼ OF THE SW ¼ OF SEC. 9, AT THE TRANSMISSION LINE CONFIGURATION*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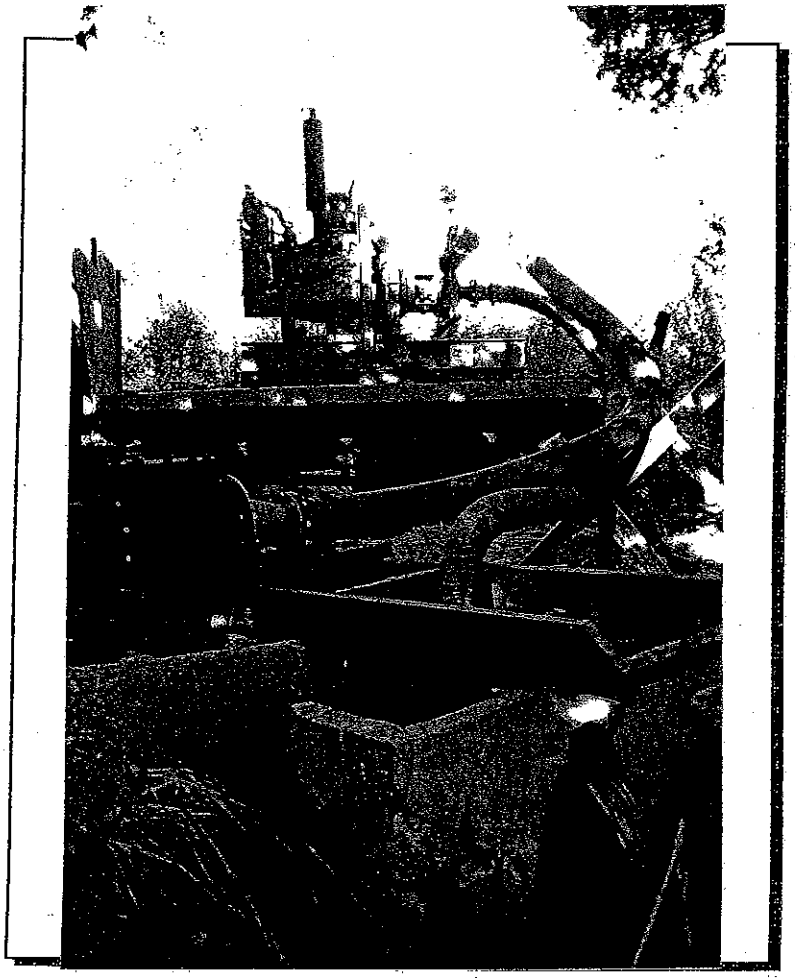
SALEM, OREGON

# *Rex Barber Application*



***McKenzie Canyon Pump System in Operation***
***Photos supplied by applicant Rex Barber***

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SALEM, OREGON

McKenzie Canyon Pump System in Operation
Photos supplied by Applicant Rex Barber

McKenzie Canyon Pump System in Operation
Photos supplied by applicant Rex Barber

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SALEM, OREGON

DESC 2100

RECEIVED
NOV 18 1966
STATE ENGINEER
SALEM OREGON

RECEIVED
JUN 20 1967
STATE ENGINEER
SALEM, OREGON

#1

NOTICE TO WATER WELL CONTRACTOR: The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

# WATER WELL REPORT

(Please type or print)

State Well No. 14/12-18dca

State Permit No. G-4843

## (1) OWNER:
Name DOUBLE R.C. RANCH
Address RT-1 BOX 236
TERREBONNE ORE.

## (2) LOCATION OF WELL:
County DESC. Driller's well number
¼ ¼ Section T. R. W.M.
Bearing and distance from section or subdivision corner
SEC-18- T 14 S- RANGE 12 E.

## (3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

## (4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☒ Other ☐

## (5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

## (6) CASING INSTALLED:
Threaded ☐ Welded ☒
12" Diam. from 0 ft. to 232 ft. Gage 350
24" Diam. from 8 ft. to 16 ft. Gage 312
" Diam. from ft. to ft. Gage

## (7) PERFORATIONS:
Perforated? ☒ Yes ☐ No
Type of perforator used CUTTING TORCH
Size of perforations ¼ in. by 3 in.
150 perforations from 170 ft. to 232 ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

## (8) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

## (9) CONSTRUCTION:
Well seal—Material used in seal
Depth of seal ft. Was a packer used?
Diameter of well bore to bottom of seal 24 in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth
Was a drive shoe used? ☒ Yes ☐ No
Was well gravel packed? ☒ Yes ☐ No Size of gravel: ¼ MIN. TO ¾
Gravel placed from 160 ft. to 232 ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off

## (10) WATER LEVELS:
Static level 170 ft. below land surface Date 11-12-66
Artesian pressure lbs. per square inch Date

## (11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☒ No If yes, by whom? EASTERN MILLS ORE.
Yield: 2000 gal./min. with NO ft. drawdown after 20 hrs.
" " " "
" " " "
Baller test 100 gal./min. with NO ft. drawdown after 3 hrs.
Artesian flow g.p.m. Date
Temperature of water 56 Was a chemical analysis made? ☐ Yes ☒ No

## (12) WELL LOG:
Diameter of well below casing CASED TO BOTTOM
Depth drilled 232 ft. Depth of completed well 232 ft.
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

| MATERIAL | FROM | TO |
|---|---|---|
| OVER BURDEN | 0 | 5 |
| SAND STONE | 5 | 45 |
| RED CINDERS | 45 | 70 |
| BOULDER CONG. | 70 | 120 |
| SANDSTONE | 120 | 171 |
| WATER BEARING BLACK SAND MIXED WITH LARGE RIVER AGGREGATE | 171 | 232 |

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SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON

Work started 10-25 19 66 Completed 11-12 19 66
Date well drilling machine moved off of well 11-14 19 66

## (13) PUMP:
Manufacturer's Name NONE
Type: H.P.

**Water Well Contractor's Certification:**

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME JACKSON DRILLING SERVICE (Person, firm or corporation) (Type or print)
Address REDMOND ORE.
Drilling Machine Operator's License No. 330
[Signed] Thomas D. Jackson (Water Well Contractor)
Contractor's License No. 442 Date 11-17, 19 66

(USE ADDITIONAL SHEETS IF NECESSARY)

LUBA #2008-203

00193

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

# WATER WELL REPORT
STATE OF OREGON
(Please type or print)

RECEIVED
FEB 1 1979
(Do not write above this line)

DESC 2089

State Well No. 14S/12E-17ac
State Permit No. WELL #3

## (1) OWNER:
WATER RESOURCES DEPT.
SALEM, OREGON

Name Bobby Beesley
Address Culver, Ore. 97734

## (2) TYPE OF WORK (check):
New Well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]
If abandonment, describe material and procedure in Item 12.

## (3) TYPE OF WELL:
Rotary [X] Driven [ ]
Cable [ ] Jetted [ ]
Dug [ ] Bored [ ]

## (4) PROPOSED USE (check):
Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

## (5) CASING INSTALLED:
Threaded [ ] Welded [ ]
16 " Diam. from 2 ft. to -19 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

## PERFORATIONS:
Perforated? [ ] Yes [X] No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

## (7) SCREENS:
Well screen installed? [ ] Yes [X] No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

## (8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test 8 gal./min. with no ft. drawdown after 1 hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

## (9) CONSTRUCTION:
Well seal—Material used cement
Well sealed from land surface to -19 ft.
Diameter of well bore to bottom of seal 20 in.
Diameter of well bore below seal 15 in.
Number of sacks of cement used in well seal 12 sacks
How was cement grout placed? gravity flow

Was a drive shoe used? [ ] Yes [X] No Plugs Size: location ft.
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? [ ] Yes [X] No Size of gravel:
Gravel placed from ft. to ft.

## (10) LOCATION OF WELL:
County Deschutes Driller's well number
SW ¼ NE ¼ Section 17 T. 14S R. 12E W.M.
Bearing and distance from section or subdivision corner
800 ft. north and 1,540 ft. west from the east quarter corner of Section 17

## (11) WATER LEVEL: Completed well.
Depth at which water was first found 191 ft.
Static level 171 ft. below land surface. Date 1-3-79
Artesian pressure lbs. per square inch. Date

## (12) WELL LOG:
Diameter of well below casing 15
Depth drilled 262 ft. Depth of completed well 262 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

| MATERIAL | From | To | SWL |
|---|---|---|---|
| brown soil & small boulders | 0 | 5 | |
| brown coarse sandstone | 5 | 76 | |
| brown coarse sandstone & large boulders | 76 | 191 | 171 |
| black fine sand & gravel WB | 191 | 223 | |
| black doarse sand & gravel W.B. | 223 | 252 | |
| red soft rock | 252 | 262 | |

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WATER RESOURCES DEPT.
SALEM, OREGON

Work started 12-26 1978 Completed 1-4 1979
Date well drilling machine moved off of well 1-5 1979

**Drilling Machine Operator's Certification:**
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Tony K. Crawford (Drilling Machine Operator) Date 1-8, 1979
Drilling Machine Operator's License No. 678

**Water Well Contractor's Certification:**
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Crawford Well Drilling, Inc. (Person, firm or corporation) (Type or print)
Address 1245 N.W. Lower Bridge Terrebonne, Ore.
[Signed] Tony K. Crawford (Water Well Contractor)
Contractor's License No. 570 Date 1-8, 1979

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

# WATER WELL REPORT
STATE OF OREGON

DESC 2086

RECEIVED
JUN 14 1983
WATER RESOURCES DEPT.
SALEM, OREGON

State Well No. 14S/12E-Mac Second
Permit No. WELL 3 RECOND.

## (1) OWNER:
Name Deschutes Valley Liquidation
Address P. O. Box 166
City Culver 97734 State OR

## (2) TYPE OF WORK (check):
New Well ☐ Deepening ☐ Reconditioning ☒ Abandon ☐
If abandonment, describe material and procedure in Item 12.

## (3) TYPE OF WELL:
Rotary Air ☒ Driven ☐
Rotary Mud ☐ Dug ☐
Cable ☐ Bored ☐

## (4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐
Thermal: Withdrawal ☐ Reinjection ☐

## (5) CASING INSTALLED:
Steel ☒ Threaded ☐ Plastic ☐ Welded ☒
..... " Diam. from ..... ft. to ..... ft. Gauge .....
..... " Diam. from ..... ft. to ..... ft. Gauge .....

## LINER INSTALLED:
12 " Diam. from 0 ft. to -232 ft. Gauge .280

## (6) PERFORATIONS:
Perforated? ☒ Yes ☐ No
Type of perforator used factory
Size of perforations ¼ in. by 6 in.
12 rows perforations from -172 ft. to -232 ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

## (7) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name .....
Type ..... Model No. .....
Diam. ..... Slot Size ..... Set from ..... ft. to ..... ft.
Diam. ..... Slot Size ..... Set from ..... ft. to ..... ft.

## (8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
Air test ..... gal./min. with drill stem at ..... ft. hrs.
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m.
Temperature of water ..... Depth artesian flow encountered ..... ft.

## (9) CONSTRUCTION:
Special standards: Yes ☐ No ☐
Well seal—Material used .....
Well sealed from land surface to ..... ft.
Diameter of well bore to bottom of seal ..... in.
Diameter of well bore below seal ..... in.
Number of sacks of cement used in well seal ..... sacks
How was cement grout placed? existing grout not disturbed
.....
.....
Was pump installed? no Type ..... HP ..... Depth ..... ft.
Was a drive shoe used? ☐ Yes ☒ No Plugs ..... Size: location ..... ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of Water? ..... depth of strata .....
Method of sealing strata off .....
Was well gravel packed? ☐ Yes ☒ No Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

## (10) LOCATION OF WELL:
County Deschutes Driller's well number
SW ¼ NE ¼ Section 17 T. 14S R. 12E W.M.
Tax Lot # Lot Blk Subdivision
Address at well location: .....

## (11) WATER LEVEL: Completed well.
Depth at which water was first found ..... ft.
Static level 135 ft. below land surface. Date 6/3/83
Artesian pressure ..... lbs. per square inch. Date .....

## (12) WELL LOG:
Diameter of well below casing 0
Depth drilled 232 ft. Depth of completed well 232 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

| MATERIAL | From | To | SWL |
|---|---|---|---|
| drilled metal, wood and other foreign material in sand and gravel from | 193 | ~~220~~ 232 | |

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WATER RESOURCES DEPT.
SALEM, OREGON

Work started 5/30 19 83 Completed 6/3 1983
Date well drilling machine moved off of well 6/3 1983

**Drilling Machine Operator's Certification:**
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] ..... (Drilling Machine Operator) Date 6/6, 19 83
Drilling Machine Operator's License No. 628

**Water Well Contractor's Certification:**
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Cranford Well Drilling, Inc. (Person, firms or corporation) (Type or print)
Address 1245 Lower Bridge Terrebonne, OR
[Signed] ..... (Water Well Contractor)
Contractor's License No. 570 Date 6/6, 19 83

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the

WATER RESOURCES DEPARTMENT,
SALEM, OREGON 97310
within 30 days from the date of well completion.

SP*12658-590

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED (DESC 2098) WELL #4
FEB - 01978
WATER RESOURCES DEPT.
SALEM, OREGON

# WATER WELL REPORT
## STATE OF OREGON

(Please Type or print) (Do not write above this line)

RECEIVED
JAN 10 1978
WATER RESOURCES DEPT.
SALEM, OREGON

State Well No. 14S/12E-18aa

State Permit No.

### (1) OWNER:
Name Bob Beesley
Address Rt. 1, Box 31
Culver, Ore. 97734

### (2) TYPE OF WORK (check):
New Well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]
If abandonment, describe material and procedure in Item 12.

### (3) TYPE OF WELL:
Rotary [X] Driven [ ]
Cable [ ] Jetted [ ]
Dug [ ] Bored [ ]

### (4) PROPOSED USE (check):
Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

### CASING INSTALLED:
Threaded [ ] Welded [ ]
16 " Diam. from 1 ft. to -19 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

### PERFORATIONS:
Perforated? [ ] Yes [X] No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

### (7) SCREENS:
Well screen installed? [ ] Yes [X] No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

### (8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test 20 gal./min. with no ft. drawdown after 1 hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

### (9) CONSTRUCTION:
Well seal—Material used cement
Well sealed from land surface to 18 ft.
Diameter of well bore to bottom of seal 20 in.
Diameter of well bore below seal 15 in.
Number of sacks of cement used in well seal 11 sacks
How was cement grout placed? gravity flow
Was a drive shoe used? [ ] Yes [X] No Plugs Size: location ft.
Did any strata contain unusable water? [ ] Yes [ ] No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? [ ] Yes [X] No Size of gravel:
Gravel placed from ft. to ft.

### (10) LOCATION OF WELL:
County ~~Jefferson~~ Deschutes Driller's well number
NE ¼ NE ¼ Section 18 T. 14S R. 12 W.M.
Bearing and distance from section or subdivision corner
1110 ft. south of the NE corner of section 18

### (11) WATER LEVEL: Completed well.
Depth at which water was first found 210 ft.
Static level 163 ft. below land surface. Date 12/20/77
Artesian pressure lbs. per square inch. Date

### (12) WELL LOG:
Diameter of well below casing 15
Depth drilled 288 ft. Depth of completed well 288 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

| MATERIAL | From | To | SWL |
|---|---|---|---|
| brown sandy soil | 0 | 3 | |
| brown sandstone | 3 | 28 | |
| soft red rock | 28 | 36 | |
| brown sandstone | 36 | 210 | 163 |
| brown coarse gravel W. B. | 210 | 267 | |
| red soft rock | 267 | 279 | |
| black hard rock | 279 | 288 | |

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SALEM, OREGON

Work started 12/19 19 77 Completed 12/21 19 77
Date well drilling machine moved off of well 12/22 19 77

**Drilling Machine Operator's Certification:**
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Dale Paul Orem (Drilling Machine Operator) Date 1-7, 19 78
Drilling Machine Operator's License No. 934

**Water Well Contractor's Certification:**
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Crawford Well Drilling (Person, firm or corporation) (Type or print)
Address 1245 N.W. Lower Bridge Terrebonne, Ore.
[Signed] Larry K. Crawford (Water Well Contractor)
Contractor's License No. 570 Date 1-7, 19 78

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

LUBA #2008-203

00196

STATE OF OREGON

# WATER WELL REPORT

(as required by ORS 537.765)

RECEIVED
FEB 13 1991
WATER RESOURCES DEPT.
SALEM, OREGON

WELL # 7 145/12E/9ba

(START CARD) # 24903

## (1) OWNER:

Well Number:

Name Rex Barber

Address 2045 S.W. 21st

City Redmond State Ore Zip 97760

## (2) TYPE OF WORK:

Reeming

☐ New Well ☐ Deepen ☒ Recondition ☐ Abandon

## (3) DRILL METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Other

## (4) PROPOSED USE:

☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation

☐ Thermal ☐ Injection ☐ Other

## (5) BORE HOLE CONSTRUCTION:

Special Construction approval Yes ☐ No ☒ Depth of Completed Well 340 ft.

Explosives used Yes ☐ No ☐ Type Amount

| HOLE Diameter | From | To | SEAL Material | From | To | Amount sacks or pounds |
|---|---|---|---|---|---|---|
| 16 | 0 | 25 | Bentonite | 0 | 25 | 22 bags |
| | | | | | | |
| | | | | | | |

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E

☐ Other Bentonite (Granular)

Backfill placed from ft. to ft. Material

Gravel placed from ft. to ft. Size of gravel

## (6) CASING/LINER:

| | Diameter | From | To | Gauge | Steel | Plastic | Welded | Threaded |
|---|---|---|---|---|---|---|---|---|
| Casing: | 12 | +2 | 50 | | ☒ | ☐ | ☒ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |
| Liner: | | | | | ☐ | ☐ | ☐ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |

Final location of shoe(s)

## (7) PERFORATIONS/SCREENS:

☐ Perforations Method

☐ Screens Type Material

| From | To | Slot size | Number | Diameter | Tele/pipe size | Casing | Liner |
|---|---|---|---|---|---|---|---|
| | | | | | | ☐ | ☐ |
| | | | | | | ☐ | ☐ |
| | | | | | | ☐ | ☐ |
| | | | | | | ☐ | ☐ |
| | | | | | | ☐ | ☐ |
| | | | | | | ☐ | ☐ |

## (8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

| Yield gal/min | Drawdown | Drill stem at | Time |
|---|---|---|---|
| 500 | 0 | 320 | 1 hr. |
| | | | |
| | | | |

Temperature of water 61 Depth Artesian Flow Found

Was a water analysis done? ☐ Yes By whom

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata:

## (9) LOCATION OF WELL by legal description:

County Desch Latitude Longitude

Township 14 N or S. Range 12 E or W. WM.

Section 9 NE ¼ NW ¼

Tax Lot 1400 Lot Block Subdivision

Street Address of Well (or nearest address) lower bridge

## (10) STATIC WATER LEVEL:

170 ft. below land surface. Date 2-7-91

Artesian pressure lb. per square inch. Date

## (11) WATER BEARING ZONES:

Depth at which water was first found 213

| From | To | Estimated Flow Rate | SWL |
|---|---|---|---|
| 213 | 340 | 500 | 170 |
| | | | |
| | | | |
| | | | |

## (12) WELL LOG:

Ground elevation

| Material | From | To | SWL |
|---|---|---|---|
| Sand & Gravel | 0 | 19 | |
| Brown Sand Stone Congl | 19 | 32 | |
| Cemented Sand & Gravel | 32 | 60 | |
| Brown Sand Stone | 60 | 62 | |
| Red lava | 62 | 77 | |
| Brown Sand Stone Congl | 77 | 147 | |
| Red fine sand stone | 147 | 213 | |
| (W.B.) Gray lava broken | 213 | 231 | |
| (W.B) Black Basalt broken | 231 | 276 | |
| (W.B) Red Sand Stone | 276 | 280 | |
| (W.B) Coarse black Sand stone Congl | 280 | 340 | |

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SALEM, OREGON

Date started 2-4-91 Completed 2-7-91

**(unbonded) Water Well Constructor Certification:**

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

WWC Number

Signed Date

**(bonded) Water Well Constructor Certification:**

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief. WWC Number 1255

Signed William D. Kloss Date

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9809C 3/88

LUBA #2008-203

00197

#7

11/03/76

IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

PAGE 2

7

CUSTOMER

EFESLEY FARMS, INC.

CULVER OR 97734

DEALER

JASA AG. SERVICE 003540

MODEL NUMBER 4971
LENGTH 992.2
GALLONAGE 272
PIVOT PRESSURE 64
SERIAL NUMBER 000000

END GUN RADIUS 0
PIPE LOSS COEFF
LAST DRIVE UNIT WATER
TOTAL DRIVE WATER
APPLICATION RATE (IN./DAY)
TOTAL ACRES COVERED 81.55
GPM PER ACRE 7.07

LUBA #2008-203
00198

| DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 143.5 | | | PLUG | | 14 | | | | | | 14 |
| 1 | 148.5 | | | | | | 1 | | | | | |
| | 154.1 | | | PLUG | | 15 | | | | | | 15 |
| | 164.6 | 62.0 | | F33AS | 5/32 | 16 | | 62.7 | 5.29 | 5.54 | | 16 |
| | 175.1 | | | PLUG | | 17 | | | | | | 17 |
| | 185.7 | | | PLUG | | 18 | | | | | | 18 |
| | 196.3 | 61.7 | | F33AS | 11/64 | 19 | | 62.6 | 6.51 | 6.66 | | 19 |
| | 206.5 | | | PLUG | | 20 | | | | | | 20 |
| | 217.4 | | | PLUG | | 21 | | | | | | 21 |
| | 227.9 | 61.5 | | F33AS | 11/64 | 22 | | 62.4 | 7.31 | 6.65 | | 22 |
| | 238.4 | | | PLUG | | 23 | | | | | | 23 |
| | 249.0 | | | PLUG | | 24 | | | | | | 24 |
| | 259.5 | 60.7 | | F33AS | 3/16 | 25 | | 62.2 | 8.33 | 7.89 | | 25 |

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SALEM, OREGON

IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET PAGE 3

CUSTOMER

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P IN. BEESLEY FARMS, INC.
RESS
Y CULVER OR 97734
NTRY
DEALER
E JASA AG. SERVICE 003540

MODEL NUMBER 4971
LENGTH 992.2
GALLONAGE 575
PIVOT PRESSURE 64
SERIAL NUMBER 000000

END GUN RADIUS
PIPE LOSS COEFF 0
LAST DRIVE UNIT WATER
TOTAL DRIVE WATER
APPLICATION RATE (IN./DAY) .7
TOTAL ACRES COVERED 81.5
GPM PER ACRE 7.07

OWRD #2008-203
00199

| DRIVE AG. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNR NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE CPL WATER LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 270.0 | | | PLUG | | 26 | | | | | 26 |
| | 280.6 | | | PLUG | | 27 | | | | | 27 |
| | 291.1 | 59.9 | | F33AS | 13/64 | 28 | | 62.0 | 9.54 | 9.24 | 28 |
| 2 | 296.4 | | | | | | 2 | | | | |
| | 301.6 | | | PLUG | | 29 | | | | | 29 |
| | 312.2 | | | PLUG | | 30 | | | | | 30 |
| | 322.7 | 59.6 | | F33AS | 7/32 | 31 | | 61.8 | 10.38 | 10.72 | 31 |
| | 333.2 | | | PLUG | | 32 | | | | | 32 |
| | 343.9 | | | PLUG | | 33 | | | | | 33 |
| | 354.4 | 59.0 | | F33AS | 13/64 | 34 | | 61.7 | 9.50 | 9.22 | 34 |
| | 364.9 | | | PLUG | | 35 | | | | | 35 |
| | 375.5 | 60.1 | | F33AS | 3/16 | 36 | | 61.6 | 8.03 | 7.85 | 36 |
| | 386.0 | | | PLUG | | 37 | | | | | 37 |

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# IRRIGATION SPRINKLER SETUP CHART AND SERVICE INFORMATION SHEET

PAGE 1

CUSTOMER

[redacted] CULVER OR 97734

DEALER

BASA AG. SERVICE 003540

MODEL NUMBER 4971
LENGTH 992.2
GALLONAGE 575
PIVOT PRESSURE 64
SERIAL NUMBER 000000

END GUN RADIUS 70
PIPE LOSS COEFF
LAST DRIVE UNIT WATER
TOTAL DRIVE WATER
APPLICATION RATE (IN./DAY) .37
TOTAL ACRES COVERED 135.07
GPM PER ACRE

LUBA #2008-203

| DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 396.5 | 59.4 | | F33AS | 13/64 | 38 | | 61.5 | 8.48 | 9.20 | | 38 |
| | 407.1 | | | PLUG | | 39 | | | | | | 39 |
| | 417.6 | 59.3 | | F33AS | 13/64 | 40 | | 61.4 | 8.93 | 9.20 | | 40 |
| | 428.1 | | | PLUG | | 41 | | | | | | 41 |
| | 438.7 | 59.2 | | F33AS | 13/64 | 42 | | 61.3 | 9.38 | 9.19 | | 42 |
| | 443.9 | | | | | | | | | | | |
| | 449.2 | | | PLUG | | 43 | | | | | | 43 |
| | 459.7 | 59.1 | | F33AS | 13/64 | 44 | | 61.2 | 9.83 | 9.18 | | 44 |
| | 470.2 | | | PLUG | | 45 | | | | | | 45 |
| | 480.8 | 58.9 | | F33AS | 7/32 | 46 | | 61.1 | 10.37 | 10.65 | | 46 |
| | 491.6 | | | PLUG | | 47 | | | | | | 47 |
| | 502.2 | 58.8 | | F33AS | 7/32 | 48 | | 61.0 | 10.83 | 10.64 | | 48 |
| | 512.7 | | | PLUG | | 49 | | | | | | 49 |

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IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

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F TL BEESLEY FARMS, INC.
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Y CULVER OR. 97734
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CEALER
E USDA AG. SERVICE 003540

MODEL NUMBER 4971
LENGTH 992.2
GALLONAGE 57.5
PIVOT PRESSURE 64
SERIAL NUMBER 000000

END GUN RADIUS 70
PIPE LOSS COEFF
LAST DRIVE UNIT WATER
TOTAL DRIVE WATER
APPLICATION RATE (IN./DAY) .7
TOTAL ACRES COVERED 61.5
GPM PER ACRE 7.07

| DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 523.2 | 57.5 | | F43A | 15/64X PLUG | 50 | | 60.9 | 11.19 | 11.95 | | 50 |
| | 533.8 | | | PLUG | | 51 | | | | | | 51 |
| | 544.3 | 57.5 | | F43A | 15/64X PLUG | 52 | | 60.8 | 11.64 | 11.94 | | 52 |
| | 554.8 | | | PLUG | | 53 | | | | | | 53 |
| | 565.4 | 57.4 | | F43A | 15/64X PLUG | 54 | | 60.7 | 12.09 | 11.93 | | 54 |
| | 570.2 | | | | | | 4 | | | | | |
| | 575.9 | | | PLUG | | 55 | | | | | | 55 |
| | 586.4 | 57.3 | | F43A | 15/64X PLUG | 56 | | 60.7 | 12.54 | 11.93 | | 56 |
| | 596.9 | | | PLUG | | 57 | | | | | | 57 |
| | 607.5 | 56.7 | | F43A | 1/4 X PLUG | 58 | | 60.6 | 13.08 | 13.51 | | 58 |
| | 618.3 | | | PLUG | | 59 | | | | | | 59 |
| | 628.8 | 56.7 | | F43A | 1/4 X PLUG | 60 | | 60.5 | 13.54 | 13.51 | | 60 |
| | 639.4 | | | PLUG | | 61 | | | | | | 61 |

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IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

CUSTOMER

REESLEY FARMS, INC.

CULVER OR 97734

DEALER

JASA AG. SERVICE 003540

MODEL NUMBER 4971
LENGTH 992.2
GALLONAGE 579
PIVOT PRESSURE 64
SERIAL NUMBER 000000

END GUN RADIUS 70
PIPE LOSS COEFF
LAST DRIVE UNIT WATER
TOTAL DRIVE WATER
APPLICATION RATE (IN./DAY) .37
TOTAL ACRES COVERED 81.35
GPM PER ACRE 7.07

| DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 649.9 | 56.6 | | F43A | 1/4 X PLUG | 62 | | 60.5 | 13.90 | 13.50 | | 62 |
| | 660.4 | | | PLUG | | 63 | | | | | | 63 |
| | 670.9 | 55.4 | | F43A | 17/64X PLUG | 64 | | 60.4 | 14.35 | 14.99 | | 64 |
| | 681.5 | | | PLUG | | 65 | | | | | | 65 |
| | 692.0 | 55.4 | | F43A | 17/64X PLUG | 66 | | 60.4 | 14.80 | 14.55 | | 66 |
| 5 | 697.2 | | | | | | 5 | | | | | |
| | 702.5 | | | PLUG | | 67 | | | | | | 67 |
| | 713.1 | 55.3 | | F43A | 17/64X PLUG | 68 | | 60.3 | 15.25 | 14.98 | | 68 |
| | 723.6 | | | PLUG | | 69 | | | | | | 69 |
| | 734.1 | 55.3 | | F43A | 17/64X PLUG | 70 | | 60.3 | 15.61 | 14.98 | | 70 |
| | 744.9 | | | PLUG | | 71 | | | | | | 71 |
| | 755.5 | 53.7 | | F43A | 9/32X PLUG | 72 | | 60.2 | 16.27 | 16.56 | | 72 |
| | 766.0 | | | PLUG | | 73 | | | | | | 73 |

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SALEM, OREGON

LUBA #2008-203
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Revised

#3

ORDER NO. 2467750

VALMONT INDUSTRIES INC
03/02/79
PAGE

IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

LUBA #2008-203 00203

CUSTOMER #3

NAME
SHIP TO ADDRESS — BEESLEY FARMS INC.
CITY — CULVER — OR 97734
COUNTRY — 8

DEALER
NAME — JASA AG. SERVICE — 003540

| | | | |
|---|---|---|---|
| MODEL NUMBER | 4971 | END GUN RADIUS | 7( |
| LENGTH | 1709.3 | PIPE LOSS COEFF | |
| GALLONAGE | 950 | LAST DRIVE UNIT WATER | |
| PIVOT PRESSURE | 76 | TOTAL DRIVE WATER | |
| SERIAL NUMBER | 000000 | APPLICATION RATE (IN./DAY) | .2 |
| | | TOTAL ACRES COVERED | 228.2 |
| | | GPM PER ACRE | 4.1( |

| CPL LOCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 6.5 | | | GAUGE | | 1 | | | | | | 1 |
| 2 | | 17.0 | | | PLUG | | 2 | | | | | | 2 |
| 3 | | 27.6 | | | PLUG | | 3 | | | | | | 3 |
| 4 | | 38.2 | 50.0 | P16 | F32AS | 7/64 | 4 | | 50.0 | .87 | 2.45 | | 4 |
| 5 | | 48.8 | | | PLUG | | 5 | | | | | | 5 |
| 6 | | 59.3 | | | PLUG | | 6 | | | | | | 6 |
| 7 | | 69.8 | 50.0 | P16 | F32AS | 7/64 | 7 | | 50.0 | 1.32 | 2.45 | | 7 |
| 8 | | 80.4 | | | PLUG | | 8 | | | | | | 8 |
| 9 | | 90.9 | | | PLUG | | 9 | | | | | | 9 |
| 10 | | 101.4 | 50.0 | P16 | F32AS | 7/64 | 10 | | 50.0 | 1.92 | 2.45 | | 10 |
| 11 | | 111.9 | | | PLUG | | 11 | | | | | | 11 |
| 12 | | 122.5 | | | PLUG | | 12 | | | | | | 12 |
| 13 | | 133.0 | 50.0 | P16 | F32AS | 7/64 | 13 | | 50.0 | 2.52 | 2.45 | | 13 |

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WATER RESOURCES DEPT.
SALEM, OREGON

VALMONT INDUSTRIES INC

RDER NO. 2467750 03/02/79 PAGE

IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

LUBA #2008-203 00204

CUSTOMER

| | | | | | |
|---|---|---|---|---|---|
| AME | | MODEL NUMBER | 4971 | END GUN RADIUS | 7 |
| HIP TO | EEESLEY FARMS INC. | LENGTH | 1709.3 | PIPE LOSS COEFF | |
| DDRESS | | GALLONAGE | 950 | LAST DRIVE UNIT WATER | |
| ITY | CULVER OR 97734 | PIVOT PRESSURE | 76 | TOTAL DRIVE WATER | |
| OUNTRY | 8 | SERIAL NUMBER | 000000 | APPLICATION RATE (IN./DAY) | .2 |
| | DEALER | | | TOTAL ACRES COVERED | 228.2 |
| AME | JASA AG. SERVICE 003540 | | | GPM PER ACRE | 4.1 |

| CPL LOCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | 143.5 | | | PLUG | | 14 | | | | | | 1 |
| | 1 | 148.8 | | | | | | 1 | | | | | |
| 15 | | 154.1 | | | PLUG | | 15 | | | | | | 1 |
| 16 | | 164.6 | 49.8 | P16 | F32AS | 1/8 | 16 | | 50.0 | 3.12 | 3.22 | | 1 |
| 17 | | 175.1 | | | PLUG | | 17 | | | | | | 1 |
| 18 | | 185.7 | | | PLUG | | 18 | | | | | | 1 |
| 19 | | 196.3 | 49.7 | P16 | F32AS | 9/64 | 19 | | 50.0 | 3.72 | 4.05 | | 1 |
| 20 | | 206.9 | | | PLUG | | 20 | | | | | | 2 |
| 21 | | 217.4 | | | PLUG | | 21 | | | | | | 2 |
| 22 | | 227.9 | 49.7 | P16 | F32AS | 9/64 | 22 | | 50.0 | 4.31 | 4.05 | | 2 |
| 23 | | 238.4 | | | PLUG | | 23 | | | | | | 2 |
| 24 | | 249.0 | | | PLUG | | 24 | | | | | | 2 |
| 25 | 2 | 259.5 | 49.4 | P16 | F33AS | 5/32 | 25 | | 50.0 | 4.91 | 4.95 | | 2 |

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## IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

PAGE

LUBA #2008-203 00205

CUSTOMER

NAME

SHIP TO ADDRESS BEESLEY FARMS INC.

CITY CULVER OR 97734

COUNTRY 8

DEALER

NAME JASA AG. SERVICE 003540

MODEL NUMBER 4971
LENGTH 1709.3
GALLONAGE 950
PIVOT PRESSURE 76
SERIAL NUMBER 000000

END GUN RADIUS 7
PIPE LOSS COEFF
LAST DRIVE UNIT WATER
TOTAL DRIVE WATER
APPLICATION RATE (IN./DAY) .2
TOTAL ACRES COVERED 228.2
GPM PER ACRE 4.1

| SPL LOCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | | 270.0 | | | PLUG | | 26 | | | | | | 26 |
| 27 | | 280.6 | | | PLUG | | 27 | | | | | | 27 |
| 28 | | 291.1 | 49.3 | P16 | F33AS | 11/64 | 28 | | 50.0 | 5.51 | 5.95 | | 28 |
| | 2 | 296.4 | | | | | | 2 | | | | | |
| 29 | | 301.6 | | | PLUG | | 29 | | | | | | 29 |
| 30 | | 312.2 | | | PLUG | | 30 | | | | | | 30 |
| 31 | | 322.7 | 49.3 | P16 | F33AS | 11/64 | 31 | | 50.0 | 6.12 | 5.95 | | 31 |
| 32 | | 333.2 | | | PLUG | | 32 | | | | | | 32 |
| 33 | | 343.9 | | | PLUG | | 33 | | | | | | 33 |
| 34 | | 354.4 | 48.8 | P16 | F33AS | 3/16 | 34 | | 50.0 | 6.72 | 7.08 | | 34 |
| 35 | | 364.9 | | | PLUG | | 35 | | | | | | 35 |
| 36 | | 375.5 | | | PLUG | | 36 | | | | | | 36 |
| 37 | | 386.0 | 48.8 | P16 | F33AS | 3/16 | 37 | | 50.0 | 7.30 | 7.08 | | 37 |

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## IRRIGATION SPRINKLER SET-LP CHART AND SERVICE INFORMATION SHEET

LUBA #2008-203 00206

CUSTOMER

NAME
SHIP TO BEESLEY FARMS INC.
ADDRESS
CITY CULVER OR 97734
COUNTY 8

DEALER

NAME JASA AG. SERVICE 003540

| | | | |
|---|---|---|---|
| MODEL NUMBER | 4971 | END GUN RADIUS | 7 |
| LENGTH | 1709.3 | PIPE LOSS COEFF | |
| GALLONAGE | 950 | LAST DRIVE UNIT WATER | |
| PIVOT PRESSURE | 76 | TOTAL DRIVE WATER | |
| SERIAL NUMBER | 000000 | APPLICATION RATE (IN./DAY) | .2 |
| | | TOTAL ACRES COVERED | 228.2 |
| | | GPM PER ACRE | 4.1 |

| CPL LOCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | | 396.5 | | | PLUG | | 38 | | | | | | 3 |
| 39 | 3 | 407.1 | | | PLUG | | 39 | | | | | | 3 |
| 40 | | 417.6 | 48.8 | P16 | F33AS | 3/16 | 40 | | 50.0 | 7.90 | 7.08 | | 4 |
| 41 | | 428.1 | | | PLUG | | 41 | | | | | | 4 |
| 42 | | 438.7 | | | PLUG | | 42 | | | | | | 4 |
| | 3 | 443.9 | | | | | | 3 | | | | | |
| 43 | | 449.2 | 48.3 | P16 | F33AS | 13/64 | 43 | | 50.0 | 8.50 | 8.30 | | 4 |
| 44 | | 459.7 | | | PLUG | | 44 | | | | | | 4 |
| 45 | | 470.2 | | | PLUG | | 45 | | | | | | 4 |
| 46 | | 480.8 | 48.2 | P16 | F33AS | 7/32 | 46 | | 50.0 | 9.12 | 9.64 | | 4 |
| 47 | | 491.4 | | | PLUG | | 47 | | | | | | 4 |
| 48 | | 502.0 | | | PLUG | | 48 | | | | | | 4 |
| 49 | | 512.5 | 48.3 | P16 | F33AS | 13/64 | 49 | | 50.0 | 8.10 | 8.30 | | 4 |

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## IRRIGATION SPRINKLER SET-LP CHART AND SERVICE INFORMATION SHEET



LUBA #2008-203 00207

CUSTOMER

NAME
SHIP TO BEESLEY FARMS INC.
ADDRESS
CITY CULVER OR 97734
COUNTRY 8

DEALER

NAME JASA AG. SERVICE 003540

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1709.3 |
| GALLONAGE | 950 |
| PIVOT PRESSURE | 76 |
| SERIAL NUMBER | 000000 |
| END GUN RADIUS | |
| PIPE LOSS COEFF | |
| LAST DRIVE UNIT WATER | |
| TOTAL DRIVE WATER | |
| APPLICATION RATE (IN./DAY) | .2 |
| TOTAL ACRES COVERED | 228.2 |
| GPM PER ACRE | 4.1 |

| CPL LOCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | | 523.0 | | | PLUG | | 50 | | | | | | |
| 51 | | 533.6 | 48.8 | P16 | F33AS | 3/16 | 51 | | 50.0 | 6.73 | 7.08 | | 5 |
| 52 | | 544.1 | | | PLUG | | 52 | | | | | | |
| 53 | | 554.6 | 48.8 | P16 | F33AS | 3/16 | 53 | | 50.0 | 7.00 | 7.08 | | 5 |
| 54 | | 565.2 | | | PLUG | | 54 | | | | | | |
| 55 | | 575.7 | 48.8 | P16 | F33AS | 3/16 | 55 | | 50.0 | 7.26 | 7.08 | | 5 |
| 56 | | 586.2 | | | PLUG | | 56 | | | | | | |
| | 4 | 591.5 | | | | | | 4 | | | | | |
| 57 | | 596.7 | 48.8 | P16 | F33AS | 3/16 | 57 | | 50.0 | 7.53 | 7.08 | | 5 |
| 58 | | 607.3 | | | PLUG | | 58 | | | | | | |
| 59 | | 617.8 | 48.3 | P16 | F33AS | 13/64 | 59 | | 50.0 | 7.82 | 8.30 | | 5 |
| 60 | | 628.3 | | | PLUG | | 60 | | | | | | |
| 61 | | 639.0 | 48.3 | P16 | F33AS | 13/64 | 61 | | 50.0 | 8.09 | 8.30 | | 6 |

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## IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

LUBA #2008-203 00208

CUSTOMER

| | | | | | |
|---|---|---|---|---|---|
| AME | | MODEL NUMBER | 4971 | END GUN RADIUS | 7 |
| HIP TO | BEESLEY FARMS INC. | LENGTH | 1709.3 | PIPE LOSS COEFF | |
| DDRESS | | GALLONAGE | 950 | LAST DRIVE UNIT WATER | |
| ITY | CULVER OR 97734 | PIVOT PRESSURE | 76 | TOTAL DRIVE WATER | |
| COUNTRY | 8 | SERIAL NUMBER | 000000 | APPLICATION RATE (IN./DAY) | .2 |
| | DEALER | | | TOTAL ACRES COVERED | 228.2 |
| AME | JASA AG. SERVICE 003540 | | | GPM PER ACRE | 4.1 |

| PL CCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 62 | | 649.5 | | | PLUG | | 62 | | | | | | 6 |
| 63 | | 660.1 | 48.3 | P16 | F33AS | 13/64 | 63 | | 50.0 | 8.33 | 8.30 | | 6 |
| 64 | | 670.6 | | | PLUG | | 64 | | | | | | 6 |
| 65 | | 681.1 | 48.3 | P16 | F33AS | 13/64 | 65 | | 50.0 | 8.59 | 8.30 | | 6 |
| 66 | | 691.7 | | | PLUG | | 66 | | | | | | 6 |
| 67 | 5 | 702.2 5 | 48.3 | P16 | F33AS | 13/64 | 67 | | 50.0 | 8.86 | 8.30 | | 6 |
| 68 | | 712.7 | | | PLUG | | 68 | | | | | | 6 |
| 69 | | 723.2 | 48.2 | P16 | F33AS | 7/32 | 69 | | 50.0 | 9.12 | 9.64 | | 6 |
| 70 | | 733.8 | | | PLUG | | 70 | | | | | | 7 |
| | 5 | 739.1 | | | | | | 5 | | | | | |
| 71 | | 744.3 | 48.2 | P16 | F33AS | 7/32 | 71 | | 50.0 | 9.39 | 9.64 | | 7 |
| 72 | | 754.8 | | | PLUG | | 72 | | | | | | 7 |
| 73 | | 765.4 | 48.2 | P16 | F33AS | 7/32 | 73 | | 50.0 | 9.69 | 9.64 | | 7 |

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SALEM, OREGON

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## IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

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LUBA #2008-203 00209

CUSTOMER

AME
HIP TO BEESLEY FARMS INC.
DDRESS
ITY CULVER OR 97734
OUNTY 8

DEALER

AME JASA AG. SERVICE 003540

MODEL NUMBER 4971
LENGTH 1709.3
GALLONAGE 950
PIVOT PRESSURE 76
SERIAL NUMBER 000000

END GUN RADIUS 7
PIPE LOSS COEFF
LAST DRIVE UNIT WATER
TOTAL DRIVE WATER
APPLICATION RATE (IN./DAY) .2
TOTAL ACRES COVERED 228.2
GPM PER ACRE 4.1

| PL CCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 74 | | 775.9 | | | PLUG | | 74 | | | | | | 7 |
| 75 | | 786.6 | 48.2 | P16 | F33AS | 7/32 | 75 | | 50.0 | 9.95 | 9.64 | | 7 |
| 76 | | 797.1 | | | PLUG | | 76 | | | | | | 7 |
| 77 | | 807.6 | 48.2 | P16 | F33AS | 7/32 | 77 | | 50.0 | 10.19 | 9.64 | | 7 |
| 78 | | 818.2 | | | PLUG | | 78 | | | | | | 7 |
| 79 | | 828.7 | 47.2 | P16 | F43A | 15/64X PLUG | 79 | | 50.0 | 10.45 | 10.83 | | 7 |
| 80 | | 839.2 | | | PLUG | | 80 | | | | | | 8 |
| 81 | 6 | 849.7 | 47.2 | P16 | F43A | 15/64X PLUG | 81 | | 50.0 | 10.72 | 10.83 | | 8 |
| 82 | | 860.3 | | | PLUG | | 82 | | | | | | 8 |
| 83 | | 870.8 | 47.2 | P16 | F43A | 15/64X PLUG | 83 | | 50.0 | 10.98 | 10.83 | | 8 |
| 84 | | 881.3 | | | PLUG | | 84 | | | | | | 8 |
| | 6 | 886.6 | | | | | | 6 | | | | | |
| 85 | | 891.9 | 47.2 | P16 | F43A | 15/64X PLUG | 85 | | 50.0 | 11.25 | 10.83 | | 8 |

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## IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

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CUSTOMER

| | | | | | |
|---|---|---|---|---|---|
| NAME | | MODEL NUMBER | 4971 | END GUN RADIUS | 7 |
| SHIP TO | BEESLEY FARMS INC. | LENGTH | 1709.3 | PIPE LOSS COEFF | |
| ADDRESS | | GALLONAGE | 950 | LAST DRIVE UNIT WATER | |
| CITY | CULVER OR 97734 | PIVOT PRESSURE | 76 | TOTAL DRIVE WATER | |
| COUNTRY | 8 | SERIAL NUMBER | 000000 | APPLICATION RATE (IN./DAY) | .2 |
| | DEALER | | | TOTAL ACRES COVERED | 228.2 |
| NAME | JASA AG. SERVICE 003540 | | | GPM PER ACRE | 4.1 |

| SPL LOCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE CPL WATER LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 86 | | 902.4 | | | PLUG | | 86 | | | | | 8 |
| 87 | | 912.9 | 46.8 | P16 | F43A | 1/4 X PLUG | 87 | | 50.0 | 11.61 | 12.28 | 8 |
| 88 | | 923.5 | | | PLUG | | 88 | | | | | 8 |
| 89 | | 934.3 | 46.8 | P16 | F43A | 1/4 X PLUG | 89 | | 50.0 | 11.88 | 12.28 | 8 |
| 90 | | 944.9 | | | PLUG | | 90 | | | | | 9 |
| 91 | | 955.4 | 46.8 | P16 | F43A | 1/4 X PLUG | 91 | | 50.0 | 12.05 | 12.28 | 9 |
| 92 | | 965.9 | | | PLUG | | 92 | | | | | 9 |
| 93 | | 976.4 | 46.8 | P16 | F43A | 1/4 X PLUG | 93 | | 50.0 | 12.32 | 12.28 | 9 |
| 94 | | 987.0 | | | PLUG | | 94 | | | | | 9 |
| 95 | 7 | 997.5 | 46.8 | P16 | F43A | 1/4 X PLUG | 95 | | 50.0 | 12.58 | 12.28 | 9 |
| 96 | | 1008.0 | | | PLUG | | 96 | | | | | 9 |
| | 7 | 1013.3 | | | | | | 7 | | | | |
| 97 | | 1018.6 | 46.8 | P16 | F43A | 1/4 X PLUG | 97 | | 50.0 | 12.85 | 12.28 | 9 |

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IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

LUBA #2008-203 00211

CUSTOMER

| | | | | | |
|---|---|---|---|---|---|
| AME | | MODEL NUMBER | 4971 | END GUN RADIUS | 7( |
| HIP TO | BEESLEY FARMS INC. | LENGTH | 1709.3 | PIPE LOSS COEFF | |
| DDRESS | | GALLONAGE | 950 | LAST DRIVE UNIT WATER | |
| ITY | CULVER OR 97734 | PIVOT PRESSURE | 76 | TOTAL DRIVE WATER | |
| OUNTRY | & | SERIAL NUMBER | 000000 | APPLICATION RATE (IN./DAY) | .2 |
| | DEALER | | | TOTAL ACRES COVERED | 228.2 |
| AME | JASA AG. SERVICE 003540 | | | GPM PER ACRE | 4.1 |

| PL OCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 98 | | 1029.1 | | | PLUG | | 98 | | | | | | 9 |
| 99 | | 1039.6 | 45.9 | P16 | F43A | 17/64X PLUG | 99 | | 50.0 | 13.20 | 13.64 | | 9 |
| 00 | | 1050.2 | | | PLUG | | 100 | | | | | | 10 |
| 01 | | 1061.0 | 45.9 | P16 | F43A | 17/64X PLUG | 101 | | 50.0 | 13.47 | 13.64 | | 10 |
| 02 | | 1071.5 | | | PLUG | | 102 | | | | | | 10 |
| 03 | | 1082.0 | 45.9 | P16 | F43A | 17/64X PLUG | 103 | | 50.0 | 13.65 | 13.64 | | 10 |
| 04 | | 1092.6 | | | PLUG | | 104 | | | | | | 10 |
| 05 | | 1103.1 | 45.9 | P16 | F43A | 17/64X PLUG | 105 | | 50.0 | 13.91 | 13.64 | | 10 |
| 06 | | 1113.6 | | | PLUG | | 106 | | | | | | 10 |
| 07 | 8 | 1124.2 | 45.98 | P16 | F43A | 17/64X PLUG | 107 | | 50.0 | 14.18 | 13.64 | | 10 |
| 08 | | 1134.7 | | | PLUG | | 108 | | | | | | 10 |
| | 8 | 1139.9 | | | | | | 8 | | | | | |
| 09 | | 1145.2 | 44.6 | P16 | F43A | 9/32X PLUG | 109 | | 50.0 | 14.44 | 15.08 | | 10 |

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IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

LUBA #2008-203 00212

CUSTOMER

| | | | | | |
|---|---|---|---|---|---|
| NAME | | MODEL NUMBER | 4971 | END GUN RADIUS | 7 |
| SHIP TO | BEESLEY FARMS INC. | LENGTH | 1709.3 | PIPE LOSS COEFF | |
| ADDRESS | | GALLONAGE | 950 | LAST DRIVE UNIT WATER | |
| CITY | CULVER OR 97734 | PIVOT PRESSURE | 76 | TOTAL DRIVE WATER | |
| COUNTRY | 8 | SERIAL NUMBER | 000000 | APPLICATION RATE (IN./DAY) | .2 |
| | DEALER | | | TOTAL ACRES COVERED | 228.2 |
| NAME | JASA AG. SERVICE 003540 | | | GPM PER ACRE | 4.1 |

| CPL LOCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ'D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | 1155.7 | | | PLUG | | 110 | | | | | | 11 |
| 11 | | 1166.3 | 44.6 | P16 | F43A | 9/32X PLUG | 111 | | 50.0 | 14.81 | 15.08 | | 11 |
| 12 | | 1176.8 | | | PLUG | | 112 | | | | | | 11 |
| 13 | | 1187.6 | 47.2 | P16 | F43A | 15/64X PLUG | 113 | | 50.0 | 11.34 | 10.83 | | 11 |
| 14 | | 1198.2 | 48.8 | P16 | F33AS | 3/16 | 114 | | 50.0 | 7.56 | 7.08 | | 11 |
| 15 | | 1208.7 | 48.3 | P16 | F33AS | 13/64 | 115 | | 50.0 | 7.62 | 8.30 | | 11 |
| 16 | | 1219.2 | 48.8 | P16 | F33AS | 3/16 | 116 | | 50.0 | 7.69 | 7.08 | | 11 |
| 17 | | 1229.7 | 48.3 | P16 | F33AS | 13/64 | 117 | | 50.0 | 7.76 | 8.30 | | 11 |
| 18 | | 1240.3 | 48.8 | P16 | F33AS | 3/16 | 118 | | 50.0 | 7.82 | 7.08 | | 11 |
| 19 | 9 | 1250.8 | 48.3 | P16 | F33AS | 13/64 | 119 | | 50.0 | 7.89 | 8.30 | | 11 |
| 20 | | 1261.3 | 48.3 | P16 | F33AS | 13/64 | 120 | | 50.0 | 7.95 | 8.30 | | 12 |
| | 9 | 1266.6 | | | | | | 9 | | | | | |
| 21 | | 1271.9 | 48.3 | P16 | F33AS | 13/64 | 121 | | 50.0 | 8.02 | 8.30 | | 12 |

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IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

LUBA #2008-203 00213

CUSTOMER

| | | | | | |
|---|---|---|---|---|---|
| AME | | MODEL NUMBER | 4971 | END GUN RADIUS | 7 |
| HIP TO | BEESLEY FARMS INC. | LENGTH | 1709.3 | PIPE LOSS COEFF | |
| DDRESS | | GALLONAGE | 950 | LAST DRIVE UNIT WATER | |
| ITY | CULVER OR 97734 | PIVOT PRESSURE | 76 | TOTAL DRIVE WATER | |
| OUNTRY | 8 | SERIAL NUMBER | 000000 | APPLICATION RATE (IN./DAY) | .2 |
| | DEALER | | | TOTAL ACRES COVERED | 228.2 |
| AME | JASA AG. SERVICE 003540 | | | GPM PER ACRE | 4.1 |

| PL OCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | | 1409.0 | 48.3 | P16 | F33AS | 13/64 | 134 | | 50.0 | 8.89 | 8.30 | | 13 |
| 35 | | 1419.6 | 48.2 | P16 | F33AS | 7/32 | 135 | | 50.0 | 8.95 | 9.64 | | 13 |
| 36 | | 1430.1 | 48.3 | P16 | F33AS | 13/64 | 136 | | 50.0 | 7.91 | 8.30 | | 13 |
| 37 | | 1438.0 | 48.8 | P16 | F33AS | 3/16 | 137 | | 50.0 | 6.86 | 7.08 | | 13 |
| 38 | | 1446.0 | 48.8 | P16 | F33AS | 3/16 | 138 | | 50.0 | 6.92 | 7.08 | | 13 |
| 39 | | 1454.0 | 48.8 | P16 | F33AS | 3/16 | 139 | | 50.0 | 6.96 | 7.08 | | 13 |
| 40 | | 1462.0 | 48.3 | P16 | F33AS | 13/64 | 140 | | 50.0 | 8.12 | 8.30 | | 14 |
| 41 | | 1472.6 | 48.3 | P16 | F33AS | 13/64 | 141 | | 50.0 | 9.31 | 8.30 | | 14 |
| 42 | | 1483.1 | 48.2 | P16 | F33AS | 7/32 | 142 | | 50.0 | 9.38 | 9.64 | | 14 |
| 43 | // | 1493.7 | // 48.2 | P16 | F33AS | 7/32 | 143 | | 50.0 | 9.45 | 9.64 | | 14 |
| | 11 | 1498.9 | | | | | | 11 | | | | | |
| 44 | | 1504.2 | 48.2 | P16 | F33AS | 7/32 | 144 | | 50.0 | 9.51 | 9.64 | | 14 |
| 45 | | 1514.8 | 48.2 | P16 | F33AS | 7/32 | 145 | | 50.0 | 9.58 | 9.64 | | 14 |

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ORDER NO. 2467750

# VALMONT INDUSTRIES INC

03/02/79

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## IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

LUBA #2008-203 00214

CUSTOMER

NAME

SHIP TO ADDRESS BEESLEY FARMS INC.

CITY CULVER OR 97734

COUNTRY 8

DEALER

NAME JASA AG. SERVICE 003540

MODEL NUMBER 4971

LENGTH 1709.3

GALLONAGE 950

PIVOT PRESSURE 76

SERIAL NUMBER 000000

END GUN RADIUS 1

PIPE LOSS COEFF

LAST DRIVE UNIT WATER

TOTAL DRIVE WATER

APPLICATION RATE (IN./DAY) .2

TOTAL ACRES COVERED 228.2

GPM PER ACRE 4.1

| CPL LOCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 122 | | 1282.4 | 48.3 | P16 | F33AS | 13/64 | 122 | | 50.0 | 8.09 | 8.30 | | 12 |
| 123 | | 1292.9 | 48.3 | P16 | F33AS | 13/64 | 123 | | 50.0 | 8.15 | 8.30 | | 12 |
| 124 | | 1303.5 | 48.3 | P16 | F33AS | 13/64 | 124 | | 50.0 | 8.33 | 8.30 | | 12 |
| 125 | | 1314.3 | 48.3 | P16 | F33AS | 13/64 | 125 | | 50.0 | 8.40 | 8.30 | | 12 |
| 126 | | 1324.8 | 48.3 | P16 | F33AS | 13/64 | 126 | | 50.0 | 8.36 | 8.30 | | 12 |
| 127 | | 1335.3 | 48.3 | P16 | F33AS | 13/64 | 127 | | 50.0 | 8.42 | 8.30 | | 12 |
| 128 | | 1345.9 | 48.3 | P16 | F33AS | 13/64 | 128 | | 50.0 | 8.49 | 8.30 | | 12 |
| 129 | | 1356.4 | 48.3 | P16 | F33AS | 13/64 | 129 | | 50.0 | 8.55 | 8.30 | | 12 |
| 130 | | 1366.9 | 48.3 | P16 | F33AS | 13/64 | 130 | | 50.0 | 8.62 | 8.30 | | 12 |
| 131 | 10 | 1377.5 | 48.3 | P16 | F33AS | 13/64 | 131 | | 50.0 | 8.69 | 8.30 | | 12 |
| 132 | | 1388.0 | 48.2 | P16 | F33AS | 7/32 | 132 | | 50.0 | 8.75 | 9.64 | | 12 |
| | 10 | 1393.2 | | | | | | 10 | | | | | |
| 133 | | 1398.5 | 48.3 | P16 | F33AS | 13/64 | 133 | | 50.0 | 8.82 | 8.30 | | 12 |

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## IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

LUBA #2008-203 00215

CUSTOMER

| | | | | | |
|---|---|---|---|---|---|
| NAME | | MODEL NUMBER | 4971 | END GUN RADIUS | 7 |
| SHIP TO | BEESLEY FARMS INC. | LENGTH | 1709.3 | PIPE LOSS COEFF | |
| ADDRESS | | GALLONAGE | 950 | LAST DRIVE UNIT WATER | |
| CITY | CULVER OR 97734 | PIVOT PRESSURE | 76 | TOTAL DRIVE WATER | |
| COUNTRY | 8 | SERIAL NUMBER | 000000 | APPLICATION RATE (IN./DAY) | .2 |
| | DEALER | | | TOTAL ACRES COVERED | 228.2 |
| NAME | JASA AG. SERVICE 003540 | | | GPM PER ACRE | 4.1 |

| CPL LOCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 146 | | 1525.4 | 48.2 | P16 | F33AS | 7/32 | 146 | | 50.0 | 9.65 | 9.64 | | 14 |
| 147 | | 1535.9 | 48.2 | P16 | F33AS | 7/32 | 147 | | 50.0 | 9.77 | 9.64 | | 14 |
| 148 | | 1546.6 | 48.2 | P16 | F33AS | 7/32 | 148 | | 50.0 | 9.82 | 9.64 | | 14 |
| 149 | | 1557.1 | 48.2 | P16 | F33AS | 7/32 | 149 | | 50.0 | 9.82 | 9.64 | | 14 |
| 150 | | 1567.7 | 48.2 | P16 | F33AS | 7/32 | 150 | | 50.0 | 9.89 | 9.64 | | 15 |
| 151 | | 1578.2 | 48.2 | P16 | F33AS | 7/32 | 151 | | 50.0 | 9.95 | 9.64 | | 15 |
| 152 | | 1588.7 | 47.2 | P16 | F43A | 15/64X PLUG | 152 | | 50.0 | 10.02 | 10.83 | | 15 |
| 153 | | 1599.3 | 48.2 | P16 | F33AS | 7/32 | 153 | | 50.0 | 10.09 | 9.64 | | 15 |
| 154 | | 1609.8 | 48.2 | P16 | F33AS | 7/32 | 154 | | 50.0 | 10.15 | 9.64 | | 15 |
| 155 | | 1620.3 | 48.2 | P16 | F33AS | 7/32 | 155 | | 50.0 | 9.17 | 9.64 | | 15 |
| | 12 | 1625.3 | | | | | | 12 | | | | | |
| 156 | | 1628.7 | 48.8 | P16 | F33AS | 3/16 | 156 | | 50.0 | 7.57 | 7.08 | | 15 |
| 157 | | 1635.8 | 48.8 | P16 | F33AS | 3/16 | 157 | | 50.0 | 7.15 | 7.08 | | 15 |

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# VALMONT INDUSTRIES INC.

ORDER NO. 2467750 — 03/02/79 — PAGE 1

## IRRIGATION SPRINKLER SET-UP CHART AND SERVICE INFORMATION SHEET

CUSTOMER

NAME

SHIP TO ADDRESS BEESLEY FARMS INC.

CITY CULVER OR 97734

COUNTRY 8

DEALER

NAME JASA AG. SERVICE 003540

MODEL NUMBER 4971
LENGTH 1709.3
GALLONAGE 950
PIVOT PRESSURE 76
SERIAL NUMBER 000000

END GUN RADIUS 7
PIPE LOSS COEFF
LAST DRIVE UNIT WATER
TOTAL DRIVE WATER
APPLICATION RATE (IN./DAY) .2
TOTAL ACRES COVERED 228.2
GPM PER ACRE 4.1

LUBA #2008-203 00216

| CPL LOCN | DRIVE NO. | FT. FROM PIVOT | NOZZLE PRESS. | FIXED ORIFICE | SPNK NO. | NOZZLE | CPL LOCN | DRIVE NO. | LINE PRESS. | REQ-D GPM | ACTUAL GPM | DRIVE WATER | CPL LOCN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 158 | | 1643.3 | 48.8 | P16 | F33AS | 3/16 | 158 | | 50.0 | 7.32 | 7.08 | | 158 |
| 159 | | 1650.7 | 48.3 | P16 | F33AS | 13/64 | 159 | | 50.0 | 7.36 | 8.30 | | 159 |
| 160 | | 1658.2 | 48.8 | P16 | F33AS | 3/16 | 160 | | 50.0 | 7.39 | 7.08 | | 160 |
| 161 | | 1665.6 | 48.8 | P16 | F33AS | 3/16 | 161 | | 50.0 | 7.42 | 7.08 | | 161 |
| 162 | | 1673.0 | 48.3 | P16 | F33AS | 13/64 | 162 | | 50.0 | 7.46 | 8.30 | | 162 |
| 163 | | 1680.5 | 48.8 | P16 | F33AS | 3/16 | 163 | | 50.0 | 7.49 | 7.08 | | 163 |
| 164 | | 1687.9 | 48.8 | P16 | F33AS | 3/16 | 164 | | 50.0 | 7.52 | 7.08 | | 164 |
| 165 | | 1695.4 | 48.3 | P16 | F33AS | 13/64 | 165 | | 50.0 | 7.55 | 8.30 | | 165 |
| 166 | | 1702.8 | 48.2 | P16 | F33AS | 7/32 | 166 | | 50.0 | 9.32 | 9.64 | | 166 |
| 167 | | 1709.3 | 54.6 | | 100 | .6 | 167 | | 60.1 | 76.10 | 76.17 | | 167 |

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SALEM, OREGON

Rex Barber

NELSON IRRIGATION CORPORATION
CENTER PIVOT SPRINKLER CHART
LOG NUMBER: N960035 , PSN541
DATE: 25 JAN 96

CUSTOMER: THOMPSON PUMP
MADRAS, OR
326900

IDENTIFYING MARKS: BIG FALLS, #5
10 TOWER

| | | | |
|---|---|---|---|
| NUMBER OF TOWERS: | 10 | NOZZLE FILE: | R3000R |
| PIVOT PRESSURE: | 50.0 PSI | NOZZLE SELECTION OPTION: | 1 |
| TOTAL SYSTEM FLOW: | 1100.0 GPM | FRICTION C-FACTOR: | 150 |
| TOTAL PIPE LENGTH: | 1496.3 FT | COVERAGE WITHOUT GUN: | 1496.3 FT |
| END GUN TYPE: SR100 | | ADJ. END GUN RADIUS: | 95.1 FT |

SYSTEM MANUFACTURER: VALMONT

| | | | |
|---|---|---|---|
| 1 MD7147 | SPAN(S), | 148.7 FT, | 6.41 INCH ID PIPE |
| 6 MD7147 | SPAN(S), | 147.4 FT, | 6.41 INCH ID PIPE |
| 3 MD7126 | SPAN(S), | 126.5 FT, | 6.41 INCH ID PIPE |
| 1 MD084OH | OVERHANG, | 83.5 FT, | 5.79 INCH ID PIPE |

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DISCLAIMER

The products manufactured by Nelson Irrigation Corporation which are specified as a part of this system design are covered by the manufacturer's printed "Warranty and Disclaimer", which applies to the individual components of its own manufacture. The manufacturer cannot be responsible for the performance of the system and makes no warranties, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE and does hereby disclaim any liability for damages due to failure of the system to perform as anticipated.

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N960035 25 JAN 96 VALMONT , 10 TOWER, 1100 GPM, 50 PSI 

| ----OUTLET---- No | Loc | Sep | -REG- Model | PSI RegIn | ---GPM--- Req | Del | ----SPRINKLER---- Model | Plate | SpNo. | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6.9 | | | | | | GAUGE | | | |
| 2 | 17.4 | 17.4 | LB20 | 52.2 | .5 | 1.6 | R3000 | Red | 1 | #14 Lime |
| 3 | 27.9 | | | | | | PLUG | | | |
| 4 | 38.4 | 21.0 | LB20 | 51.7 | 1.1 | 1.6 | R3000 | Red | 2 | #14 Lime |
| 5 | 48.9 | | | | | | PLUG | | | |
| 6 | 59.4 | 21.0 | LB20 | 51.3 | 1.5 | 1.6 | R3000 | Red | 3 | #14 Lime |
| 7 | 69.8 | | | | | | PLUG | | | |
| 8 | 80.3 | 21.0 | LB20 | 50.8 | 1.9 | 1.8 | R3000 | Red | 4 | #15 Lime w/lav |
| 9 | 90.8 | | | | | | PLUG | | | |
| 10 | 101.3 | 21.0 | LB20 | 50.3 | 2.4 | 2.3 | R3000 | Red | 5 | #17 Lvndr w/gra |
| 11 | 111.8 | | | | | | PLUG | | | |
| 12 | 122.3 | 21.0 | LB20 | 49.9 | 2.6 | 2.6 | R3000 | Red | 6 | #18 Gray |
| 13 | 132.8 | | | | | | PLUG | | | |
| 14 | 143.3 | 21.0 | LB20 | 49.4 | 2.8 | 2.9 | R3000 | Red | 7 | #19 Gray w/trqu |
| | 148.7 TOWER NO. 1 | | | | INLINE PRESSURE: 47.0 PSI | | | | | |
| 15 | 154.3 | | | | | | PLUG | | | |
| 16 | 164.8 | 21.5 | LB20 | 49.0 | 3.0 | 2.9 | R3000 | Red | 8 | #19 Gray w/trqu |
| 17 | 175.3 | | | | | | PLUG | | | |
| 18 | 185.8 | 21.0 | LB20 | 48.5 | 3.5 | 3.4 | R3000 | Red | 9 | #21 Trqu w/yllw |
| 19 | 196.3 | | | | | | PLUG | | | |
| 20 | 206.8 | 21.0 | LB20 | 48.0 | 3.9 | 3.8 | R3000 | Red | 10 | #22 Yellow |
| 21 | 217.3 | | | | | | PLUG | | | |
| 22 | 227.8 | 21.0 | LB20 | 47.5 | 4.2 | 4.1 | R3000 | Red | 11 | #23 Yllw w/red |
| 23 | 238.3 | | | | | | PLUG | | | |
| 24 | 248.7 | 21.0 | LB20 | 47.0 | 4.7 | 4.5 | R3000 | Red | 12 | #24 Red |
| 25 | 259.2 | | | | | | PLUG | | | |
| 26 | 269.7 | 21.0 | LB20 | 46.5 | 5.1 | 5.3 | R3000 | Red | 13 | #26 White |
| 27 | 280.2 | | | | | | PLUG | | | |
| 28 | 290.7 | 21.0 | LB20 | 46.1 | 5.2 | 5.3 | R3000 | Red | 14 | #26 White |
| | 296.1 TOWER NO. 2 | | | | INLINE PRESSURE: 43.9 PSI | | | | | |
| 29 | 301.8 | | | | | | PLUG | | | |
| 30 | 312.2 | 21.5 | LB20 | 45.6 | 5.7 | 5.7 | R3000 | Red | 15 | #27 White w/blu |
| 31 | 322.7 | | | | | | PLUG | | | |
| 32 | 333.2 | 21.0 | LB20 | 45.1 | 6.1 | 6.2 | R3000 | Red | 16 | #28 Blue |
| 33 | 343.7 | | | | | | PLUG | | | |
| 34 | 354.2 | 21.0 | LB20 | 44.6 | 6.4 | 6.6 | R3000 | Red | 17 | #29 Blue w/brn |
| 35 | 364.7 | | | | | | PLUG | | | |
| 36 | 375.2 | 21.0 | LB20 | 44.1 | 6.7 | 6.6 | R3000 | Red | 18 | #29 Blue w/brn |
| 37 | 385.7 | | | | | | PLUG | | | |
| 38 | 396.2 | 21.0 | LB20 | 43.6 | 7.4 | 7.4 | R3000 | Red | 19 | #31 Brwn w/orng |
| 39 | 406.6 | | | | | | PLUG | | | |
| 40 | 417.1 | 21.0 | LB20 | 43.2 | 7.6 | 7.4 | R3000 | Red | 20 | #31 Brwn w/orng |
| 41 | 427.6 | | | | | | PLUG | | | |
| 42 | 438.1 | 21.0 | LB20 | 42.6 | 8.3 | 8.5 | R3000 | Red | 21 | #33 Ornge w/grn |
| | 443.5 TOWER NO. 3 | | | | INLINE PRESSURE: 41.1 PSI | | | | | |
| 43 | 449.2 | | | | | | PLUG | | | |
| 44 | 459.7 | 21.5 | LB20 | 42.2 | 8.4 | 8.5 | R3000 | Red | 22 | #33 Ornge w/grn |
| 45 | 470.1 | | | | | | PLUG | | | |
| 46 | 480.6 | 21.0 | LB20 | 41.7 | 8.7 | 9.0 | R3000 | Red | 23 | #34 Drk Green |

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| ----OUTLET---- No | Loc | Sep | -REG- Model | PSI RegIn | ---GPM--- Req | Del | ----SPRINKLER---NOZZLE--- Model | Plate | SpNo. | |
|---|---|---|---|---|---|---|---|---|---|---|
| 47 | 491.1 | | | | | | PLUG | | | |
| 48 | 501.6 | 21.0 | LB20 | 41.3 | 8.9 | 9.0 | R3000 | Red | 24 | #34 Drk Green |
| 49 | 512.1 | | | | | | PLUG | | | |
| 50 | 522.6 | 21.0 | LB20 | 40.8 | 9.5 | 9.4 | R3000 | Red | 25 | #35 Green w/prp |
| 51 | 533.1 | | | | | | PLUG | | | |
| 52 | 543.6 | 21.0 | HB20 | 40.3 | 10.0 | 10.0 | R3000 | Red | 26 | #36 Purple |
| 53 | 554.1 | | | | | | PLUG | | | |
| 54 | 564.6 | 21.0 | HB20 | 39.8 | 10.3 | 10.6 | R3000 | Red | 27 | #37 Prpl w/blck |
| 55 | 575.0 | | | | | | PLUG | | | |
| 56 | 585.5 | 21.0 | HB20 | 39.4 | 10.6 | 10.6 | R3000 | Red | 28 | #37 Prpl w/blck |
| | 591.0 TOWER NO. 4 | | | INLINE PRESSURE: 38.6 PSI | | | | | | |
| 57 | 596.6 | | | | | | PLUG | | | |
| 58 | 607.1 | 21.5 | HB20 | 38.8 | 11.2 | 11.2 | R3000 | Red | 29 | #38 Black |
| 59 | 617.6 | | | | | | PLUG | | | |
| 60 | 628.1 | 21.0 | HB20 | 38.4 | 11.5 | 11.2 | R3000 | Red | 30 | #38 Black |
| 61 | 638.5 | | | | | | PLUG | | | |
| 62 | 649.0 | 21.0 | HB20 | 37.9 | 12.2 | 12.4 | R3000 | Red | 31 | #40 DrkTurquse |
| 63 | 659.5 | | | | | | PLUG | | | |
| 64 | 670.0 | 21.0 | HB20 | 37.6 | 12.0 | 12.4 | R3000 | Red | 32 | #40 DrkTurquse |
| 65 | 680.5 | | | | | | PLUG | | | |
| 66 | 691.0 | 21.0 | HB20 | 37.2 | 12.3 | 12.4 | R3000 | Red | 33 | #40 DrkTurquse |
| 67 | 701.5 | | | | | | PLUG | | | |
| 68 | 712.0 | 21.0 | HB20 | 36.7 | 12.9 | 12.4 | R3000 | Red | 34 | #40 DrkTurquse |
| 69 | 722.5 | | | | | | PLUG | | | |
| 70 | 733.0 | 21.0 | HB20 | 35.9 | 14.1 | 13.6 | R3000 | Red | 35 | #42 Mustard |
| | 738.4 TOWER NO. 5 | | | INLINE PRESSURE: 36.4 PSI | | | | | | |
| 71 | 744.0 | | | | | | PLUG | | | |
| 72 | 754.5 | 21.5 | HB20 | 35.4 | 14.5 | 14.9 | R3000 | Red | 36 | #44 Maroon |
| 73 | 765.0 | | | | | | PLUG | | | |
| 74 | 775.5 | 21.0 | HB20 | 35.5 | 13.7 | 13.6 | R3000 | Red | 37 | #42 Mustard |
| 75 | 786.0 | | | | | | PLUG | | | |
| 76 | 796.5 | 21.0 | HB20 | 34.8 | 14.6 | 14.9 | R3000 | Red | 38 | #44 Maroon |
| 77 | 806.9 | | | | | | PLUG | | | |
| 78 | 817.4 | 21.0 | HB20 | 34.6 | 14.6 | 14.9 | R3000 | Red | 39 | #44 Maroon |
| 79 | 827.9 | | | | | | PLUG | | | |
| 80 | 838.4 | 21.0 | HB20 | 34.2 | 15.0 | 14.9 | R3000 | Red | 40 | #44 Maroon |
| 81 | 848.9 | | | | | | PLUG | | | |
| 82 | 859.4 | 21.0 | HB20 | 35.2 | 11.9 | 12.4 | R3000 | Red | 41 | #40 DrkTurquse |
| 83 | 869.9 | 10.5 | HB20 | 36.4 | 7.5 | 7.5 | R3000 | Red | 42 | #31 Brwn w/orng |
| 84 | 880.4 | 10.5 | HB20 | 36.1 | 8.3 | 8.0 | R3000 | Red | 43 | #32 Orange |
| | 885.8 TOWER NO. 6 | | | INLINE PRESSURE: 34.6 PSI | | | | | | |
| 85 | 891.4 | 11.1 | HB20 | 35.8 | 8.6 | 8.5 | R3000 | Red | 44 | #33 Ornge w/grn |
| 86 | 901.9 | 10.5 | HB20 | 35.8 | 8.4 | 8.5 | R3000 | Red | 45 | #33 Ornge w/grn |
| 87 | 912.4 | 10.5 | HB20 | 35.7 | 8.2 | 8.0 | R3000 | Red | 46 | #32 Orange |
| 88 | 922.9 | 10.5 | HB20 | 35.5 | 8.6 | 8.5 | R3000 | Red | 47 | #33 Ornge w/grn |
| 89 | 933.4 | 10.5 | HB20 | 35.4 | 8.6 | 8.5 | R3000 | Red | 48 | #33 Ornge w/grn |
| 90 | 943.9 | 10.5 | HB20 | 35.3 | 8.8 | 8.5 | R3000 | Red | 49 | #33 Ornge w/grn |
| 91 | 954.4 | 10.5 | HB20 | 35.1 | 9.0 | 9.0 | R3000 | Red | 50 | #34 Drk Green |

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N960035 25 JAN 96 VALMONT , 10 TOWER, 1100 GPM, 50 PSI 

| OUTLET No | Loc | Sep | REG Model | PSI RegIn | GPM Req | GPM Del | SPRINKLER Model | NOZZLE Plate | Spn | |
|---|---|---|---|---|---|---|---|---|---|---|
| 92 | 964.9 | 10.5 | HB20 | 35.1 | 8.8 | 9.0 | R3000 | Red | 51 | #34 Drk Green |
| 93 | 975.3 | 10.5 | HB20 | 35.0 | 8.7 | 8.5 | R3000 | Red | 52 | #33 Ornge w/grn |
| 94 | 985.8 | 10.5 | HB20 | 34.8 | 9.2 | 9.0 | R3000 | Red | 53 | #34 Drk Green |
| 95 | 996.3 | 10.5 | HB20 | 34.7 | 9.3 | 9.5 | R3000 | Red | 54 | #35 Green w/prp |
| 96 | 1006.8 | 10.5 | HB20 | 34.7 | 9.0 | 9.0 | R3000 | Red | 55 | #34 Drk Green |
| 97 | 1017.3 | 10.5 | HB20 | 34.5 | 9.3 | 9.5 | R3000 | Red | 56 | #35 Green w/prp |
| 98 | 1027.8 | 10.5 | HB20 | 34.4 | 9.5 | 9.5 | R3000 | Red | 57 | #35 Green w/prp |
| | 1033.2 TOWER NO. 7 | | | INLINE PRESSURE: 33.2 PSI | | | | | | |
| 99 | 1038.8 | 11.1 | HB20 | 34.2 | 9.7 | 9.9 | R3000 | Red | 58 | #36 Purple |
| 100 | 1049.3 | 10.5 | HB20 | 34.2 | 9.4 | 9.5 | R3000 | Red | 59 | #35 Green w/prp |
| 101 | 1059.8 | 10.5 | HB20 | 34.1 | 9.6 | 9.5 | R3000 | Red | 60 | #35 Green w/prp |
| 102 | 1070.3 | 10.5 | HB20 | 33.9 | 9.9 | 9.9 | R3000 | Red | 61 | #36 Purple |
| 103 | 1080.8 | 10.5 | HB20 | 33.9 | 9.9 | 9.9 | R3000 | Red | 62 | #36 Purple |
| 104 | 1091.3 | 10.5 | HB20 | 33.8 | 9.9 | 9.9 | R3000 | Red | 63 | #36 Purple |
| 105 | 1101.8 | 10.5 | HB20 | 33.7 | 10.1 | 9.9 | R3000 | Red | 64 | #36 Purple |
| 106 | 1112.3 | 10.5 | HB20 | 33.5 | 10.3 | 10.6 | R3000 | Red | 65 | #37 Prpl w/blck |
| 107 | 1122.8 | 10.5 | HB20 | 33.6 | 10.0 | 9.9 | R3000 | Red | 66 | #36 Purple |
| 108 | 1133.3 | 10.5 | HB20 | 33.4 | 10.5 | 10.6 | R3000 | Red | 67 | #37 Prpl w/blck |
| 109 | 1143.7 | 10.5 | HB20 | 33.3 | 10.3 | 10.6 | R3000 | Red | 68 | #37 Prpl w/blck |
| 110 | 1154.2 | 10.5 | HB20 | 33.2 | 10.6 | 10.6 | R3000 | Red | 69 | #37 Prpl w/blck |
| | 1159.8 TOWER NO. 8 | | | INLINE PRESSURE: 32.4 PSI | | | | | | |
| 111 | 1165.4 | 11.1 | HB20 | 33.0 | 11.0 | 11.2 | R3000 | Red | 70 | #38 Black |
| 112 | 1175.9 | 10.5 | HB20 | 33.1 | 10.6 | 10.6 | R3000 | Red | 71 | #37 Prpl w/blck |
| 113 | 1186.4 | 10.5 | HB20 | 32.9 | 10.9 | 11.2 | R3000 | Red | 72 | #38 Black |
| 114 | 1196.8 | 10.5 | HB20 | 33.0 | 10.7 | 10.6 | R3000 | Red | 73 | #37 Prpl w/blck |
| 115 | 1207.3 | 10.5 | HB20 | 32.8 | 11.1 | 11.2 | R3000 | Red | 74 | #38 Black |
| 116 | 1217.8 | 10.5 | HB20 | 32.7 | 11.1 | 11.2 | R3000 | Red | 75 | #38 Black |
| 117 | 1228.3 | 10.5 | HB20 | 32.7 | 11.1 | 11.2 | R3000 | Red | 76 | #38 Black |
| 118 | 1238.8 | 10.5 | HB20 | 32.6 | 11.3 | 11.2 | R3000 | Red | 77 | #38 Black |
| 119 | 1249.3 | 10.5 | HB20 | 32.5 | 11.6 | 11.1 | R3000 | Red | 78 | #38 Black |
| 120 | 1259.8 | 10.5 | HB20 | 32.3 | 11.9 | 12.4 | R3000 | Red | 79 | #40 DrkTurquse |
| 121 | 1270.3 | 10.5 | HB20 | 32.5 | 11.2 | 11.2 | R3000 | Red | 80 | #38 Black |
| 122 | 1280.8 | 10.5 | HB20 | 32.2 | 12.1 | 12.3 | R3000 | Red | 81 | #40 DrkTurquse |
| | 1286.3 TOWER NO. 9 | | | INLINE PRESSURE: 31.9 PSI | | | | | | |
| 123 | 1291.9 | 11.1 | HB20 | 32.2 | 11.9 | 12.4 | R3000 | Red | 82 | #40 DrkTurquse |
| 124 | 1302.4 | 10.5 | HB20 | 32.3 | 11.5 | 11.1 | R3000 | Red | 83 | #38 Black |
| 125 | 1312.9 | 10.5 | HB20 | 32.0 | 12.3 | 12.3 | R3000 | Red | 84 | #40 DrkTurquse |
| 126 | 1323.4 | 10.5 | HB20 | 32.1 | 12.1 | 12.3 | R3000 | Red | 85 | #40 DrkTurquse |
| 127 | 1333.9 | 10.5 | HB20 | 32.1 | 11.9 | 12.3 | R3000 | Red | 86 | #40 DrkTurquse |
| 128 | 1344.4 | 10.5 | HB20 | 32.1 | 11.9 | 12.4 | R3000 | Red | 87 | #40 DrkTurquse |
| 129 | 1354.8 | 10.5 | HB20 | 32.1 | 11.9 | 12.4 | R3000 | Red | 88 | #40 DrkTurquse |
| 130 | 1365.3 | 10.5 | HB20 | 32.0 | 12.0 | 12.3 | R3000 | Red | 89 | #40 DrkTurquse |
| 131 | 1375.8 | 10.5 | HB20 | 31.9 | 12.3 | 12.3 | R3000 | Red | 90 | #40 DrkTurquse |
| 132 | 1386.3 | 10.5 | HB20 | 31.7 | 12.6 | 12.3 | R3000 | Red | 91 | #40 DrkTurquse |
| 133 | 1396.8 | 10.5 | HB20 | 31.6 | 13.0 | 13.6 | R3000 | Red | 92 | #42 Mustard |
| 134 | 1407.3 | 10.5 | HB20 | 32.2 | 11.3 | 11.2 | R3000 | Red | 93 | #38 Black |

N960035 25 JAN 96 VALMONT , 10 TOWER, 1100 GPM, 50 PSI PAGE 5

| -----OUTLET---- No | Loc | Sep | -REG- Model | PSI RegIn | ---GPM--- Req | Del | ----SPRINKLER----- Model | Plate | SpNo. | ---NOZZLE--- |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1412.8 | | TOWER NO. 10 | | | | INLINE PRESSURE: 31.6 PSI | | | |
| 135 | 1416.2 | 8.9 | HB20 | 32.6 | 10.1 | 9.9 | R3000 | Red | 94 | #36 Purple |
| 136 | 1423.5 | 7.3 | HB20 | 32.8 | 9.2 | 9.0 | R3000 | Red | 95 | #34 Drk Green |
| 137 | 1430.8 | 7.3 | HB20 | 32.8 | 9.3 | 9.5 | R3000 | Red | 96 | #35 Green w/prp |
| 138 | 1438.0 | 7.3 | HB20 | 32.9 | 8.9 | 9.0 | R3000 | Red | 97 | #34 Drk Green |
| 139 | 1445.3 | 7.3 | HB20 | 32.8 | 9.1 | 9.0 | R3000 | Red | 98 | #34 Drk Green |
| 140 | 1452.6 | 7.3 | HB20 | 32.6 | 9.8 | 9.9 | R3000 | Red | 99 | #36 Purple |
| 141 | 1460.7 | 8.2 | HB20 | 32.6 | 9.9 | 9.9 | R3000 | Red | 100 | #36 Purple |
| 142 | 1468.2 | 7.5 | HB20 | 32.7 | 9.5 | 9.5 | R3000 | Red | 101 | #35 Green w/prp |
| 143 | 1475.7 | 7.5 | HB20 | 32.6 | 9.6 | 9.4 | R3000 | Red | 102 | #35 Green w/prp |
| 144 | 1483.1 | 7.5 | HB20 | 32.6 | 9.8 | 9.9 | R3000 | Red | 103 | #36 Purple |
| 145 | 1490.6 | 7.5 | HB20 | 31.7 | 12.2 | 12.3 | R3000 | Red | 104 | #40 DrkTurquse |

END GUN: (NOZZLE SELECTED BASED ON RECOMMENDED 170 DEGREE ARC.)
1496.3 * 31.5 127.6 121.0 SR100 .85"

SYSTEM INLINE END PRESSURE: 31.5 PSI, INCLUDING 0 FT. INCREASE IN ELEVATION

TOTAL GPM DELIVERED: 1100.3

SYSTEM GPM PER ACRE: 6.0

* INDICATES SPRINKLERS OPERATING BELOW RECOMMENDED PRESSURE LIMITS.

104 MOUNTING ASSEMBLIES USED:
Flex Hose (6')
3/4" Sch.40 Galv. Steel Gooseneck
72" Flexible Hose
Standard Tee (as needed)
Standard Regulator (as needed)

NOZZLE SELECTION VERIFICATION

| SPAN # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | OH+EG |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GPM REQ. | 12.8 | 29.6 | 48.2 | 66.4 | 86.1 | 100.1 | 123.8 | 120.3 | 134.7 | 144.8 | 235.1 |
| GPM DEL. | 14.3 | 29.3 | 48.2 | 67.0 | 85.5 | 101.2 | 123.5 | 120.8 | 135.1 | 147.0 | 228.4 |
| % DEV. | 11% | -1% | 0% | 1% | -1% | 1% | 0% | 0% | 0% | 2% | -3% |

A HIGH DEVIATION IN SPAN 1 IS UNAVOIDABLE DUE TO NOZZLE SIZE LIMITATIONS

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## DATA FILE IDENTIFICATION

| Nozzle File ID | | Regulator Table ID | |
|---|---|---|---|
| R3000R | 1A13 | LB20 | 1303 |
| | | HB20 | 196D |

| WATER APPLICATION DEPTH PER REVOLUTION | | | | | | |
|---|---|---|---|---|---|---|
| REVOLUTION TIME | 12 HRS | 24 HRS | 36 HRS | 48 HRS | 60 HRS | 72 HRS |
| APPLICATION DEPTH (INCHES) | .16 | .32 | .48 | .64 | .80 | .96 |

Percentage timer chart not included due to lack of data.

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LUBA #2008-203
00222

NELSON IRRIGATION CORPORATION
CENTER PIVOT SPRINKLER CHART
LOG NUMBER: N900635 , PSN321
DATE: 9/24/90

CUSTOMER: CENTRAL OREGON IRRIG
MADRAS, OR
60900

INDENTIFYING MARKS: BARBER 1 1/2 prt
CENTRAL OREGON IRRIG
MADRAS, OR

| | | | |
|---|---|---|---|
| NUMBER OF TOWERS: | 7 | NOZZLE FILE: LABHP | |
| PIVOT PRESSURE: | 55.0 PSI | NOZZLE SELECTION OPTION: | 2 |
| TOTAL SYSTEM FLOW: | 350.0 GPM | FRICTION C-FACTOR: | 150 |
| TOTAL PIPE LENGTH: | 949.4 FT | COVERAGE WITHOUT GUN: | 949.4 FT |
| END GUN TYPE: P85ASV | | ADJ. END GUN RADIUS: | 60.3 FT |

| | | | |
|---|---|---|---|
| 1 | MD7147F | SPAN(S), 148.7 FT, | 6.41 INCH ID PIPE |
| 2 | MD7147A | SPAN(S), 147.4 FT, | 6.41 INCH ID PIPE |
| 3 | MD7126A | SPAN(S), 126.5 FT, | 6.41 INCH ID PIPE |
| 1 | MD7126L | SPAN(S), 126.3 FT, | 6.41 INCH ID PIPE |

#9

147
147
126
126
147
147
75 915 ft total

DISCLAIMER

The products manufactured by Nelson Irrigation Corporation which are specified as a part of this system design are covered by the manufacturer's printed "Warranty and Disclaimer", which applies to the individual components of its own manufacture. The manufacturer cannot be responsible for the performance of the system and makes no warranties, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE and does hereby disclaim any liability for damages due to failure of the system to perform as anticipated.

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LUBA #2008-203
0223

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| -OUTLET- NO. | LOC. | -SPRINKLER- NO. | MODEL | NOZZLE | REG- MODEL | -GPM- REQ. | DEL. | -PRESSURE- INLINE |
|---|---|---|---|---|---|---|---|---|
| 1 | 6.9 | | GAUGE | | | | | |
| 2 | 17.4 | | PLUG | | | | | |
| 3 | 27.9 | | PLUG | | | | | |
| 4 | 38.3 | 1 | L2004T | RN-7/64 (14) | PR50 | 1.5 | 2.5 | 54.9 |
| 5 | 48.8 | | PLUG | | | | | |
| 6 | 59.3 | | PLUG | | | | | |
| 7 | 69.8 | 2 | L2004T | RN-7/64 (14) | PR50 | 1.6 | 2.5 | 54.8 |
| 8 | 80.3 | | PLUG | | | | | |
| 9 | 90.8 | | PLUG | | | | | |
| 10 | 101.3 | 3 | L2004T | RN-7/64 (14) | PR50 | 2.0 | 2.5 | 54.7 |
| 11 | 111.8 | | PLUG | | | | | |
| 12 | 122.3 | | PLUG | | | | | |
| 13 | 132.8 | 4 | L2004T | RN-7/64 (14) | PR50 | 2.7 | 2.5 | 54.7 |
| 14 | 143.2 | | PLUG | | | | | |
| | 148.7 | TOWER NO. 1 | | | | | | |
| 15 | 154.3 | | PLUG | | | | | |
| 16 | 164.8 | 5 | L2004T | RN-9/64 (18) | PR50 | 3.8 | 4.1 | 54.6 |
| 17 | 175.3 | | PLUG | | | | | |
| 18 | 185.8 | | PLUG | | | | | |
| 19 | 196.3 | 6 | L2004T | RN-9/64 (18) | PR50 | 3.9 | 4.1 | 54.5 |
| 20 | 206.8 | | PLUG | | | | | |
| 21 | 217.3 | | PLUG | | | | | |
| 22 | 227.8 | 7 | F33AS | RN-5/32 (20) | PR50 | 4.7 | 5.0 | 54.4 |
| 23 | 238.3 | | PLUG | | | | | |
| 24 | 248.7 | | PLUG | | | | | |
| 25 | 259.2 | 8 | F33AS | RN-5/32 (20) | PR50 | 5.3 | 4.9 | 54.4 |
| 26 | 269.7 | | PLUG | | | | | |
| 27 | 280.2 | | PLUG | | | | | |
| 28 | 290.7 | 9 | F33AS | RN-11/64 (22) | PR50 | 5.6 | 5.9 | 54.3 |
| | 296.1 | TOWER NO. 2 | | | | | | |
| 29 | 301.8 | | PLUG | | | | | |
| 30 | 312.2 | 10 | L2004T | RN-9/64 (18) | PR50 | 4.2 | 4.1 | 54.3 |
| 31 | 322.7 | | PLUG | | | | | |
| 32 | 333.2 | 11 | F33AS | RN-5/32 (20) | PR50 | 4.9 | 4.9 | 54.2 |
| 33 | 343.7 | | PLUG | | | | | |
| 34 | 354.2 | 12 | F33AS | RN-5/32 (20) | PR50 | 5.0 | 4.9 | 54.2 |
| 35 | 364.7 | | PLUG | | | | | |
| 36 | 375.2 | 13 | F33AS | RN-11/64 (22) | PR50 | 5.5 | 5.9 | 54.1 |
| 37 | 385.7 | | PLUG | | | | | |
| 38 | 396.2 | 14 | F33AS | RN-5/32 (20) | PR50 | 5.2 | 4.9 | 54.1 |
| 39 | 406.6 | | PLUG | | | | | |
| 40 | 417.1 | 15 | F33AS | RN-11/64 (22) | PR50 | 6.3 | 5.9 | 54.1 |
| 41 | 427.6 | | PLUG | | | | | |
| 42 | 438.1 | 16 | F33AS | RN-3/16 (24) | PR50 | 6.7 | 6.9 | 54.0 |
| | 443.5 | TOWER NO. 3 | | | | | | |
| 43 | 449.2 | | PLUG | | | | | |
| 44 | 459.7 | 17 | F33AS | RN-3/16 (24) | PR50 | 6.5 | 6.9 | 54.0 |
| 45 | 470.1 | | PLUG | | | | | |

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| -OUTLET- NO. | LOC. | -SPRINKLER- NO. | MODEL | NOZZLE | -REG- MODEL | -GPH- REQ. | DEL. | -PRESSURE- INLINE |
|---|---|---|---|---|---|---|---|---|
| 46 | 480.6 | 18 | F33AS | RN-11 | PR50 | 6.4 | 5.9 | 53.9 |
| 47 | 491.1 | | PLUG | | | | | |
| 48 | 501.6 | 19 | F33AS | RN-13/64 (26) | PR50 | 7.7 | 8.1 | 53.9 |
| 49 | 512.1 | | PLUG | | | | | |
| 50 | 522.6 | 20 | F33AS | RN-3/16 (24) | PR50 | 7.1 | 6.9 | 53.9 |
| 51 | 533.1 | | PLUG | | | | | |
| 52 | 543.6 | 21 | F33AS | RN-13/64 (26) | PR50 | 8.0 | 8.1 | 53.9 |
| 53 | 554.1 | | PLUG | | | | | |
| 54 | 564.6 | 22 | F33AS | RN-13/64 (26) | PR50 | 8.1 | 8.1 | 53.8 |
| | 570.1 | TOWER NO. 4 | | | | | | |
| 55 | 575.7 | | PLUG | | | | | |
| 56 | 586.2 | 23 | F33AS | RN-13/64 (26) | PR50 | 8.5 | 8.0 | 53.8 |
| 57 | 596.7 | | PLUG | | | | | |
| 58 | 607.2 | 24 | F33AS | RN-7/32 (28) | PR50 | 9.2 | 9.3 | 53.8 |
| 59 | 617.7 | | PLUG | | | | | |
| 60 | 628.2 | 25 | F33AS | RN-7/32 (28) | PR50 | 8.9 | 9.3 | 53.8 |
| 61 | 638.6 | | PLUG | | | | | |
| 62 | 649.1 | 26 | F33AS | RN-7/32 (28) | PR50 | 8.9 | 9.3 | 53.7 |
| 63 | 659.6 | | PLUG | | | | | |
| 64 | 670.1 | 27 | F33AS | RN-7/32 (28) | PR50 | 9.2 | 9.3 | 53.7 |
| 65 | 680.6 | | PLUG | | | | | |
| 66 | 691.1 | 28 | F43AP | RN-15/64 (30) | PR50 | 9.9 | 10.4 | 53.7 |
| | 696.6 | TOWER NO. 5 | | | | | | |
| 67 | 702.2 | | PLUG | | | | | |
| 68 | 712.7 | 29 | F43AP | RN-15/64 (30) | PR50 | 9.9 | 10.4 | 53.7 |
| 69 | 723.2 | | PLUG | | | | | |
| 70 | 733.7 | 30 | F43AP | RN-15/64 (30) | PR50 | 10.1 | 10.3 | 53.7 |
| 71 | 744.2 | | PLUG | | | | | |
| 72 | 754.7 | 31 | F43AP | RN-15/64 (30) | PR50 | 10.5 | 10.3 | 53.7 |
| 73 | 765.2 | | PLUG | | | | | |
| 74 | 775.7 | 32 | F43AP | RN-1/4 (32) | PR50 | 11.3 | 11.7 | 53.6 |
| 75 | 786.2 | | PLUG | | | | | |
| 76 | 796.6 | 33 | F43AP | RN-15/64 (30) | PR50 | 11.0 | 10.4 | 53.6 |
| 77 | 807.1 | | PLUG | | | | | |
| 78 | 817.6 | 34 | F43AP | RN-17/64 (34) | PR50 | 12.5 | 13.0 | 53.6 |
| | 823.1 | TOWER NO. 6 | | | | | | |
| 79 | 828.8 | | PLUG | | | | | |
| 80 | 839.3 | 35 | F43AP | RN-1/4 (32) | PR50 | 11.7 | 11.7 | 53.6 |
| 81 | 849.7 | | PLUG | | | | | |
| 82 | 860.2 | 36 | F43AP | RN-17/64 (34) | PR50 | 12.3 | 13.0 | 53.6 |
| 83 | 870.7 | | PLUG | | | | | |
| 84 | 881.2 | 37 | F43AP | RN-1/4 (32) | PR50 | 12.0 | 11.7 | 53.6 |
| 85 | 891.7 | | PLUG | | | | | |
| 86 | 902.2 | 38 | F43AP | RN-17/64 (34) | PR50 | 13.2 | 12.9 | 53.6 |
| 87 | 912.7 | | PLUG | | | | | |
| 88 | 923.2 | 39 | F43AP | RN-17/64 (34) | PR50 | 13.5 | 12.9 | 53.6 |
| 89 | 933.7 | | PLUG | | | | | |
| 90 | 944.2 | 40 | F43AP | RN-15/64 (30) | PR50 | 10.7 | 10.4 | 53.6 |

| -OUTLET- NO. | LOC. | -SPRINKLER- NO. | MODEL | NOZZLE | -REG- MODEL | -GPM- REQ. | DEL. | -PRESSURE- INLINE |
|---|---|---|---|---|---|---|---|---|
| 949.4 | TOWER NO. 7 | | | | | | | |
| END GUN: (BASED ON RECOMMENDED ARC SETTING.) | | | | | | | | |
| 949.4 | | | P85ASV | 7/16" NOZZLE | | 40.6 | 40.0 | 53.6 |

SYSTEM END PRESSURE: 53.6 PSI, INCLUDING 0 FT. INCREASE IN ELEVATION

TOTAL GPM DELIVERED: 349.7

SYSTEM GPM PER ACRE: 4.8

NOZZLE SELECTION VERIFICATION

| SPAN # | 1 | 2 | 3 | 4 | 5 | 6 | 7+EG |
|---|---|---|---|---|---|---|---|
| GPM REQ. | 7.8 | 23.2 | 37.7 | 43.7 | 54.7 | 65.3 | 114.0 |
| GPM DEL. | 10.0 | 24.0 | 37.6 | 43.9 | 55.5 | 66.1 | 112.6 |
| % DEV. | 29% | 3% | 0% | 1% | 2% | 1% | -1% |

A HIGH DEVIATION IN SPAN 1 IS UNAVOIDABLE DUE TO NOZZLE SIZE LIMITATIONS

WATER APPLICATION DEPTH PER REVOLUTION

| REVOLUTION TIME | 12 HRS | 24 HRS | 36 HRS | 48 HRS | 60 HRS | 72 HRS |
|---|---|---|---|---|---|---|
| APPLICATION DEPTH (INCHES) | .13 | .25 | .38 | .50 | .63 | .76 |

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-PART NUMBER SUMMARY-

| PART NO. | QTY | DESCRIPTION |
|---|---|---|
| 6165-000 | 13 | 3P PLUG |
| 6902-000 | 20 | F33AS IMPACT SPRINKLER |
| 6903-000 | 13 | F43A IMPACT SPRINKLER |
| 7185-210 | 7 | L2004T IMPACT SPRINKLER 10d |
| 8189-109 | 4 | #14 (7/64) 2RN NOZZLE |
| 8189-141 | 3 | #18 (9/64) 2RN NOZZLE |
| 8250-009 | 40 | HI-FLO 50 PSI REGULATOR 3/4ExF |
| 8898-156 | 5 | #20 (5/32) 3RN NOZZLE |
| 8898-172 | 4 | #22 (11/64) 3RN NOZZLE |
| 8898-187 | 3 | #24 (3/16) 3RN NOZZLE |
| 8898-203 | 4 | #26 (13/64) 3RN NOZZLE |
| 8898-219 | 4 | #28 (7/32) 3RN NOZZLE |
| 8898-234 | 6 | #30 (15/64) 3RN NOZZLE |
| 8898-250 | 3 | #32 (1/4) 3RN NOZZLE |
| 8898-266 | 4 | #34 (17/64) 3RN NOZZLE |

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LUBA #2008-203
00227

ORDER NO: 2640194 CONVERTED TO PARTS ORDER 0E49094

SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

*** SPRINKLER SPECIFICATIONS ***

SYSTEM TYPE: PIVOT MODEL: 4971

SYSTEM GALLONAGE: 560

SPAN CONFIGURATION USING: LIBRARY SPAN DESCRIPTION

| NUMBER | LENGTH | DIAMETER | DESCRIPTION |
|---|---|---|---|
| 5 | 147 | 6 5/8 | VARIABLE SPACED PIPE |
| 5 | 126 | 6 5/8 | VARIABLE SPACED PIPE |
| 1 | 42 | 6 | VARIABLE SPACED PIPE |

| CODE | SPRINKLER PACKAGE DESCRIPTION | LENGTH |
|---|---|---|
| RND6 | (ROTATOR MOTOR (BLUE) WITH D6 PLATES (RED) (R30)) | 1414 |

PIVOT PSI: 45

REGULATORS SELECTED - MANUFACTURER: SENNINGER

ELEVATION RISE 10

ELEVATION DROP 1

SPECIAL REGULATOR OUTLET PSI: 20 LENGTH: 1414

OUTLET SIZE SPECIFIED: 1.00

END GUN CODE: 85 (85 ENDGUN)

END GUN WILL APPEAR ON CHART BUT HAS BEEN DELETED FROM SHIPPING PAPERS

BOOSTER PUMP SELECTED: NONE

TIRE TYPE DESCRIPTION: HIGH FLOAT

DRIVE TYPE DESCRIPTION: STANDARD SPEED US

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SALEM, OREGON
00228

LUBA #2008-203

SPRINKLER SETUP CHART

CUSTOMER

NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER

NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

DROPS WILL APPEAR ON CHART BUT HAVE BEEN DELETED FROM SHIPPING PAPERS

DROPS SELECTED: VARIABLE LENGTH GALVANIZED DROPS

DROP MATERIALS SELECTED: VARIABLE LENGTH GALVANIZED (SEE CHART)

GROUND HEIGHT: 102

*** END OF SPRINKLER SPECIFICATIONS ***

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SALEM, OREGON

LUBA #2008-203

ORDER NO: 2640194 CONVERTED TO PARTS ORDER 0E49094 04/11/

# SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

| CPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | NOZ NO | DROP/ BOOM/ RISER | NOZ PSI | GAL/MIN REQ | GAL/MIN ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6.87 | | | GAUGE | | | | | | |
| 2 | 17.36 | | | PLUG | | | | | | |
| 3 | 27.85 | | | PLUG | | | | | | |
| 4 | 38.34 | 44.8 | LOW 20PSI | DROP | 2.0 FCN | 1 | 72 | 19.9 | .87 | 1. |
| 5 | 48.83 | | | PLUG | | | | | | |
| 6 | 59.32 | 44.7 | LOW 20PSI | DROP | 2.0 FCN | 2 | 78 | 19.9 | .89 | 1. |
| 7 | 69.81 | | | PLUG | | | | | | |
| 8 | 80.30 | 44.6 | LOW 20PSI | DROP | 2.0 FCN | 3 | 78 | 19.7 | 1.18 | 1. |
| 9 | 90.79 | | | PLUG | | | | | | |
| 10 | 101.28 | 44.4 | LOW 20PSI | DROP | 2.0 FCN | 4 | 78 | 19.6 | 1.45 | 1. |
| 11 | 111.77 | | | PLUG | | | | | | |
| 12 | 122.26 | 44.3 | LOW 20PSI | DROP | 2.0 FCN | 5 | 72 | 19.5 | 1.72 | 1. |
| 13 | 132.75 | | | PLUG | | | | | | |
| 14 | 143.24 | 44.2 | LOW 20PSI | DROP | 2.5 FCN | 6 | 60 | 19.3 | 1.99 | 1. |
| | 148.70 | TOWER NO 1 - SPAN LENGTH - 148.70 | | | | | | | | |
| 15 | 154.33 | | | PLUG | | | | | | |
| 16 | 164.82 | 44.0 | LOW 20PSI | DROP | 3.0 FCN | 7 | 66 | 19.3 | 2.23 | 2. |
| 17 | 175.31 | | | PLUG | | | | | | |
| 18 | 185.80 | 43.9 | LOW 20PSI | DROP | 9/64 | 8 | 72 | 19.2 | 2.42 | 2. |
| 19 | 196.29 | | | PLUG | | | | | | |
| 20 | 206.78 | 43.8 | LOW 20PSI | DROP | 19/128 | 9 | 78 | 19.2 | 2.63 | 2. |

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WATER RESOURCES DEPT.
SALEM, OREGON

SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

| CPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | NOZ NO | DROP/ BOOM/ RISER | NOZ PSI | GAL/MIN REQ | GAL/MIN ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 21 | 217.27 | | | PLUG | | | | | | |
| 22 | 227.76 | 43.7 | LOW 20PSI | DROP | 19/128 | 10 | 78 | 19.1 | 2.83 | 2.7 |
| 23 | 238.25 | | | PLUG | | | | | | |
| 24 | 248.74 | 43.6 | LOW 20PSI | DROP | 5/32 | 11 | 78 | 19.1 | 3.01 | 3.0 |
| 25 | 259.23 | | | PLUG | | | | | | |
| 26 | 269.72 | 43.4 | LOW 20PSI | DROP | 5/32 | 12 | 72 | 19.1 | 3.18 | 3.0 |
| 27 | 280.21 | | | PLUG | | | | | | |
| 28 | 290.70 | 43.3 | LOW 20PSI | DROP | 21/128 | 13 | 60 | 19.0 | 3.38 | 3.3 |
| | 296.12 | TOWER NO 2 - SPAN LENGTH - 147.42 | | | | | | | | |
| 29 | 301.75 | | | PLUG | | | | | | |
| 30 | 312.24 | 43.2 | LOW 20PSI | DROP | 11/64 | 14 | 66 | 19.0 | 3.53 | 3.67 |
| 31 | 322.73 | | | PLUG | | | | | | |
| 32 | 333.22 | 43.1 | LOW 20PSI | DROP | 11/64 | 15 | 72 | 19.0 | 3.61 | 3.67 |
| 33 | 343.71 | | | PLUG | | | | | | |
| 34 | 354.20 | 43.0 | LOW 20PSI | DROP | 11/64 | 16 | 78 | 19.0 | 3.70 | 3.67 |
| 35 | 364.69 | | | PLUG | | | | | | |
| 36 | 375.18 | 42.9 | LOW 20PSI | DROP | 23/128 | 17 | 78 | 18.9 | 3.92 | 4.01 |
| 37 | 385.67 | | | PLUG | | | | | | |
| 38 | 396.16 | 42.7 | LOW 20PSI | DROP | 23/128 | 18 | 78 | 18.9 | 4.14 | 4.00 |
| 39 | 406.65 | | | PLUG | | | | | | |

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON

ORDER NO: 2640194 CONVERTED TO PARTS ORDER 0E49094 04/11/9

# SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

| CPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | NOZ NO | DROP/ BOOM/ RISER | NOZ PSI | - GAL/MIN - REQ | ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 417.14 | 42.6 | LOW 20PSI | DROP | 3/16 | 19 | 72 | 18.9 | 4.35 | 4.31 |
| 41 | 427.63 | | | PLUG | | | | | | |
| 42 | 438.12 | 42.5 | LOW 20PSI | DROP | 25/128 | 20 | 60 | 18.8 | 4.63 | 4.71 |
| | 443.54 | TOWER NO 3 - SPAN LENGTH - 147.42 | | | | | | | | |
| 43 | 449.17 | | | PLUG | | | | | | |
| 44 | 459.66 | 42.4 | LOW 20PSI | DROP | 25/128 | 21 | 66 | 18.8 | 4.86 | 4.71 |
| 45 | 470.15 | | | PLUG | | | | | | |
| 46 | 480.64 | 42.3 | LOW 20PSI | DROP | 13/64 | 22 | 72 | 18.8 | 5.02 | 5.08 |
| 47 | 491.13 | | | PLUG | | | | | | |
| 48 | 501.62 | 42.2 | LOW 20PSI | DROP | 13/64 | 23 | 78 | 18.7 | 5.24 | 5.08 |
| 49 | 512.11 | | | PLUG | | | | | | |
| 50 | 522.60 | 42.1 | LOW 20PSI | DROP | 27/128 | 24 | 78 | 18.7 | 5.46 | 5.46 |
| 51 | 533.09 | | | PLUG | | | | | | |
| 52 | 543.58 | 42.0 | LOW 20PSI | DROP | 7/32 | 25 | 78 | 18.7 | 5.67 | 5.86 |
| 53 | 554.07 | | | PLUG | | | | | | |
| 54 | 564.56 | 41.9 | LOW 20PSI | DROP | 7/32 | 26 | 72 | 18.7 | 5.89 | 5.86 |
| 55 | 575.05 | | | PLUG | | | | | | |
| 56 | 585.54 | 41.8 | LOW 20PSI | DROP | 29/128 | 27 | 60 | 18.6 | 6.19 | 6.28 |
| | 590.96 | TOWER NO 4 - SPAN LENGTH - 147.42 | | | | | | | | |
| 57 | 596.59 | | | PLUG | | | | | | |
| 58 | 607.08 | 41.7 | LOW 20PSI | DROP | 29/128 | 28 | 66 | 18.6 | 6.42 | 6.28 |

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON

ORDER NO: 2640194 CONVERTED TO PARTS ORDER 0E49094 04/11/94

# SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

| CPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | NOZ NO | DROP/ BOOM/ RISER | NOZ PSI | - GAL/MIN - REQ | ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 59 | 617.57 | | | PLUG | | | | | | |
| 60 | 628.06 | 41.6 | MED 20PSI | DROP | 29/128 | 29 | 72 | 21.0 | 6.56 | 6.68 |
| 61 | 638.55 | | | PLUG | | | | | | |
| 62 | 649.04 | 41.6 | MED 20PSI | DROP | 29/128 | 30 | 78 | 21.0 | 6.78 | 6.67 |
| 63 | 659.53 | | | PLUG | | | | | | |
| 64 | 670.02 | 41.5 | MED 20PSI | DROP | 15/64 | 31 | 78 | 21.0 | 6.99 | 7.12 |
| 65 | 680.51 | | | PLUG | | | | | | |
| 66 | 691.00 | 41.4 | MED 20PSI | DROP | 15/64 | 32 | 78 | 21.0 | 7.21 | 7.12 |
| 67 | 701.49 | | | PLUG | | | | | | |
| 68 | 711.98 | 41.3 | MED 20PSI | DROP | 31/128 | 33 | 72 | 20.9 | 7.43 | 7.58 |
| 69 | 722.47 | | | PLUG | | | | | | |
| 70 | 732.96 | 41.2 | MED 20PSI | DROP | 31/128 | 34 | 60 | 20.9 | 7.75 | 7.58 |
| | 738.38 | TOWER NO 5 - SPAN LENGTH - 147.42 | | | | | | | | |
| 71 | 744.01 | | | PLUG | | | | | | |
| 72 | 754.50 | 41.2 | MED 20PSI | DROP | 1/4 | 35 | 66 | 20.9 | 7.98 | 8.06 |
| 73 | 764.99 | | | PLUG | | | | | | |
| 74 | 775.48 | 41.1 | MED 20PSI | DROP | 1/4 | 36 | 72 | 20.9 | 8.10 | 8.05 |
| 75 | 785.97 | | | PLUG | | | | | | |
| 76 | 796.46 | 41.0 | MED 20PSI | DROP | 33/128 | 37 | 72 | 20.8 | 8.31 | 8.55 |
| 77 | 806.95 | | | PLUG | | | | | | |

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON

NELSON IRRIGATION CORPORATION
CENTER PIVOT SPRINKLER CHART
LOG NUMBER: N940860 , PSN500
DATE: 16 NOV 94

OK WB
#4 same

CUSTOMER: THOMPSON PUMP
MADRAS, OR
326900

IDENTIFYING MARKS: BIG FALLS #6
9 TOWER

| | | | |
|---|---|---|---|
| NUMBER OF TOWERS: | 9 | NOZZLE FILE: | R30D612 |
| PIVOT PRESSURE: | 40.0 PSI | NOZZLE SELECTION OPTION: | 1 |
| TOTAL SYSTEM FLOW: | 900.0 GPM | FRICTION C-FACTOR: | 150 |
| TOTAL PIPE LENGTH: | 1307.1 FT | COVERAGE WITHOUT GUN: | 1307.1 FT |
| END GUN TYPE: P85ASV WITH DIFFUSER NOZZLE | | ADJ. END GUN RADIUS: | 51.5 FT |

SYSTEM MANUFACTURER: VALMONT

| | | | |
|---|---|---|---|
| 1 | MD7147F SPAN(S), | 148.7 FT, | 6.41 INCH ID PIPE |
| 3 | MD7147A SPAN(S), | 147.4 FT, | 6.41 INCH ID PIPE |
| 5 | MD7126A SPAN(S), | 126.5 FT, | 6.41 INCH ID PIPE |
| 1 | MD084OH OVERHANG, | 83.5 FT, | 5.79 INCH ID PIPE |

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DISCLAIMER

The products manufactured by Nelson Irrigation Corporation which are specified as a part of this system design are covered by the manufacturer's printed "Warranty and Disclaimer", which applies to the individual components of its own manufacture. The manufacturer cannot be responsible for the performance of the system and makes no warranties, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE and does hereby disclaim any liability for damages due to failure of the system to perform as anticipated.

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RECEIVED
SEP 14 2001
LUBA #2008-203
WATER RESOURCES DEPT.
SALEM, OREGON

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON



| ----OUTLET---- No | Loc | Sep | -REG- Model | PSI RegIn | ---GPM--- Req | Del | ----SPRINKLER----- Model | Plate | SpNo. | ---NOZZLE--- |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6.9 | | | | | | GAUGE | | | |
| 2 | 17.4 | 17.4 | LB20 | 42.0 | .6 | 1.9 | R30-R | 5.5 | 1 | 2.0 FCN |
| 3 | 27.9 | | | | | | PLUG | | | |
| 4 | 38.3 | 21.0 | LB20 | 41.7 | 1.1 | 1.9 | R30-R | 6.0 | 2 | 2.0 FCN |
| 5 | 48.8 | | | | | | PLUG | | | |
| 6 | 59.3 | 21.0 | LB20 | 41.4 | 1.5 | 1.9 | R30-R | 6.5 | 3 | 2.0 FCN |
| 7 | 69.8 | | | | | | PLUG | | | |
| 8 | 80.3 | 21.0 | LB20 | 41.1 | 1.8 | 1.9 | R30-R | 6.5 | 4 | 2.0 FCN |
| 9 | 90.8 | | | | | | PLUG | | | |
| 10 | 101.3 | 21.0 | LB20 | 40.8 | 2.3 | 2.3 | R30-R | 6.5 | 5 | 2.5 FCN |
| 11 | 111.8 | | | | | | PLUG | | | |
| 12 | 122.3 | 21.0 | LB20 | 40.4 | 2.6 | 2.6 | R30-R | 6.0 | 6 | 9/64 (#18) |
| 13 | 132.8 | | | | | | PLUG | | | |
| 14 | 143.2 | 21.0 | LB20 | 40.1 | 3.0 | 2.9 | R30-R | 5.5 | 7 | 19/128 (#19) |
| | 148.7 TOWER NO. 1 | | | INLINE PRESSURE: 37.9 PSI | | | | | | |
| 15 | 154.3 | | | | | | PLUG | | | |
| 16 | 164.8 | 21.6 | LB20 | 39.7 | 3.4 | 3.5 | R30-R | 5.5 | 8 | 21/128 (#21) |
| 17 | 175.3 | | | | | | PLUG | | | |
| 18 | 185.8 | 21.0 | LB20 | 39.4 | 3.7 | 3.5 | R30-R | 6.0 | 9 | 21/128 (#21) |
| 19 | 196.3 | | | | | | PLUG | | | |
| 20 | 206.8 | 21.0 | LB20 | 38.9 | 4.4 | 4.2 | R30-R | 6.5 | 10 | 23/128 (#23) |
| 21 | 217.3 | | | | | | PLUG | | | |
| 22 | 227.8 | 21.0 | LB20 | 38.6 | 4.8 | 4.9 | R30-R | 6.5 | 11 | 25/128 (#25) |
| 23 | 238.3 | | | | | | PLUG | | | |
| 24 | 248.7 | 21.0 | LB20 | 38.2 | 4.9 | 4.9 | R30-R | 6.5 | 12 | 25/128 (#25) |
| 25 | 259.2 | | | | | | PLUG | | | |
| 26 | 269.7 | 21.0 | LB20 | 37.8 | 5.5 | 5.3 | R30-R | 6.0 | 13 | 13/64 (#26) |
| 27 | 280.2 | | | | | | PLUG | | | |
| 28 | 290.7 | 21.0 | LB20 | 37.4 | 6.2 | 6.1 | R30-R | 5.5 | 14 | 7/32 (#28) |
| | 296.1 TOWER NO. 2 | | | INLINE PRESSURE: 35.9 PSI | | | | | | |
| 29 | 301.8 | | | | | | PLUG | | | |
| 30 | 312.2 | 21.5 | LB20 | 37.0 | 6.5 | 6.5 | R30-R | [illegible] | 15 | 29/128 (#29) |
| 31 | 322.7 | | | | | | PLUG | | | |
| 32 | 333.2 | 21.0 | LB20 | 36.7 | 6.7 | 6.5 | R30-R | [illegible] | 16 | 29/128 (#29) |
| 33 | 343.7 | | | | | | PLUG | | | |
| 34 | 354.2 | 21.0 | LB20 | 36.2 | 7.3 | 7.4 | R30-R | [illegible] | 17 | 31/128 (#31) |
| 35 | 364.7 | | | | | | PLUG | | | |
| 36 | 375.2 | 21.0 | LB20 | 35.9 | 7.5 | 7.4 | R30-R | [illegible] | 18 | 31/128 (#31) |
| 37 | 385.7 | | | | | | PLUG | | | |
| 38 | 396.2 | 21.0 | LB20 | 35.4 | 8.2 | 8.3 | R30-R | [illegible] | 19 | 33/128 (#33) |
| 39 | 406.6 | | | | | | PLUG | | | |
| 40 | 417.1 | 21.0 | LB20 | 35.1 | 8.3 | 8.3 | R30-R | [illegible] | 20 | 33/128 (#33) |
| 41 | 427.6 | | | | | | PLUG | | | |
| 42 | 438.1 | 21.0 | HB20 | 34.6 | 9.0 | 8.9 | R30-R | [illegible] | 21 | 17/64 (#34) |
| | 443.5 TOWER NO. 3 | | | INLINE PRESSURE: 34.0 PSI | | | | | | |
| 43 | 449.2 | | | | | | PLUG | | | |
| 44 | 459.7 | 21.5 | HB20 | 34.1 | 9.6 | 9.4 | R30-R | [illegible] | 22 | 35/128 (#35) |
| 45 | 470.1 | | | | | | PLUG | | | |
| 46 | 480.6 | 21.0 | HB20 | 33.7 | 9.9 | 9.9 | R30-R | [illegible] | 23 | 9/32 (#36) |

LUBA #2008-203
00235

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON



| ----OUTLET---- | | | -REG- | PSI | ---GPM--- | | ----SPRINKLER---- | | --NOZZLE--- | |
|---|---|---|---|---|---|---|---|---|---|---|
| No | Loc | Sep | Model | RegIn | Req | Del | Model | Plate | SpNo. | |
| 47 | 491.1 | | | | | | PLUG | | | |
| 48 | 501.6 | 21.0 | HB20 | 33.4 | 10.2 | 10.4 | R30-R | | 24 | 37/128 (#37) |
| 49 | 512.1 | | | | | | PLUG | | | |
| 50 | 522.6 | 21.0 | HB20 | 33.1 | 10.4 | 10.4 | R30-R | | 25 | 37/128 (#37) |
| 51 | 533.1 | | | | | | PLUG | | | |
| 52 | 543.6 | 21.0 | HB20 | 32.6 | 11.1 | 10.9 | R30-R | | 26 | 19/64 (#38) |
| 53 | 554.1 | | | | | | PLUG | | | |
| 54 | 564.6 | 21.0 | HB20 | 32.1 | 11.6 | 12.0 | R30-R | | 27 | 5/16 (#40) |
| 55 | 575.0 | | | | | | PLUG | | | |
| 56 | 585.5 | 21.0 | HB20 | 31.9 | 11.6 | 12.0 | R30-R | | 28 | 5/16 (#40) |
| | 591.0 TOWER NO. 4 | | | | | | INLINE PRESSURE: 32.4 PSI | | | |
| 57 | 596.6 | | | | | | PLUG | | | |
| 58 | 607.1 | 21.5 | HB20 | 31.4 | 12.1 | 12.0 | R30-R | | 29 | 5/16 (#40) |
| 59 | 617.6 | | | | | | PLUG | | | |
| 60 | 628.1 | 21.0 | HB20 | 30.9 | 12.8 | 13.2 | R30-R | | 30 | 21/64 (#42) |
| 61 | 638.5 | | | | | | PLUG | | | |
| 62 | 649.0 | 21.0 | HB20 | 30.7 | 12.9 | 13.2 | R30-R | | 31 | 21/64 (#42) |
| 63 | 659.5 | | | | | | PLUG | | | |
| 64 | 670.0 | 21.0 | HB20 | 30.3 | 13.3 | 13.1 | R30-R | | 32 | 21/64 (#42) |
| 65 | 680.5 | | | | | | PLUG | | | |
| 66 | 691.0 | 21.0 | HB20 | 31.3 | 10.7 | 10.4 | R30-R | | 33 | 37/128 (#37) |
| 67 | 701.5 | 10.5 | HB20 | 32.5 | 7.4 | 7.5 | R30-R | | 34 | 31/128 (#31) |
| 68 | 712.0 | 10.5 | HB20 | 32.4 | 7.4 | 7.5 | R30-R | | 35 | 31/128 (#31) |
| | 717.5 TOWER NO. 5 | | | | | | INLINE PRESSURE: 31.2 PSI | | | |
| 69 | 723.1 | 11.1 | HB20 | 32.3 | 7.4 | 7.5 | R30-R | | 36 | 31/128 (#31) |
| 70 | 733.6 | 10.5 | HB20 | 32.2 | 7.4 | 7.5 | R30-R | | 37 | 31/128 (#31) |
| 71 | 744.1 | 10.5 | HB20 | 32.1 | 7.4 | 7.5 | R30-R | | 38 | 31/128 (#31) |
| 72 | 754.6 | 10.5 | HB20 | 32.0 | 7.6 | 7.5 | R30-R | | 39 | 31/128 (#31) |
| 73 | 765.1 | 10.5 | HB20 | 31.8 | 7.9 | 8.0 | R30-R | | 40 | 1/4 (#32) |
| 74 | 775.6 | 10.5 | HB20 | 31.8 | 7.8 | 8.0 | R30-R | | 41 | 1/4 (#32) |
| 75 | 786.1 | 10.5 | HB20 | 31.7 | 7.9 | 8.0 | R30-R | | 42 | 1/4 (#32) |
| 76 | 796.5 | 10.5 | HB20 | 31.6 | 8.0 | 7.9 | R30-R | | 43 | 1/4 (#32) |
| 77 | 807.0 | 10.5 | HB20 | 31.4 | 8.2 | 8.4 | R30-R | | 44 | 33/128 (#33) |
| 78 | 817.5 | 10.5 | HB20 | 31.4 | 8.1 | 7.9 | R30-R | | 45 | 1/4 (#32) |
| 79 | 828.0 | 10.5 | HB20 | 31.1 | 8.6 | 8.4 | R30-R | | 46 | 33/128 (#33) |
| 80 | 838.5 | 10.5 | HB20 | 30.9 | 9.0 | 8.9 | R30-R | | 47 | 17/64 (#34) |
| | 844.0 TOWER NO. 6 | | | | | | INLINE PRESSURE: 30.3 PSI | | | |
| 81 | 849.7 | 11.1 | HB20 | 30.9 | 9.0 | 8.9 | R30-R | | 48 | 17/64 (#34) |
| 82 | 860.1 | 10.5 | HB20 | 30.9 | 8.8 | 8.9 | R30-R | | 49 | 17/64 (#34) |
| 83 | 870.6 | 10.5 | HB20 | 30.8 | 8.8 | 8.9 | R30-R | | 50 | 17/64 (#34) |
| 84 | 881.1 | 10.5 | HB20 | 30.8 | 8.8 | 8.9 | R30-R | | 51 | 17/64 (#34) |
| 85 | 891.6 | 10.5 | HB20 | 30.6 | 9.0 | 8.9 | R30-R | | 52 | 17/64 (#34) |
| 86 | 902.1 | 10.5 | HB20 | 30.5 | 9.3 | 9.4 | R30-R | | 53 | 35/128 (#35) |
| 87 | 912.6 | 10.5 | HB20 | 30.5 | 9.2 | 9.4 | R30-R | | 54 | 35/128 (#35) |
| 88 | 923.1 | 10.5 | HB20 | 30.4 | 9.1 | 9.4 | R30-R | | 55 | 35/128 (#35) |
| 89 | 933.6 | 10.5 | HB20 | 30.3 | 9.2 | 9.4 | R30-R | | 56 | 35/128 (#35) |
| 90 | 944.1 | 10.5 | HB20 | 30.2 | 9.4 | 9.4 | R30-R | | 57 | 35/128 (#35) |
| 91 | 954.5 | 10.5 | HB20 | 30.0 | 9.8 | 9.9 | R30-R | | 58 | 9/32 (#36) |

| ----OUTLET---- No | Loc | Sep | -REG- Model | PSI RegIn | ---GPM--- Req | Del | ----SPRINKLER----- Model | Plate | SpNo. | ---NOZZLE--- | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 92 | 965.0 | 10.5 | HB20 | 29.9 | 10.0 | 9.9 | R30-R | 5.5 | 59 | 9/32 | (#36) |
| | 970.5 TOWER NO. 7 | | | | | INLINE PRESSURE: 29.7 PSI | | | | | |
| 93 | 976.2 | 11.1 | HB20 | 29.7 | 10.4 | 10.4 | R30-R | 5.5 | 60 | 37/128 | (#37) |
| 94 | 986.7 | 10.5 | HB20 | 29.8 | 10.0 | 9.9 | R30-R | | 61 | 9/32 | (#36) |
| 95 | 997.2 | 10.5 | HB20 | 29.7 | 10.3 | 10.4 | R30-R | 6 | 62 | 37/128 | (#37) |
| 96 | 1007.7 | 10.5 | HB20 | 29.7 | 10.1 | 9.9 | R30-R | | 63 | 9/32 | (#36) |
| 97 | 1018.1 | 10.5 | HB20 | 29.5 | 10.6 | 10.4 | R30-R | | 64 | 37/128 | (#37) |
| 98 | 1028.6 | 10.5 | HB20 | 29.4 | 10.7 | 10.9 | R30-R | | 65 | 19/64 | (#38) |
| 99 | 1039.1 | 10.5 | HB20 | 29.5 | 10.3 | 10.4 | R30-R | 6.5 | 66 | 37/128 | (#37) |
| 100 | 1049.6 | 10.5 | HB20 | 29.4 | 10.6 | 10.4 | R30-R | | 67 | 37/128 | (#37) |
| 101 | 1060.1 | 10.5 | HB20 | 29.2 | 11.0 | 10.9 | R30-R | 6 | 68 | 19/64 | (#38) |
| 102 | 1070.6 | 10.5 | HB20 | 29.2 | 10.9 | 10.9 | R30-R | | 69 | 19/64 | (#38) |
| 103 | 1081.1 | 10.5 | HB20 | 29.1 | 11.0 | 10.9 | R30-R | 5.5 | 70 | 19/64 | (#38) |
| 104 | 1091.6 | 10.5 | HB20 | 28.9 | 11.5 | 12.0 | R30-R | | 71 | 5/16 | (#40) |
| | 1097.1 TOWER NO. 8 | | | | | INLINE PRESSURE: 29.3 PSI | | | | | |
| 105 | 1102.7 | 11.1 | HB20 | 29.1 | 11.1 | 10.9 | R30-R | 5.5 | 72 | 19/64 | (#38) |
| 106 | 1113.2 | 10.5 | HB20 | 28.9 | 11.5 | 10.9 | R30-R | 5.5 | 73 | 19/64 | (#38) |
| 107 | 1123.7 | 10.5 | HB20 | 28.6 | 12.0 | 12.0 | R30-R | 6 | 74 | 5/16 | (#40) |
| 108 | 1134.2 | 10.5 | HB20 | 28.8 | 11.5 | 12.0 | R30-R | 6 | 75 | 5/16 | (#40) |
| 109 | 1144.7 | 10.5 | HB20 | 29.0 | 11.1 | 10.9 | R30-R | 6 | 76 | 19/64 | (#38) |
| 110 | 1155.2 | 10.5 | HB20 | 28.6 | 11.9 | 12.0 | R30-R | 6 | 77 | 5/16 | (#40) |
| 111 | 1165.7 | 10.5 | HB20 | 28.6 | 11.8 | 12.0 | R30-R | 6 | 78 | 5/16 | (#40) |
| 112 | 1176.1 | 10.5 | HB20 | 28.6 | 11.7 | 12.0 | R30-R | 6 | 79 | 5/16 | (#40) |
| 113 | 1186.6 | 10.5 | HB20 | 28.6 | 11.7 | 12.0 | R30-R | 6 | 80 | 5/16 | (#40) |
| 114 | 1197.1 | 10.5 | HB20 | 28.5 | 11.9 | 12.0 | R30-R | 6 | 81 | 5/16 | (#40) |
| 115 | 1207.6 | 10.5 | HB20 | 28.4 | 12.2 | 12.0 | R30-R | 5.5 | 82 | 5/16 | (#40) |
| 116 | 1218.1 | 10.5 | HB20 | 28.7 | 11.6 | 12.0 | R30-R | 5.5 | 83 | 5/16 | (#40) |
| | 1223.6 TOWER NO. 9 | | | | | INLINE PRESSURE: 29.1 PSI | | | | | |
| 117 | 1227.0 | 8.9 | HB20 | 29.7 | 9.2 | 9.4 | R30-R | | 84 | 35/128 | (#35) |
| 118 | 1234.3 | 7.3 | HB20 | 29.9 | 8.5 | 8.4 | R30-R | | 85 | 33/128 | (#33) |
| 119 | 1241.6 | 7.3 | HB20 | 29.8 | 8.8 | 8.9 | R30-R | | 86 | 17/64 | (#34) |
| 120 | 1248.8 | 7.3 | HB20 | 29.8 | 8.7 | 8.9 | R30-R | | 87 | 17/64 | (#34) |
| 121 | 1256.1 | 7.3 | HB20 | 29.8 | 8.7 | 8.9 | R30-R | | 88 | 17/64 | (#34) |
| 122 | 1263.4 | 7.3 | HB20 | 29.6 | 9.2 | 9.4 | R30-R | | 89 | 35/128 | (#35) |
| 123 | 1271.5 | 8.2 | HB20 | 29.5 | 9.5 | 9.4 | R30-R | | 90 | 35/128 | (#35) |
| 124 | 1279.0 | 7.5 | HB20 | 29.6 | 9.3 | 9.4 | R30-R | | 91 | 35/128 | (#35) |
| 125 | 1286.4 | 7.5 | HB20 | 29.6 | 9.3 | 9.4 | R30-R | | 92 | 35/128 | (#35) |
| 126 | 1293.9 | 7.5 | HB20 | 29.6 | 9.2 | 9.4 | R30-R | | 93 | 35/128 | (#35) |
| 127 | 1301.4 | 7.5 | HB20 | 28.5 | 11.8 | 12.0 | R30-R | | 94 | 5/16 | (#40) |
| END GUN: (BASED ON RECOMMENDED ARC SETTING.) | | | | | | | | | | | |
| | 1307.1 | | | | 29.1 | 66.9 | 68.4 | P85ASV | | 11/16" | |

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SALEM, OREGON
LUBA #2008-203
00237

SYSTEM INLINE END PRESSURE: 29.1 PSI, INCLUDING 0 FT. INCREASE IN ELEVATION

TOTAL GPM DELIVERED: 900.3

SYSTEM GPM PER ACRE: 6.8

94 MOUNTING ASSEMBLIES USED:

Default Drop
Default Gooseneck
Default Drop Pipe (as needed)
Standard Tee (as needed)
Standard Regulator

========== NOZZLE SELECTION VERIFICATION ==========

| SPAN # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | OH+EG |
|---|---|---|---|---|---|---|---|---|---|---|
| GPM REQ. | 12.8 | 32.8 | 53.5 | 74.5 | 76.5 | 95.3 | 110.5 | 127.3 | 139.8 | 169.1 |
| GPM DEL. | 15.5 | 32.5 | 53.5 | 75.1 | 76.9 | 95.5 | 111.2 | 127.4 | 140.8 | 171.8 |
| % DEV. | 21% | -1% | 0% | 1% | 1% | 0% | 1% | 0% | 1% | 2% |

A HIGH DEVIATION IN SPAN 1 IS UNAVOIDABLE DUE TO NOZZLE SIZE LIMITATIONS

DATA FILE IDENTIFICATION

| Nozzle File ID | | Regulator Table ID | |
|---|---|---|---|
| R30D612 | 10CE | LB20 | 1303 |
| | | HB20 | 196D |

========== WATER APPLICATION DEPTH PER REVOLUTION ==========

| REVOLUTION TIME | 12 HRS | 24 HRS | 36 HRS | 48 HRS | 60 HRS | 72 HRS |
|---|---|---|---|---|---|---|
| APPLICATION DEPTH (INCHES) | .18 | .36 | .54 | .72 | .90 | 1.08 |

Percentage timer chart not included due to lack of data.

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SALEM, OREGON
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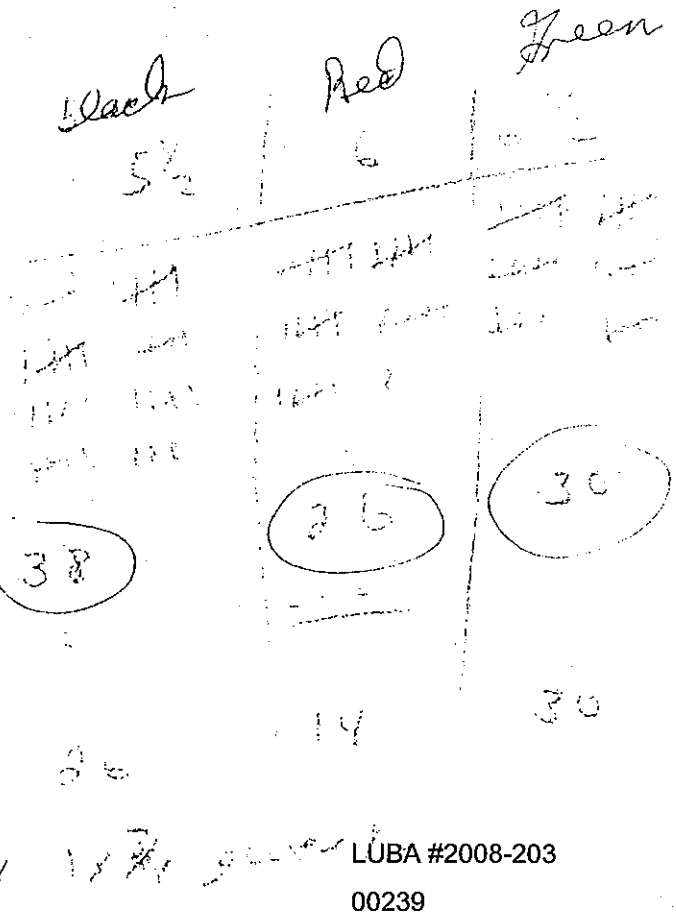
-PART NUMBER AND SHIPPING SUMMARY

| PART NO. | SHIP QTY | SYSTEM QTY | | DESCRIPTION |
|---|---|---|---|---|
| 6921-000 | 1 | 1 | 2.5 | 3FCN NOZZLE |
| 8825-000 | 4 | 4 | 2.0 | 3FCN NOZZLE |
| 8827-002 | 94 | 94 | R30 PIVOT ROTATOR (3/4") | |
| 8839-000 | 94 | 94 | D6 ROTOR PLATE -12 deg. (Red) | |
| 8898-141 | 1 | 1 | #18 (9/64) | 3RN NOZZLE |
| 8898-148 | 1 | 1 | #19 (19/128) | 3RN NOZZLE |
| 8898-164 | 2 | 2 | #21 (21/128) | 3RN NOZZLE |
| 8898-180 | 1 | 1 | #23 (23/128) | 3RN NOZZLE |
| 8898-195 | 2 | 2 | #25 (25/128) | 3RN NOZZLE |
| 8898-203 | 1 | 1 | #26 (13/64) | 3RN NOZZLE |
| 8898-219 | 1 | 1 | #28 (7/32) | 3RN NOZZLE |
| 8898-227 | 2 | 2 | #29 (29/128) | 3RN NOZZLE |
| 8898-242 | 8 | 8 | #31 (31/128) | 3RN NOZZLE |
| 8898-250 | 5 | 5 | #32 (1/4) | 3RN NOZZLE |
| 8898-258 | 5 | 5 | #33 (33/128) | 3RN NOZZLE |
| 8898-266 | 10 | 10 | #34 (17/64) | 3RN NOZZLE |
| 8898-273 | 12 | 12 | #35 (35/128) | 3RN NOZZLE |
| 8898-281 | 5 | 5 | #36 (9/32) | 3RN NOZZLE |
| 8898-289 | 8 | 8 | #37 (37/128) | 3RN NOZZLE |
| 8898-297 | 8 | 8 | #38 (19/64) | 3RN NOZZLE |
| 8898-312 | 14 | 14 | #40 (5/16) | 3RN NOZZLE |
| 8898-328 | 3 | 3 | #42 (21/64) | 3RN NOZZLE |
| 9071-005 | 74 | 74 | HI-FLO 20psi REG Blue 3/4FxF | |
| 9491-004 | 20 | 20 | LO-FLO 20psi REG Blue 3/4FxF | |
| 8079-000 | 0 | 1 | P85ASV GUN 18DEG | |
| 8457-000 | 0 | 1 | 11/16 8ADN NOZZLE | |

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WATER RESOURCES DEPT.
SALEM, OREGON

ORDER NO: 2640194 CONVERTED TO PARTS ORDER 0E49094 04/11/94

# SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

| CPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | NOZ NO | DROP/ BOOM/ RISER | NOZ PSI | GAL/MIN REQ | GAL/MIN ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 817.44 | 41.0 | MED 20PSI | DROP | 33/128 | 38 | 72 | 20.8 | 8.53 | 8.55 |
| 79 | 827.93 | | | PLUG | | | | | | |
| 80 | 838.42 | 40.9 | MED 20PSI | DROP | 33/128 | 39 | 66 | 20.8 | 8.75 | 8.54 |
| 81 | 848.91 | | | PLUG | | | | | | |
| 82 | 859.40 | 40.8 | MED 20PSI | DROP | 17/64 | 40 | 60 | 20.7 | 9.11 | 9.04 |
| | 864.91 | TOWER NO 6 - SPAN LENGTH - 126.53 | | | | | | | | |
| 83 | 870.54 | | | PLUG | | | | | | |
| 84 | 881.03 | 40.8 | MED 20PSI | DROP | 35/128 | 41 | 66 | 20.7 | 9.34 | 9.55 |
| 85 | 891.52 | | | PLUG | | | | | | |
| 86 | 902.01 | 40.7 | MED 20PSI | DROP | 35/128 | 42 | 72 | 20.7 | 9.42 | 9.55 |
| 87 | 912.50 | | | PLUG | | | | | | |
| 88 | 922.99 | 40.7 | MED 20PSI | DROP | 35/128 | 43 | 72 | 20.7 | 9.64 | 9.55 |
| 89 | 933.48 | | | PLUG | | | | | | |
| 90 | 943.97 | 40.6 | MED 20PSI | DROP | 35/128 | 44 | 72 | 20.6 | 9.85 | 9.54 |
| 91 | 954.46 | | | PLUG | | | | | | |
| 92 | 964.95 | 40.6 | MED 20PSI | DROP | 9/32 | 45 | 66 | 20.6 | 10.07 | 10.07 |
| 93 | 975.44 | | | PLUG | | | | | | |
| 94 | 985.93 | 40.5 | MED 20PSI | DROP | 37/128 | 46 | 60 | 20.5 | 10.45 | 10.64 |
| | 991.44 | TOWER NO 7 - SPAN LENGTH - 126.53 | | | | | | | | |
| 95 | 997.07 | | | PLUG | | | | | | |
| 96 | 1007.56 | 40.5 | MED 20PSI | DROP | 37/128 | 47 | 66 | 20.5 | 10.68 | 10.64 |

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SALEM, OREGON

SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

| CPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | NOZ NO | DROP/ BOOM/ RISER | NOZ PSI | - GAL/MIN - REQ | ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 97 | 1018.05 | | | PLUG | | | | | | |
| 98 | 1028.54 | 40.4 | MED 20PSI | DROP | 37/128 | 48 | 72 | 20.5 | 10.74 | 10.64 |
| 99 | 1039.03 | | | PLUG | | | | | | |
| 100 | 1049.52 | 40.4 | MED 20PSI | DROP | 19/64 | 49 | 72 | 20.5 | 10.96 | 11.14 |
| 101 | 1060.01 | | | PLUG | | | | | | |
| 102 | 1070.50 | 40.4 | MED 20PSI | DROP | 19/64 | 50 | 72 | 20.5 | 11.18 | 11.13 |
| 103 | 1080.99 | | | PLUG | | | | | | |
| 104 | 1091.48 | 40.3 | MED 20PSI | DROP | 19/64 | 51 | 66 | 20.4 | 11.39 | 11.12 |
| 105 | 1101.97 | | | PLUG | | | | | | |
| 106 | 1112.46 | 40.3 | MED 20PSI | DROP | 5/16 | 52 | 60 | 20.4 | 11.79 | 12.26 |
| | 1117.97 | TOWER NO 8 - SPAN LENGTH - 126.53 | | | | | | | | |
| 107 | 1123.60 | | | PLUG | | | | | | |
| 108 | 1134.09 | 40.3 | MED 20PSI | DROP | 5/16 | 53 | 66 | 20.4 | 12.02 | 12.26 |
| 109 | 1144.58 | | | PLUG | | | | | | |
| 110 | 1155.07 | 40.3 | MED 20PSI | DROP | 5/16 | 54 | 72 | 20.4 | 12.06 | 12.26 |
| 111 | 1165.56 | | | PLUG | | | | | | |
| 112 | 1176.05 | 40.2 | MED 20PSI | DROP | 5/16 | 55 | 72 | 20.4 | 12.28 | 12.25 |
| 113 | 1186.54 | | | PLUG | | | | | | |
| 114 | 1197.03 | 40.2 | MED 20PSI | DROP | 5/16 | 56 | 72 | 20.3 | 12.50 | 12.25 |
| 115 | 1207.52 | | | PLUG | | | | | | |

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SALEM, OREGON

SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL. RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

| CPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | NOZ NO | DROP/ BOOM/ RISER | NOZ PSI | - GAL/MIN - REQ | ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 116 | 1218.01 | 40.2 | MED 20PSI | DROP | 5/16 | 57 | 66 | 20.3 | 12.72 | 12.23 |
| 117 | 1228.50 | | | PLUG | | | | | | |
| 118 | 1238.99 | 40.2 | MED 20PSI | DROP | 21/64 | 58 | 60 | 20.2 | 13.13 | 13.37 |
| | 1244.50 | TOWER NO 9 - SPAN LENGTH - 126.53 | | | | | | | | |
| 119 | 1250.13 | | | PLUG | | | | | | |
| 120 | 1260.62 | 40.2 | MED 20PSI | DROP | 21/64 | 59 | 66 | 20.2 | 13.36 | 13.37 |
| 121 | 1271.11 | | | PLUG | | | | | | |
| 122 | 1281.60 | 40.2 | MED 20PSI | DROP | 21/64 | 60 | 72 | 20.2 | 13.38 | 13.37 |
| 123 | 1292.09 | | | PLUG | | | | | | |
| 124 | 1302.58 | 40.1 | MED 20PSI | DROP | 21/64 | 61 | 72 | 20.2 | 13.60 | 13.36 |
| 125 | 1313.07 | | | PLUG | | | | | | |
| 126 | 1323.56 | 40.1 | MED 20PSI | DROP | 21/64 | 62 | 72 | 20.1 | 13.82 | 13.34 |
| 127 | 1334.05 | | | PLUG | | | | | | |
| 128 | 1344.54 | 40.1 | MED 20PSI | DROP | 11/32 | 63 | 66 | 20.1 | 14.04 | 14.63 |
| 129 | 1355.03 | | | PLUG | | | | | | |
| 130 | 1365.52 | 40.1 | MED 20PSI | DROP | 21/64 | 64 | 60 | 20.2 | 13.24 | 13.37 |
| | 1370.81 | TOWER NO 10 - SPAN LENGTH - 126.31 | | | | | | | | |
| 131 | 1374.99 | | | PLUG | | | | | | |
| 132 | 1383.52 | 40.1 | MED 20PSI | DROP | 5/16 | 65 | 60 | 20.4 | 12.07 | 12.25 |
| 133 | 1392.05 | | | PLUG | | | | | | |
| 134 | 1400.58 | 40.1 | MED 20PSI | DROP | 33/128 | 66 | 60 | 20.8 | 8.92 | 8.54 |

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SALEM, OREGON

ORDER NO: 2640194 CONVERTED TO PARTS ORDER 0E49094

# SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

| CPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | NOZ NO | DROP/ BOOM/ RISER | NOZ PSI | - GAL/MIN - REQ | ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 135 | 1409.11 | 40.0 | LOW 20PSI DROP | | 7/32 | 67 | 60 | 18.2 | 5.92 | 5.79 |
| 136 | 1411.61 | 40.0 | | DRAIN | SENN 13 | 68 | | 40.0 | 6.94 | 7.51 |
| 137 | 1413.11 | 39.8 | | 85 | 17/32 | 69 | | 38.7 | 48.87 | 49.05 |

ENDGUN ARC SETTINGS. FORWARD ANGLE = 45 BACKWARD ANGLE = 75

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# VALMONT INDUSTRIES INC

ORDER NO: 2640194 CONVERTED TO PARTS ORDER 0E49094

## SPRINKLER SETUP CHART

CUSTOMER

NAME BIG FALLS RANCH #2
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER

NUMBER: 011159
NAME Thompson Pump & Irr.

| | |
|---|---|
| MODEL NUMBER | 4971 |
| LENGTH | 1414.0 |
| GALLONAGE | 560 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 66 |
| APPL RATE (IN/DAY) | .19 |
| TOTAL ACRES COVERED | 157.79 |
| GPM PER ACRE | 4.00 |

## PERCENTAGE TIMER DATA

| INCHES PER REVOLUTION | PERCENT TIMER SETTING | HOURS PER REVOLUTION |
|---|---|---|
| .17 | 100 | 21 |
| .20 | 83 | 26 |
| .30 | 56 | 38 |
| .40 | 42 | 51 |
| .50 | 33 | 64 |
| .60 | 28 | 77 |
| .70 | 24 | 89 |
| .80 | 21 | 102 |
| .90 | 19 | 115 |
| 1.00 | 17 | 128 |
| 1.25 | 13 | 159 |
| 1.50 | 11 | 191 |
| 1.75 | 10 | 223 |
| 2.00 | 8 | 255 |
| 2.50 | 7 | 319 |
| 3.00 | 6 | 383 |
| 3.50 | 5 | 446 |

ABOVE DATA FOR 30.0 RPM (480 V., 60 HZ.) CENTERDRIVE GEARBOX WITH HI-FLT 14.9X 24 TIRES AT OUTER TOWER. BECAUSE THE ABOVE INFORMATION IS BASED ON VARIABLES WHICH CANNOT BE TOTALLY CONTROLLED (PIVOT PRESSURE, ENDGUN RANGE, TIRE SLIP, TERRAIN VARIATIONS), VALMONT CANNOT GUARANTEE THE ACCURACY OF THE APPLICATION DEPTH AND PERCENTAGE TIMER CALCULATIONS. FURTHERMORE, VALMONT MAKES NO REPRESENTATIONS OR RECOMMENDATIONS AS TO PERCENTAGE TIMER SETTINGS, WATER APPLICATION RATES, AND OTHER SIMILIAR FARM MANAGEMENT DECISIONS.

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WATER RESOURCES DEPT.
SALEM, OREGON

03. 25. 92

NELSON IRRIGATION CORPORATION
CENTER PIVOT SPRINKLER CHART
LOG NUMBER: N920231 , PSN360
DATE: 25 MAR 92

CUSTOMER: CENTRAL OREGON IRR.
MADRAS, OR
60900

IDENTIFYING MARKS: BARBER #9 prt
CENTRAL OREGON IRR.
MADRAS, OR

| | | | |
|---|---|---|---|
| NUMBER OF TOWERS: | 6 | NOZZLE FILE: | LABHP |
| PIVOT PRESSURE: | 50.0 PSI | NOZZLE SELECTION OPTION: | 2 |
| TOTAL SYSTEM FLOW: | 425.0 GPM | FRICTION C-FACTOR: | 150 |
| TOTAL PIPE LENGTH: | 918.8 FT | COVERAGE WITHOUT GUN: | 918.8 FT |
| END GUN TYPE: P85ASV | | ADJ. END GUN RADIUS: | 63.3 FT |

| | | | | |
|---|---|---|---|---|
| 1 | MD7147F | SPAN(S), | 148.7 FT, | 6.41 INCH ID PIPE |
| 1 | MD7147A | SPAN(S), | 147.4 FT, | 6.41 INCH ID PIPE |
| 2 | MD7126A | SPAN(S), | 126.5 FT, | 6.41 INCH ID PIPE |
| 1 | MD7147A | SPAN(S), | 147.4 FT, | 6.41 INCH ID PIPE |
| 1 | MD7147L | SPAN(S), | 147.2 FT, | 6.41 INCH ID PIPE |
| 1 | | OVERHANG, | 75.0 FT, | 6.41 INCH ID PIPE |

DISCLAIMER

The products manufactured by Nelson Irrigation Corporation which are specified as a part of this system design are covered by the manufacturer's printed "Warranty and Disclaimer", which applies to the individual components of its own manufacture. The manufacturer cannot be responsible for the performance of the system and makes no warranties, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE and does hereby disclaim any liability for damages due to failure of the system to perform as anticipated.

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WATER RESOURCES DEPT.
SALEM, OREGON

LUBA #2008-203
60245

| -OUTLET- NO. | LOC. | -SPRINKLER- NO. SEP. | MODEL | NOZZLE | | -REG- MODEL | -GPM- REQ. | DEL. | -PRESSURE- INLINE |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 6.9 | | GAUGE | | | | | | |
| 2 | 17.4 | | PLUG | | | | | | |
| 3 | 27.9 | | PLUG | | | | | | |
| 4 | 38.3 | 1 38.3 | L2004T | RN-7/64 | (14) | | 1.8 | 2.4 | 49.9 |
| 5 | 48.8 | | PLUG | | | | | | |
| 6 | 59.3 | | PLUG | | | | | | |
| 7 | 69.8 | 2 31.5 | L2004T | RN-7/64 | (14) | | 2.0 | 2.4 | 49.7 |
| 8 | 80.3 | | PLUG | | | | | | |
| 9 | 90.8 | | PLUG | | | | | | |
| 10 | 101.3 | 3 31.5 | L2004T | RN-7/64 | (14) | | 2.6 | 2.4 | 49.6 |
| 11 | 111.8 | | PLUG | | | | | | |
| 12 | 122.3 | | PLUG | | | | | | |
| 13 | 132.8 | 4 31.5 | L2004T | RN-9/64 | (18) | | 3.8 | 4.0 | 49.5 |
| 14 | 143.2 | | PLUG | | | | | | |
| | 148.7 TOWER NO. | | 1 | | | | | | |
| 15 | 154.3 | | PLUG | | | | | | |
| 16 | 164.8 | 5 32.1 | L2004T | RN-9/64 | (18) | | 4.4 | 4.0 | 49.4 |
| 17 | 175.3 | | PLUG | | | | | | |
| 18 | 185.8 | | PLUG | | | | | | |
| 19 | 196.3 | 6 31.5 | F33AS | RN-11/64 | (22) | | 5.7 | 5.9 | 49.3 |
| 20 | 206.8 | | PLUG | | | | | | |
| 21 | 217.3 | | PLUG | | | | | | |
| 22 | 227.8 | 7 31.5 | F33AS | RN-11/64 | (22) | | 6.1 | 5.9 | 49.2 |
| 23 | 238.3 | | PLUG | | | | | | |
| 24 | 248.7 | | PLUG | | | | | | |
| 25 | 259.2 | 8 31.5 | F33AS | RN-3/16 | (24) | | 7.3 | 7.0 | 49.1 |
| 26 | 269.7 | | PLUG | | | | | | |
| 27 | 280.2 | | PLUG | | | | | | |
| 28 | 290.7 | 9 31.5 | F33AS | RN-3/16 | (24) | | 7.0 | 7.0 | 49.0 |
| | 296.1 TOWER NO. | | 2 | | | | | | |
| 29 | 301.8 | | PLUG | | | | | | |
| 30 | 312.2 | 10 21.5 | F33AS | RN-11/64 | (22) | | 5.8 | 5.9 | 48.9 |
| 31 | 322.7 | | PLUG X | | | | | | |
| 32 | 333.2 | 11 21.0 | F33AS | RN-11/64 | (22) | | 6.0 | 5.9 | 48.9 |
| 33 | 343.7 | | PLUG | | | | | | |
| 34 | 354.2 | 12 21.0 | F33AS X | RN-3/16 | (24) | | 6.6 | 7.0 | 48.8 |
| 35 | 364.7 | | PLUG | | | | | | |
| 36 | 375.2 | 13 21.0 | F33AS | RN-3/16 | (24) | | 6.5 | 7.0 | 48.7 |
| 37 | 385.7 | | PLUG X | | | | | | |
| 38 | 396.2 | 14 21.0 | F33AS | RN-3/16 | (24) | | 6.8 | 7.0 | 48.7 |
| 39 | 406.6 | | PLUG | | | | | | |
| 40 | 417.1 | 15 21.0 | F33AS X | RN-13/64 | (26) | | 7.6 | 8.2 | 48.6 |
| | 422.6 TOWER NO. | | 3 | | | | | | |
| 41 | 428.3 | | PLUG | | | | | | |
| 42 | 438.8 | 16 21.6 | F33AS | RN-13/64 | (26) | | 7.6 | 8.2 | 48.6 |
| 43 | 449.3 | | PLUG X | | | | | | |
| 44 | 459.8 | 17 21.0 | F33AS | RN-13/64 | (26) | | 7.9 | 8.2 | 48.5 |
| 45 | 470.2 | | PLUG | | | | | | |

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WATER RESOURCES DEPT.
SALEM, OREGON

| -OUTLET- NO. | LOC. | -SPRINKLER- NO. | SEP. | MODEL | NOZZLE | | -REG- MODEL | -GPM- REQ. | DEL. | -PRESSURE- INLINE |
|---|---|---|---|---|---|---|---|---|---|---|
| 46 | 480.7 | 18 | 21.0 | F33ASX | RN-13/64 | (26) | | 8.5 | 8.2 | 48.5 |
| 47 | 491.2 | | | PLUG | | | | | | |
| 48 | 501.7 | 19 | 21.0 | F33AS | RN-7/32 | (28) | | 9.5 | 9.5 | 48.4 |
| 49 | 512.2 | | | PLUG X | | | | | | |
| 50 | 522.7 | 20 | 21.0 | F33AS | RN-7/32 | (28) | | 9.6 | 9.5 | 48.4 |
| 51 | 533.2 | | | PLUG X | | | | | | |
| 52 | 543.7 | 21 | 21.0 | F43AP | RN-15/64 | (30) | | 10.2 | 10.6 | 48.4 |
| | 549.2 | TOWER NO. | | 4 | | | | | | |
| 53 | 554.8 | | | PLUG X | | | | | | |
| 54 | 565.3 | 22 | 21.6 | F43AP | RN-15/64 | (30) | | 10.1 | 10.6 | 48.3 |
| 55 | 575.8 | | | PLUG | | | | | | |
| 56 | 586.3 | 23 | 21.0 | F43APX | RN-15/64 | (30) | | 10.2 | 10.6 | 48.3 |
| 57 | 596.8 | | | PLUG | | | | | | |
| 58 | 607.3 | 24 | 21.0 | F43AP | RN-15/64 | (30) | | 10.7 | 10.6 | 48.3 |
| 59 | 617.7 | | | PLUG X | | | | | | |
| 60 | 628.2 | 25 | 21.0 | F43AP | RN-1/4 | (32) | | 11.6 | 12.0 | 48.2 |
| 61 | 638.7 | | | PLUG | | | | | | |
| 62 | 649.2 | 26 | 21.0 | F43APX | RN-1/4 | (32) | | 11.5 | 12.0 | 48.2 |
| 63 | 659.7 | | | PLUG | | | | | | |
| 64 | 670.2 | 27 | 21.0 | F43AP | RN-1/4 | (32) | | 11.7 | 12.0 | 48.2 |
| 65 | 680.7 | | | PLUG X | | | | | | |
| 66 | 691.2 | 28 | 21.0 | F43AP | RN-1/4 | (32) | | 12.5 | 12.0 | 48.1 |
| | 696.6 | TOWER NO. | | 5 | | | | | | |
| 67 | 702.2 | | | PLUG | | | | | | |
| 68 | 712.7 | 29 | 21.5 | F43AP | RN-17/64 | (34) | | 13.8 | 13.3 | 48.1 |
| 69 | 723.2 | | | PLUG | | | | | | |
| 70 | 733.7 | 30 | 21.0 | F43AP | RN-17/64 | (34) | | 13.9 | 13.3 | 48.1 |
| 71 | 744.2 | | | PLUG | | | | | | |
| 72 | 754.7 | 31 | 21.0 | F43AP | RN-9/32 | (36) | | 14.4 | 14.7 | 48.1 |
| 73 | 765.2 | | | PLUG | | | | | | |
| 74 | 775.7 | 32 | 21.0 | F43AP | RN-17/64 | (34) | | 13.8 | 13.3 | 48.1 |
| 75 | 786.1 | | | PLUG | | | | | | |
| 76 | 796.6 | 33 | 21.0 | F43AP | RN-9/32 | (36) | | 15.1 | 14.7 | 48.1 |
| 77 | 807.1 | | | PLUG | | 17/64 | | | | |
| 78 | 817.6 | 34 | 21.0 | F43AP | RN-9~~/32~~ | (36) | | 15.4 | 14.7 | 48.1 |
| 79 | 828.1 | | | PLUG | | | | | | |
| 80 | 838.6 | 35 | 21.0 | F43AP | RN-1/4 | (32) 13/64 | | 12.1 | 12.0 | 48.0 |
| | 843.8 | TOWER NO. | | 6 | | | | | | |
| 81 | 849.0 | 36 | 10.5 | F33AS | RN-13/64 | (26) | | 7.9 | 8.1 | 48.0 |
| 82 | 859.5 | 37 | 10.5 | F33AS | RN-13/64 | (26) | | 7.6 | 8.1 | 48.0 |
| 83 | 870.0 | 38 | 10.5 | F33AS | RN-3/16 | (24) | | 7.5 | 6.9 | 48.0 |
| 84 | 880.5 | 39 | 10.5 | F33AS | RN-13/64 | (26) | | 8.6 | 8.1 | 48.0 |
| 85 | 891.0 | 40 | 10.5 | F33AS | RN-13/64 | (26) | | 8.7 | 8.1 | 48.0 |
| 86 | 901.5 | 41 | 10.5 43 | F~~33~~AS | RN-7/32 | (28) | | 8.8 | 9.5 | 48.0 |
| 87 | 912.0 | 42 | 10.5 43 | F33AS | RN-7/32 | (28) | | 8.9 | 9.5 | 48.0 |
| | | | 43 | | 7/32 | | | | | |
| | | | 43 | | 15/64 | | | | | |

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WATER RESOURCES DEPT.
SALEM, OREGON
LUBA #2008-203
00247

)20231 25 MAR 92 VALMONT , 6 TOWER, 425 GPM, 50 PSI 

| ·OUTLET- | | -SPRINKLER- | | | -REG- | -GPM- | | -PRESSURE- |
|---|---|---|---|---|---|---|---|---|
| )O. | LOC. | NO. SEP. | MODEL | NOZZLE | MODEL | REQ. | DEL. | INLINE |
| )D GUN: (BASED ON RECOMMENDED ARC SETTING.) | | | | | | | | |
| | 918.8 | | P85ASV | 17/32" NOZZLE | | 53.0 | 55.0 | 48.0 |

'STEM END PRESSURE: 48.0 PSI, INCLUDING 0 FT. INCREASE IN ELEVATION

'TAL GPM DELIVERED: 425.6

'STEM GPM PER ACRE: 6.1

2 MOUNTING ASSEMBLIES USED:
-top (two regulators if tee used)
Standard Tee (as needed)
Standard Regulator (as needed)

NOZZLE SELECTION VERIFICATION

| SPAN # | 1 | 2 | 3 | 4 | 5 | 6 | OH+EG |
|---|---|---|---|---|---|---|---|
| M REQ. | 10.3 | 30.5 | 39.5 | 53.3 | 78.2 | 98.4 | 111.0 |
| M DEL. | 11.4 | 29.8 | 40.8 | 54.2 | 79.9 | 96.2 | 113.3 |
| % DEV. | 10% | -2% | 3% | 2% | 2% | -2% | 2% |

HIGH DEVIATION IN SPAN 1 IS UNAVOIDABLE DUE TO NOZZLE SIZE LIMITATIONS

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WATER RESOURCES DEPT.
SALEM, OREGON
LUBA #2008-203
00248

Nelson Irrigation Corporation

PERCENTAGE TIMER REPORT

JSTOMER: CENTRAL OREGON IRR.
MADRAS, OR
60900

IDENTIFYING MARKS: BARBER #9 prt
CENTRAL OREGON IRR.
MADRAS, OR

/stem Manufacturer: VALMONT
)tal Pipe Length: 918.8 FT
)tal System Flow: 425.0 GPM

End Gun Radius: 63.3 FT
Irrigated Area: 69.6 AC

)tor Speed: 1740 RPM
:nter Gear Ratio: 58:1
)minal Tire Size: 14.9 x 24

Center Drive Speed: 30 RPM
Wheel Gear Ratio: 52:1
Loaded Tire Radius: 22.6 IN

ist Tower Ground Speed at 100% Timer Setting: 6.83 Ft/Min

WATER APPLICATION DEPTH PER REVOLUTION

| Water Application (in) | Timer Setting (%) | Last Tower Ground Speed (ft/min) | Time Per Revolution (hrs) |
|---|---|---|---|
| .17 | 100.0 | 6.83 | 12.94 |
| .19 | 90.0 | 6.14 | 14.38 |
| .22 | 80.0 | 5.46 | 16.18 |
| .25 | 70.0 | 4.78 | 18.49 |
| .29 | 60.0 | 4.10 | 21.57 |
| .35 | 50.0 | 3.41 | 25.89 |
| .44 | 40.0 | 2.73 | 32.36 |
| .58 | 30.0 | 2.05 | 43.14 |
| .87 | 20.0 | 1.37 | 64.72 |
| 1.75 | 10.0 | .68 | 129.43 |

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SALEM, OREGON

The relationships between water application, timer setting and pivot speed provided above are theoretical. Actual application rates may vary due to the following: tire slippage, tire inflation and tread wear; variations in terrain and soils; wind drift; evaporation; and drive train efficiency. For this reason the above data are intended only as a guide and should be used with due caution.

920231 25 MAR 92 VALMONT , 6 TOWER, 425 GPM, 50 PSI PAGE 6

-PART NUMBER SUMMARY-

| ART NO. | QTY | DESCRIPTION |
|---|---|---|
| 165-000 | 15 | 3P PLUG |
| 902-000 | 22 | F33AS IMPACT SPRINKLER |
| 903-000 | 15 | F43A IMPACT SPRINKLER |
| 185-210 | 5 | L2004T IMPACT SPRINKLER 10d |
| 189-109 | 3 | #14 (7/64) 2RN NOZZLE |
| 189-141 | 2 | #18 (9/64) 2RN NOZZLE |
| 198-172 | 4 | #22 (11/64) 3RN NOZZLE |
| 198-187 | 6 | #24 (3/16) 3RN NOZZLE |
| 198-203 | 8 | #26 (13/64) 3RN NOZZLE |
| 198-219 | 4 | #28 (7/32) 3RN NOZZLE |
| 198-234 | 4 | #30 (15/64) 3RN NOZZLE |
| 198-250 | 5 | #32 (1/4) 3RN NOZZLE |
| 198-266 | 3 | #34 (17/64) 3RN NOZZLE |
| 198-281 | 3 | #36 (9/32) 3RN NOZZLE |

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WATER RESOURCES DEPT.
SALEM, OREGON
LUBA #2008-203
00250

# V A L M O N T  I N D U S T R I E S  I N C

DER NO: 2640094 CONVERTED TO PARTS ORDER 0E49194

## SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #1
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

MODEL NUMBER 5071
LENGTH 1014.0
GALLONAGE 800
PIVOT PRESSURE 45
END GUN RADIUS 63
APPL RATE (IN/DAY)
TOTAL ACRES COVERED
GPM PER ACRE

*** SPRINKLER SPECIFICATIONS ***

'STEM TYPE: CORNER SYSTEM MODEL: 5071

'STEM GALLONAGE: 800

'AN CONFIGURATION USING: LIBRARY SPAN DESCRIPTION

| NUMBER | LENGTH | DIAMETER | DESCRIPTION |
|---|---|---|---|
| 8 | 126 | 6 5/8 | VARIABLE SPACED PIPE |
| 1 | 256 | 6 | VARIABLE SPACED PIPE |

| JDE | SPRINKLER PACKAGE DESCRIPTION | LENGTH |
|---|---|---|
| 4D6 | (ROTATOR MOTOR (BLUE) WITH D6 PLATES (RED) (R30)) | 1270 |

IVOT PSI: 45

EGULATORS SELECTED - MANUFACTURER: SENNINGER

LEVATION RISE 1

LEVATION DROP 1

PECIAL REGULATOR OUTLET PSI: 20 LENGTH: 1269

UTLET SIZE SPECIFIED: 1.00

ND GUN CODE: 85 (85 ENDGUN)

ND GUN WILL APPEAR ON CHART BUT HAS BEEN DELETED FROM SHIPPING PAPERS

OOSTER PUMP SELECTED: NONE

T TYPE DESCRIPTION: HIGH FLOAT

'YPE DESCRIPTION: STANDARD SPEED US

APPEAR ON CHART BUT HAVE BEEN DELETED FROM SHIPPING PAPERS

White 72"
Black 66"
yellow 60"

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON
LUBA #2008-203
00251

# V A L M O N T  I N D U S T R I E S  I N C



ORDER NO: 2640094 CONVERTED TO PARTS ORDER 0E49194

05/02/94

SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #1
ADDRESS
CT/ST/ZP 99999
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

MODEL NUMBER 5071
LENGTH 1014.0
GALLONAGE 300
PIVOT PRESSURE 45
END GUN RADIUS 63
APPL RATE (IN/DAY)
TOTAL ACRES COVERED
GPM PER ACRE

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON

| CP'L LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | DROP/ NOZ NO | BOOM/ RISER | NOZ PSI | - GAL/MIN - REQ | ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6.87 | | | GAUGE | | | | | | |
| 2 | 17.36 | | | PLUG | | | | | | |
| 3 | 27.85 | | | PLUG | | | | | | |
| 4 | 38.34 | 44.6 | LOW 20PSI | DROP | 2.0 FCN | 1 white | | 72 | 19.6 | 1.53 | 1.55 |
| 5 | 48.83 | | | PLUG | | | | | | |
| 6 | 59.32 | 44.4 | LOW 20PSI | DROP | 2.0 FCN | 2 IV | | 72 | 19.5 | 1.54 | 1.55 |
| 7 | 69.81 | | | PLUG | | | | | | |
| 8 | 80.30 | 44.1 | LOW 20PSI | DROP | 2.5 FCN | 3 IV | | 72 | 19.3 | 2.96 | 1.85 |
| 9 | 90.79 | | | PLUG | | | | | | |
| 10 | 101.28 | 43.9 | LOW 20PSI | DROP | 19/128 | 4 Black | | 66 | 19.2 | 2.54 | 2.76 |
| 11 | 111.77 | | | PLUG | | | | | | |
| 12 | 122.26 | 43.6 | LOW 20PSI | DROP | 5/32 | 5 Yellow | | 60 | 19.1 | 3.04 | 3.06 |
| | 127.81 | TOWER NO 1 - SPAN LENGTH - 127.81 | | | | | | | | | |
| 13 | 133.44 | | | PLUG | | | | | | |
| 14 | 143.93 | 43.4 | LOW 20PSI | DROP | 21/128 | 6 D | | 66 | 19.0 | 3.49 | 3.35 |
| 15 | 154.42 | | | PLUG | | | | | | |
| 16 | 164.91 | 43.1 | LOW 20PSI | DROP | 23/128 | 7 | | 72 | 18.9 | 3.83 | 4.01 |
| 17 | 175.40 | | | PLUG | | | | | | |
| 18 | 185.89 | 42.9 | LOW 20PSI | DROP | 23/128 | 8 | | 72 | 18.9 | 4.20 | 4.00 |
| 19 | 196.38 | | | PLUG | | | | | | |
| 20 | 206.87 | 42.7 | LOW 20PSI | DROP | 25/128 | 9 | | 72 | 18.8 | 4.54 | 4.71 |

# V A L M O N T  I N D U S T R I E S  I N C



ORDER NO: 2640094 CONVERTED TO PARTS ORDER 0E49194 05/02/94

SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #1
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

MODEL NUMBER 5071
LENGTH 1014.0
GALLONAGE 800
PIVOT PRESSURE 45
END GUN RADIUS 63
APPL RATE (IN/DAY)
TOTAL ACRES COVERED
GPM PER ACRE

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON

| SPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | DROP/ NOZ NO | BOOM/ RISER | NOZ PSI | - GAL/MIN - REQ | ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 21 | 217.36 | | | PLUG | | | | | | |
| 22 | 227.85 | 42.4 | LOW 20PSI | DROP | 25/128 | 10 | B | 66 | 18.8 | 4.86 | 4.71 |
| 23 | 238.34 | | | PLUG | | | | | | |
| 24 | 248.83 | 42.2 | LOW 20PSI | DROP | 27/128 | 11 | Y | 60 | 18.7 | 5.24 | 5.47 |
| | 254.34 | TOWER NO 2 - SPAN LENGTH - 126.53 | | | | | | | | |
| 25 | 259.97 | | | PLUG | | | | | | |
| 26 | 270.46 | 42.0 | LOW 20PSI | DROP | 27/128 | 12 | B | 66 | 18.7 | 5.52 | 5.46 |
| 27 | 280.95 | | | PLUG | | | | | | |
| 28 | 291.44 | 41.7 | LOW 20PSI | DROP | 27/128 | 13 | W | 72 | 18.7 | 5.67 | 5.46 |
| 29 | 301.93 | | | PLUG | | | | | | |
| 30 | 312.42 | 41.5 | LOW 20PSI | DROP | 7/32 | 14 | W | 72 | 18.6 | 5.89 | 5.86 |
| 31 | 322.91 | | | PLUG | | | | | | |
| 32 | 333.40 | 41.3 | LOW 20PSI | DROP | 29/128 | 15 | W | 72 | 18.6 | 6.17 | 6.28 |
| 33 | 343.89 | | | PLUG | | | | | | |
| 34 | 354.38 | 41.1 | MED 20PSI | DROP | 29/128 | 16 | B | 66 | 21.0 | 6.56 | 6.68 |
| 35 | 364.87 | | | PLUG | | | | | | |
| 36 | 375.36 | 40.9 | MED 20PSI | DROP | 15/64 | 17 | Y | 60 | 21.0 | 7.06 | 7.12 |
| | 380.87 | TOWER NO 3 - SPAN LENGTH - 126.53 | | | | | | | | |
| 37 | 386.50 | | | PLUG | | | | | | |
| 38 | 396.99 | 40.7 | MED 20PSI | DROP | 31/128 | 18 | B | 66 | 20.9 | 7.47 | 7.58 |

# V A L M O N T  I N D U S T R I E S  I N C



ORDER NO: 2640094 CONVERTED TO PARTS ORDER 0E49194 05/02/94

## SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #1
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr

MODEL NUMBER 5071
LENGTH 1014.0
GALLONAGE 800
PIVOT PRESSURE 45
END GUN RADIUS 53
APPL RATE (IN/DAY)
TOTAL ACRES COVERED
GPM PER ACRE

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON

| SPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | NOZ NO | DROP/ BOOM/ RISER | NOZ PSI | GAL/MIN REQ | GAL/MIN ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 39 | 407.48 | | | PLUG | | | | | | |
| 40 | 417.97 | 40.5 | MED 20PSI | DROP | 31/128 | 19 W | 72 | 20.9 | 7.74 | 7.58 |
| 41 | 428.46 | | | PLUG | | | | | | |
| 42 | 438.95 | 40.3 | MED 20PSI | DROP | 1/4 | 20 W | 72 | 20.8 | 8.13 | 8.05 |
| 43 | 449.44 | | | PLUG | | | | | | |
| 44 | 459.93 | 40.1 | MED 20PSI | DROP | 33/128 | 21 W | 72 | 20.8 | 8.52 | 8.55 |
| 45 | 470.42 | | | PLUG | | | | | | |
| 46 | 480.91 | 39.9 | MED 20PSI | DROP | 17/64 | 22 B | 66 | 20.7 | 8.91 | 9.05 |
| 47 | 491.40 | | | PLUG | | | | | | |
| 48 | 501.89 | 39.7 | MED 20PSI | DROP | 35/128 | 23 Y | 60 | 20.7 | 9.44 | 9.55 |
| | 507.40 | TOWER NO 4 - SPAN LENGTH - 126.53 | | | | | | | | |
| 49 | 513.03 | | | PLUG | | | | | | |
| 50 | 523.52 | 39.5 | MED 20PSI | DROP | 35/128 | 24 B | 66 | 20.6 | 9.85 | 9.54 |
| 51 | 534.01 | | | PLUG | | | | | | |
| 52 | 544.50 | 39.3 | MED 20PSI | DROP | 9/32 | 25 W | 72 | 20.6 | 10.08 | 10.07 |
| 53 | 554.99 | | | PLUG | | | | | | |
| 54 | 565.48 | 39.1 | MED 20PSI | DROP | 37/128 | 26 W | 72 | 20.5 | 10.47 | 10.64 |
| 55 | 575.97 | | | PLUG | | | | | | |
| 56 | 586.46 | 39.0 | MED 20PSI | DROP | 37/128 | 27 W | 72 | 20.5 | 10.66 | 10.63 |
| 57 | 596.95 | | | PLUG | | | | | | |
| 58 | 607.44 | 38.8 | MED 20PSI | DROP | 19/64 | 28 B | 66 | 20.4 | 11.25 | 11.12 |

# V A L M O N T  I N D U S T R I E S  I N C



ORDER NO: 2640094 CONVERTED TO PARTS ORDER 0E49194

05/02/94

## SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #1
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

MODEL NUMBER 5071
LENGTH 1014.0
GALLONAGE 800
PIVOT PRESSURE 45
END GUN RADIUS 63
APPL RATE (IN/DAY)
TOTAL ACRES COVERED
GPM PER ACRE

| SPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | DROP/ NOZ NO | BOOM/ RISER | NOZ PSI | GAL/MIN REQ | GAL/MIN ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 59 | 617.93 | | | PLUG | | | | | | |
| 60 | 628.42 | 38.7 | MED 20PSI | DROP | 5/16 | 29 | W | 60 | 20.4 | 11.82 | 12.25 |
| | 633.93 | TOWER NO 5 - SPAN LENGTH - 126.53 | | | | | | | | |
| 61 | 639.56 | | | PLUG | | | | | | |
| 62 | 650.05 | 38.5 | MED 20PSI | DROP | 5/16 | 30 | B | 66 | 20.3 | 12.22 | 12.25 |
| 63 | 660.54 | | | PLUG | | | | | | |
| 64 | 671.03 | 38.3 | MED 20PSI | DROP | 5/16 | 31 | W | 72 | 20.3 | 12.43 | 12.24 |
| 65 | 681.52 | | | PLUG | | | | | | |
| 66 | 692.01 | 38.2 | MED 20PSI | DROP | 21/64 | 32 | W | 72 | 20.3 | 12.82 | 13.39 |
| 67 | 702.50 | | | PLUG | | | | | | |
| 68 | 712.99 | 38.1 | MED 20PSI | DROP | 21/64 | 33 | W | 72 | 20.2 | 13.20 | 13.38 |
| 69 | 723.48 | | | PLUG | | | | | | |
| 70 | 733.97 | 37.9 | MED 20PSI | DROP | 21/64 | 34 | B | 66 | 20.2 | 13.59 | 13.37 |
| 71 | 744.46 | | | PLUG | | | | | | |
| 72 | 754.95 | 37.8 | MED 20PSI | DROP | 21/64 | 35 | Y | 60 | 20.1 | 14.20 | 13.34 |
| | 760.46 | TOWER NO 6 - SPAN LENGTH - 126.53 | | | | | | | | |
| 73 | 766.09 | | | PLUG | | | | | | |
| 74 | 776.58 | 37.7 | MED 20PSI | DROP | 19/64 | 36 | B | 66 | 20.5 | 11.01 | 11.13 |
| 75 | 787.07 | 37.6 | MED 20PSI | DROP | 31/128 | 37 | B | 66 | 20.9 | 7.29 | 7.50 |
| 76 | 797.56 | 37.6 | MED 20PSI | DROP | 15/64 | 38 | W | 72 | 20.9 | 7.38 | 7.11 |

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WATER RESOURCES DEPT.
SALEM, OREGON

# V A L M O N T I N D U S T R I E S I N C



ORDER NO: 2640094 CONVERTED TO PARTS ORDER 0E49194 05/02/94

SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #1
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011157
NAME Thompson Pump & Irr

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON

MODEL NUMBER 5071
LENGTH 1014.0
GALLONAGE 800
PIVOT PRESSURE 45
END GUN RADIUS 63
APPL RATE (IN/DAY)
TOTAL ACRES COVERED
GPM PER ACRE

| CPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | NOZ NO | DROP/ BOOM/ RISER | NOZ PSI | - GAL/MIN - REQ | ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 77 | 808.05 | 37.5 | MED 20PSI | DROP | 31/128 | 39 | 72 | 20.9 | 7.48 | 7.58 |
| 78 | 818.54 | 37.5 | MED 20PSI | DROP | 31/128 | 40 | 72 | 20.9 | 7.58 | 7.58 |
| 79 | 829.03 | 37.4 | MED 20PSI | DROP | 31/128 | 41 | 72 | 20.9 | 7.68 | 7.57 |
| 80 | 839.52 | 37.4 | MED 20PSI | DROP | 1/4 | 42 | 72 | 20.9 | 7.77 | 8.06 |
| 81 | 850.01 | 37.3 | MED 20PSI | DROP | 1/4 | 43 | 72 | 20.9 | 7.87 | 8.06 |
| 82 | 860.50 | 37.3 | MED 20PSI | DROP | 1/4 | 44 | 66 | 20.9 | 7.97 | 8.06 |
| 83 | 870.99 | 37.2 | MED 20PSI | DROP | 1/4 | 45 | 66 | 20.9 | 8.06 | 8.06 |
| 84 | 881.48 | 37.2 | MED 20PSI | DROP | 1/4 | 46 | 60 | 20.8 | 8.41 | 8.05 |
| | 886.99 | TOWER NO 7 - SPAN LENGTH - 126.53 | | | | | | | | |
| 85 | 892.62 | 37.2 | MED 20PSI | DROP | 33/128 | 47 | 60 | 20.8 | 8.52 | 8.55 |
| 86 | 903.11 | 37.1 | MED 20PSI | DROP | 33/128 | 48 | 66 | 20.8 | 8.36 | 8.55 |
| 87 | 913.60 | 37.1 | MED 20PSI | DROP | 33/128 | 49 | 66 | 20.8 | 8.46 | 8.55 |
| 88 | 924.09 | 37.0 | MED 20PSI | DROP | 33/128 | 50 | 72 | 20.8 | 8.56 | 8.55 |
| 89 | 934.58 | 37.0 | MED 20PSI | DROP | 33/128 | 51 | 72 | 20.8 | 8.65 | 8.55 |
| 90 | 945.07 | 37.0 | MED 20PSI | DROP | 33/128 | 52 | 72 | 20.8 | 8.75 | 8.54 |
| 91 | 955.56 | 36.9 | MED 20PSI | DROP | 17/64 | 53 | 72 | 20.8 | 8.85 | 9.05 |
| 92 | 966.05 | 36.9 | MED 20PSI | DROP | 17/64 | 54 | 72 | 20.8 | 8.95 | 9.05 |
| 93 | 976.54 | 36.9 | MED 20PSI | DROP | 17/64 | 55 | 72 | 20.7 | 9.04 | 9.05 |
| 94 | 987.03 | 36.8 | MED 20PSI | DROP | 17/64 | 56 | 66 | 20.7 | 9.14 | 9.04 |
| 95 | 997.52 | 36.8 | MED 20PSI | DROP | 17/64 | 57 | 66 | 20.7 | 9.24 | 9.04 |
| 96 | 1008.01 | 36.8 | MED 20PSI | DROP | 9/32 | 58 | 60 | 20.6 | 10.23 | 10.06 |

# VALMONT INDUSTRIES INC

ORDER NO: 2640094 CONVERTED TO PARTS ORDER 0E49194

SPRINKLER SETUP CHART

05/02/94

CUSTOMER
NAME BIG FALLS RANCH #1
ADDRESS
CT/ST/ZP
COUNTRY USA 00000

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

RECEIVED
SEP 14 2001
WATER RESOURCES DEPT.
SALEM, OREGON

| | |
|---|---|
| MODEL NUMBER | 5071 |
| LENGTH | 1014.0 |
| GALLONAGE | 800 |
| PIVOT PRESSURE | 45 |
| END GUN RADIUS | 63 |
| APPL RATE (IN/DAY) | |
| TOTAL ACRES COVERED | |
| GPM PER ACRE | |

| CPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | DROP/ NOZ NO | BOOM/ RISER | NOZ PSI | GAL/MIN REQ | GAL/MIN ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1013.30 | TOWER NO 8 - SPAN LENGTH - 126.31 | | | | | | | | |
| 97 | 1020.52 | 35.0 | MED 20PSI | DROP | 21/64 | | | | | |
| 98 | 1030.76 | 34.9 | MED 20PSI | DROP | 33/128 | | | | | |
| 99 | 1039.67 | 34.9 | MED 20PSI | DROP | 31/128 | | | | | |
| 100 | 1047.43 | 34.9 | MED 20PSI | DROP | 31/128 | | | | | |
| 101 | 1056.25 | 34.9 | MED 20PSI | DROP | 1/4 | | | | | |
| 102 | 1064.76 | 34.8 | MED 20PSI | DROP | 1/4 | | | | | |
| 103 | 1073.27 | 34.8 | MED 20PSI | DROP | 1/4 | | | | | |
| 104 | 1081.18 | 34.8 | MED 20PSI | DROP | 1/4 | | | | | |
| 105 | 1089.94 | 34.8 | MED 20PSI | DROP | 1/4 | | | | | |
| 106 | 1097.32 | 34.7 | MED 20PSI | DROP | 33/128 | | | | | |
| 107 | 1099.32 | | | PLUG | | | | | | |
| 108 | 1106.79 | 34.7 | MED 20PSI | DROP | 17/64 | | | | | |
| 109 | 1115.46 | 34.7 | MED 20PSI | DROP | 33/128 | | | | | |
| 110 | 1123.37 | 34.7 | MED 20PSI | DROP | 33/128 | | | | | |
| 111 | 1131.88 | 34.7 | MED 20PSI | DROP | 33/128 | | | | | |
| 112 | 1140.39 | 34.7 | MED 20PSI | DROP | 17/64 | | | | | |
| 113 | 1149.21 | 34.6 | MED 20PSI | DROP | 33/128 | | | | | |
| 14 | 1155.98 | 34.6 | MED 20PSI | DROP | 15/64 | | | | | |
| 15 | 1162.75 | 34.6 | MED 20PSI | DROP | 15/64 | | | | | |
| 59 | 60 | 20.2 | 12.84 | 13.38 | | | | | | |
| 60 | 66 | 20.8 | 8.76 | 8.54 | | | | | | |
| 61 | 66 | 20.9 | 7.71 | 7.58 | | | | | | |
| 62 | W72 | 20.9 | 7.75 | 7.57 | | | | | | |
| 63 | W72 | 20.8 | 8.19 | 8.05 | | | | | | |
| 64 | W72 | 20.8 | 8.13 | 8.05 | | | | | | |
| 65 | W72 | 20.8 | 7.93 | 8.05 | | | | | | |
| 66 | 78 | 20.8 | 8.13 | 8.05 | | | | | | |
| 67 | 78 | 20.8 | 7.95 | 8.05 | | | | | | |
| 68 | 78 | 20.8 | 8.33 | 8.55 | | | | | | |
| 69 | 78 | 20.7 | 9.12 | 9.04 | | | | | | |
| 70 | 78 | 20.8 | 8.47 | 8.55 | | | | | | |
| 71 | W72 | 20.8 | 8.42 | 8.55 | | | | | | |
| 72 | W72 | 20.8 | 8.82 | 8.54 | | | | | | |
| 73 | W72 | 20.7 | 9.07 | 9.04 | | | | | | |
| 74 | W72 | 20.8 | 8.25 | 8.55 | | | | | | |
| 75 | 66 | 21.0 | 7.22 | 7.12 | | | | | | |
| 76 | 66 | 21.0 | 7.27 | 7.11 | | | | | | |

# V A L M O N T I N D U S T R I E S I N C

ORDER NO: 2640094 CONVERTED TO PARTS ORDER 0E49194 -9- 05/02/94

## SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #1
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

MODEL NUMBER 5071
LENGTH 1014.0
GALLONAGE 800
PIVOT PRESSURE 45
END GUN RADIUS 63
APPL RATE (IN/DAY)
TOTAL ACRES COVERED
GPM PER ACRE

| SPL LOCN | FT FROM PIVOT | LINE PRESS | ORIFICE/ REGULATOR | SPRK MODEL | NOZZLE SIZES | DROP/ NOZ NO | BOOM/ RISER | NOZ PSI | - GAL/MIN - REQ | ACT |
|---|---|---|---|---|---|---|---|---|---|---|
| 116 | 1169.52 | 34.6 | MED 20PSI | DROP | 1/4 | 77 | 66 | 20.9 | 8.00 | 8.05 |
| 117 | 1177.53 | 34.6 | MED 20PSI | DROP | 35/128 | 78 | 60 | 20.7 | 9.37 | 9.55 |
| | 1183.31 | TOWER NO 9 - SPAN LENGTH - 170.01 | | | | | | | | |
| 118 | 1186.71 | 34.6 | MED 20PSI | DROP | 17/64 | 79 | 60 | 20.7 | 9.09 | 9.04 |
| 119 | 1193.98 | 34.6 | MED 20PSI | DROP | 1/4 | 80 | 60 | 20.8 | 8.10 | 8.05 |
| 120 | 1201.24 | 34.6 | MED 20PSI | DROP | 1/4 | 81 | 60 | 20.8 | 8.16 | 8.05 |
| 121 | 1208.51 | 34.6 | MED 20PSI | DROP | 1/4 | 82 | 60 | 20.8 | 8.23 | 8.05 |
| 122 | 1215.78 | 34.6 | MED 20PSI | DROP | 33/128 | 83 | 60 | 20.8 | 8.30 | 8.55 |
| 123 | 1223.05 | 34.6 | MED 20PSI | DROP | 17/64 | 84 | 60 | 20.7 | 8.87 | 9.05 |
| 124 | 1231.20 | 34.5 | MED 20PSI | DROP | 17/64 | 85 | 60 | 20.7 | 9.07 | 9.04 |
| 125 | 1238.67 | 34.5 | MED 20PSI | DROP | 33/128 | 86 | 60 | 20.8 | 8.75 | 8.54 |
| 126 | 1246.14 | 34.5 | MED 20PSI | DROP | 17/64 | 87 | 60 | 20.8 | 8.82 | 9.05 |
| 127 | 1253.61 | 34.5 | MED 20PSI | DROP | 17/64 | 88 | 60 | 20.8 | 8.89 | 9.05 |
| 128 | 1261.08 | 34.4 | MED 20PSI | DROP | 9/32 | 89 | 60 | 20.6 | 10.48 | 10.06 |
| 129 | 1266.58 | 34.4 | | DRAIN | SENN 17 | 90 | | 34.4 | 11.20 | 11.73 |
| 130 | 1268.08 | 34.0 | | 85 | 5/8 | 91 | | 32.5 | 73.75 | 60.25 |

ENDGUN ARC SETTINGS. FORWARD ANGLE = 65 BACKWARD ANGLE = 55

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SALEM, OREGON

# VALMONT INDUSTRIES INC



ORDER NO: 2640094 CONVERTED TO PARTS ORDER 0E49194 05/02/94

## SPRINKLER SETUP CHART

CUSTOMER
NAME BIG FALLS RANCH #1
ADDRESS
CT/ST/ZP 00000
COUNTRY USA

DEALER
NUMBER: 011159
NAME Thompson Pump & Irr.

MODEL NUMBER 5071
LENGTH 1014.0
GALLONAGE 800
PIVOT PRESSURE 45
END GUN RADIUS 63
APPL RATE (IN/DAY)
TOTAL ACRES COVERED
GPM PER ACRE

## PERCENTAGE TIMER DATA

| INCHES PER REVOLUTION | PERCENT TIMER SETTING | HOURS PER REVOLUTION |
|---|---|---|
| .22 | 100 | 16 |
| .30 | 72 | 22 |
| .40 | 54 | 29 |
| .50 | 43 | 36 |
| .60 | 36 | 43 |
| .70 | 31 | 51 |
| .80 | 27 | 58 |
| .90 | 24 | 65 |
| 1.00 | 22 | 72 |
| 1.25 | 17 | 90 |
| 1.50 | 14 | 108 |
| 1.75 | 12 | 126 |
| 2.00 | 11 | 145 |
| 2.50 | 9 | 181 |
| 3.00 | 7 | 217 |
| 3.50 | 6 | 253 |
| 4.00 | 5 | 289 |
| 5.00 | 4 | 361 |

ABOVE DATA FOR 30.0 RPM (480 V., 60 HZ.) CENTERDRIVE GEARBOX WITH HI-FLT 14.9X 24 TIRES AT OUTER TOWER. BECAUSE THE ABOVE INFORMATION IS BASED ON VARIABLES WHICH CANNOT BE TOTALLY CONTROLLED (PIVOT PRESSURE, ENDGUN RANGE, TIRE SLIP, TERRAIN VARIATIONS), VALMONT CANNOT GUARANTEE THE ACCURACY OF THE APPLICATION DEPTH AND PERCENTAGE TIMER CALCULATIONS. FURTHERMORE, VALMONT MAKES NO REPRESENTATIONS OR RECOMMENDATIONS AS TO PERCENTAGE TIMER SETTINGS, WATER APPLICATION RATES, AND OTHER SIMILIAR FARM MANAGEMENT DECISIONS.

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SALEM, OREGON

# Native Restoration Fund

*A mission of Vulcan Power Company*

August 28, 2008

Ruth Herzer, Associate Planner
Deschutes County CDD
117 NW Lafayette Ave.
Bend, OR 97701-1925

Re: Thornburgh Final Master Plan M-07-2; MA-08-6

Enclosed are the following comments in reply to new information provided by Thornburgh Resort in their submittal dated 8-12-2008.

**1. <u>Steve Munson's Comments (7 pages)</u>**

RECEIVED
BY: Munson
AUG 28 2008
DELIVERED BY:
Ginger
4:30pm

SCANNED
SEP 23 2008

LUBA #2008-203
00260

PA 0721
MA 086

# Native Restoration Fund

*A mission of Vulcan Power Company*

RECEIVED
BY: Steve Munson
AUG 2 8 2008
DELIVERED BY:
Ginger
4:30pm

August 28, 2008

Ruth Herzer, Associate Planner
Deschutes County CDD
117 NW Lafayette Ave.
Bend, OR 97701-1925

Re: File # M-07-2; MA-08-6

**Reply to new information provided by Thornburgh Resort in their submittal dated 8-12-2008**

Native Restoration Fund
Steve Munson, Local Citizen

These comments concern Thornburgh filings listed in their table of contents as E. Munson Documents 1. 2. and 3. The documents submitted by Thornburgh and Schwabe Williamson and Wyatt law firm are from Sharon Gambrel and Craig Gambrel who have longstanding personal grudges against local citizen Steve Munson.

While these filings have no direct relevancy to the issue at hand, namely the consideration of whether or not the Thornburgh golf resort should be permitted, Thornburgh and Schwabe Williamson seem intent on destroying the credibility of the testimony of a resort opponent and local citizen.

The Gambrel clan grudges against Steve Munson are derived from the fact that at the specific request of a terrified Gambrel grand-daughter, Steve Munson rescued her mother, the badly beaten daughter-in-law of Sharon Gambrel and sister-in-law of Craig Gambrel, from a day of terror and beatings at the hands of the eldest son of Sharon Gambrel and elder brother of Craig Gambrel.

The Gambrel clan grudges and several years of their harassment of Munson, derive from the related fact that after I rescued the beaten wife I then was asked to and did testify against the eldest Gambrel son at the subsequent Deschutes County grand jury. That process resulted, I was later told, in Sharon Gambrels eldest son being returned to prison for the parole violation assault on his common law wife and/or for the related harassment of their children, who are Sharon Gambrels grandchildren.

The enmity of Sharon Gambrel, her 3 sons and deceased husband against Munson, carried out over a year of threats and harassment of Munson by the male members of the Gambrel clan, derive entirely from the fact that Munson was a citizen hero who stepped in due to the lack of sheriff department timely response, at the request of the terrified hysterical Gambrel granddaughter and grandson to stop an afternoon of brutal beatings and murderous death threats by their drugged-out father, the eldest Gambrel son against their mother, and his common law wife in front of the kids which resulted in the his return to prison for parole violation of a conviction for growing marijuana on an alleged mining claim (subsequently judged illegal by USBLM) on Cline Butte.



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The law firm Schwabe Williamson maliciously submitted these untruthful self-serving comments in a transparent, slanderous and desperate effort to both: (1) discredit the efficacy of the comments of local citizen Steve Munson made to the Deschutes County land use hearings officer in opposition to the Thornburgh resort; and (2) to attempt to threaten and scare Munson away from further opposition to the law firm proposed resort client.

Aside from this thoroughly unprofessional effort to undermine the factual comments of citizen Munson and others in opposition to the Thornburgh resort, the untruthful allegations, hearsay and innuendo in the Gambrel clan comments and any past alleged actions of Munson have nothing to do with the basic unalterable facts that the Thornburgh wildlife plan does not meet professional standards and that the proposed resort is more likely than not to adversely affect wildlife and that golf course water use will have an adverse effect on Federally protected Bull Trout critical habitat and the local water aquifer already being drawn down by massive growth.

Most comments of the Gambrel clan alleged to relate to Steve Munson's moral or ethical conduct are not factual. As with many of the Thornburgh proponents comments, the Gambrel comments include untruths, deceitful innuendos, hearsay and other self serving allegations heaping discredit on Munson, his thoroughly public spirited efforts to preserve wildlife, the local life style in Tumalo and the local water aquifer from further waste on still more unneeded golf courses.

Recent Local Golf Course Use

The press has recently reported that local golf course use over the past five years demonstrates that additional golf courses are not needed in Deschutes County. Golf course use has been basically flat for five years or more despite numerous additional golf courses.

Other resort areas with more golf courses than they need have reportedly undertaken a logical transition which Deschutes County should consider instead of permitting more golf courses, in which needed existing lower use golf courses in urban areas created to sell subdivision lots on the courses, are being converted to housing providing land and reducing water use.

A large resort and three golf courses is inappropriate in Tumalo and will have massive unreported and understudied adverse effects on local wildlife, local lifestyles, local wells and Federally protected Bull Trout critical habitat in cold water springs refugia.

It is Munson's opinion that Thornburgh proponents and Schwabe Williamson acted in extreme malicious bad faith in using known untruths to disparage a local citizen opposed to the resort for public spirited reasons rather than for self interest.

Unlike the Thornburghs, their attorneys, and possibly the Gambrels, I have nothing to gain from opposing the Thornburgh resort. To the contrary, I have expended considerable amounts of time and money on fighting for this important Central Oregon cause for no other reason than it's the right thing to do. I have no motives of profit from real estate, geothermal or other means related to this resort application, just the deep sense of connection to an area that I grew up in and the knowledge that we cannot allow the continuous construction of large resorts without the people of Central Oregon being involved. I am a Central Oregonian, and I am involved, nothing more.



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Geo thermo (sic) Allegation

One particularly ridiculous Gambrel allegation is that Munson opposed the Thornburgh resort project because of a desire to develop what Sharon Gambrel alleged to be Geo thermo power potential at Cline Butte. It is presumed Gambrel means "geothermal" power.

She alleged that I approached her to buy her "alleged" mining claims because they are on a hot spot and that I could sell power to Bend, Redmond and Sisters. I do not ever recall saying any such thing to Gambrel. Son Craig Gambrel also alleged that, "Munson made numerous attempts to get our family off our mining claims because he wanted geothermal rights under the land." He also stated that, "I think Munson is opposing the resort because he couldn't get the geothermal." Both allegations are utterly ludicrous.

This can be disproven in part by the fact that I have never sought geothermal lease sites there. Had I truly wanted to develop geothermal power at Cline Butte, I could have and would have applied to the USBLM for geothermal lease rights at a cost of a mere $1.00 per acre on the 240 acres and more of Federal public lands at Cline Butte, a very small portion of which Federal land represented the "alleged" mining claims of Gambrel. I also never applied to the State of Oregon for the additional 40 acres of state geothermal rights right up on the west flank of Cline Butte.

This can only be construed as an effort by the Gambrels to:

(1) Get even with Munson for protecting the Gambrel grandchildren and daughter-in-law against the eldest Gambrel son and in doing so testifying against the eldest Gambrel son putting him back in prison. The Deschutes County Deputy District Attorney actually told Munson he was a local hero for standing up for the beaten wife and threatened kids;

(2) Get even with Munson for his requests to BLM that it act as it had said it intended to act to declare the alleged Gambrel mining claim invalid. This was done in an effort to stop unremitting Gambrel clan harassment of Munson and his son and threats to their safety from drugged-out and/or drunken Gambrel male family members; and

(3) Assist the elder Thornburgh friends of Gambrel in gaining approval of the proposed resort by disparaging Munson's opposition comments against resort approval. This is a red herring argument.

In addition to the foregoing, after hearing from locals that the Gambrels did not have a legal mining claim (which was later confirmed by BLM geologist Steve Story who stated he did not believe the mining claim was valid), had I even wanted to obtain the geothermal rights to the land Gambrel improperly claimed was theirs, I would simply have filed the $ 1.00 per acre geothermal lease application with USBLM and sought to perfect that lease application to allow geothermal development.

The fact that I did none of these actions clearly demonstrates that I did not attempt to buy geothermal rights which were easily available, at much lower costs, even on this very same land and immediately adjacent much larger lands, than buying fee land of the alleged mining claims.



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Second, there is no science that I am aware of which indicates that Cline Buttes would be a good geothermal power resource area worthy of development. Accordingly, I had and have no reason to seek the geothermal rights.

The Gambrels then stretch from this allegation to an even more ridiculous allegation that I then engaged in 3 years of harassing her family members because Gambrel refused to sell the "alleged" mining claims to me for geothermal development. Nothing could be further from the truth.

Indeed, this allegation is nothing more than another round of revengeful efforts by the Gambrel clan as "payback" for my testimony against the elder brother of the clan who was sent to prison for brutally beating his common law wife and dragging her off into the trees with a sword on her throat threatening to kill her in front of their children.

Munson Interface With BLM Over Alleged Mining Claims

Sharon Gambrel alleged, "I know Munson called BLM about my family and I several times." In truth, the alleged Gambrel mining claims were disallowed by BLM, as Munson had been told years ago by BLM.

I had been told by other local citizens that they believed the alleged Gambrel mining claim was illegal and not a valid claim. The initial discussion I had with BLM about the alleged Gambrel mining claim was after a traumatic altercation caused entirely by the drugged-out elder Gambrel son on the alleged mining claim.

This incident occurred when I went up to the alleged Federal mining claim at the hysterical request of Sharon Gambrel's granddaughter. I literally rescued the wife of Sharon Gambrel's eldest son, (Craig Gambrel's brother) and I rescued Sharon Gambrel's grandson who was so scared by his father's actions that he had literally defecated in his pants, was hysterical and ran screaming to me, hugging my legs and begging me to stop his father from killing his mother.

I did so without regard to my own safety, after leaving my own young son at some risk, and having first hidden Sharon Gambrel's grand-daughter and my young son down at my house in case the drug sodden elder Gambrel son happened to head that way off the alleged claim.

The elder son beat and threatened to kill his wife and harassed his children, reportedly telling the wife in a drugged-out state he was "going to send them back to god" as he was beating on her.

It was actually a dangerous situation that I handled well and heroically. I did not feel compelled to, and I did not point the rifle in my hands at the time at the then very violent drugged out man. Having saved the woman and children, I testified against the drugged-out the man, and he was sent back to prison. This directly led to an incident which they falsely allege I criminally used an assault rifle. I did not use the assault rifle, and I was doing what any good citizen would do.

Later Munson testified at a grand jury to the deputy district attorney regarding the attack which resulted in her eldest son being sent back to prison for a year. His wife and child told Munson he



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had been taking a mixture of drugs all day long and beating on her all afternoon. She was beaten black and blue in the face.

At the grand jury meeting Munson was called a hero by the deputy district attorney for intervening to save the women when the local sheriff's department didn't respond to the 911 calls for over a half hour. The deputy district attorney also commented that our society would be better off if more citizens stood up for the weak and young as Munson had done.

This encounter with the Gambrels was the reason I desired to have them removed as neighbors, if indeed the alleged mining claim was invalid. It had been proven to me beyond any doubt that the elder Gambrel was a vicious multi-drug user and woman and child abuser dangerous to my own young son and perhaps even to myself. It had nothing to do whatsoever with the alleged Geo thermo illusion now alleged by Gambrel.

From the very first discussion about this with BLM, their staff stated that, in their opinion, the alleged mining claim was invalid. I was told it might take some time to remove the Gambrels but that the BLM intended to do so. BLM asked me to be patient while the process took place.

Little did I know at that point what the remaining Gambrel bothers would do to harass me and my son, including:

(1) Several drunken harassments by another Gambrel son in which he and another person were shooting guns near our house in the evening without my or the ranch owner's approval, where he drunkenly attempted to goad me into a fight in front of my young son until my son ran to call 911; and

(2) After having the Gambrel sons push a gasoline-dripping car off the alleged mining claim over the hillside down towards my house, which would have burned us out if it had exploded; and

(3) After the drunken Gambrel father (since deceased) was told to remove that gasoline car to the dump by message of the owner and he instead pulled it down into the ranch area leaving behind a string of his beer cans behind along the path; and

(4) After picking up the Gambrels' beer and wine and whiskey bottles and somebody's drug paraphernalia time after time along the road to our house and the alleged mining claims; and

(5) After parties who worked for the Redmond police or sheriffs office literally burned up their little pickup and left it on the road into our house; and

(6) After someone having one of numerous gun shooting party up on the hillside near the alleged mining claims put an M 60 machine gun round ricochet into my horse corral when I was working my horses; then

I decided we had had more than enough of the Gambrels and their associates. There were reports to the sheriff's office on many of these occasions. Virtually none of them resulted in apprehension or actions against the Gambrels with the exception of the elder brother's arrest and prison sentence.



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This was only because the sheriffs typically showed up a half hour late, if at all, and later told me part of the reason they didn't help out timely was that they didn't have a proper law enforcement agreement with BLM. It is basically a "no-man's land" where we lived.

With the approval of the owner we posted about 20 no trespassing signs on the road in. We put an unlocked gate on the road in after the signs and left it with a chain instead of a lock.

For several months before this incident, I saw two women who associated with two drunken brothers who were trespassing and apparently living from time to time on my property. While out hunting rabbits with my son, I saw the trespassers and demanded they leave the property. At no time during that attempt to get the trespassers related to the drugged out man who was sent to prison off our ranch, did I or my son point a gun at anyone. We merely were hunting rabbits with a BB gun and small rifle at the time and were holding them casually in parade rest style when I told them to leave the ranch which was posted against since incursions.

The local deputy sheriff attempted to prove to the DA before the no contest plea that I had used an assault rifle instead of the rabbit gun. That allegation which was pushed on the trespassers by the deputy sheriff was completely disproven and abandoned during the initial evaluation by the DA office.

There was a false story printed at the time that alleged an assault rifle was used in what later was said to have been a misdemeanor without such rifle involved at all in any way.

As with many things of this nature in a small community the event transpired in part because of personal issues and because I had been critical locally of the lack of timely response by the local sheriff deputy to matters like the wife beating and death threats.

It resulted in me agreeing, rather than undergoing an expensive trial we could not afford at that time several years ago, to not contest a misdemeanor which court charging statement, describes the event thusly, "it is a misdemeanor to frighten a trespasser to cause that person to exit a property in a vehicle driven in reverse fast on a bumpy dirt road."

The Gambrels later attempted (unsuccessfully) to frame me over alleged guns events much as they have done again in this letter from Ms Gambrel.

All of these incidents have been mischaracterized in an effort to discredit my opposition to the proposed resort, to both personally discredit me and to incorrectly claim that I am opposed to this resort because of some alleged desire to "obtain the geo thermo rights alleged to exist there." I trust that everyone will see these allegations as false, as they truly are.

Respectfully Submitted,

Steve Munson, Citizen



345 SW Cyber Drive # 103 Bend, OR 97702 (541) 317-1984

## Ruth Herzer

**From:** Ruth Herzer
**Sent:** Thursday, August 28, 2008 8:48 AM
**To:** 'nunzie@pacifier.com'
**Subject:** FW: Thornburgh Resort Final Master Plan

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**From:** Livingston, Peter [mailto:plivingston@SCHWABE.com]
**Sent:** Monday, August 25, 2008 8:54 AM
**To:** Ruth Herzer
**Cc:** Anne Corcoran Briggs
**Subject:** RE: Thornburgh Resort Final Master Plan

This is a replacement for the Attachment E-2 that was part of the TetraTech wildlife mitigation plan, to correct a small inconsistency in the number of acres stated for different uses. The only change is that four acres are moved from "Facilities" to "Golf Course" in the "Acres Breeding Habitat" column. As a result, there are one-digit adjustments in the number of HUs in the "Post-Development" rows. It should have been submitted with other rebuttal materials on August 12, but during the compilation of materials, it was inadvertently omitted. There is no reason for the hearings officer to do anything with it until the final argument (and perhaps not then).

**PETER LIVINGSTON | Attorney**
SCHWABE, WILLIAMSON & WYATT
**1211 SW 5th Ave., Ste. 1900 Portland, OR 97204**
**Direct: 503-796-2892 | Fax: 503-796-2900 | Cell: 503-314-1050 | Email: plivingston@schwabe.com**
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**From:** Ruth Herzer [mailto:Ruth_Herzer@co.deschutes.or.us]
**Sent:** Monday, August 25, 2008 8:40 AM
**To:** Livingston, Peter
**Cc:** Anne Corcoran Briggs
**Subject:** FW: Thornburgh Resort Final Master Plan

Peter,
Please see Anne's response to your submittal of Thurs evening. Can you please clarify where this document is supposed to go in your submittal of 8/12/08?

*Ruth Herzer*
*Associate Planner*
*Deschutes County Community Development*
*117 NW Lafayette*
*Bend, OR 97701*
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Okay, I've received it, but I'm not sure what it means. Is there any supporting/explanatory documentation? Or am I supposed to go through the record to find the appropriate references?

>
>
>
> -----Original Message-----
> From: Livingston, Peter [mailto:plivingston@SCHWABE.com]
> Sent: Thursday, August 21, 2008 6:32 PM
> To: Ruth Herzer
> Subject: Thornburgh Resort Final Master Plan
>
> Ruth:
>
> Please include the attached document in the record.
>
> > > <<0776_001.pdf>>
> >
> PETER LIVINGSTON | Attorney
> SCHWABE, WILLIAMSON & WYATT
> 1211 SW 5th Ave., Ste. 1900 Portland, OR 97204
> Direct: 503-796-2892 | Fax: 503-796-2900 | Cell: 503-314-1050 | Email:
> plivingston@schwabe.com
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>
>
> _____
>
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## Ruth Herzer

**From:** Ruth Herzer
**Sent:** Thursday, August 28, 2008 8:46 AM
**To:** 'nunzie@pacifier.com'
**Subject:** FW: Thornburgh Resort Final Master Plan

**Attachments:** 0776_001.pdf

0776_001.pdf (708 KB)

-----Original Message-----
From: Livingston, Peter [mailto:plivingston@SCHWABE.com]
Sent: Thursday, August 21, 2008 6:32 PM
To: Ruth Herzer
Subject: Thornburgh Resort Final Master Plan

Ruth:

Please include the attached document in the record.

> > <<0776_001.pdf>>
>
PETER LIVINGSTON | Attorney
SCHWABE, WILLIAMSON & WYATT
1211 SW 5th Ave., Ste. 1900 Portland, OR 97204
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## Modified HEP Analysis
## Thornburgh Resort

### TABLE E-2. MODIFIED HEP ANALYSIS CALCULATIONS

| SPECIES | | Breeding | | | Foraging | | | | | Comments and Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Northern Flicker | Acres Breeding Hab | Disturbance Reduction Multiplier | SI | HUs | Acres Foraging Hab | Disturbance Reduction Multiplier | SI | HUs | Total HUs | |
| **ONSITE** | | | | | | | | | | |
| **BEFORE DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 4 | 0.29 | 0.20 | 1 | 4 | 0.29 | 0.20 | 1 | 2 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 134 | 0.86 | 0.60 | 81 | 134 | 0.86 | 0.60 | 81 | 161 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 1605 | 0.86 | 0.60 | 963 | 1605 | 0.91 | 0.64 | 1022 | 1985 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 227 | 1.00 | 0.70 | 159 | 227 | 1.00 | 0.70 | 159 | 318 | |
| **Total** | **1970** | | | **1203** | **1970** | | | **1263** | **2466** | |
| **POST DEVELOPMENT** | | | | | | | | | | |
| Undeveloped | 568 | - | 0.60 | 341 | | - | 0.60 | 341 | 682 | Large reduction in flicker habitat in residential, facilities, golf course after development; smaller reduction in undeveloped |
| Residential | 426 | - | 0.20 | 85 | | - | 0.20 | 85 | 170 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.10 | 62 | | - | 0.10 | 62 | 123 | |
| Lakes | 45 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| **Total** | **1970** | | | **488** | | | | **488** | **975** | |
| **AFTER ENHANCEMENT** | | | | | | | | | | |
| Undeveloped | 568 | - | 0.60 | 341 | | - | 0.70 | 398 | 738 | No change to breeding habitat from enhancement, small improvement in foraging habitat from enhancement from |
| Residential | 426 | - | 0.20 | 85 | | - | 0.28 | 119 | 204 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.10 | 62 | | - | 0.10 | 62 | 123 | |
| Lakes | 45 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| **Total** | **1970** | | | **488** | | | | **578** | **1066** | |
| **OFFSITE WITHIN 1 MI** | | | | | | | | | | |
| **BEFORE DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.29 | 0.20 | 60 | 296 | 0.29 | 0.20 | 60 | 120 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 1156 | 0.86 | 0.60 | 696 | 1156 | 0.86 | 0.60 | 696 | 1392 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 6022 | 0.86 | 0.60 | 3625 | 6022 | 0.91 | 0.64 | 3836 | 7461 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 1418 | 1.00 | 0.70 | 992 | 1418 | 1.00 | 0.70 | 993 | 1985 | |
| **Total** | **8892** | | | **5374** | **8892** | | | **5585** | **10958** | |
| **POST DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.29 | 0.20 | 60 | 296 | 0.29 | 0.20 | 60 | 120 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 2703 | 0.86 | 0.60 | 1627 | 2703 | 0.86 | 0.60 | 1622 | 3249 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 4613 | 0.86 | 0.60 | 2777 | 4613 | 0.91 | 0.64 | 2938 | 5716 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 1280 | 1.00 | 0.70 | 896 | 1280 | 1.00 | 0.70 | 896 | 1792 | |
| **Total** | **8892** | | | **5360** | **8892** | | | **5516** | **10877** | |

## Modified HEP Analysis
## Thornburgh Resort

| SPECIES | | Breeding | | | Foraging | | | | | Comments and Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| American Kestrel | Acres Breeding Hab | Disturbance Reduction Multiplier | SI | HUs | Acres Foraging Hab | Disturbance Reduction Multiplier | SI | HUs | Total HUs | |
| **ONSITE** | | | | | | | | | | |
| **BEFORE DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 4 | 0.00 | 0.00 | 0 | 4 | 0.50 | 0.10 | 0 | 0 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 175 | 0.00 | 0.00 | 0 | 134 | 1.00 | 0.20 | 27 | 27 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 1764 | 0.25 | 0.05 | 88 | 1605 | 1.00 | 0.20 | 321 | 409 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 27 | 1.00 | 0.20 | 5 | 227 | 1.00 | 0.20 | 45 | 51 | |
| **Total** | **1970** | | | **94** | **1970** | | | **394** | **487** | |
| **POST DEVELOPMENT** | | | | | | | | | | |
| Undeveloped | 568 | - | 0.00 | 0 | | - | 0.20 | 114 | 114 | Elimination of breeding habitat due to disturbance, foraging habitat reduced except at undeveloped areas |
| Residential | 426 | - | 0.00 | 0 | | - | 0.10 | 43 | 43 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.00 | 0 | | - | 0.10 | 62 | 62 | |
| Lakes | 45 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| **Total** | **1970** | | | **0** | | | | **218** | **218** | |
| **AFTER ENHANCEMENT** | | | | | | | | | | |
| Undeveloped | 568 | - | 0.10 | 57 | | - | 0.20 | 114 | 170 | Addition of kestrel nest boxes will enhance remaining nesting habitat |
| Residential | 426 | - | 0.00 | 0 | | - | 0.20 | 85 | 85 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.00 | 0 | | - | 0.10 | 62 | 62 | |
| Lakes | 45 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| **Total** | **1970** | | | **57** | | | | **260** | **317** | |
| **OFFSITE WITHIN 1 MI** | | | | | | | | | | |
| **BEFORE DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.00 | 0.00 | 0 | 296 | 0.50 | 0.20 | 59 | 59 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 1444 | 0.00 | 0.00 | 0 | 1156 | 1.00 | 0.20 | 231 | 231 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 6999 | 0.25 | 0.05 | 350 | 6022 | 1.00 | 0.20 | 1204 | 1554 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 153 | 1.00 | 0.20 | 31 | 1418 | 1.00 | 0.20 | 284 | 314 | *B refers to breeding habitat impacts<br>F refers to foraging habitat impacts |
| **Total** | **8892** | | | **381** | **8892** | | | **1778** | **2159** | |
| **POST DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.00 | 0.00 | 0 | 296 | 0.50 | 0.20 | 59 | 59 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 3204 | 0.00 | 0.00 | 0 | 2703 | 1.00 | 0.20 | 541 | 541 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 5241 | 0.25 | 0.05 | 262 | 4613 | 1.00 | 0.20 | 923 | 1185 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 151 | 1.00 | 0.20 | 30 | 1280 | 1.00 | 0.20 | 256 | 286 | *B refers to breeding habitat impacts<br>F refers to foraging habitat impacts |
| **Total** | **8892** | | | **292** | **8892** | | | **1778** | **2071** | |

## Modified HEP Analysis
## Thornburgh Resort

| SPECIES | | Breeding | | | Foraging | | | | | Comments and Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Red-tailed Hawk | Acres Breed-ing Hab | Disturbance Reduction Multiplier | SI | HUs | Acres Forag-ing Hab | Disturbance Reduction Multiplier | SI | HUs | Total HUs | |
| **ONSITE** | | | | | | | | | | |
| **BEFORE DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 4 | 0.00 | 0.00 | 0 | 4 | 0.00 | 0.00 | 0 | 0 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 175 | 0.00 | 0.00 | 0 | 134 | 0.33 | 0.10 | 13 | 13 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 1764 | 0.25 | 0.09 | 154 | 1605 | 0.80 | 0.24 | 385 | 540 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 27 | 1.00 | 0.35 | 9 | 227 | 1.00 | 0.30 | 68 | 78 | |
| **Total** | **1970** | | | **164** | **1970** | | | **467** | **630** | |
| **POST DEVELOPMENT** | | | | | | | | | | |
| Undeveloped | 568 | - | 0.00 | 0 | - | | 0.10 | 57 | 57 | Future avoidance of the Resort after development is assumed so that breeding habitat is lost after development and foraging |
| Residential | 426 | - | 0.00 | 0 | - | | 0.00 | 0 | 0 | |
| Facilities | 316 | - | 0.00 | 0 | - | | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.00 | 0 | - | | 0.10 | 62 | 62 | |
| Lakes | 45 | - | 0.00 | 0 | - | | 0.00 | 0 | 0 | |
| **Total** | **1970** | | | **0** | | | | **118** | **118** | |
| **AFTER ENHANCEMENT** | | | | | | | | | | |
| Undeveloped | 568 | - | 0.00 | 0 | - | | 0.10 | 57 | 57 | Enhancement of habitat assumed to provide no improvement to red-tailed hawk foraging habitat |
| Residential | 426 | - | 0.00 | 0 | - | | 0.00 | 0 | 0 | |
| Facilities | 316 | - | 0.00 | 0 | - | | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.00 | 0 | - | | 0.10 | 62 | 62 | |
| Lakes | 45 | - | 0.00 | 0 | - | | 0.00 | 0 | 0 | |
| **Total** | **1970** | | | **0** | | | | **118** | **118** | |
| **OFFSITE WITHIN 1 MI** | | | | | | | | | | |
| **BEFORE DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.00 | 0.00 | 0 | 296 | 0.00 | 0.00 | 0 | 0 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 1444 | 0.00 | 0.00 | 0 | 1156 | 0.33 | 0.10 | 114 | 114 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 6999 | 0.25 | 0.09 | 612 | 6022 | 0.80 | 0.24 | 1445 | 2058 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 153 | 1.00 | 0.35 | 54 | 1418 | 1.00 | 0.30 | 425 | 479 | *B refers to breeding habitat impacts<br>F refers to foraging habitat impacts |
| **Total** | **8892** | | | **666** | **8892** | | | **1985** | **2651** | |
| **POST DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.00 | 0.00 | 0 | 296 | 0.00 | 0.00 | 0 | 0 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 3204 | 0.00 | 0.00 | 0 | 2703 | 0.33 | 0.10 | 268 | | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 5241 | 0.25 | 0.09 | 459 | 4613 | 0.80 | 0.24 | 1107 | 1566 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 151 | 1.00 | 0.35 | 53 | 1280 | 1.00 | 0.30 | 384 | 437 | *B refers to breeding habitat impacts<br>F refers to foraging habitat impacts |
| **Total** | **8892** | | | **511** | **8892** | | | **1759** | **2270** | |

## Modified HEP Analysis
## Thornburgh Resort

| SPECIES | | Breeding | | | Foraging | | | | | Comments and Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Mountain Bluebird | Acres Breeding Hab | Disturbance Reduction Multiplier | SI | HUs | Acres Foraging Hab | Disturbance Reduction Multiplier | SI | HUs | Total HUs | |
| **ON-SITE** | | | | | | | | | | |
| **BEFORE DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 4 | 0.25 | 0.10 | 0 | 4 | 0.33 | 0.10 | 0 | 1 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 134 | 0.75 | 0.30 | 40 | 134 | 0.67 | 0.20 | 27 | 67 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 1605 | 0.75 | 0.30 | 482 | 1605 | 0.90 | 0.27 | 433 | 915 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 227 | 1.00 | 0.40 | 91 | 227 | 1.00 | 0.30 | 68 | 159 | |
| **Total** | **1970** | | | **613** | **1970** | | | **529** | **1142** | |
| **POST DEVELOPMENT** | | | | | | | | | | |
| Undeveloped | 568 | - | 0.30 | 170 | | - | 0.20 | 114 | 284 | Development will reduce quality of both breeding and foraging habitat |
| Residential | 426 | - | 0.10 | 43 | | - | 0.10 | 43 | 85 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.10 | 62 | | - | 0.10 | 62 | 123 | |
| Lakes | 45 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| **Total** | **1970** | | | **275** | | | | **218** | **492** | |
| **AFTER ENHANCEMENT** | | | | | | | | | | |
| Undeveloped | 568 | - | 0.50 | 284 | | - | 0.40 | 227 | 511 | Mitigation from nest boxes and habitat managed and created will reduce habitat loss by improving quality of remaining habitat |
| Residential | 426 | - | 0.20 | 85 | | - | 0.20 | 85 | 170 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.20 | 123 | | - | 0.20 | 123 | 246 | |
| Lakes | 45 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| **Total** | **1970** | | | **492** | | | | **435** | **928** | |
| **OFF-SITE WITHIN UMP** | | | | | | | | | | |
| **BEFORE DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.25 | 0.10 | 30 | 296 | 0.33 | 0.10 | 30 | 59 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 1156 | 0.75 | 0.30 | 347 | 1156 | 0.67 | 0.20 | 232 | 579 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 6022 | 0.75 | 0.30 | 1807 | 6022 | 0.90 | 0.27 | 1626 | 3433 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 1418 | 1.00 | 0.40 | 567 | 1418 | 1.00 | 0.30 | 425 | 992 | |
| **Total** | **8892** | **1970** | | **2750** | **8892** | | | **2313** | **5063** | |
| **AFTER DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.25 | 0.10 | 30 | 296 | 0.33 | 0.10 | 30 | 59 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 2703 | 0.75 | 0.30 | 811 | 2703 | 0.67 | 0.20 | 543 | 1354 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 4613 | 0.75 | 0.30 | 1384 | 4613 | 0.90 | 0.27 | 1246 | 2629 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 1280 | 1.00 | 0.40 | 512 | 1280 | 1.00 | 0.30 | 384 | 896 | |
| **Total** | **8892** | | | **2736** | **8892** | | | **2202** | **4939** | |

## Modified HEP Analysis
## Thornburgh Resort

| SPECIES | Breeding | | | | Foraging | | | | | Comments and Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| [redacted] | Acres Breeding Hab | Disturbance Reduction Multiplier | SI | HUs | Acres Foraging Hab | Disturbance Reduction Multiplier | SI | HUs | Total HUs | |
| [redacted] | | | | | | | | | | |
| Urban and Exurban Development | 4 | 0.29 | 0.20 | 1 | 4 | 0.50 | 0.30 | 1 | 2 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 134 | 0.57 | 0.40 | 53 | 134 | 0.67 | 0.40 | 54 | 107 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 1605 | 1.00 | 0.70 | 1124 | 1605 | 1.00 | 0.60 | 963 | 2087 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 227 | 1.00 | 0.70 | 159 | 227 | 1.00 | 0.60 | 136 | 295 | |
| **Total** | **1970** | | | **1337** | **1970** | | | **1154** | **2491** | |
| [redacted] | | | | | | | | | | |
| Undeveloped | 568 | - | 0.40 | 227 | | - | 0.40 | 227 | 454 | Development will reduce quality of both breeding and foraging habitat |
| Residential | 426 | - | 0.20 | 85 | | - | 0.30 | 128 | 213 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.10 | 62 | | - | 0.10 | 62 | 123 | |
| Lakes | 45 | - | 0.05 | 2 | | - | 0.05 | 2 | 5 | |
| **Total** | **1970** | | | **376** | | | | **419** | **795** | |
| [redacted] | | | | | | | | | | |
| Undeveloped | 568 | - | 0.60 | 341 | | - | 0.60 | 341 | 682 | Mitigation will enhance quality of habitat remaining in the undeveloped portions of the site |
| Residential | 426 | - | 0.30 | 128 | | - | 0.30 | 128 | 256 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.15 | 92 | | - | 0.15 | 92 | 185 | |
| Lakes | 45 | - | 0.05 | 2 | | - | 0.10 | 5 | 7 | |
| **Total** | **1970** | | | **563** | | | | **565** | **1128** | |
| [redacted] | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.29 | 0.20 | 59 | 296 | 0.50 | 0.30 | 89 | 148 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 1156 | 0.57 | 0.40 | 461 | 1156 | 0.67 | 0.40 | 465 | 926 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 6022 | 1.00 | 0.70 | 4215 | 6022 | 1.00 | 0.60 | 3613 | 7829 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 1418 | 1.00 | 0.70 | 992 | 1418 | 1.00 | 0.60 | 851 | 1843 | |
| **Total** | **8892** | | | **5728** | **8892** | | | **5018** | **10746** | |
| [redacted] | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.29 | 0.20 | 59 | 296 | 0.50 | 0.30 | 89 | 148 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 2703 | 0.57 | 0.40 | 1078 | 2703 | 0.67 | 0.40 | 1087 | 2165 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 4613 | 1.00 | 0.70 | 3229 | 4613 | 1.00 | 0.60 | 2768 | 5997 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 1280 | 1.00 | 0.70 | 896 | 1280 | 1.00 | 0.60 | 768 | 1664 | |
| **Total** | **8892** | | | **5263** | **8892** | | | **4711** | **9974** | |

## Modified HEP Analysis
## Thornburgh Resort

| SPECIES | Breeding | | | | Foraging | | | | | Comments and Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Western Fence Lizard | Acres Breeding Hab | Disturbance Reduction Multiplier | SI | HUs | Acres Foraging Hab | Disturbance Reduction Multiplier | SI | HUs | Total HUs | |
| **ONSITE** | | | | | | | | | | |
| **BEFORE DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 4 | 0.50 | 0.30 | 1 | 4 | 0.50 | 0.30 | 1 | 2 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 134 | 0.67 | 0.40 | 54 | 134 | 0.67 | 0.40 | 54 | 108 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 1605 | 1.00 | 0.60 | 963 | 1605 | 1.00 | 0.60 | 963 | 1926 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 227 | 1.00 | 0.60 | 136 | 227 | 1.00 | 0.60 | 136 | 272 | |
| **Total** | **1970** | | | **1154** | **1970** | | | **1154** | **2309** | |
| **POST DEVELOPMENT** | | | | | | | | | | |
| Undeveloped | 568 | - | 0.40 | 227 | | - | 0.40 | 227 | 454 | Development will reduce quality of both breeding and foraging habitat |
| Residential | 426 | - | 0.30 | 128 | | - | 0.30 | 128 | 256 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.10 | 62 | | - | 0.10 | 62 | 123 | |
| Lakes | 45 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| **Total** | **1970** | | | **417** | | | | **417** | **833** | |
| **AFTER ENHANCEMENT** | | | | | | | | | | |
| Undeveloped | 568 | - | 0.50 | 284 | | - | 0.50 | 284 | 568 | Mitigation will enhance quality of habitat remaining in the undeveloped portions of the site |
| Residential | 426 | - | 0.30 | 128 | | - | 0.30 | 128 | 256 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.10 | 62 | | - | 0.10 | 62 | 123 | |
| Lakes | 45 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| **Total** | **1970** | | | **473** | | | | **473** | **947** | |
| **OFFSITE WITHIN 1 MI** | | | | | | | | | | |
| **BEFORE DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.50 | 0.30 | 89 | 296 | 0.50 | 0.30 | 89 | 178 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 1156 | 0.67 | 0.40 | 465 | 1156 | 0.67 | 0.40 | 465 | 929 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 6022 | 1.00 | 0.60 | 3613 | 6022 | 1.00 | 0.60 | 3613 | 7226 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 1418 | 1.00 | 0.60 | 851 | 1418 | 1.00 | 0.60 | 851 | 1701 | |
| **Total** | **8892** | | | **5017** | **8892** | | | **5017** | **10035** | |
| **AFTER DEVELOPMENT** | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.50 | 0.30 | 89 | 296 | 0.50 | 0.30 | 89 | 178 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 2703 | 0.67 | 0.40 | 1087 | 2703 | 0.67 | 0.40 | 1087 | 2173 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 4613 | 1.00 | 0.60 | 2768 | 4613 | 1.00 | 0.60 | 2768 | 5536 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 1280 | 1.00 | 0.60 | 768 | 1280 | 1.00 | 0.60 | 768 | 1536 | |
| **Total** | **8892** | | | **4711** | **8892** | | | **4711** | **9422** | |

## Modified HEP Analysis
## Thornburgh Resort

| SPECIES | | Breeding | | | Foraging | | | | | Comments and Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Mule Deer | Acres Breeding Hab | Disturbance Reduction Multiplier | SI | HUs | Acres Foraging Hab | Disturbance Reduction Multiplier | SI | HUs | Total HUs | |
| **ONSITE** | | | | | | | | | | |
| BEFORE DEVELOPMENT | | | | | | | | | | |
| Urban and Exurban Development | 4 | 0.00 | 0.00 | 0 | 4 | 0.00 | 0.00 | 0 | 0 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 1784 | 0.50 | 0.25 | 446 | 1784 | 0.50 | 0.25 | 446 | 892 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 182 | 0.50 | 0.25 | 46 | 182 | 0.50 | 0.25 | 46 | 91 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 0 | 1.00 | 0.50 | 0 | 0 | 1.00 | 0.50 | 0 | 0 | |
| **Total** | **1970** | | | **492** | **1970** | | | **492** | **983** | |
| POST DEVELOPMENT | | | | | | | | | | |
| Undeveloped | 568 | - | 0.13 | 71 | | - | 0.13 | 71 | 142 | Reduction in mule deer habitat quality, although some mule deer will remain or even be attracted to the golf course and possibly landscaping |
| Residential | 426 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Lakes | 45 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| **Total** | 1970 | | | **71** | | | | **71** | **142** | Assume that fencing will greatly reduce deer access to the property after development. |
| AFTER ENHANCEMENT | | | | | | | | | | |
| Undeveloped | 568 | - | 0.13 | 74 | | - | 0.18 | 99 | 173 | No mitigation gain in breeding habitat quality, small increase in quality of foraging habitat, especially in irrigated areas |
| Residential | 426 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Facilities | 316 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Golf Course | 615 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| Lakes | 45 | - | 0.00 | 0 | | - | 0.00 | 0 | 0 | |
| **Total** | 1970 | | | **74** | | | | **99** | **173** | |
| **OFFSITE WITHIN 1 MI** | | | | | | | | | | |
| BEFORE DEVELOPMENT | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.00 | 0.00 | 0 | 296 | 0.00 | 0.00 | 0 | 0 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 4914 | 0.50 | 0.25 | 1229 | 4914 | 0.50 | 0.25 | 1229 | 2457 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 3682 | 0.50 | 0.25 | 921 | 3682 | 0.50 | 0.25 | 921 | 1841 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 0 | 1.00 | 0.50 | 0 | 0 | 1.00 | 0.50 | 0 | 0 | |
| **Total** | **8892** | | | **2149** | **8892** | | | **2149** | **4298** | |
| AFTER DEVELOPMENT | | | | | | | | | | |
| Urban and Exurban Development | 296 | 0.00 | 0.00 | 0 | 296 | 0.00 | 0.00 | 0 | 0 | Includes the Eagle Crest Resort and rural residential homes |
| Urban/Exurban Disturbance Zone | 8596 | 0.50 | 0.25 | 2149 | 8596 | 0.50 | 0.25 | 2149 | 4298 | Includes the Eagle Crest Resort and rural residential development disturbance zones |
| Trails and Roads Disturbance Zone | 0 | 0.50 | 0.25 | 0 | | 0.50 | 0.25 | 0 | 0 | Includes motorized trails and highway disturbance zones |
| Undisturbed (no disturbance zone) | 0 | 1.00 | 0.50 | 0 | 0 | 1.00 | 0.50 | 0 | 0 | |
| **Total** | **8892** | | | **2149** | **8892** | | | **2149** | **4298** | |

## Modified HEP Analysis
## Thornburgh Resort

| SPECIES | Breeding | Foraging | | Comments and Notes |
|---|---|---|---|---|

**Summary of Impacts by Species and Total Habitat Units**

| Evaluation Species | Pre-development HUs | | Post-development HUs | | | Net Change | |
|---|---|---|---|---|---|---|---|
| | Onsite | Offsite | Onsite | | Offsite | Onsite | Offsite |
| Northern flicker | 2466 | 10958 | 488 | | 10877 | -1979 | -82 |
| American kestrel | 487 | 2159 | 317 | | 2071 | -170 | -88 |
| Red-tailed hawk | 630 | 2651 | 118 | | 2270 | -512 | -381 |
| Mountain bluebird | 1142 | 5063 | 928 | | 4939 | -214 | -125 |
| Small mammals | 2491 | 10746 | 1128 | | 9974 | -1362 | -772 |
| Western fence lizard | 2309 | 10035 | 947 | | 9422 | -1362 | -612 |
| Mule deer | 983 | 4298 | 173 | | 4298 | -810 | 0 |
| Total | 10508 | 45910 | 4099 | | 43851 | -6409 | -2060 |

| | |
|---|---|
| Average baseline HU/acre, all species combined (calculated as all species total of pre-development HUs divided by 1980+8892 or 10862 acres) | 5.2 |
| Average net gain in HU/acre due to mitigation, for all species combined, in the 568 acres of on-site undeveloped areas (other land uses not included as undeveloped land considered to be the most representative of offsite mitigation lands) | 1.3 |
| Average assumed net gain in HU/acre at offsite mitigation site, assuming mitigation off site yields 50% more mitigation credits per acre than the on-site mitigation due to its more isolated location and long-term management by BLM | 1.9 |
| Approximate acreage needed for offsite enhancement (calculated as habitat value lost divided by average gain to mitigation) | 4498.7 |

| Land Type after Development | Acres |
|---|---|
| Undeveloped | 568 |
| Residential | 426 |
| Facilities | 316 |
| Golf Course | 615 |
| Lakes+Streams | 45 |
| Total | 1970 |

| | |
|---|---|
| Mitigation:Impact Acres Ratio | 2.3 |

C:\Documents and Settings\pli\Local Settings\Temporary Internet Files\OLK121\[HEP table rev 22 080508 rev acres.xls]Thornburgh

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AUG 28 2008

Deschutes County CDD

**BEFORE THE HEARINGS OFFICER**
**OF DESCHUTES COUNTY**

| | |
|---|---|
| **In the Matter of the Application for a Final Master Plan for a Destination Resort** | **M-07-2; MA-08-6**<br>**Thornburgh Destination Resort** |

# THIRD SUPPLEMENTAL MEMORANDUM OF NUNZIE GOULD IN OPPOSITION TO THE PROPOSED DEVELOPMENT (8/28/08)

## I. INTRODUCTION

This filing is in response to the Applicant's submittals on August 12, 2008, and is made pursuant to the Hearings Officer's Order of August 18 permitting the filing of this rebuttal. Attached are reports of David Dobkin and Brett Michalski responding to the new wildlife plan materials submitted by the Applicant.

This response will be organized by the main categories of exhibits submitted by the Applicant.

## II. WATER-RELATED MATERIALS

The following subjects are addressed in the water-related materials submitted by the Applicant on August 12.

### A. The Applicant acknowledges that there will be impacts to fish resources.

The Applicant's Exhibit A-6 Newton Report acknowledges at page 2 that whether total consumption is considered or not that there will be an increase in water temperature from the Thornburgh pumping. The Applicant argues, however, that there will be only a "very slight increase" in water temperature. Its Table 1 on page 3 substantiates the increases in temperature. Furthermore, the Applicant's TetraTech Exhibit A-8 report acknowledges that there will an overall reduction in the spring flow in the Deschutes River, but characterizes the temperature difference as "negligible." (Ex. A-8, p. 2) The Applicant has also consistently acknowledged impacts to Whychus Creek.

The Applicant's approach to justify a finding of compliance under DCC 18.113.070(D) appears to be one of making an argument of significance. That emphasis on significance is not consistent with the language of the Code which provides a no net loss standard:

> "Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource."

Even if what the Applicant acknowledges to be impacts is described by it as small, it is still negative and a net loss.



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Beyond the impacts acknowledged by Applicant, Mr. Huntington has pointed out the additional losses associated with localized impacts and the loss of existing cool habitat patches. See his report attached to our Second Supplemental Memorandum of August 28.

**B. ODFW's letters do not establish compliance with DCC 18.113.070(D).**

A recurring theme in the Applicant's August 12 exhibits is that ODFW has found that what Thornburgh has proposed satisfies the criteria of DCC 18.113.070(D). For examples, Exhibit A-6 at page 2 refers to ODFW's letter finding that the proposed mitigation "should mitigate for potential impacts on springs and seeps and provide a net benefit to the resource." That report at page 3 also states, "ODFW determined that this reduction was fully mitigated under the Thornburgh plan by the addition of cold water from Deep Canyon Creek under the Big Falls water rights." Then in Exhibit A-8 TetraTech asserts that the Thornburgh pumping is completely mitigated "as verified in the ODFW letter dated June 13, 2008." (p. 3) It also quotes ODFW to the effect that it determined that providing the proposed mitigation should mitigate for potential impacts on springs and seeps and providing net benefit to the resource. (Ex. A-8, p. 3)

An examination of the ODFW correspondence on this matter reveals that ODFW has not, in fact, given the extensive endorsement claimed by Thornburgh. First of all, ODFW in its letter of June 13, 2008, makes clear that the context for its analysis is ODFW's Fish and Wildlife Habitat Mitigation Policy, which as we have explained earlier contains significantly different standards than the Deschutes County Code. Additionally, its letter only addresses actual mitigation work occurring in the Deschutes River. The only mention of any mitigation for Whychus Creek is Thornburgh's proposal to provide funds to help complete a thermal modeling project on Whychus Creek. While such funding of a modeling project might consist of mitigation under ODFW's Fish and Wildlife Habitat Mitigation Policy, that does not constitute mitigation in the context of DCC 18.113.070(D). In that context, ODFW's statement that the proposed mitigation "should mitigate for potential impacts on springs and seeps and provide a net benefit to the resource" does not answer the question posed by DCC 18.113.070(D).

The Newton Exhibit A-6 report at page 4 asserts:

> "The water-related component of the Thornburgh mitigation plan was developed in coordination with ODFW and ODFW has confirmed that it believes the plan complies with the County mitigation standard."

To the contrary, there is no confirmation by ODFW that it believes the plan complies with the County mitigation standard. The closest ODFW got to addressing compliance with DCC 18.113.070(D) was in its letter of June 13 thanking Deschutes County for the opportunity to work with the resort to assess potential impacts and propose measures that "should mitigation" [sic] those impacts as directed by DCC 18.113.070(D). Merely suggesting measures to mitigate impacts as directed by the Code does not constitute a finding that any negative impact on fish resources will be completely mitigated so there is



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no net loss or net degradation of the resource. In addition, ODFW qualified its statement by pointing out that mitigation will be conceptual unless measures are implemented, some of which would need to be maintained "in perpetuity." (6/13/08 letter, p. 3)

Even if one could read into the ODFW statements some conclusion that the standards of DCC 18.113.070(D) have in fact been met, the bottom line is that it is not up to ODFW to determine that point. Just because ODFW might determine that merely providing funding for a study on Whychus constitutes mitigation for impacts to Whychus does not mean the County must reach the same conclusion. It is up to the County to determine whether or not the Code criteria has been complied with and it is only the County that has considered the evidence in the Record as has been developed over the past several months which post-date any conclusion by ODFW. Furthermore, there is no showing of feasibility that mitigation measures can be maintained "in perpetuity."

**C. The new proposal for possible mitigation water on Whychus Creek is not adequate.**

The Applicant in its August 12 materials for the first time proposes the addition of 106 acre feet of water to Whychus Creek to make up for water withdrawal impacts to the Creek. This is discussed in the Applicant's Exhibit A-3 letter from Martha Pagel and the Exhibit A-9 letter from Mr. Thalacker of the Three Sisters Irrigation District. This is apparently in response to our argument that there needs to be some mitigation provided for Whychus Creek. Unfortunately, what is proposed would actually compound the problem by increasing temperatures in the creek. Adding more warm surface water into the creek does not compensate for withdrawals of cold groundwater. The evidence is also not clear what the status of this alleged mitigation water actually is. It is apparently to come from conservation measures in 2009 and 2010, but full funding hasn't been secured. (Ex. A-9)

**D. The OWRD determination of consumptive use is not controlling here.**

The Applicant again repeats, such as in Exhibit A-6, that OWRD determined a different amount of consumptive use than is being argued by the opponents. However, as we have previously argued, the Record was different before OWRD than it is in this proceeding and this land use proceeding must develop its own factual record. While the determination in this land use proceeding will not control OWRD, it should control the determination of whether DCC 18.113.070(D) is met here.

Also relevant to consumptive use, the Newton Exhibit A-7 argues that sewer water is going to be recharging the aquifer. However, the language and the permit only allows "controlled seepage," not the kind of seepage that would result in this polluted water recharging the aquifer.



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**E. The Yinger model is consistent with the USGS model.**

The Applicant repeats its argument, as in Exhibit A-8, that the Yinger Report's use of the USGS model is inappropriate to address a particular development. However, as has been explained before, and as has been verified by the USGS's Marshall Gannett, the use in this case is appropriate and is consistent with modeling in this area already done by USGS. In fact, to demonstrate the use of the model the USGS used it to simulate the impact on streamflow for a hypothetical well in the Redmond area. See Yinger 7/14 letter, p. 2. Mr. Gannett has said that the results in the Yinger Report "are very consistent with similar simulations in our report." (Davis 6/13 e-mail)

**F. The proposed dam removal is not adequately explained.**

The proposed dam removal on property not owned by the Applicant or Big Falls Ranch has not been shown to be feasible or how it would in fact be accomplished. It is also not clear that the legal document would be binding on the limited partnership where the legal status of the partner signing the agreement for himself and for another party is not identified. Another named partner, Weigand, also did not sign. Mr. Parker, an owner of the resort development along with Thornburgh Resort Company, is also not a signatory.

It is further not clear what the significance of removing this dam will be where it is already partially breached. Where there is no showing that this structure is impeding any flows, its removal should not be considered as mitigation for anything.

**G. The Big Falls water rights has still not been substantiated.**

It is not entirely clear why the Applicant has submitted Exhibit A-2 which is a 2006 summary report by Newton consultants on the Big Falls Ranch water rights. This does not answer the questions raised by opponents regarding these rights which were submitted in July. As explained in the attached letter by Jim Crocker, the Big Falls water rights are simply not what they are alleged to be by Thornburgh.

## III. WILDLIFE-RELATED MATERIALS

A number of the exhibits which were submitted by the Applicant on August 12 are merely studies on juniper removal or studies for various other projects not relevant to this application. Accordingly, we will restrict our comments to just a few of the exhibits and wish to focus on a few consistent themes which reflect an inappropriate approach by the Applicant toward meeting the Code requirements of DCC 18.113.070(D).

**A. Reliance on BLM procedures and standards is not appropriate.**

There has been a fundamental shift in the approach by the Applicant for meeting the criteria of DCC 18.113.070(D) with the Applicant's submittals of August 12. Instead of trying to identify specific measures to meet the standards of the Code, the Applicant now generally refers to meeting BLM procedures and standards and complying with future



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planning documents being prepared by the BLM. This is not appropriate since there has been no showing that the BLM standards and procedures are oriented to the County Code standard of any negative impact on fish and wildlife resources being completely mitigated so that there is no net loss or degradation of the resource. That is simply not a standard in the rules and regulations for the management of BLM lands. There is also no reason to believe that the Cline Buttes Recreation Area Plan (CBRAP) will incorporate as objectives and standards this Deschutes County Code requirement. BLM in its letter, Exhibit B-2, does not state that the CBRAP or even the Upper Deschutes Resource Management Plan (UDRMP) match the Deschutes County Code wildlife mitigation standard.

This shift to reliance on BLM standards and procedures is particularly apparent in Exhibit B-13 where the Applicant states that the "success criteria established in the mitigation plan are based on the realistic goals established by the BLM." (p. 3) Applicant also acknowledges that BLM "will continue to manage grazing consistent with their policies and the designation of the land as to land use priority." (Emphasis added.) (p. 4) TetraTech goes on to state that the methods "described in this plan are consistent with the federal standards and management objectives outlines [sic] in the Upper Deschutes Resource Management Plan and Final Environmental Impact Statement (BLM 2005) and the Cline Buttes Recreation Area Plan that is currently under development." (p. 4) TetraTech further states, "This monitoring and management plan will use an adapted management approach" as used by BLM. (p. 7) TetraTech goes on to state, " The Thornburgh mitigation plan is based on this BLM approach [rehabilitating and restoring old growth juniper]." (p. 10) Finally, TetraTech states, "The mitigation plan directly addresses and is built on the principles and goals established by the BLM for the UDRMP." (p. 12)

One of the consequences of this shift in approach to meet BLM standards rather than the County's standards is that there will be reliance on what are referred to as "Best Management Practices," rather than the true objective of there being no negative impact on fish and wildlife resources. The Applicant is seeking to substitute the County's standard which is based on results to the BLM's standard which is based only on process and procedures.

**B. The ODFW standards and its review of the TetraTech plan are misrepresented.**

TetraTech in Exhibit B-13 incorrectly states, "ODFW has agreed that implementation of this mitigation plan would meet the no net loss or degradation standard." (p. 1) No citation is given for this statement and this statement cannot be found in ODFW's letter of June 13. When Thornburgh followed up with a request for clarification on ODFW's position with regard to the wildlife mitigation plan, Steven George of ODFW e-mailed Martha Pagel and stated only that the wildlife mitigation plan "should address" the mitigation requirements for Deschutes County. There is no basis to conclude that this language of addressing the mitigation requirements is the equivalent of concluding there



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will be no net loss or degradation. It should also be noted that TetraTech's wildlife mitigation plan has changed since the version that ODFW saw back in June.

TetraTech is also wrong in stating in Exhibit B-13, at page 4, that the ODFW standard "is more restrictive than DCC 18.113.070(D). As I explained in our Second Supplemental Memorandum of July 29, at page 6, the ODFW Administrative Rules are not the same as and are not as stringent as DCC 18.113.070(D). The ODFW rules focus solely on habitat while the DCC addresses the more broad "wildlife resource." The ODFW rules don't have a "no net loss" or "completely mitigate" standard. The rules also set priorities for native wildlife while the DCC applies to all wildlife. Unlike the ODFW rules, DCC 18.113.070(D) has the very strict standard, as found by the Oregon Court of Appeals, of requiring "complete" mitigation for "any" negative impact, resulting in no net loss or degradation to the resource.

**C. References to "field work" are overstated.**

At page 1 of TetraTech's August 12, 2008, letter (Ex. B-13) TetraTech refers to its HEP analysis being "originally based on the real-world data collected for Eagle Crest III." (Emphasis added.) There is no evidence, however, of any such "real-world data" that was collected for Eagle Crest III. In fact, ODFW refers only to "a field tour to assess habitat conditions" with regard to Eagle Crest III. (Ex. B-1) Additionally, document contained in Exhibit B-12 regarding Eagle Crest III refer only to "field surveys" conducted in the dead of winter in February of 1999.

TetraTech also apparently relies solely on analyses of "habitat" rather than wildlife as being required to determine whether or not the Code criteria can be met. It refers to baseline habitat surveys to be done for offsite mitigation in its new off-site plan, Exhibit B-3, page 3. There is no survey, however, for wildlife, or any way of determining whether or not any increase in habitat actually results in the complete mitigation for the wildlife displaced from the Thornburgh Resort area.

**D. Other issues raised by TetraTech in Exhibit B-13 need correction.**

In addition to the issues discussed above regarding this Exhibit B-13, there are a number of other matters raised by TetraTech in this exhibit which need clarification and/or correction. They include:

1. At page 2 TetraTech states that basic surveys are not a requirement of current regulations and statutes governing destination resort permits and that not even large wind projects or pipelines require such surveys. TetraTech makes no showing, however, that the "large wind projects or pipelines" are to meet the specific standard of DCC 18.113.070(D). Doing the fundamental baseline research that can be done with periodic surveys over a two-year period is hardly a strenuous requirement in the context of massive developments such as destination resorts which cover large areas and will have impacts associated with small cities. *Johnson v Jefferson County*, ____ Or LUBA ____ (LUBA No. 2007, et al.; Slip Op. 32 (2008)). There has been more than adequate



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time during this process within which Thornburgh could have easily conducted these surveys.

2. TetraTech at page 3 attempts to make real surveys of wildlife appear to be unrealistic by suggesting that "every species on this site be identified and studied." That has not been suggested by Dr. Dobkin or Mr. Michalski. (p. 3)

3. TetraTech at page 5 inappropriately tries to minimize the importance of deer winter range by asserting that this area is not protected under Goal 5. DCC 18.113.070(D) does not apply only to Goal 5 resources, but to all wildlife. It should also be noted that the BLM has designated virtually the entire area of the Thornburgh Resort as "deer winter range" in Figure 1 attached to Exhibit B-3.

4. TetraTech at page 5 suggests that the impacts on mule deer from increased traffic on roads is completely mitigated by assessing impacts only on Cline Falls Highway and associating the value of only $20,000. First of all, there are many more new roads being built as part of this destination resort, including a new road connecting the resort to Highway 126, two new roads from Cline Falls Highway to the resort and multiple roads within the resort. The small figure of $20,000 merely reflects how little Thornburgh thinks of this resource. There is also no showing that this figure is going to be enough over the long-term to actually achieve any measurable mitigation.

5. TetraTech is wrong at page 6 in stating that the Cars require residents at this project to leash all pets outdoors. Actually, the Cars only apply to the land within the resort.

6. TetraTech at page 7 refers to adaptive management as the means that will be used to determine whether the desired mitigation performance standard has been met, and, if not, to allow for changes in the mitigation plan to achieve the desired success. There has been no showing that the proposed cost and funding of the mitigation would actually cover any more than the original work and the monitoring. There is no provision for additions to the mitigation plan to be adequately financed.

7. TetraTech at page 8 disputes that the land use process is a separate fact-finding process and questions what the purpose is of the state having entire departments of experts to manage resources and provide comments on land use proceedings. As we have previously argued, the land use process is a separate fact-finding process and different facts are obviously being developed in this process than were considered by OWRD or that was considered by ODFW as of June. ODFW has not seen the reports and has not heard the testimony of Dr. Dobkin or Mr. Michalski.

8. TetraTech at page 9 makes the interesting statement that "although species composition may change," there will be no net loss because restoration and enhancement actions will benefit many wildlife species. This reflects a fundamental problem in Thornburgh's approach, which is premised not on completely mitigating for the wildlife resource being impacted but instead substituting new habitats and new species so that "in



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balance" there is no net loss. There is no suggestion in the County Code that the mitigation objectives of DCC 18.113.070(D) can be met by substituting one species for another. Of course, Thornburgh will never know whether or not there is any change in species composition since its analysis and monitoring only looks at habitat rather than to the wildlife resource itself. The Code provision clearly focuses on negative impacts on "fish and wildlife resources," requiring that the impacts be "completely mitigated" so that there is no net loss or net degradation of "the resource." (Emphasis added.) Where any impacts on wildlife resources are to be completely mitigated so that there is no net loss to "the resource," it would be inappropriate to assume that mitigation can merely provide for substitution of other species.

9. TetraTech at page 11 argues that its habitat approach has been used by ODFW in relation to other destination resorts in Deschutes County for years. It should be noted, however, that most of these resorts and certainly the wildlife mitigation plans have not had serious scrutiny. The first time that the Deschutes County Code requirements of 18.113.070(D) were tested in court is *Gould v Deschutes County*, 216 Or App 150 (2007), where the Court interpreted the provision as setting very strict standards. Prior to this Court of Appeals' decision, obviously neither the County nor ODFW treated this requirement very seriously.

10. TetraTech at page 12 states that wildlife damage to the golf course will be minimized "by fencing the perimeter of the property to exclude big game." This is a factor that is not explained in the proposed wildlife mitigation plan. There is no mention of this fence all around the perimeter of the property to exclude big game in the description of existing conditions, proposed development or impacts of development in the Wildlife Mitigation Plan, Exhibit L1. ODFW's policy toward fences has been to require "wildlife-friendly" fences of a height that they can be easily jumped or with bottom wires high enough that they can be crawled under. There is no basis for assuming that ODFW has understood Thornburgh's objective to be the development of fences that "exclude" big game.

**E. The Exhibit B-14 cumulative effects analysis is inadequate.**

Exhibit B-14 is a one-page "cumulative impacts assessment" by TetraTech that does not in any way constitute a true cumulative impacts analysis. There is no assessment, for example, of the level of OHV use in the area, the development by ODOT of a gravel pit along Barr Road, developments in Eagle Crest, the mitigation requirements by BLM for the road right-of-ways, etc. A basic requirement of any cumulative effects analysis is to address all other ongoing activities within an area and then to assess impacts based on that survey. This one-page cumulative impacts assessment does not even assess what impacts it does identify.



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## IV. TRAFFIC-RELATED MATERIALS

The Applicant submitted several new documents related to traffic issues. The following discussion addresses the documents separately.

### A. Exhibit C.1 Group MacKenzie Letter

The Applicant's traffic engineer, Group MacKenzie, states that the resort development assumptions have not changed from those contemplated in the CMP TIA. Unfortunately, Group MacKenzie does not explain what those resort development assumptions are so that one could see whether they have changed, but it is apparent that they have changed in at least two respects.

First, there is an entirely new road proposed between the Pinnacle in the north and the Tribute in the south, crossing the southwest corner of the DSL land. This new road is circled on the attached "Access, Circulation and Trail Plan." Ex. A.7.1.[1] This short route is apparently intended to provide quicker access between the two portions of the resort than what was originally proposed in the CMP which was a more circuitous route on the DSL land. This is significant because Group MacKenzie in its TIA did not utilize this road in its assessment which assumed more people would use Highway 126 for access. Easier accessibility to the Tribute and thus Cline Falls Highway will result in more traffic in Tumalo over which Thornburgh is negotiating with ODOT.

Additionally, the residential development areas have been substantially changed in the new Master Development Plan, as discussed below.

### B. Exhibit C.2 Revised Fire Evacuation Routes

Unfortunately, the Applicant again does not explain the changes made in the fire evacuation routes as depicted in Exhibit F.7.1 and Rebuttal Exhibit C.2. Apparently the only changes are including some additional roadway in Phase A and converting part of a Phase C route to a Phase A route in the Tribute. The fundamental problem with the fire evacuation routes remains, however, in that these routes and their phases are not consistent with the Phasing Plan. See the new Exhibit D.1 which show routes as Phase A which the Exhibit C.2 shows as being developed in Phases C and D. There is simply no way to determine how the various residential pods are to be evacuated where a particular pod, such as Pods 10 and 19 in Phase A, are to be accessed by an evacuation route developed in Phase C. Given the differences between the fire evacuation routes and the Phasing Plan and the further difference between the Phasing Plan and the current

[1] There is no evidence that the County Roads Department has seen this new route or would approve of its steep 200' vertical climb/descent.



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Residential Development Plan, it is impossible to know how particular residential areas will be evacuated.[2]

## V. PHASING

The Applicant has presented Rebuttal Exhibit D.1 which is a revised Phasing Plan. Apparently, the purpose of this new map is to show the location of overnight housing in Phase B in Pod 27. The Applicant may also be attempting to comply with the County's requirement of submitting a new Phasing Plan consistent with the overnight ratio calculation chart.

The problem, however, is that this is an outdated depiction of what would actually be developed at the resort. For comparison, I am attaching Exhibit G.1.1.b, the Residential Development Plan which shows substantially different locations for the residential areas or pods. Because of the Phasing Plan's intermixing of residential developments in various phases in a particular area, it is not possible to tell what residential areas or pods in the Residential Development Plan are to be developed in which phases. See also Ex. A.3.1, the Revised "Master Development Plan." Not only is a significantly different development plan shown, but the area of Pod 27 is not shown as visitor lodging on Ex. A.3.1. The other overnight lodging in Pods 5 and 32 are also not shown on Ex. A.3.1.

DCC 18.113.060(E) requires that each phase of a destination resort shall be as described in the CMP. The Rebuttal Exhibit D.1 depicts the Phasing Plan from the CMP, but where the FMP Residential Development and Master Development Plan are not shown to be consistent with that Phasing Plan, there needs to be a CMP amendment of the Phasing Plan which the Applicant has not provided.

## VI. MISCELLANEOUS

The Applicant in Exhibit F-4 has presented an open space exhibit showing the location of proposed new open space areas in the Final Master Plan design. The fact that there are some new open space areas does not answer our objection that previously-designated large blocks of open space are being fragmented in the new Final Master Plan and that they will not function in the same way as they were designed in the Conceptual Master Plan. This is particularly important with regard to preservation of natural areas. This change is significant and the Applicant should have accordingly amended the CMP open space plan or at the very least included some analysis of the impact on natural open space areas.

[2] It should be noted that the substantial confusion on this issue comes from the multiple changes in the fire evacuation routes, from an original Exhibit F.3 to an Exhibit F.7.1 to Rebuttal Exhibit C.2. Further confusion is added by the substantial inconsistencies between the Exhibit D.1 Phasing Plan and the Exhibit G.1.1.b Residential Development Plan.



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## VII. CONCLUSION

As we have previously pointed out, the Applicant at the CMP stage stated that it was not providing details on its proposed development because that would await the submittal of the Final Master Plan. However, now that we are at the Final Master Plan, there still remains substantial unknowns as to this very large development. Moreover, the FMP is inconsistent with the CMP in significant ways, including the Phasing Plan, evacuation routes and the open space plan. See our earlier briefs addressing all of the other inconsistencies.

Furthermore, the Applicant has failed to sustain its burden of proof regarding DCC 18.113.170(D). There is no dispute that there will be negative impacts to Whychus Creek and the Deschutes River in terms of both water quality and water quantity. The Applicant's wildlife plan lacks the necessary foundation of determining what is actually there and thus what needs to be mitigated. It also lacks a means of determining whether or not any impact is going to be completely mitigated.

DATED this 28th day of August, 2008.

Respectfully submitted,

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## ATTACHMENTS

August 28 Report of David Dobkin

August 28 Report of Brett Michalski

Statement by James Crocker on Big Falls Ranch Water Rights

Applicant's Exhibit A.3.1, "Master Development Plan"

Applicant's Exhibit G.1.1.b, "Residential Development Plan"

Applicant's Exhibit A.7.1, "Access, Circulation and Trail Plan"

Applicant's Rebuttal Exhibit D.1, "Phasing Plan"

Applicant's Rebuttal Exhibit C.2, "Fire Evacuation Routes"

David S. Dobkin, Ph.D.
Ecological Research and Consultation
Bend, Oregon, USA

TO: Paul D. Dewey, Attorney
FROM: David S. Dobkin, Ph.D.
DATE: 27 August 2008
RE: Response to Thornburgh Rebuttal Materials submitted 12 August 2008 regarding Thornburgh Resort Wildlife Mitigation Plan

The rebuttal materials submitted on 12 August are extensive, but unfortunately provide little that is relevant to the central issues raised previously.[1,2] The fundamental problem remains: without quantitative pre-treatment data for wildlife and vegetation, along with equivalent quantitative post-treatment data collection, the approach taken by the Applicant cannot measure the success or failure of mitigation efforts. The rebuttal materials provide no plan for acquisition of the data necessary to provide a quantitative baseline of the composition of the wildlife resource on the Thornburgh property or on the off-site mitigation lands. In the absence of such data, there is no valid basis for evaluating the success or failure of complete mitigation of negative impacts in order to demonstrate no net loss or net degradation of the wildlife resource.

A plan for off-site mitigation and monitoring has now been submitted[3] that makes no commitment to specific quantitative plant-sampling techniques, and which clearly indicates that no quantitative sampling of wildlife will be conducted. The mitigation and monitoring "plan" instead defers to the BLM standard manual for ecological site inventory (Exhibit B11), the agency's comprehensive approach to assessment of forage production and forage potential for livestock on public lands. Although the habitat-sampling to be conducted is unclear, it is quite clear that extensive use of non-native seeding likely will be used for habitat "improvement" (Appendix F, in relation to Appendices C, D, and E [pages 20-23]),[3] which raises serious concerns about the utility of such mitigation efforts for many wildlife species dependent on habitat composed of native juniper woodland and native shrubsteppe plant communities.[4] It is also now explicit that any BLM lands to be used for off-site mitigation will continue to be grazed by livestock [page 4].[5] As previously noted,[1] for the great majority of wildlife species dependent on juniper woodland or sagebrush shrubsteppe, any purported mitigation benefits will be reduced greatly or nullified completely by livestock grazing.

Applicant contends that no further data are needed to serve as a baseline against which no net loss can be measured because "Baseline conditions [are] described in terms of wildlife habitat value in the modified HEP analysis, which was originally based on real-world data collected for Eagle Crest III" [page 1],[5] and that "The modified HEP analysis was based on actual data gathered from the local area for Eagle Crest III" [page 2].[5] Based on the materials now submitted, it is clear that the real-world data referred to repeatedly are comprised entirely of vegetation sampling that characterizes habitat physical structure on the Eagle Crest III site.[6] What these "real-world data" do not provide, however, is any quantitative (or even qualitative) information about either plant or wildlife species composition on the site to serve as baselines for evaluating the success or failure of mitigation efforts in order to demonstrate no net loss or net degradation of the wildlife resource. In fact, wildlife "surveys" conducted for the Eagle Crest III assessment apparently consisted of cursory field visits in the dead of winter that produced

sightings of three bird species, black-tailed jackrabbit, mule deer, and tracks of potentially five other mammal species [page 3].[6] It should be noted that the vast majority of breeding bird species potentially on the site would be on their wintering grounds in the southwestern U.S., Mexico, and points further south at the time these wildlife "surveys" were conducted.

Applicant still contends that their HEP analysis of the seven "species" sufficed in lieu of collecting actual data to quantitatively sample the species composition of wildlife. Applicant asserts that the HEP process was designed to analyze a very limited number of species that would serve as surrogates for the large and diverse array of species potentially present on the Thornburgh property, and states that "The HEP process was designed by the USFWS to do exactly that." [page 3],[5] Applicant provided excerpts from the USFWS HEP manual in support of their contention, but in fact the USFWS manual states explicitly that "[HEP] is applicable only for the species evaluated and does not directly relate that species with other ecosystem components."[7] "Other ecosystem components" includes all other species, along with their respective habitat and other ecological requirements. As detailed previously,[2] a HEP analysis for each individual species is only as good as the data fed into the model, and the relevant quantitative data necessary for such models simply do not really exist for any of the "species" analyzed (other than, perhaps, the Mule Deer).

Mitigation measures, both on-site and off-site, are to be evaluated for their success in achieving the goal of no net loss or degradation of the wildlife resource by an ongoing monitoring program. We have argued that specific types of data and specific types of quantitative sampling protocols are necessary to measure the success or failure of mitigation efforts **in order to demonstrate no net loss or net degradation of the wildlife resource**. The proposed Thornburgh Resort mitigation measures for off-site BLM lands are essentially the same as those proposed and presumably implemented for the Eagle Crest Expansion #3,[8] including rehabilitation on the BLM Maston Allotment, which is once again proposed for off-site mitigation. Analysis of the <u>efficacy</u> of the mitigation that was required for the Eagle Crest #3 expansion is conspicuously absent from the copious materials provided by the Applicant. We presume that the proposed mitigation measures were implemented, but it is the <u>results of those mitigation efforts,</u> their demonstrated efficacy in producing measurable positive effects on the sites' wildlife populations, that would be highly relevant to the potential efficacy of the proposed Thornburgh wildlife mitigation measures.

[1]Review of Thornburgh Resort Wildlife Mitigation Plan (by David S. Dobkin), 16 June 2008.
[2]Response to Materials and Testimony for Thornburgh Resort Wildlife Mitigation Plan (by David S. Dobkin), 27 July 2008.
[3]Off-site habitat mitigation and monitoring plan for the Thornburgh Destination Resort project, August 2008 (Prepared by Tetra Tech). Exhibit B3 of Thornburgh Rebuttal Materials submitted 12 August 2008.
[4]Dobkin, D.S. and J.D. Sauder. 2004. Shrubsteppe landscapes in jeopardy. Distributions, abundances, and the uncertain future of birds and small mammals in the Intermountain West. High Desert Ecological Research Institute, Bend, Oregon. 202 pages.
[5]Tetra Tech response to testimony and written materials from 15 July 2008 hearing for Thornburgh Resort Wildlife Mitigation Plan. Exhibit B13 of Thornburgh Rebuttal Materials submitted 12 August 2008.

[6]Eagle Crest Expansion HEP Analysis, 5 April 1999 (Prepared by Shapiro and Associates, Inc.). Exhibit B12 of Thornburgh Rebuttal Materials submitted 12 August 2008.
[7]USFWS. 1981. Habitat as a basis for environmental assessment, Section 5.2(6). Exhibit B10 of Thornburgh Rebuttal Materials submitted 12 August 2008.
[8]Eagle Crest, Inc. Wildlife Mitigation Plan for Eagle Crest Expansion #3, January 2000. Exhibit B12 of Thornburgh Rebuttal Materials submitted 12 August 2008.

David S. Dobkin, Ph.D.
27 August 2008

CURRICULUM VITAE
(Brief Version)

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## EDUCATION

| | | | |
|---|---|---|---|
| Ph.D. | 1983 | Zoology | University of California, Berkeley |
| M.S. | 1975 | Zoology & Entomology | Colorado State University |
| B.A. | 1972 | Biology | George Washington University |

## RESEARCH & PROFESSIONAL EXPERIENCE

**Member, Independent Science Panel**, 2001 – 2003
National Elk Refuge and Grand Teton National Park, United States Department of the Interior.

**Editor, The Condor**, 2000 – 2008
An international journal of avian biology published by the Cooper Ornithological Society.

**Member, Scientific Review Panel**, 1999 – 2000
National Center for Environmental Assessment, United States Environmental Protection Agency.

**Member, Expert Panel**, 1998
Implementation of National Wildlife Refuge System Improvement Act, Defenders of Wildlife.

**Science Advisor, Oregon Biodiversity Project**, 1998
Consortium of Federal, State, and Private Agencies and Organizations, Portland, Oregon.

**Adjunct Professor**, 1997 – Present
Graduate School of Professional Studies and Northwestern School of Law, Lewis & Clark College, Portland, Oregon.

**Member, Scientific Review Panel**, 1997 – 1999
Grand Canyon Monitoring and Research Center, United States Department of Interior, Bureau of Reclamation.

**Member, Expert Panels**, 1994 – 1997
Interior Columbia Basin Ecosystem Management Project, United States Forest Service and United States Bureau of Land Management.

**Founder and Executive Director**, 1993 – Present
High Desert Ecological Research Institute, Bend, Oregon.

**Member, Policy Development Panel**, 1993 – 1994
Wildlife Conservation and Range Management, The Wildlife Society.

## RESEARCH & PROFESSIONAL EXPERIENCE (CONTINUED)

**Member, Oregon/Washington Joint Steering Committee**, 1992 – 1999
Neotropical Migratory Bird Conservation and Management Program.

**Member, Desert Wilderness and Wildlife Management Task Force**, 1992 – 1993
The Wildlife Society.

**Member, Nongame Wildlife Task Force**, 1991 – 1993
Oregon Department of Fish and Wildlife.

**Visiting Research Ecologist** (Sabbatical Leave), 1990 – 1992
The High Desert Museum, Bend, Oregon.

**Member, Endangered and Nongame Species Advisory Committee**, 1988 – 1991
New Jersey Department of Environmental Protection, Division of Fisheries and Wildlife.

**Assistant Professor of Zoology and Curator of Vertebrate Collections**, 1986 – 1992
Department of Biology, Rutgers University, Camden, New Jersey.

**Postdoctoral Research Fellow** (with Dr. Paul Ehrlich), 1983 – 1986
Department of Biological Sciences, Stanford University, Stanford, California.

**Senior Ecologist**, 1983 – 1986
Center for Conservation Biology, Stanford University, Stanford, California.

**Consultant**, 1982 – 1983
California Department of Fisheries and Wildlife (California Wildlife Habitat Relationships Model Program).

## TEACHING EXPERIENCE

**Adjunct Professor, Lewis & Clark College and Northwestern School of Law**, Portland, Oregon, 1998 – Present
· Ecological Knowledge for Environmental Problem solving (graduate level)
· Legal Ecology: Ecosystem Function and the Law (environmental and natural resources law)

**Instructor, BLM National Training Center**, Sierra Vista, Arizona, 1994 – 1995
· Neotropical Migratory Bird Conservation

**Visiting Professor**, Malheur Field Station, Princeton, Oregon, 1991
· Avian Ecology

**Assistant Professor of Zoology**, Rutgers University, 1986 – 1990
· Vertebrate Zoology
· Animal Behavior
· General Ecology
· Population Ecology (graduate level)
· Graduate Seminars in Population Ecology, Community Ecology, and Conservation Biology
· Man-Ecosystem Interactions (nonmajor)

## TEACHING EXPERIENCE (CONTINUED)

**Acting Assistant Professor**, Stanford University, 1985
· Ornithology

## HONORS, AWARDS AND APPOINTMENTS

| | |
|---|---|
| 2004 - Present | Elected Fellow, American Ornithologists' Union |
| 2001 – Present | Certified Senior Ecologist, Ecological Society of America |
| 2000 – 2008 | Editor, The Condor |
| 1996 – 1999 | Board of Directors, Cooper Ornithological Society |
| 1989 – 1994 | Editorial Board, American Zoologist |
| 1986 – 1988 | Henry Rutgers Research Fellow, Rutgers University |

## PROFESSIONAL SOCEITY MEMBERSHIPS

American Ornithologists' Union
Association for Tropical Biology
Cooper Ornithological Society
Ecological Society of America
Society for Conservation Biology

## SELECTED PAPERS PRESENTED AT SCIENTIFIC MEETINGS

Avian response to changes in structure and composition of riparian and upland cover in the Great Basin. Invited session paper, Ecological Society of America Annual Meeting, 2007.

Instability versus stability of avian community composition in riparian habitats of the Intermountain West: What's going on? Invited symposium paper, American Ornithologists' Union Annual Meeting, 2005.

Historical distribution and changes in populations of sagebrush steppe species. Invited symposium paper, Ecological Society of America Annual Meeting, 2004.

Out of steppe with sacred cows in the Intermountain West: multiple challenges to ecological restoration of shrubsteppe ecosystems. Invited keynote address, Front Range Student Ecology Symposium, Fort Collins, Colorado, 2003.

Historical view of land cover changes in shrubsteppe ecosystems. Invited sumposium paper and keynote address, Cooper Ornithological Society Annual Meeting, 2003.

Riparian songbird abundance a decade after cattle removal on Hart Mountain and Sheldon National Wildlife Refuge, Third North American Ornithological Conference, 2002.

Rangeland fragmentation and the unsuspected biodiversity crisis. Invited keynote symposium paper, Society for Range Management Annual Meeting, 2000.

Differences between eastern and western landscapes: topography, ecological processes, and the matrix. Invited symposium paper, Cooper Ornithological Society Annual Meeting, 1999.

Effects of anthropogenic fragmentation and livestock grazing on western riparian bird communities. Invited symposium paper, Cooper Ornithological Society Annual Meeting, 1999.

"To ensure biological integrity, diversity, and environmental health": science as the key to comprehensive conservation planning under the Refuge Improvement Act. Invited paper, Wildlife Society Annual Meeting (Western Section), 1999.

## SELECTED PUBLICATIONS

### Books

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The Birder's Handbook: A Field Guide to the Natural History of North American Birds. Simon and Schuster, New York. 815 pages.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1992. Birds in Jeopardy: The Imperiled and Extinct Birds of the United States and Canada Including Hawaii and Puerto Rico. Stanford University Press, Stanford, California. 259 pages.

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George, T.L., and D.S. Dobkin, (Editors). 2002. Effects of Habitat Fragmentation on Birds in Western Landscapes: Contrasts with Paradigms from the Eastern United States. Studies in Avian Biology Number 25. 270 pages.

Smith, B., E. Cole, and D. Dobkin. 2004. Imperfect Pasture. A Century of Change at the National Elk Refuge in Jackson Hole, Wyoming. Grand Teton Natural History Association, Moose, Wyoming. 169 pages.

### Other Publications

Dobkin, D.S. and B.A. Wilcox. 1986. Analysis of natural forest fragments: Riparian birds in the Toiyabe Mountains, Nevada. In: Wildlife 2000: Modeling Habitat Relationships of Terrestrial Vertebrates, J. Verner, M.L. Morrison, and C.J. Ralph (eds.), pp. 293-299. University of Wisconsin Press, Madison.

Dobkin, D.S., J.A. Holmes, and B.A. Wilcox. 1986. Traditional nest-site use by White-throated Swifts. Condor 88: 252-253.

Dobkin, D.S. 1987. Synchronous flower abscission in plants pollinated by hermit hummingbirds and the evolution of one-day flowers. Biotropica 19: 90-93.

Dobkin, D.S., I. Olivieri, and P.R. Ehrlich. 1987. Rainfall and the interaction of microclimate with larval resources in the population dynamics of checkerspot butterflies (*Euphydryas editha*) inhabiting serpentine grassland. Oecologia 71: 161-166.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1989. A Guide to the Natural History of the Birds of the Pribilof Islands. Center for Conservation Biology Special Publication No. 1. Stanford, California. 16 pp.

**PUBLICATIONS (CONTINUED)**

Craig, L.J. and D.S. Dobkin. 1993. Community dynamics of small mammals in mature and logged Atlantic white cedar swamps of the New Jersey Pine Barrens. New York State Museum Bulletin No. 487. 39 pages.

Bock, C.E., V.A. Saab, T.D. Rich, and D.S. Dobkin. 1993. Effects of livestock grazing on Neotropical migratory landbirds in western North America. In: Status and Management of Neotropical Migratory Birds, D.M. Finch and P.W. Stangel (eds.), pp. 296-309. U.S.D.A. Forest Service Gen. Tech. Rep. RM-229.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1993. A Guide to the Natural History of the Birds of St. Lawrence Island, Alaska. Center for Conservation Biology, Stanford University, California. 31 pages.

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Saab, V.A., C.E. Bock, T.D. Rich, and D.S. Dobkin. 1995. Livestock grazing effects on migratory landbirds in western North America. In: Ecology and Management of Neotropical Migratory Birds: A Synthesis and Review of Critical Issues, T.E. Martin and D.M. Finch (eds.), pp. 311-353. Oxford University Press, New York.

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Knick, S.T., D.S. Dobkin, J.T. Rotenberry, M.A. Schroeder, W.M. Vander Haegen, and C. Van Riper, III. 2003. Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. Condor 105: 611-634.

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Thomson, J.R., E. Fleishman, R. Mac Nally, and D.S. Dobkin. 2007. Comparison of predictor sets for species richness and the number of rare species of butterflies and birds. Journal of Biogeography 34: 90-101.

Pellet, J., E. Fleishman, D.S. Dobkin, A. Gander, and D.D. Murphy. 2007. An empirical evaluation of the area and isolation paradigm of metapopulation dynamics. Biological Conservation 136: 483-495.

Fleishman, E. and D.S. Dobkin. 2008. Nestedness analysis and temporal change in butterfly and bird communities of isolated mountain ranges in central Nevada. Great Basin Birds. In press.

Mac Nally, R., E. Fleishman, J.R. Thomson, and D.S. Dobkin. 2008. Use of guilds for modeling avian responses to vegetation in the Intermountain West. Global Ecology and Biogeography. In press.

DATE: 28 August 2008

TO: Paul Dewey

From: Bret Michalski
Consulting Wildlife Biologist
19325 Kiowa Road
Bend, OR 97702

RE: Thornburgh and Tetra Tech Revised Wildlife Mitigation Plan

Paul –

I have reviewed the Revised Off-Site Mitigation and Monitoring Plan for the Thornburgh Destination Resort Project (dated August 2008) prepared by Tetra Tech EC, Inc. for the Thornburgh Resort Company. While the mitigation and monitoring plan represents an improvement in the area of gathering data to insure that habitat improvements actually occur, I still have concerns as to whether the Deschutes County Code 18.113.070(D) will have been met.

The code specifies that negative impacts to *"fish and wildlife resources"* be completely mitigated. This includes *habitat* as well as *population numbers*. One of the greatest shortcomings of the HEP analysis and subsequent mitigation plan, is that it rests on the premise that improved habitat (off-site) *will* accommodate additional animals, of the same species, to a level that mitigates for the populations lost due to the loss of habitat to development. The mitigation and monitoring plan does a fairly good job of detailing base-line vegetative data to be collected, so that changes due to mitigation activities can be evaluated for success. However, there is no assurance (and no way to document under the current plan) that these areas, if improved, *would* support added individuals. It is the opinion of the biologists who conducted the HEP analysis that this is so. However, to my knowledge, there is no body of literature that shows that taking a habitat with a Habitat Suitability Index (HSI) of .5 and raising it to a .7 or .8, will support the number of animals lost from a developed site with an initial HSI of .3 or .4. To begin with, the HIS's for the species in question are subjective and subject to potential error. In addition, factors such as territoriality of species, variations in food sources from one habitat to another, and unknown or unmeasured factors affecting species density in a particular habitat serve to make the aforementioned presumption tenuous at best. If the standard were to "make a concerted effort to reduce wildlife impacts", I might agree that the standard has been met by the current mitigation and monitoring plan. But given the language of the county code, I don't see how the standard can be shown to have been met when there is no mention in the mitigation and monitoring plan of surveying initial species composition and approximate density, both on the proposed Thornburgh site and the off-site mitigation areas. As a biologist, I would have a hard time stating that I had met a standard without anything other than vegetation data to support my assertion.

My final comments stem from my review of the Tetra Tech responses to verbal testimony given at the 15 July 2008 hearing (letter dated 12 August 2008). Point-by-point rebuttal is not appropriate at this stage of the process, but there is something in the tone of the responses that leaves me wondering if folks aren't ignoring a major ramification. On page 7 of the letter, it is acknowledged that fragmentation of an existing old-growth juniper block *will* occur. Yet the response seems almost dismissive of the significance of this. It is stated that "that is why a habitat mitigation plan was developed, and why mitigation will be performed off-site." Yet merely enhancing existing habitat does not undo fragmentation of habitat elsewhere. If a habitat block is made smaller, enhancing another block of habitat (that may or may not be adjacent to the habitat in question) may not replace the connectivity function that

the lost habitat may have provided. While Tetra Tech points out that the Thornburgh and adjacent properties do not constitute an unfragmented block of juniper woodland, they concede that the development actions will make it more fragmented.

In addressing the last statement on page 6, they state that literature shows that restoration is more cost efficient and effective than creation (pertaining to wetlands, not juniper woodlands), and then almost scoff at the suggestion that old-growth juniper be created from "scratch". My suggestion that areas in other current land uses be protected via purchase or conservation easement was interpreted to mean growing old-growth from scratch. But my thoughts centered on the idea of truly being able to say that no net loss of wildlife resources had occurred.

If I can be of further assistance, please feel free to contact me.

Bret L. Michalski
Associate Professor Forest Resources Technology
Consulting Wildlife Biologist

Anne Corcoran Briggs c/o Ruth Herzer asst. Planner Deschutes County

## Big Falls Ranch, Water Rights Transfer

I would like to take a few minutes and relate what I have discovered with regards to the potential transfer of water rights from the Big Falls Ranch at Lower Bridge to the proposed Thornburgh destination resort.

First of all it is important to understand the most recent filing from Big Falls Ranch for transfer of water rights. This transfer was filed in 2001 and the reference document is 6854. While this transfer was sent to Oregon Water Resources Department (OWDR) in Salem in 2001, I was informed by OWRD on 7/22/08 that the final transfer has not been issued.

It is obvious from OWRD documents that Big Falls desires to have over 300 acres of supplemental water converted to primary water rights.

A primary right is usually associated with surface water. These are the rights that are to be used first for irrigation. A supplemental right is one that exists to back-up the primary right in case the primary runs out. A supplemental right also is to be used casually and only when the primary right has been exhausted. A supplemental right is usually a subsurface water right.

Document 6854 indicates that there were supplemental rights in place without an underlying primary right, which is unusual. It is also unusual that Big Falls wishes to convert these to primary rights.

In the Thornburgh documentation it is stated that they are wishing to transfer 5.5 c.f.s of water from Deep Canyon Creek, making the impression that this is surface water. That simply is not the case, as there is not 5.5 cfs in Deep Canyon Creek. Deep Canyon Creek is a highly intermittent stream that rarely flows water except perhaps near the confluence of the Deschutes River. If Deep Canyon Creek had 5.5 cfs of surface water there would not have been any need to convert the 300+ acres of supplemental rights to

primary. If Deep Canyon Creek had 300+ acres of water flowing it would have been a primary right. Since there are not 300+ acres of primary/surface water the only explanation is that document 6854 is an effort to convert subsurface well water to a primary right.

Therefore there can be no transfer of 5.5 cfs surface water from Deep Canyon Creek because it does not exist.

Respectfully Submitted

James C. Crocker

**Jim Crocker**
Redmond, OR 97760
(541) 317-1984
jcrocker@vulcanpower.com

James C. Crocker

## Employment Experience

2007-Present Project Manager Vulcan Power Company, Bend, OR

1996-2007 Warm Springs GIS, Warm Springs Geo Vision Warms Spring, OR
GIS Supervisor/Operations Manager

* Developed grants and contracts with multiple agencies and groups.
* Oversaw crew and professional operations, including forestry, fire, GIS, and other crews
* Oversaw creation of Warm Springs Geo Visions.
* Implemented web-based GIS deliver tools.
* Managed diverse GIS staff, projects and budget.
* Oversaw submission of grants and other "new" funding tools.
* Delivered diverse mapping and imagery products.

1996-1998 Warm Springs GIS Warm Springs, OR
Database Administrator
* Implemented VLDB protocol for natural resources.
* Managed timber harvest records.
* Developed billing and accounting techniques for timber sales
* Developed disaster recover plan for natural resources.

1985-Present Self Employed
Cow/Calf Operation
* Manage commercial cow/calf operation

## Education

Oregon State University

Bachelor of Science in Rangeland Resources,
Bachelor of Science in Animal Science,
Masters of Science in Animal Science w/ minor in Computer Science
Phd work in GIS/Rangeland Resources

## Projects

2004 Confederate Tribes of Warm Springs- Ground water analysis study for Confederated Tribes on ground water movement in the Deschutes basin.

2003 Confederate Tribes of Warm Springs- Flood plane analysis for Confederated Tribes.

2002 Infrared Water Temperature Analysis. Provided analytical and mapping support for large scale infrared data collection project encompassing 5 sub-basin watersheds. Stream temperature analysis was used for endangered species biological assessments and opinions.

2000 Columbia River Intertribal Fish Commission -Cross border endangered species analysis. Provided analysis and mapping support to the Columbia River Intertribal Fish Commission in determining the distribution of the catch/haul for hatchery grown salmon.

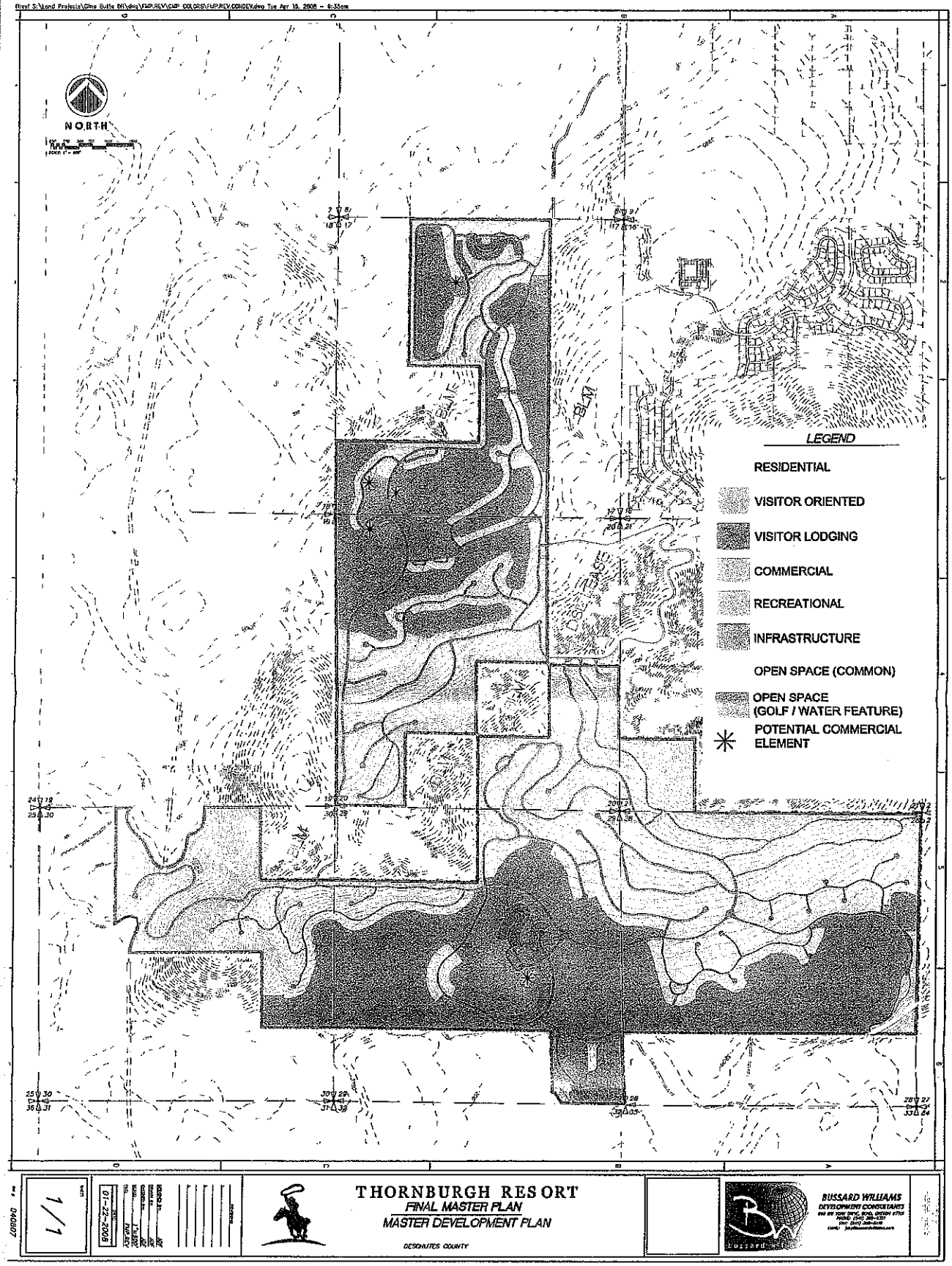



*Exhibit A.3.1*

LUBA #2008-203

00307

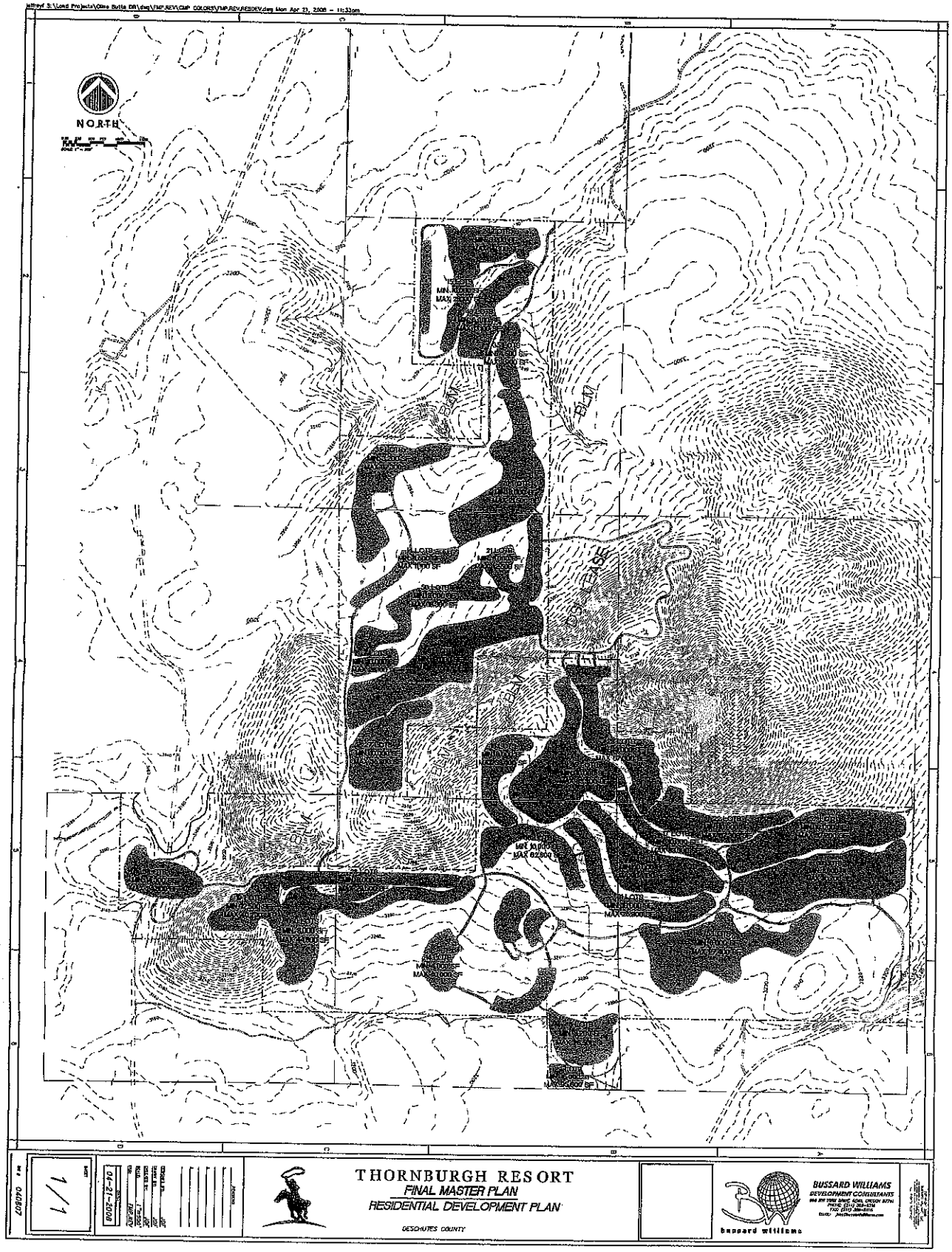
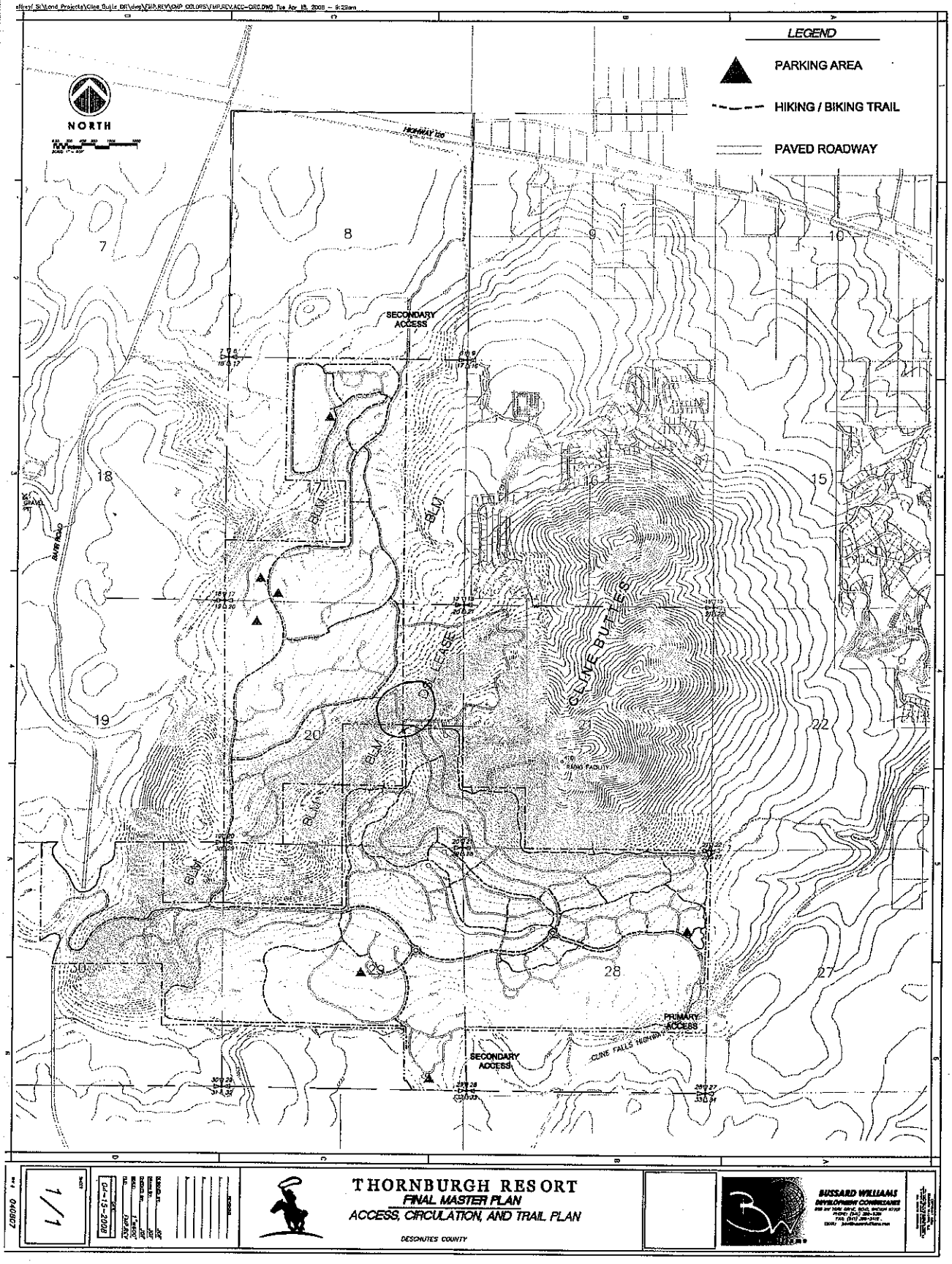



*EXHIBIT G.1.1b*

LUBA #2008-203

00308




THORNBURGH RESORT
FINAL MASTER PLAN
ACCESS, CIRCULATION, AND TRAIL PLAN
DESCHUTES COUNTY

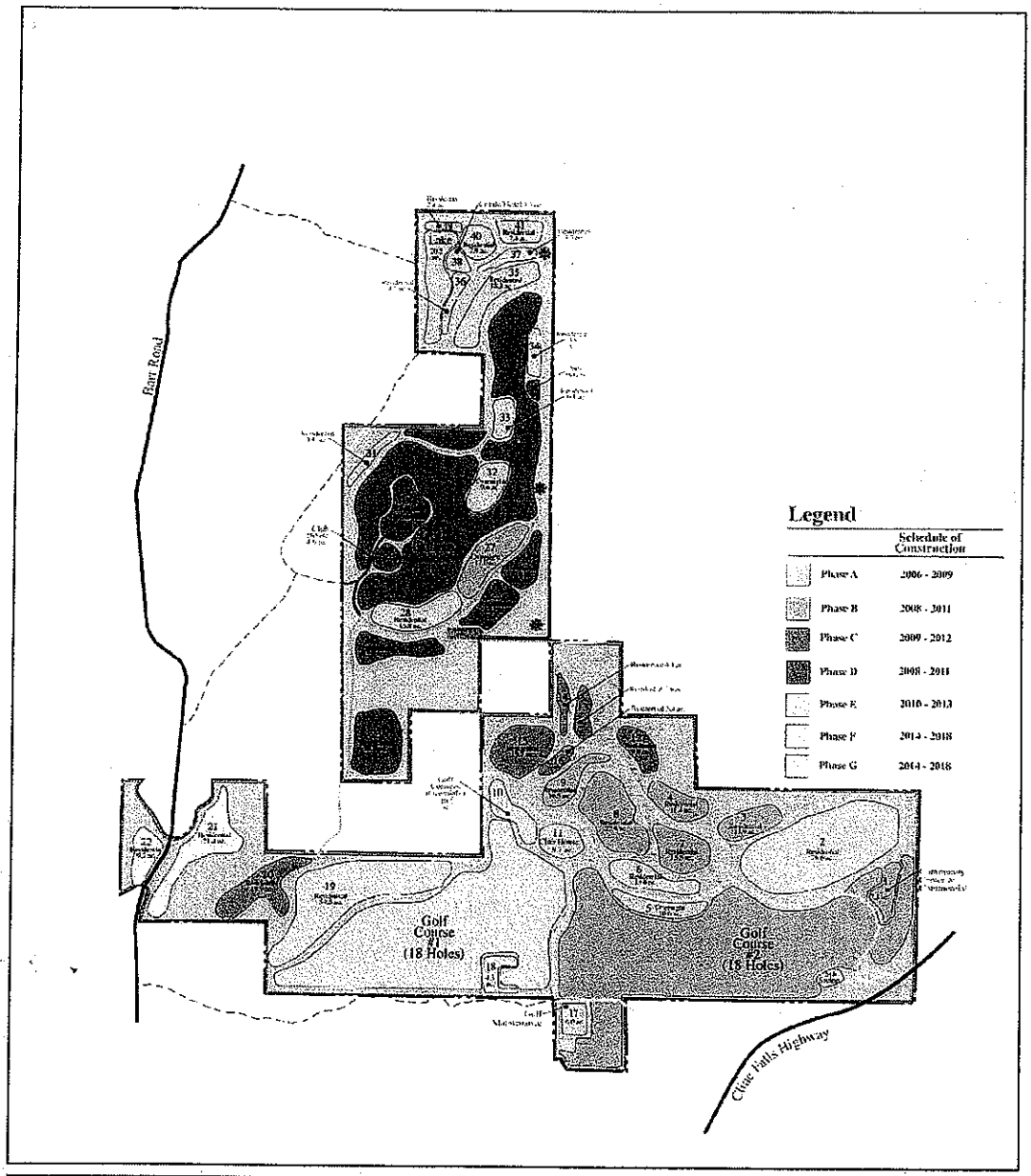
BUSSARD WILLIAMS
DEVELOPMENT CONSULTANTS

04080.03
1/1
04-15-2008

*Exhibit A.7.1*

LUBA #2008-203

00309




THORNBURGH RESORT

*PHASING PLAN - EXHIBIT #B-1.08*

***REVISED B-1.08 AUGUST 11, 2008***

***REVISED AS REBUTTAL EXHIBIT D.1***

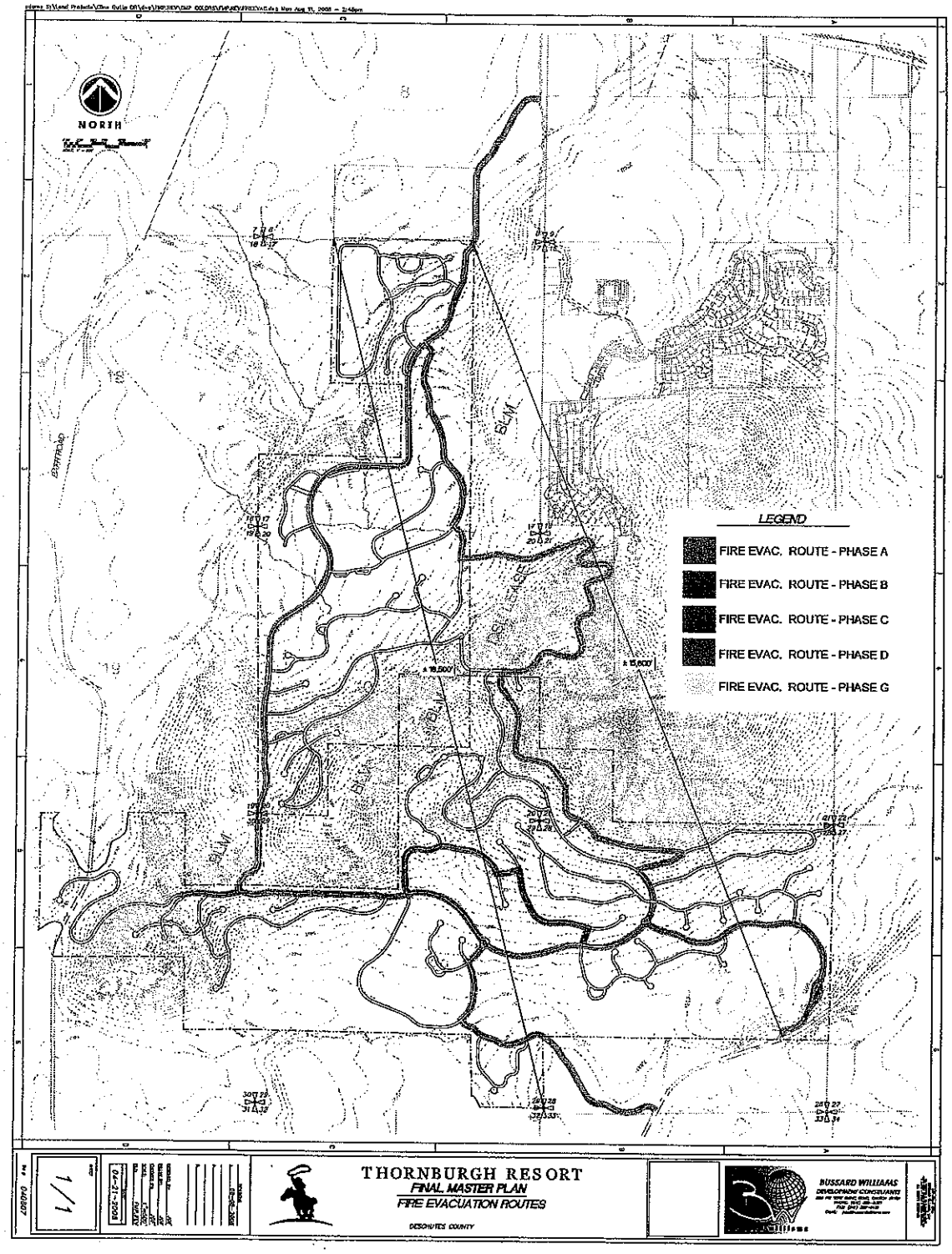



*Exhibit F.7.1*
*REVISED AS REBUTTAL EXHIBIT C.2*

Groundwater & Environmental Consultants

**Mark Yinger Associates**

69860 Camp Polk Road, Sisters, OR 97759 – 541-549-3030

RECEIVED

AUG 28 2008

Deschutes County CDD

August 27, 2008

Steve Munson
Vulcan Power Company - Native Restoration Fund
345 SW Cyber Drive, Suite 103
Bend, OR 97702

Ref: Thornburgh Resort - rebuttal and comment in response to applicant's rebuttal evidence submitted to Ruth Herzer, Deschutes County Planning Division, on August 12, 2008.

Dear Mr. Munson:

The following are my responses to written evidence submitted on behalf of Thornburgh Resort to Ruth Herzer, Deschutes County Planning Division, on August 12, 2008. My comments are organized by individual documents contained in the submittal.

**Martha Pagel's Letter to Anne Corcoran Briggs, dated August 11, 2008**

In Martha Pagel's letter date August 11, 2008, it is proposed that Thornburgh could provide mitigation for loss of groundwater discharge to lower Whychus Creek due to the pumping of its proposed wells. The mitigation would consist of 106 acre feet of water provided by Three Sisters Irrigation District through transfer of irrigation water to instream flow. This will not mitigate impact to Whychus Creek because it replaces cold groundwater with warm water from upstream during the irrigation season. It is the cold groundwater discharge at Alder Springs that is the defining and essential factor that makes the lower reach of Whychus Creek critical habitat for native bull trout, redband trout and reintroduced steelhead trout and Chinook salmon.

The pumping of Thornburgh wells will reduce cold groundwater discharges. Replacing this lost flow of 106 acre feet by reducing upstream irrigation diversions would result in more hot water mixing with the cold water of the lower reach of Whychus Creek. The proposed mitigation is harmful to critical fish habitat in two ways: first it would allow the reduction of cold groundwater discharge to the stream, and second it would increase the flow of warm water into the cold lower reach of the stream.

Using the thermal mass balance equation, the calculated the increase in stream temperature at Alder Springs due to the pumping of the Thornburgh wells would be 0.07° C. The calculated change in stream temperature due to both the reduction in cold groundwater discharge and the increased stream flow due to the propose mitigation would result in even a greater stream temperature increase of 0.12° C at Alder Springs. It is clear that the proposed mitigation for Thornburgh's impact to Whychus Creek would only increase the impact to critical cold water habitat that native and reintroduced fish are dependant on.

**Richard Nichols Letter to Anne Corcoran Briggs, dated August 6, 2008, concerning impacts to Deschutes River and Whychus Creek**

I have a number of concerns with Mr. Nichols letter for Newton Consultants dated August 6, 2008 (Thornburgh Ex A6) and I will address some of them.

At pages one and two of his letter, Mr. Nichols states that our use of the total Thornburgh pumpage for groundwater modeling is not consistent with comments in the USGS report. That statement is not supported with any citations and we have not found comments of this nature in the USGS reports.

Mr. Nichols at page two states that the "Yinger Report" did not predict or quantify impacts on stream temperature. While we did not quantify temperature impacts in the Report, we did predict that there would be temperature increases and he is incorrect to state that we did not. Calculations done by Thornburgh's consultants confirmed our prediction that stream temperatures will increase.

Mr. Nichols' comment at page three that "mixing zone" is a regulatory term under the federal Clean Water Act is irrelevant. "Mixing zones" as referred to in this case are where cold groundwater mixes with warm stream water resulting in localized cold water refugia critical for fish. These refugia are not addressed in Thornburgh's mitigation plan and the plan provides no mitigation for Whychus Creek.

The final bulleted item at the end of the letter is incorrect. The mitigation plan does not fully mitigate impact to stream flow and temperature. The mitigation plan ignores impacts to Whychus Creek.

**Richard Nichols Second Letter to Anne Corcoran Briggs, dated August 6, 2008, concerning my comments related to Thornburgh sewage effluent**

The final sentence of Mr. Nichols' letter of August 6, 2008 (Thornburgh Ex A7) misses the point I made that there will be no recharge to groundwater from sewage effluent and that water consumption will thus be 100%. Of course there will be seepage of sewage effluent into the ground, but the plants will uptake that seepage. That is why the Water Pollution Control Facilities (WPCF) permit specifies that the effluent be applied "on the land, for dissipation by evapotranspiration and controlled seepage" (page 3 of Schedule A). The objective is not to prevent seepage into the ground but to prevent seepage at a rate such that it gets by the plants and negatively impacts groundwater quality.

The reason the terms of the WPFC permit are important is that the objective is to prevent sewage effluent from reaching groundwater, and therefore, Thornburgh should not be counting sewage effluent as recharging groundwater and thereby reducing its mitigation obligation under Oregon Water Resource Department rules.

Sincerely,

Mark Yinger, R.G.
Hydrogeologist

55.00


**Community Development Department**

Planning Division Building Safety Division Environmental Health Division

117 NW Lafayette Avenue Bend Oregon 97701-1925
(541)388-6575 FAX (541)385-1764
http://www.co.deschutes.or.us/cdd/


## APPLICATION FOR ACCESS-DRIVEWAY PERMIT

(connections to public roads or right-of-way only)

Date: 4-15-08 Access Permit Number: SW8645

Land Use File Number (if applicable): M-07-02

Road Name: Cline Falls Rd. Road Number: 1148

Applicant Name: Thornburgh Resort Company, LLC

Owner Name (if different): Same

Home Phone: _____ Work Phone: 541.318.9950

Permit Address: 67527 SW Cline Falls HWY.

Mailing Address (if different): P.O. Box 264 Bend, OR 97709

Property Description: 15 Township 12 Range 00 Section 7700 Tax Lot

Nearest Intersection: HWY 126 and Cline Falls Road

Type of Access (check one): ☑Residential ☐Commercial ☐Farm

Type of surface to be constructed (check one):

☐Concrete ☑Asphalt ☐Aggregate or Cinder base Other: _____

Applicant hereby applies to Deschutes County for permission to construct a driveway access at the permit address above. All work shall be in conformance with Deschutes County Code (DCC) 17.48.210, 17.48.220 and 12.28. The driveway access shall be maintained as approved and shall not present a traffic hazard for road or driveway users.

Permittee agrees and understands that this permit does not equal a land use approval. It is for access only. Any development of property connected with this permit must comply with all applicable land use regulations.

Please include a DRAWING OR SITE PLAN SKETCH (space provided on the back of this form) showing the location and type of access. It should indicate the driveway's position relative to landmarks such as roads, other driveways, fence lines, power poles, etc. Please include a north arrow. Applicant needs to mark the proposed access in the field at the road with stakes, flagging, ribbons, or paint on the road.

SCANNED

Once the location is marked, CALL 388-6581 FOR AN INSPECTION. Inspections will be scheduled as soon as practical. For properties within Unincorporated Communities, indicate whether a curb cut and/or sidewalks will be required. If required, public sidewalks shall be constructed at the time the driveway access is constructed. Note: If a curb cut is required for installation of the driveway, a permit to work in the public right-of-way is required from the County Road Department.

DISCLAIMER: Deschutes County will not take responsibility for ensuring that all other conditions of any other regulating agency have been complied with. It is the responsibility of the homeowner to meet subdivision Covenants, Conditions and Restrictions (CC & R's) and all other neighborhood and regulatory agency requirements. The owner agrees to remove any construction, which is determined by Deschutes County not to meet standards.

Applicant's Signature: _____ Date: 4/15/08

Amount Received: $ 55.00 Receipt #: _____ Check # Cash: _____

Area Drawing Locating Subject Property
(A map can also be attached)

---

See attached.

---

**Approved Driveway Location:** Office Use Only

18010' to Hwy 126

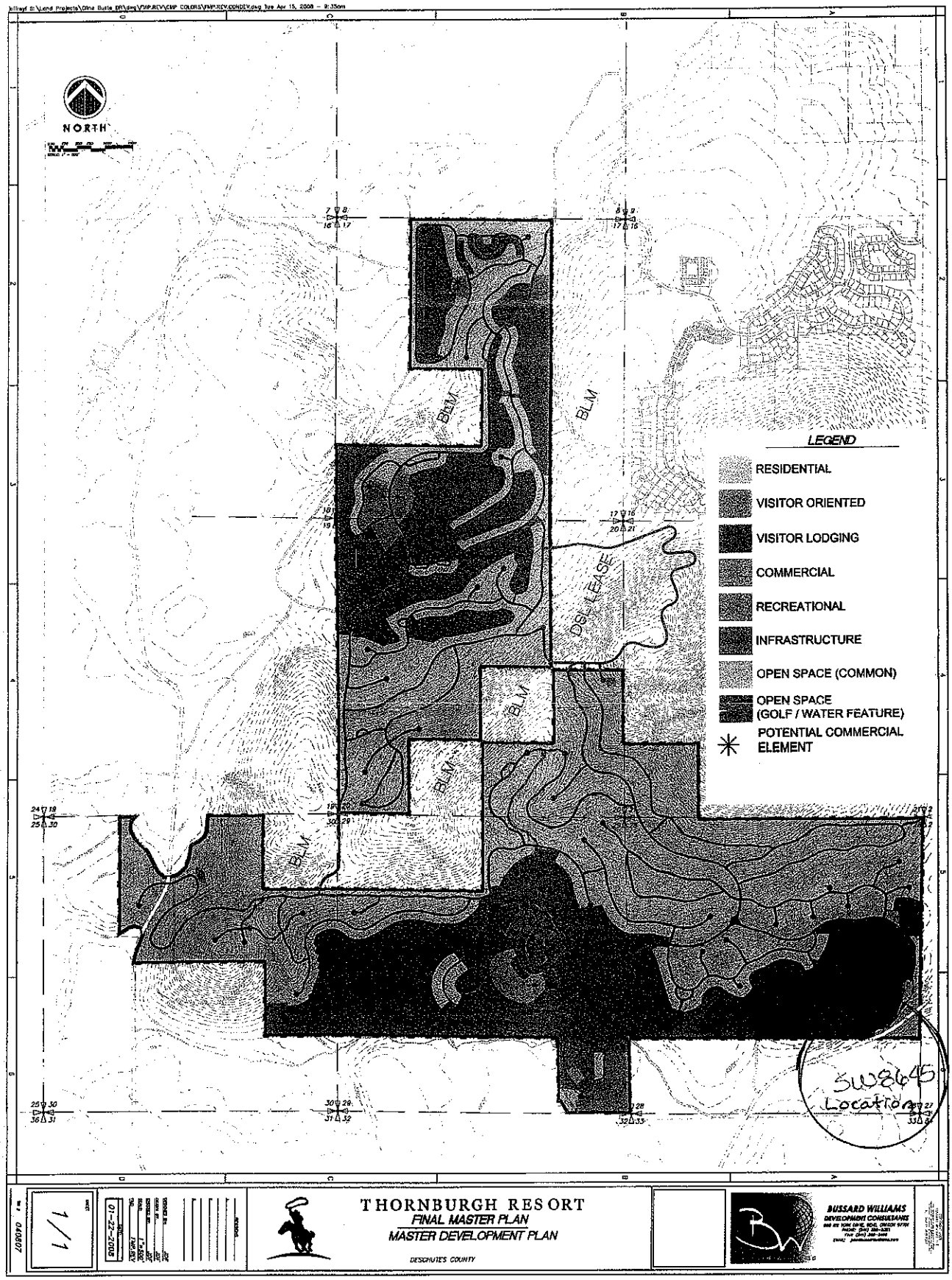
**Latitude:** 44°14'0294" **Longitude:** -121°17'44908 **Milepost:** _____

Deschutes County Road Department

Approved by: R.K.L Date: 20 Aug 08

Deschutes County Community Development Department

Reviewed By: _____ Date: _____




Tax Lot 15 1200 00 07200

*Exhibit A.3.1*

LUBA #2008-203

00317

**BEFORE THE HEARINGS OFFICER**
**FOR DESCHUTES COUNTY, OREGON**

| | | |
|---|---|---|
| **IN THE MATTER OF AN APPLICATION BY THORNBURGH RESORT COMPANY FOR FINAL MASTER PLAN APPROVAL FOR A DESTINATION RESORT** | ) ) ) ) ) | **FILE NOS. M-07-2 & MA-08-6** |

**ORDER ON REQUEST TO SUBMIT RESPONSIVE EVIDENCE AND TESTIMONY**

1. On July 15, 2008, the hearings officer closed the public hearing on this matter, and held the record open pursuant to the following schedule:

| | |
|---|---|
| July 29, 2008 | Deadline for new written evidence by opponents |
| August 12, 2008 | Deadline for response evidence by applicant |
| August 19, 2008 | Deadline for applicant's final written legal argument pursuant to ORS 197.763(6) |
| September 9, 2008 | Deadline for issuance of hearings officer's decision |

2. On August 18, 2008, the hearings official received a letter via e-mail from Paul Dewey, on behalf of Nunzie Gould, one of the opponents. Mr. Dewey commented that some of the applicant's submittals constituted new evidence. Mr. Dewey argues first that the evidence, which includes a revised wildlife mitigation plan and a new emergency access circulation plan, among other changes, are significant enough to constitute a modification of the application, as that term is used in Deschutes County Code (DCC) 22.20.055.[1]

[1] DCC 22.20.050 provides:

"A. An applicant may modify an application at any time during the approval process up until the close of the record * * *.

"B. The * * * Hearings Body shall not consider any evidence submitted by or on behalf of an applicant that would constitute a modification of an application * * * unless the applicant submits an application for a modification, pays all required modification fees and agrees in writing to restart the 150-day time clock as of the date the modification is submitted. The 150-day time clock for an application, as modified, may be restarted as many times as there are modifications."

"Modification of application" is defined in DCC 22.04.020 as

"* * * the applicant's submittal of new information after an application has been deemed complete and prior to the close of the record on a pending application that would modify a development proposal by changing one or more of the following previously described components: proposed uses, operating characteristics, intensity, scale, site lay out (including but not limited to changes in setbacks, access points, building design, size or orientation, parking , traffic or pedestrian circulation plans), or landscaping in a manner that requires the application of new criteria to the

SCANNED AUG 2 2 2008

In the event the hearings office disagrees that the submittal constitutes a modification, Mr. Dewey requests that he be permitted to submit responsive testimony and evidence to address the new evidence. Due to the variety and volume of the additional evidence, and also because Mr. Dewey will not be in the office from August 25th through 27th, 2008, he proposes that opponents be given until September 2, 2008 to file their response to the applicant's evidence. In the alternative, Mr. Dewey requests that the hearings officer reject the new evidence.

3. Peter Livingston, on behalf of the applicant, concedes that the applicant's August 12, 2008 submittals included new evidence and that, pursuant to ORS 197.763(7), the opponents are entitled to an opportunity to submit testimony and evidence that responds to that new evidence. Mr. Livingston proposes a more streamlined submittal schedule, arguing that his proposal permits adequate time for opponents to review and respond to the August 12, 2008 written testimony and evidence. Mr. Livingston does not agree that the evidence submitted by the applicant constitutes a modification of the proposal, or that the hearings officer has the authority to reject evidence proffered pursuant to the evidentiary procedures set out in ORS 197.763.

4. If the hearings officer concludes that the evidence proffered by the applicant changes the application in one of the ways described in DCC 22.04.020 AND those changes require either (1) the application of new criteria or (2) revisions to the findings of fact, the applicant must submit a modification pursuant to DCC 22.20.055, or the evidence must be rejected. If the evidence does not rise to the level of a modification, then the applicant is correct that the evidence must be accepted, and the opponents should be given an opportunity to respond to that new evidence.

The evidence submitted by the applicant on August 12, 2008 comprises approximately 500 pages of material, plus new drawings and maps. Some of that material changes previously described components, including the wildlife mitigation plan, emergency access routes and a revised phasing plan. With respect to the latter two items, the changes are minor: (1) the Phase A evacuation route is modified to eliminate an extension of the route to an area slated for development in Phase C (compare Exhibit F.7.1 in the applicant's M 08-6 application materials with F.7.1 included in Rebuttal Exhibit C.2 in the applicant's August 12, 2008 submittal) and (2) the revised phasing plan adds the word "overnight" to a development "pod" (compare Exhibit AA-11, Thornburgh Resort Phasing Plan, submitted with M-07-2, with Exhibit #B-1.08 Phasing Plan, submitted in the applicant's August 12, 2008 submittal.) The hearings officer concludes those two changes clarify or supports the pending application, and do not constitute a modification.

---

proposal or that would require the findings of fact to be changed. It does not mean the applicant's submittal of new evidence that merely clarifies or supports the pending application."

With respect to the revised wildlife mitigation plan, the August 12, 2008 submittal includes comparative studies, evidence regarding the HEP modeling, and background information summarizing the iterative process used by the applicant to craft the final wildlife mitigation plan. The submittal also expands and clarifies the applicant's proposal to mitigate impacts and monitor those impacts over time. While voluminous, the hearings officer concludes that the evidence presented does not constitute a modification, because it does not alter the basic outline of the applicant's April 2008 mitigation plan or require the application of new criteria.

5. Having concluded that the August 12, 2008 submittal does not constitute a "modification," the hearings officer now turns to the parties' proposed schedules. The opponents have had at least five days to review and consider the August 12, 2008 submittals.[2] Therefore, the deadlines for record submittals are revised as follows:

| | |
|---|---|
| August 28, 2008 | Deadline for evidence by opponents responding to the applicant's August 12, 2008 submittal |
| September 11, 2008 | Deadline for response to opponents' submittal by applicant |
| September 18, 2008 | Deadline for final written legal argument pursuant to ORS 197.763(6) |
| October 6, 2008 | Deadline for issuance of hearings officer's decision |

To meet the deadline, the parties must submit their evidence and testimony to the county planning and development department by 4:30 p.m.

Dated this 18th day of August, 2008.

Anne Corcoran Briggs
Hearings Officer

RECEIVED
AUG 22 2008
Deschutes County CDD

[2] The applicant presented the submittal to staff on August 12, 2008, Mr. Dewey requested copies of those submittals at that time, and the copies were collected by Ms. Gould on August 14, 2008.

# United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Prineville District Office
3050 N.E. 3rd Street
Prineville, Oregon 97754

IN REPLY REFER TO:

OR61170

Anne Corcoran Briggs
Deschutes County Hearings Officer
Deschutes County Community Development Department
117 NW Lafayette Avenue
Bend, OR 97701

Dear Ms. Briggs:

This letter provides a summary of the consultation and coordination between the Prineville District, Bureau of Land Management and Thornburgh Resort Company, LLC (TRC) and its affiliates with regards to TRC's Off-Site Habitat Mitigation and Monitoring Report.

Currently, the BLM is finalizing the Environmental Assessment for the Cline Buttes Recreation Area Plan (CBRAP), which is an implementation plan tiered to the Upper Deschutes Resource Management Plan, Final Environmental Impact Statement (UDRMP/FEIS). The CBRAP includes site specific implementation actions such as different vegetation treatment methods to maintain or restore desired wildlife habitat, designated road and trail systems, identification of routes to be decommissioned, and access controls/trailheads. The final version of the document is anticipated by late 2008, pending public review.

The BLM has provided input to TRC and the County on the types of mitigation actions that would be suitable to occur on BLM administered public lands. There are several areas within the 50-square mile Cline Buttes Recreation Area that are suitable for the types of habitat treatments and motor vehicle use management proposed by TRC in its off-site mitigation plan. These include the 4,099 acre Maston Area, which is designated closed to motor vehicles in the UDRMP, and the 4,200 acre area of canyons located east of Fryrear Road. These areas were designated as Primary and Secondary Wildlife Emphasis respectively in the UDRMP, which directs that management activities benefit wildlife habitat in these areas.

BLM has provided TRC with input on potential areas for mitigation, habitat treatments used during mitigation and monitoring to track effectiveness of vegetative treatments. The BLM believes that the vegetation management details provided to TRC, which are included in their Off-Site Habitat Mitigation and Monitoring Plan, would meet the wildlife and habitat resource management objectives of the UDRMP, and would help to ensure successful implementation of the CBRAP. As stated in our letter to Ruth Wahl, Deschutes County Community Development Department, dated April 21, 2008, the BLM anticipates the possibility that any support of funding provided for mitigation actions may be used as a match for additional grant funding, to allow larger scale benefits for public land management in the area.

Sincerely,

acting For

Molly M. Brown
Field Manager, Deschutes Resource Area

RECEIVED
AUG 20 2008
Deschutes County CDD

FAX

To: Ruth Hertzer, 541.385.1764

From: Anne Corcoran Briggs

Date: 19 August 2008

Pages: 4, inc. cover page

Attached the Thornburgh Order on Request to Submit Responsive Testimony/Evidence. I'll put the hard copy in the mail today. Let me know if you have any questions. 503.223.0067

Anne

LUBA #2008-203

00322

**BEFORE THE HEARINGS OFFICER**
**FOR DESCHUTES COUNTY, OREGON**

| | | |
|---|---|---|
| **IN THE MATTER OF AN APPLICATION BY THORNBURGH RESORT COMPANY FOR FINAL MASTER PLAN APPROVAL FOR A DESTINATION RESORT** | ) ) ) ) ) | **FILE NOS. M-07-2 & MA-08-6** |

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2. On August 18, 2008, the hearings official received a letter via e-mail from Paul Dewey, on behalf of Nunzie Gould, one of the opponents. Mr. Dewey commented that some of the applicant's submittals constituted new evidence. Mr. Dewey argues first that the evidence, which includes a revised wildlife mitigation plan and a new emergency access circulation plan, among other changes, are significant enough to constitute a modification of the application, as that term is used in Deschutes County Code (DCC) 22.20.055.[1]

[1] DCC 22.20.050 provides:

"A. An applicant may modify an application at any time during the approval process up until the close of the record * * *.

"B. The * * * Hearings Body shall not consider any evidence submitted by or on behalf of an applicant that would constitute a modification of an application * * * unless the applicant submits an application for a modification, pays all required modification fees and agrees in writing to restart the 150-day time clock as of the date the modification is submitted. The 150-day time clock for an application, as modified, may be restarted as many times as there are modifications."

"Modification of application" is defined in DCC 22.04.020 as

"* * * the applicant's submittal of new information after an application has been deemed complete and prior to the close of the record on a pending application that would modify a development proposal by changing one or more of the following previously described components: proposed uses, operating characteristics, intensity, scale, site lay out (including but not limited to changes in setbacks, access points, building design, size or orientation, parking , traffic or pedestrian circulation plans), or landscaping in a manner that requires the application of new criteria to the



08/19/2008 15:24 5032230035 BRIGGS/HARRIS PAGE 02/04

In the event the hearings office disagrees that the submittal constitutes a modification, Mr. Dewey requests that he be permitted to submit responsive testimony and evidence to address the new evidence. Due to the variety and volume of the additional evidence, and also because Mr. Dewey will not be in the office from August 25th through 27th, 2008, he proposes that opponents be given until September 2, 2008 to file their response to the applicant's evidence. In the alternative, Mr. Dewey requests that the hearings officer reject the new evidence.

3. Peter Livingston, on behalf of the applicant, concedes that the applicant's August 12, 2008 submittals included new evidence and that, pursuant to ORS 197.763(7), the opponents are entitled to an opportunity to submit testimony and evidence that responds to that new evidence. Mr. Livingston proposes a more streamlined submittal schedule, arguing that his proposal permits adequate time for opponents to review and respond to the August 12, 2008 written testimony and evidence. Mr. Livingston does not agree that the evidence submitted by the applicant constitutes a modification of the proposal, or that the hearings officer has the authority to reject evidence proffered pursuant to the evidentiary procedures set out in ORS 197.763.

4. If the hearings officer concludes that the evidence proffered by the applicant changes the application in one of the ways described in DCC 22.04.020 AND those changes require either (1) the application of new criteria or (2) revisions to the findings of fact, the applicant must submit a modification pursuant to DCC 22.20.055, or the evidence must be rejected. If the evidence does not rise to the level of a modification, then the applicant is correct that the evidence must be accepted, and the opponents should be given an opportunity to respond to that new evidence.

The evidence submitted by the applicant on August 12, 2008 comprises approximately 500 pages of material, plus new drawings and maps. Some of that material changes previously described components, including the wildlife mitigation plan, emergency access routes and a revised phasing plan. With respect to the latter two items, the changes are minor: (1) the Phase A evacuation route is modified to eliminate an extension of the route to an area slated for development in Phase C (compare Exhibit F.7.1 in the applicant's M 08-6 application materials with F.7.1 included in Rebuttal Exhibit C.2 in the applicant's August 12, 2008 submittal) and (2) the revised phasing plan adds the word "overnight" to a development "pod" (compare Exhibit AA-11, Thornburgh Resort Phasing Plan, submitted with M-07-2, with Exhibit #B-1.08 Phasing Plan, submitted in the applicant's August 12, 2008 submittal.) The hearings officer concludes those two changes clarify or supports the pending application, and do not constitute a modification.

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proposal or that would require the findings of fact to be changed. It does not mean the applicant's submittal of new evidence that merely clarifies or supports the pending application."



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With respect to the revised wildlife mitigation plan, the August 12, 2008 submittal includes comparative studies, evidence regarding the HEP modeling, and background information summarizing the iterative process used by the applicant to craft the final wildlife mitigation plan. The submittal also expands and clarifies the applicant's proposal to mitigate impacts and monitor those impacts over time. While voluminous, the hearings officer concludes that the evidence presented does not constitute a modification, because it does not alter the basic outline of the applicant's April 2008 mitigation plan or require the application of new criteria.

5. Having concluded that the August 12, 2008 submittal does not constitute a "modification," the hearings officer now turns to the parties' proposed schedules. The opponents have had at least five days to review and consider the August 12, 2008 submittals.[2] Therefore, the deadlines for record submittals are revised as follows:

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| August 28, 2008 | Deadline for evidence by opponents responding to the applicant's August 12, 2008 submittal |
| September 11, 2008 | Deadline for response to opponents' submittal by applicant |
| September 18, 2008 | Deadline for final written legal argument pursuant to ORS 197.763(6) |
| October 6, 2008 | Deadline for issuance of hearings officer's decision |

To meet the deadline, the parties must submit their evidence and testimony to the county planning and development department by 4:30 p.m.

Dated this 18th day of August, 2008.

Anne Corcoran Briggs
Hearings Officer

[2] The applicant presented the submittal to staff on August 12, 2008, Mr. Dewey requested copies of those submittals at that time, and the copies were collected by Ms. Gould on August 14, 2008.



08/19/2008 15:24 5032230035 BRIGGS/HARRIS PAGE 04/04

## Ruth Herzer

**From:** Livingston, Peter [plivingston@SCHWABE.com]
**Sent:** Tuesday, August 19, 2008 10:40 AM
**To:** annecorcoranbriggs@hotmail.com
**Cc:** Ruth Herzer; Kevin Harrison; pdewey@bendcable.com
**Subject:** Thornburgh, M-7-02

**Importance:** High

**Follow Up Flag:** Follow up
**Flag Status:** Red

Dear Ms. Briggs:

I am writing in response to Paul Dewey's letter dated Friday, August 15, 2008, which I saw for the first time yesterday evening. Ruth Herzer forwarded it to me by email. It still has not been delivered in any other way. Ms. Herzer informed me of your request that the parties submit argument respecting Mr. Dewey's letter by Friday.

As I stated in an email to Ms. Herzer yesterday, the possibility of further submissions from resort opponents makes it difficult for us to concentrate on the preparation of a final argument (presently due today), since that argument should not be filed until the record has been closed to further submissions.

We understand the situation this way: following the close of the public hearing on July 15, 2008, each of the parties was given two weeks (first opponents, then applicant) to submit "additional written evidence, arguments or testimony," as allowed by ORS 197.763(6)(c). That statute also gives "any participant an opportunity to file a written request with the local government for an opportunity to respond to new evidence submitted during the period the record was left open. If such a request is filed, the hearings authority shall reopen the record pursuant to subsection (7) of this section." Mr. Dewey's letter is such a request.

Subsection (7) provides that when the record is opened "to admit new evidence, arguments, or testimony, any person may raise new issues which relate to the new evidence, arguments, testimony or criteria for decision-making which apply to the matter at issue."

We are well aware that this process could go on endlessly, but we do not believe we are at the point where it is necessary to conclude that it has. We maintain that our materials are rebuttal evidence, including all three documents mentioned by Mr. Dewey in his letter. (The phasing plan, for example, is required by a CMP condition and contains only one change, the addition of the word "Overnight" to Pod 30.) However, much is at stake for both applicant and opponents with respect to this application. The statute itself does not use the term "rebuttal." We believe that if opponents are not given an opportunity to respond to new evidence, they could appeal to LUBA. (As far as we know, there is no authority that would allow you to reject any of our evidence.) Of course, we would like a reasonable opportunity to respond to the opponents' evidence. We suspect that at that point the parties will probably run out of steam. Whenever that happens, we'd like seven days to file a final argument.

We believe Mr. Dewey's request for three weeks to respond to the applicant's August 19 submission is excessive. We had only two weeks to respond to opponents in the last round. At the latest, the materials have been available to Mr. Dewey since Wednesday morning, August 20. He has already had almost a week to get ready. Therefore, we suggest the following schedule:

August 26: Opponents' new materials due.
September 9: Applicant's new materials due.
September 16: Final argument due.

Please advise us as soon as possible if the deadline for the final argument is extended.

PETER LIVINGSTON | Attorney
SCHWABE, WILLIAMSON & WYATT
1211 SW 5th Ave., Ste. 1900 Portland, OR 97204
Direct: 503-796-2892 | Fax: 503-796-2900 | Cell: 503-314-1050 | Email: plivingston@schwabe.com
Assistant: Melissa Albrecht | Direct: 503-796-3770 | malbrecht@schwabe.com www.schwabe.com

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To comply with IRS regulations, we are required to inform you that this message, if it contains advice relating to federal taxes, cannot be used for the purpose of avoiding penalties that may be imposed under federal tax law. Any tax advice that is expressed in this message is limited to the tax issues addressed in this message. If advice is required that satisfies applicable IRS regulations, for a tax opinion appropriate for avoidance of federal tax law penalties, please contact a Schwabe attorney to arrange a suitable engagement for that purpose.

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## Ruth Herzer

**From:** Livingston, Peter [plivingston@SCHWABE.com]
**Sent:** Monday, August 18, 2008 5:32 PM
**To:** Ruth Herzer
**Cc:** kameron@bendcable.com; Pagel, Martha; Conway, Myles A.
**Subject:** Rebuttal Submission

Ruth:

This is a very quick response to a problem of which I became aware 5 minutes ago.

You have advised me that Paul Dewey is objecting to some or all of the submissions in connection with applicant's rebuttal. Our understanding of rebuttal is that we can submit new evidence, so long as it is responsive to the materials submitted before. We believe all of the documents included are indeed responsive to the last round of opponents' submissions and are therefore properly part of rebuttal.

It is too late in the day for us to fully analyze Paul's letter and respond. However, we need almost immediate clarification of this, because we have a final written argument due tomorrow. If there is a possibility that the record is going to be reopened, we will need additional time to file the final argument, since that is supposed to be the last submission. You mentioned the hearings officer has said that by Friday, she will issue an order that addresses Paul's letter. We cannot file our final argument until we know what she decides.

Therefore, we ask for an extension of time sufficient to allow us to deal with her order before filing our final argument.

PETER LIVINGSTON | Attorney
SCHWABE, WILLIAMSON & WYATT
1211 SW 5th Ave., Ste. 1900 Portland, OR 97204
Direct: 503-796-2892 | Fax: 503-796-2900 | Cell: 503-314-1050 | Email: plivingston@schwabe.com
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**BEFORE THE HEARINGS OFFICER**
**FOR DESCHUTES COUNTY, OREGON**

| | | |
|---|---|---|
| **IN THE MATTER OF AN APPLICATION BY THORNBURGH RESORT COMPANY FOR FINAL MASTER PLAN APPROVAL FOR A DESTINATION RESORT** | ) ) ) ) ) | **FILE NOS. M-07-2 & MA-08-6** |

**ORDER ON REQUEST TO SUBMIT RESPONSIVE EVIDENCE AND TESTIMONY**

1. On July 15, 2008, the hearings officer closed the public hearing on this matter, and held the record open pursuant to the following schedule:

| | |
|---|---|
| July 29, 2008 | Deadline for new written evidence by opponents |
| August 12, 2008 | Deadline for response evidence by applicant |
| August 19, 2008 | Deadline for applicant's final written legal argument pursuant to ORS 197.763(6) |
| September 9, 2008 | Deadline for issuance of hearings officer's decision |

2. On August 18, 2008, the hearings official received a letter via e-mail from Paul Dewey, on behalf of Nunzie Gould, one of the opponents. Mr. Dewey commented that some of the applicant's submittals constituted new evidence. Mr. Dewey argues first that the evidence, which includes a revised wildlife mitigation plan and a new emergency access circulation plan, among other changes, are significant enough to constitute a modification of the application, as that term is used in Deschutes County Code (DCC) 22.20.055.[1]

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In the event the hearings office disagrees that the submittal constitutes a modification, Mr. Dewey requests that he be permitted to submit responsive testimony and evidence to address the new evidence. Due to the variety and volume of the additional evidence, and also because Mr. Dewey will not be in the office from August 25th through 27th, 2008, he proposes that opponents be given until September 2, 2008 to file their response to the applicant's evidence. In the alternative, Mr. Dewey requests that the hearings officer reject the new evidence.

3. Peter Livingston, on behalf of the applicant, concedes that the applicant's August 12, 2008 submittals included new evidence and that, pursuant to ORS 197.763(7), the opponents are entitled to an opportunity to submit testimony and evidence that responds to that new evidence. Mr. Livingston proposes a more streamlined submittal schedule, arguing that his proposal permits adequate time for opponents to review and respond to the August 12, 2008 written testimony and evidence. Mr. Livingston does not agree that the evidence submitted by the applicant constitutes a modification of the proposal, or that the hearings officer has the authority to reject evidence proffered pursuant to the evidentiary procedures set out in ORS 197.763.

4. If the hearings officer concludes that the evidence proffered by the applicant changes the application in one of the ways described in DCC 22.04.020 AND those changes require either (1) the application of new criteria or (2) revisions to the findings of fact, the applicant must submit a modification pursuant to DCC 22.20.055, or the evidence must be rejected. If the evidence does not rise to the level of a modification, then the applicant is correct that the evidence must be accepted, and the opponents should be given an opportunity to respond to that new evidence.

The evidence submitted by the applicant on August 12, 2008 comprises approximately 500 pages of material, plus new drawings and maps. Some of that material changes previously described components, including the wildlife mitigation plan, emergency access routes and a revised phasing plan. With respect to the latter two items, the changes are minor: (1) the Phase A evacuation route is modified to eliminate an extension of the route to an area slated for development in Phase C (compare Exhibit F.7.1 in the applicant's M 08-6 application materials with F.7.1 included in Rebuttal Exhibit C.2 in the applicant's August 12, 2008 submittal) and (2) the revised phasing plan adds the word "overnight" to a development "pod" (compare Exhibit AA-11, Thornburgh Resort Phasing Plan, submitted with M-07-2, with Exhibit #B-1.08 Phasing Plan, submitted in the applicant's August 12, 2008 submittal.) The hearings officer concludes those two changes clarify or supports the pending application, and do not constitute a modification.

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proposal or that would require the findings of fact to be changed. It does not mean the applicant's submittal of new evidence that merely clarifies or supports the pending application."

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To meet the deadline, the parties must submit their evidence and testimony to the county planning and development department by 4:30 p.m.

Dated this 18th day of August, 2008.

Anne Corcoran Briggs
Hearings Officer

[2] The applicant presented the submittal to staff on August 12, 2008, Mr. Dewey requested copies of those submittals at that time, and the copies were collected by Ms. Gould on August 14, 2008.

**Paul D. Dewey** Attorney at Law

1539 NW Vicksburg
Bend, Oregon 97701
Tel. (541) 317-1993
fax (541) 383-3470
pdewey@bendcable.com

August 15, 2008

Ms. Anne Corcoran Briggs
Deschutes County Hearings Officer
c/o Ruth Herzer
Community Development Dept.
117 NW Lafayette Ave.
Bend, OR 97701-1925

**Re: M-07-2, MA-08-6; Proposed Thornburgh Destination Resort;**
**ORS 197.763(6)(c) Request to Respond to New Evidence**

Dear Ms. Corcoran Briggs:

On behalf of my client, Nunzie Gould, I am writing pursuant to ORS 197.763(6)(c) to request an opportunity to respond to new evidence submitted by the Applicant on August 12, 2008. The statute clearly provides us with the opportunity to respond to all of the new evidence, which includes hundreds of pages and dozens of exhibits.

Because of the large amount of material submitted by the Applicant, we request that we be given until September 2 to file our response. This amount of time is also needed because of the time it took to get copies of all of the materials and we are now attempting to reach our experts to give them the new materials. I will also be out of town Monday through Wednesday of next week.

We further object to some of the materials the Applicant has submitted which are not "rebuttal," but are instead entirely new plans and maps. See, for example, the new "Off-Site Habitat Mitigation and Monitoring Plan for the Thornburgh Destination Resort Project," presented as Exhibit B2, a 26-page report. This is not written as rebuttal but is an entirely new plan. Furthermore, Exhibit C2 presents a revised Final Master Plan map of Fire Evacuation Routes and Exhibit D1 presents a revised Phasing Plan. These submittals are not "rebuttals," but rather amendments to the Applicant's application. Rather than submit a response to our critiques of their original plans and maps, they have now come up with new plans and maps.

A further concern we have is the running of the 150-day clock. There will be no end to the need to provide rebuttal if the Applicant is allowed to bring in new plans and maps. Accordingly, we request that the Hearings Officer reject the new plans and maps submitted by the Applicant, or in the alternative, to allow opponents to submit a response to all of the new materials and further to find that the amendments and new materials constitute a modification of the application, restarting the 150-day clock.

We would appreciate your ruling on this request as soon as possible before we fully engage our experts to prepare responses. Thank you for your assistance.

Very truly yours,

PAUL DEWEY

PD:ao

cc: Client
Peter Livingston

August 12, 2008

Anne Corcoran-Briggs, Hearings Officer
Deschutes County, Oregon

In this letter we are providing responses to the verbal testimony and written materials from the July 15, 2008 hearing on the proposed Thornburgh Resort Final Master Plan. The opponents' arguments are in bold type and the responses are in regular type.

**Although mitigation is predicated on no net loss, there are no data provided to serve as a baseline against which no net loss can be measured.**

Baseline conditions have been clearly described in terms of wildlife habitat value in the modified HEP analysis, which was originally based on real-world data collected for Eagle Crest III, as recommended by ODFW. The impacts and mitigation area needed were estimated using the same model. ODFW has agreed that implementation of this mitigation plan would meet the no net loss or degradation standard. Specific habitat mitigation measures are proposed in the revised mitigation plan, as are before-mitigation and after-mitigation monitoring methods to determine whether the specific habitat mitigation goals will be achieved.

**Wildlife species list is a "bizarre compilation."**

TT submitted the correct species list, which was inadvertently excluded from the June 17, 2008 hearing submittal. A corrected submittal was provided at the July 15, 2008 hearing. This list is not a bizarre compilation. The species list was derived from Csuti et al.'s (2001) "Atlas of Oregon Wildlife," which includes distribution maps and species accounts describing all wildlife species known to inhabit Oregon and which the authors hope will "serve as a useful reference for serious naturalists and wildlife professionals." (p. xii).

**Species are pulled from large areas and in lots of different habitats. The relevance to this specific site is unclear. The handful of species chosen is not representative of the "complete biota."**

See response above.

**The data doesn't generalize to the bird community or small invertebrates.**

The bird community of the Thornburgh vicinity is well represented in the list of evaluation species in the HEP model: four of the seven are the red-tailed hawk,

American kestrel, mountain bluebird, and northern flicker. Small invertebrates are inferred from the condition of the habitat at the site. The grouping of small mammals as a species guild was used due to the general response species have based on the proposed habitat treatments. Small mammals serve as a prey base to raptors and it was concluded, in consultation with ODFW, that the general treatment of small mammals as a grouping was sufficient for use in the HEP analysis.

**No data are provided to document the actual species or numbers present on the site. There is no "rudimentary metric."**

These data are not necessary for the habitat approach taken for this mitigation plan.

**Basic surveys, for which this approach is standard, should be conducted two years prior to the start of significant changes to the habitats.**

This is not a requirement of the current regulations and statutes governing destination resort permitting. The modified HEP analysis was based on actual data gathered from the local area for Eagle Crest III. Not even large wind projects or pipelines are required by regulatory agencies to conduct two years of pre-construction surveys, except in the case of endangered or threatened species such as northern spotted owls or marbled murrelets.

**The HEP and HSI approaches can work as reasonable approximations only for species for which we possess the requisite species-specific ecological data based on extensive field studies.**

*See* ODFW's email to Paul Dewey dated July 28, 2008, explaining that they used the published models for the Running Y Ranch project and found that the models needed to be modified using best professional judgment about the specific habitat conditions at the resort site, to avoid results that did not make sense, based on the local biologists' knowledge from working in the area for many years.

**The HEP data are "guesstimates."**

We disagree. The core data that were used in the model were derived from GIS-based analysis, peer-reviewed literature and local biologists' knowledge of the area.

A GIS analysis calculated the amount of breeding and foraging habitat present for each species or grouping using USGS land cover habitat data. The disturbance reduction multipliers were derived from published distances species react to disturbances. In turn, suitability indices were derived from published models used at adjacent resorts in the Cline Buttes area. From this, Habitat Units were derived and formed the total amount of off-site mitigation needed to mitigate project impacts. During this entire process, local

federal and state biologists who specialize in local wildlife habitat requirements were engaged to refine values that reflect local, site-specific conditions.

The limitations of using modified HEP models have been detailed in the USFWS methods, which describe the inherent difficulties of applying data to determine individual species-specific impacts from project activities. These limitations were addressed in the calculations by basing values in the most conservative way possible.

**It is inappropriate to limit consideration to seven entities "as surrogates for the large and diverse array of species potentially present on the Thornburgh property."**

We disagree. The HEP process was designed by the USFWS to do exactly that. It is not feasible (and for that reason, is not required anywhere in the regulations) that every species on a site be identified and studied. Guidance from the USFWS to conduct that analysis this manner is documented in their HEP manual (USFWS 1981) and an excerpt from this manual is provided with this submittal.

**The challenge of actual revegetation and restoration is not addressed. This is far more difficult than Thornburgh study acknowledges.**

Tetra Tech is following the BLM's guidance on revegetation and restoration, which was established in the UDRMP and is further developed in the draft EA on the Cline Buttes Recreation Area plan. (See draft BLM EA section). The success criteria established in the mitigation plan are based on the realistic goals established by the BLM, which recognizes that invasive species such as cheatgrass cannot be eradicated from treated areas. Instead, the BLM goal for areas with these invasive weeds is to encourage the development of native (and, if necessary, in BLM's opinion, desirable non-native) plant communities capable of competing with cheatgrass. The standards established by the BLM include minimum percent cover of natives rather than a minimum percent cover of cheatgrass and other invasives. Note that cheatgrass will be controlled where it is dense, however, for fire management purposes. BLM acknowledges this difficulty, but there are also documented successes on the part of BLM in this activity. Filed herewith, as Exhibits B4 and B5, are two poster presentations related to successful vegetation management of the same type as proposed for this mitigation program.

**There is a complete absence of quantitative vegetation data for the Thornburgh site, and no indication that such data will be obtained for the BLM site.**

The mitigation plan includes a description of how existing vegetation data will be obtained on both the resort and offsite mitigation areas, prior to mitigation actions. The same monitoring will take place on and off site annually for at least five years after the

mitigation actions are implemented. The goals for the revegetation are established by BLM in Table VM in their draft Cline Buttes Recreation Area plan.

**It is not established that the BLM would agree to permanently remove grazing from offsite mitigation areas under their jurisdiction.**

Permanent cessation of grazing on BLM lands off-site of the proposed project is not included in the mitigation plan. BLM will continue to manage grazing consistent with their policies and the designation of the area as to land use priority.

**A fundamental problem is how to measure the success or failure of mitigation. There is no pre-treatment data for wildlife or vegetation and no valid methods described for post-treatment data collection.**

These methods are described in the revised Wildlife Habitat Mitigation Plan. The methods described in this plan are consistent with the federal standards and management objectives outlines outlined in the Upper Deschutes Resource Management Plan and Final Environmental Impact Statement (BLM 2005) and the Cline Buttes Recreation Area Plan that is currently under development.

**A subjective assessment of habitat value, impacts, and improvement resulting from mitigation measures cannot be "conclusively shown to meet the standard" of DCC 18.113.070(D).**

The Oregon Energy Facility Siting Council (EFSC) has issued Site Certificates for wind and other energy facilities, which means that the facilities have met the ODFW standard which is more restrictive than DCC 18.113.070(D).

**The species used for analysis "seems largely representative of major wildlife species impacted by the development activities," but the decision was made to drop the golden eagle. Red-tailed hawk is different enough that cannot be used as sample species for "large raptors."**

ODFW directed Tetra Tech to delete the golden eagle, primarily due to the absence of nesting habitat on the Thornburgh property, which differed from the Eagle Crest III property which did have eagle nesting habitat on it. The only value was foraging habitat which was considered by ODFW to be similar enough for the golden eagle and red-tailed hawk. In any case, the removal of young juniper trees, especially removal in areas of former shrub-steppe, would improve hunting conditions for both raptor species in a similar way. A map submitted by Mr. Munson showed golden eagle nest locations approximately 4 miles to the west and 4 miles to the east-southeast of the Thornburgh project site. This indicates that the Thornburgh site could be used by foraging golden

eagles from either or both nest sites, although it is also possible that these are alternate nest sites used by one pair of birds, given their large territory size.

**Mule-deer make "seasonal" use of property, indicating it is important as deer winter range.**

The property is not included by Deschutes County in designated winter range areas. The area is acknowledged by BLM, ODFW, and Tetra Tech to experience generally *low* winter use by mule deer. It is not designated as "important" winter range according to BLM, ODFW, or Deschutes County. An e-mail from Steven George (District Wildlife Biologist – ODFW) dated April 9, 2008 concerning mule deer winter range stated "there are no County Goal 5 resources identified on the property," which was submitted as evidence at the July 15, 2008 hearing. Goal 5 resources are defined as resources considered to be of statewide importance and requires local governments to inventory those resources and create programs to protect them. This includes lists of sensitive, threatened or endangered wildlife species.

**There is some mention of the removal of shrubs, but no specific mention of how bitterbrush will be dealt with. Saving all bitterbrush is key to reducing impact on the deer population.**

BLM recognizes the importance of bitterbrush. The existing shrub cover in the area is on average lower than the standards established by BLM for representative habitats, so it is likely that bitterbrush will be mostly saved in areas where it does not exceed the desired density or conflicts with fuel management objectives. Thinning may take place where shrub cover exceeds 25% but Tetra Tech will preserve as much bitterbrush as possible when conducting shrub treatment, in compliance with fire management provisions. This type of consideration has been proposed in the draft Cline Buttes Recreation plan and has been proposed in the Off-Site Mitigation and Monitoring Plan for the Thornburgh Resort.

**Increased traffic from roads will have impacts on mule deer; these are "poorly documented and addressed."**

In our analysis we recognize and include the effects of roads on the quality of mule deer habitat, and provide compensation for this loss in the mitigation plan by $20,000 for increased traffic effects on Cline Falls Hwy.

**Starling populations will increase, but their impact is not considered.**

The impacts of increased starling populations at the proposed resort are among the factors considered when baseline and post-development Habitat Suitability Indices (HSIs) were established in the modified HEP analysis; post-development habitat value was reduced.

**It will be very difficult to eliminate cheatgrass, as promised.**

The mitigation plan submitted in July 2008 does not include a specific criterion for successful control of cheatgrass. Tetra Tech and the BLM acknowledge this in the mitigation plan and the Cline Buttes Subarea Plan Draft by establishing standards for cover of native or desirable non-native plants. In addition, all habitat treatments proposed in the mitigation plan will include weed management programs consistent with BLM protocol and follow guidelines set forth in UDRMP (BLM 2005), *Prineville District Integrated Weed Management Environmental Assessment* ( BLM 1994), and *Vegetation Treatment on Bureau of Land Management Lands in the Seventeen Western States Programmatic Environmental Report* (BLM 2007).

**Dogs and cats are almost impossible to control.**

This is patently not the case at destination resorts in central Oregon. Provisions banning uncontrolled dogs and cats are enforced, and the presence of wildlife, including deer, at sites like Sunriver support this. The free-roaming dogs and cats are usually from isolated ranch residences where animals have room to roam. Submittal of a brochure from Eagle Crest indicating that pet owners should walk their pets on BLM managed land has no relevance to what the CC&Rs require of residents of this project, which will is to leash all pets outdoors.

**The proposed mitigation is difficult to assess without knowing the specific site. The possible mitigation sites are not south facing.**

The Cline Buttes Recreation Area Plan (CBRAP) is currently under development by the BLM and is scheduled by public comment in late 2008. The BLM does not feel comfortable in recommending specific areas for mitigation prior to incorporating public comments and finalizing the CBRAP. Instead, in consultation with TtEC, the BLM has provided three general areas that may be considered for future mitigation that are consistent with the BLM's current land use designations under the UDRMP. The Maston Allotment, Canyon Region and Deep Canyon Region have been identified as potential mitigation sites. Figure 1 in the Off-site Habitat Mitigation Plan shows these areas.

**Opponents recommend that "an area of non-habitat, already in some other land use, be permanently protected via purchase or conservation easement, and restored to a condition of habitat similar to the Thornburgh property."**

The body of research that addresses habitat restoration vs. re-creation from non-resource landscratch is clearly in favor of attempting to restore poorly functioning habitats with some of the original pre-settlement characteristics, especially soils with at least some

native seedbank present, vs. creating/growing such a new community from scratch. This is particularly important in arid areas such as the Thornburgh site.

Surely the opponents are not proposing that feasible mitigation for this project is to grow old growth junipers from scratch!

For example, to account for differences in success of wetland restoration vs. creation, the Oregon Department of State Lands' compensatory mitigation ratios for wetlands are 1:1 for restoration; 1.5:1 for wetland creation; and for enhancement range from 2:1 to 3:1 depending on its use (OAR 141-085-0136 (1) and (2)). The mitigation ratio proposed for this project, 2.3:1, is in this same range as the OARs.

**Fragmentation of an existing block of old-growth juniper woodland will occur, regardless of mitigation measures.**

This is acknowledged. That is why a habitat mitigation plan was developed and why mitigation will be performed offsite. However, we also point out that the Thornburgh property is not currently an unfragmented block of pristine old-growth juniper habitat. We refer the reader to Figures E-1 through E-3, which demonstrate the current fragmentation effects to wildlife from existing land use, dwellings, roads and trails.

**There is no consideration for the *cumulative* impact of adding another resort to the fringes of Cline Butte, further isolating the upper elevations of the Butte from other Juniper woodlands.**

Cumulative impacts are addressed as one of the discussion items in the attached Cumulative Impacts Memorandum dated August 12, 2008. The Butte habitats will still be connected to other juniper woodlands through BLM land from the east and west. The upper elevations of the Butte are heavily impacted by the presence of a public road to near the summit, and OHV use which has degraded habitat conditions on the Butte.

**Because there is no effectiveness monitoring provided for the future, it will be impossible to determine if the mitigation standard is met. (No feedback loop is created to assess whether the mitigation has worked.)**

The revised habitat mitigation plan includes specific descriptions of how mitigation effectiveness will be monitored quantitatively. This monitoring and management plan will use an adaptive management approach, as is also included in BLMs approach to its Cline Buttes Recreation Area Plan draft. Adaptive management focuses on establishing a feedback loop designed to assess whether the desired mitigation performance standard has been met, and if not, allows for changes to the mitigation plan to achieve the desired success.

**Conditions of approval must be specified.**

The revised mitigation plan includes specific standards or ranges that must be met to assure success.

**The ODFW letter to governor indicates that where wildlife mitigation plans for destination resorts are concerned, there has been a lack of implementation by developers, a lack of oversight by the county, and a lack of cumulative impact assessment.**

A cumulative impact assessment is provided in the Memorandum dated August 12, 2008.

**A mitigation plan must assume growth in background use (base), as well as for other approved projects in process; the approach taken should be similar to traffic impacts analysis.**

The current background traffic conditions and their effects on wildlife were included in the spatial analysis discussed and included in the mitigation plan submitted in July 2008, and included projections of future conditions. As part of the mitigation plan, Tetra Tech has assumed that the BLM will implement the UDRMP and generally enhance local habitats through juniper thinning, invasive weed treatments, and better control of OHV use; the mitigation plan was prepared with consideration of these reasonably foreseeable actions.

**There is a need for a cumulative impacts analysis.**

This is provided in the attached Memorandum dated August 12, 2008.

**The hearings officer should not rely just on ODFW and OWRD; the land use process is a separate fact-finding process.**

Then what is the purpose of the state having entire departments of experts to manage these resources and provide comments to land use proceedings?

**The report shows no understanding of impacts of invasive species.**

We disagree with this statement. We are well aware of the problems related to invasive species and the reality of this issue is well-considered and addressed in the revised wildlife habitat mitigation plan.

**There is no recognition of human impacts on adjacent properties (ORVs, etc.).**

The effects of current human use including habitation and distances from ORV-type trails were incorporated into habitat ratings within certain distances of the source of disturbance; this analysis was jointly developed by Tetra Tech, BLM, and ODFW biologists. Impacts on areas within 1 mile of the boundary of the proposed resort were

considered in the modified HEP model for all species before and after proposed development.

**A growing body of literature challenges the notion that "If you build habitat, they will come." Generalist species may do well, but other species may not.**

There is also literature that supports the notion. The results at individual sites vary and Tetra Tech, the BLM, and ODFW feel that the restoration and enhancement actions proposed will benefit many wildlife species and that in balance, there will be no net loss, although species composition may change. Populations of non-generalist species are likely to benefit from the mitigation actions proposed.

**Miscellaneous Objections**

**Gould Ex. 3 6-17-08, submitted at FMP hearing (Submits Cline Buttes Effects Analysis Methods from BLM Standards without additional comment)**

The team worked with BLM in modifying the HEP model to account for human disturbance, and BLM based its recommendations on this document, but did not go into as much detail. This level of detail is not needed for the Thornburgh analysis.

**Legislative Concept dated April 4, 2008 from DLCD**

**Several opponents testified that the Hearings Officer should wait until the next legislative session is complete and expected changes to Destination Resort Statutory Requirements.**

The Thornburgh Resort project mitigation and additional information provided has been designed specifically to address, and does adequately address, all of the wildlife-related points discussed in this legislative concept.

**Impacts on natural resources, especially water and sensitive habitat areas**

These impacts have been investigated, and there is no surface water or sensitive habitat area on the Thornburgh property, as designated by ODFW, the BLM, or Deschutes County. Impacts are described in the resort application materials.

**Lack of ability to implement mitigation**

Financial and procedural details that will adequately fund and implement mitigation are provided in the plan.

**Wildlife impacts only assessed on site**

The Thornburgh analysis includes offsite impacts.

**Lack of cumulative impact assessment**

A cumulative impact assessment that addresses reasonably foreseeable actions in the vicinity of the proposed resort has been provided.

**Proposed legislation should ensure that resorts do not further compromise the protection of:**

*Big game winter range* - Thornburgh is not located on or within 1 ½ miles of big game winter range

*County-adopted Goal 5 resource areas* – No such areas are located at the Thornburgh site

*Areas within 6 miles of sage grouse leks* – There are no leks within 6 miles of the Thornburgh site

*Migration corridors* – The proposed resort does not block any known migration corridors

*Oregon Conservation Strategy Conservation Opportunity Areas* – The western juniper savannah is identified as a specialized and local habitat. Habitat values lost to the proposed resort will be compensated for over approximately 4,500 acres (7 $mi^2$) of land managed by the BLM in the 32,640-acre (51 $mi^2$) Cline Buttes Subarea.

*Identified critical habitat for federally listed T&E species* – There is no such habitat at or near the Thornburgh site.

*Sensitive forest habitat not addressed under Statewide Planning Goal 5* – There is no such habitat at or near the Thornburgh site. Concurrence of this testimony was provided in an email by ODFW submitted as part of the evidence in the July 2008 hearing.

**The plan lacks sufficient detail in characterizing mitigation sites as well as determining mitigation methods and monitoring success.**

We didn't identify a specific mitigation site because BLM has not completed their Cline Buttes Recreation Area Plan and identified potential mitigation sites specifically. The BLM's draft plan provides details of how their program of rehabilitating and restoring old growth juniper, young juniper-dominated shrub-steppe, and shrub-steppe areas. The Thornburgh mitigation plan is based on this BLM approach and includes additional details on study protocols, performance standards, monitoring, and adaptive management which is an integral part of both the BLM and Thornburgh's plans.

**Continued emphasis on the need to conduct field studies and identify all wildlife species present in the resort area.**

The standard expressed in DCC 18.113.070(D) does not mention or call for a complete list of wildlife species at a particular site for which development is proposed. The standard simply states that there should be no net loss or degradation of the wildlife resource. In this case,

ODFW requested, and Tetra Tech prepared, a habitat-based method of assessing habitat value, impacts, and mitigation, rather than an individual species based approach. This habitat approach has been used by ODFW in relation to destination resorts in Deschutes County for years.

**Lonsdale Letter dated July 28, 2008**

**BLM hasn't completed its Cline Buttes subarea plan and thus the mitigation is not assured.**

At least 12,500 acres of potential mitigation areas are identified by BLM as potentially suitable for Thornburgh mitigation. The financing mechanism and schedule for the mitigation have been addressed in detail in the mitigation plan and their stated goals are consistent with the BLMs UDRMP.

**There is no mention of golden eagles nesting or foraging on or near the Thornburgh property, submits map showing golden eagle nest site approximately four miles west of the Thornburgh site, and one approximately four miles ESE of the Thornburgh site.**

We do not consider a distance of four miles to be "on or near" for nesting, and neither does ODFW. The use of the area by foraging golden eagles is acknowledged in the mitigation plan on pages 9 and 10 of the Wildlife Report submitted with the FMP. The reason for the deletion of the golden eagle is given in the supporting text for the modified HEP analysis in Exhibit E of the FMP. The location of the Thornburgh property, equidistant between these two nest sites (both of which may be used the same pair in alternate years, or by two different pairs), indicates that it is used only for foraging, not nesting. Both red-tailed hawks and golden eagles forage most effectively in open habitats such as shrub-steppe and will benefit from the juniper removal planned for offsite mitigation areas, which will be within the home ranges of either one of these two golden eagle pairs, or any others that may occur in the vicinity.

**Sierra Club Letter Dated July 15, 2008**

Lists additional concerns ODFW has on destination resorts: big game winter range, Goal 5 resource overlays, areas within 1 ½ mi of big game winter range, within 6 miles of sage grouse leks, in migration corridors, Oregon Conservation Strategy, and critical habitat for listed species.

These concerns were all addressed above in the response to the Legislative Concept.

Complete mitigation within 5 years of a signed mitigation plan, or funds to a trust fund.

Mitigation implementation will be phased along with development; not all phases of development are expected to be completed in 5 years.

**Katy Yoder email to Ruth Herzer dated July 15, 2008**

Loss of wildlife during development, due to being shot, frightened, increased traffic disturbance, starving

The wildlife mitigation plan is designed to offset the impacts of the resort development.

**Package listing DCC 18.113.070 Approval Criteria in the July 29, 2008 package**

**The application does not address how the development of the resort will affect the uses in the Upper Deschutes Resource Management Area by BLM, or what mechanisms will be used to prevent wildlife damage to golf courses or other resort features and how the resort development might affect traditional use areas or connectivity to habitats along the river.**

The mitigation plan directly addresses and is built on the principles and goals established by the BLM for the UDRMP. Wildlife damage to the golf course will be minimized by fencing the perimeter of the property to exclude big game. Development of the resort does not break the existing east-west corridor of shrub-steppe and juniper woodland habitat between the Deschutes River and the eastern Cascades.

**Letter from Native Restoration Fund and Steve Munson dated July 29, 2008**

**Dogs and cats from the resort will kill smaller birds and small mammals.**

As stated above, free-roaming dogs and cats will be prohibited at Thornburgh.

**Literature Cited**

Csuti, B., T. O'Neil, M. Shaughnessy, E. Gaines, and J. Hak. 2001. Atlas of Oregon Wildlife – Distribution, Habitat, and Natural History, Second Edition. Oregon State University Press, Corvallis, OR. 525 p.

Bureau of Land Management (BLM). 2007. Vegetation Treatment on Bureau of Land Management Lands in the Seventeen Western States Programmatic Environmental Report, United States Department of the Interior. Nevada State Office. Reno, Nevada.

Bureau of Land Management (BLM). 2005. Upper Deschutes Resource Management Plan and Final Environmental Impact Statement. Deschutes County, Prineville District Office, Bend, Oregon.

Bureau of Land Management (BLM). 1994. Prineville District Integrated Weed Management Environmental Assessment. Deschutes County, Prineville District Office, Bend, Oregon.

United States Fish and Wildlife Service (USFWS). 1991. Habitat Evaluation Procedures Handbook. Division of Ecological Services. Department of the Interior. Washington, D.C.

Thank you for this opportunity.

Sincerely,

Lynn Sharp

Lynn Sharp

Tetra Tech EC, Inc.

SCHWABE, WILLIAMSON & WYATT
ATTORNEYS AT LAW

Mill View Way Building, 549 SW Mill View Way, Suite 100, Bend, OR 97702 | Phone 541.749.4044 | Fax 541.330.1153 | www.schwabe.com

**MYLES A. CONWAY**
**Admitted in Oregon and Alaska**
**Direct Line: 541-749-4019**
**E-Mail: mconway@schwabe.com**

August 12, 2008

**BY HAND DELIVERY**

Ruth Herzer
Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, OR 97701

Re: Rebuttal Evidence Submitted on Behalf of Thornburgh Resort

Dear Ruth:

Filed herewith is rebuttal evidence filed on behalf of our client, Thornburgh Resort Company LLC.

Thank you for your assistance in this matter.

Sincerely,

/s/

Myles A. Conway

MCO:kdo

SCANNED
AUG 21 2008

# Thornburgh Rebuttal Submission for 8/12/08

## A. Water-Related Materials

1. Dam Removal Agreement
2. Big Falls Ranch Water Rights; Summary Report on Due Diligence Evaluation (Letter from David Newton to Kameron DeLashmutt dated February 18, 2006)
3. Letter from Martha Pagel regarding Mitigation Plan
4. Transcript of Testimony of Kyle Gorman, region Manager, OWRD from hearing on July 15, 2008
5. Letter from Newton Consultants, Inc. regarding Response to Dewey/Clearwater Biostudies Report
6. Letter from Newton Consultants, Inc. regarding Response to Comments Concerning Impacts to Deschutes River and Whychus Creek
7. Letter from Newton Consultants, Inc. regarding Response to Yinger/Munson Comments in Letter dated July 23, 2008 from Yinger to Munson
8. Memorandum from Tetra Tech EC, Inc. regarding Response to Rebuttal Letter
9. Letter from Marc Thalacker, Manager, Three Sisters Irrigation District
10. Deboodt e-mail regarding Juniper water usage

## B. Wildlife-Related Materials

1. Letter from ODFW to Paul Dewey email 7/28/3008- Eagle Crest III methods
2. Letter from BLM
3. Monitoring plan
4. Deboodt et al. Camp Creek Juniper Management – Treatment Benefits
5. Deboodt et al. Camp Juniper Management – Response of Treatment
6. Shepard's Flat Wind Facility. 2008 Revegetation Plan
7. Shepard's Flat Wind Facility. Wildlife Mitigation Plan
8. Miller et al. 2005 Juniper Biology and Management.
9. Swanson email to Delashmutt 8/04/2008 – Benefits of Juniper Restoration.

10. United States Fish and Wildlife Service. 1980 Habitat Evaluation Procedure and Habitat Based Methods.

11. Ecological Site Inventory Publication from BLM.

12. Various earlier wildlife mitigation plans

Arrowood Wildlife Study
Arrowood Hearings Officer's Decision (CU-04-94)
Pronghorn CMP Application (Excerpts) (CU-00-118)
Pronghorn Wildlife Evaluation (CU-00-118)
Pronghorn Mitigation Update
Pronghorn Hearings Officer's Decision (CU-00-118)
Pronghorn FMP Approval (M-02-1)
Eagle Crest II BOCC Decision on Appeal (A-94-1, 94-2, etc.)
Eagle Crest II Hearings Officer's Decision (M-95-1)
Eagle Crest BOCC Decision (CU-99-85)
Eagle Crest II Mitigation Plan
Eagle Crest III Wildlife Mitigation Plan
Eagle Crest III Hearings Officer FMP Approval (M-01-1)

13. Tetra Tech rebuttal letter

14. Tetra Tech Cumulative Impacts Assessment

**C. Traffic-Related Materials**

1. Traffic Letter From Group MacKenzie dated August 12, 2008

2. Revised Fire Evacuation Map showing distance in rebuttal to Gould Revised Ex #1.

3. Email from Jeff Fuchs: Rebuttal to Gould Revised Ex #1.

4. Email from ODOT re: Timing for Study for Cook Avenue/Hwy 20 intersection

5. Email from Mark Devoney to DOJ, etc.

**D. Phasing**

1. Revised Phasing Map. CMP Exhibit B-8

**E. Munson Documents**

1. Sharon Gambrel letter

2. Craig Gambrel letter

3. Munson Criminal Conviction

**F. Miscellaneous**

1. Kameron DeLashmutt letter pertaining to various issues, green, etc.

2. Letter from Kameron DeLashmutt regarding Option Agreement to Lease Additional Lands from Department of State Lands

3. Letter from Bussard Williams

4. Open Space Exhibit

**After Recording, Return To:**
Thornburgh Resort Company, LLC
PO Box 264
Bend, OR 97709

## AGREEMENT

This AGREEMENT ("Agreement") is entered into by and between Thornburgh Resort Company, LLC, an Oregon limited liability company ("Thornburgh"), The Daniels Group, LLC, a Washington limited liability company ("Daniels"),Robert L. Riemenschneider, and Nolan and Weigand, a limited partnership (consisting of Norman L. Weigand and Janice A. Weigand, husband and wife, and Franklin S. Nolan and Doris Marie Nolan, husband and wife).

Robert L. Riemenschneider and Nolan and Weigand are referred to collectively herein as the "Owners." Thornburgh, the Owners and Daniels are referred to collectively herein as the "Parties."

## RECITALS

A. Thornburgh is developing a destination resort near Cline Buttes, in Deschutes County, Oregon (the "Resort"), and has constructed or will construct several new wells to provide water to the Resort.

B. The Owners own the property legally described in Exhibit A (the "Property") that includes a small impoundment pond behind a partially breached earthen dam (the "Dam"), as shown on Exhibit B.

C. Daniels owns rights to develop the Property.

D. In connection with the development of the Resort, the Deschutes County Code requires Thornburgh to demonstrate that any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource. As part of Thornburgh's mitigation plan, Thornburgh proposes to acquire existing water rights on Deep Canyon Creek from Big Falls Ranch, Inc., which owns land immediately downstream and adjacent to the Property. In addition, at the request of the Oregon Department of Fish and Wildlife ("ODFW"), Thornburgh proposes to remove the impoundment and restore the affected stream bank area as requested by ODFW.

E. The Parties enter into this Agreement to set forth the terms and conditions of Thornburgh's removal of the Dam and restoration of the stream bank.

## TERMS AND CONDITIONS

Now, therefore, for valuable consideration, the Parties agree as follows:

1. **Dam Removal.** The Owners and Daniels hereby grant permission and access to Thornburgh and its agents as reasonably necessary for purposes of removing the

Dam and impoundment to restore natural creek flow, and restoring the stream bank as part of its mitigation plan. A photograph illustrating the existing pond and outlet conditions is shown on Exhibit C, including a summary of the proposed project for removing the impoundment ("Project"). Thornburgh will provide notice to the Owners and Daniels at least 10 days prior to the beginning of work on the Property by Thornburgh or its agents. Thornburgh may proceed with the Project at any time after the effective date of this Agreement and after providing the required notice. All Project work will be performed in accordance with applicable permit and legal requirements.

2. **Permits, Costs and Liability.** Thornburgh will obtain all required permits to complete the Project and will pay all associated costs. Thornburgh shall indemnify, hold harmless and defend the Owners and Daniels from, for and against all damages, claims and liabilities that arise from its actions, or those of its agents, in completing the Project, under this Agreement. Thornburgh shall not cause any lien of any kind, type or description to remain upon the Property.

3. **Binding Agreement.** This Agreement shall bind and benefit the successors and assigns of the Parties. Thornburgh will record this Agreement in the real property records of Deschutes County.

4. **Effective Date.** This Agreement is effective when signed by all Parties and may be signed in counterparts.

Exhibits:
A – Legal Description of the Property
B – Site Diagram showing Dam

**SIGNATURES AND ACKNOWLEDGMENTS ON FOLLOWING PAGES**

THORNBURGH RESORT COMPANY, LLC

By: _____
Kameron DeLashmutt, Manager

Date: 7/15/08

STATE OF OREGON )
) ss.
County of Deschutes )

This instrument was acknowledged before me on July 15, 2008, by Kameron DeLashmutt, Manager of Thornburgh Resort Company, LLC, on behalf of the limited liability company.

Notary Public for Oregon Vivian M. Garcia-Coumas
My commission expires: 11/7/2011

OFFICIAL SEAL
VIVIAN M GARCIA-COUMAS
NOTARY PUBLIC-OREGON
COMMISSION NO. 423140
MY COMMISSION EXPIRES NOV. 7, 2011

ROBERT L. RIEMENSCHNEIDER

Date July 15, 08

STATE OF OREGON )
) ss.
County of Deschutes )

This instrument was acknowledged before me on July 15, 2008, by Robert L. Riemenschneider.

Notary Public for Oregon
My commission expires: 3/21/09

OFFICIAL SEAL
S. STEWART
NOTARY PUBLIC-OREGON
COMMISSION NO. 390908
MY COMMISSION EXPIRES MARCH 21, 2009

NOLAN AND WEIGAND, a limited partnership

By: Franklin S. Nolan
Franklin S. Nolan, Partner
Date: July 15-08

STATE OF OREGON )
) ss.
County of Deschutes )

This instrument was acknowledged before me on July 15, 2008, by Franklin S. Nolan, Partner of Nolan and Weigand, a limited partnership, on behalf of the limited partnership.

OFFICIAL SEAL
VIVIAN M GARCIA-COUMAS
NOTARY PUBLIC-OREGON
COMMISSION NO. 423140
MY COMMISSION EXPIRES NOV. 7, 2011

Notary Public for Oregon Vivian M. Garcia-Coumas
My commission expires: 11/7/2011

NOLAN AND WEIGAND, a limited partnership

By: Norman Weigand By Franklin S. Nolan
Norman L. Weigand, Partner
Date: July 15-08

STATE OF OREGON )
) ss.
County of Deschutes )

This instrument was acknowledged before me on July 15, 2008, by Norman L. Weigand, Partner of Nolan and Weigand, a limited partnership, on behalf of the limited partnership.

OFFICIAL SEAL
VIVIAN M GARCIA-COUMAS
NOTARY PUBLIC-OREGON
COMMISSION NO. 423140
MY COMMISSION EXPIRES NOV. 7, 2011

Notary Public for Oregon Vivian M. Garcia-Coumas
My commission expires: 11/7/2011

THE DANIELS GROUP, LLC

By: _____
Gregory W. Daniels, Managing Member
Date: 8/6/08

STATE OF WASHINGTON )
) ss.
County of Clark )

This instrument was acknowledged before me on August 6, 2008, by Gregory W. Daniels, Managing Member of The Daniels Group, LLC, on behalf of the limited liability company.

Notary Public for Oregon
My commission expires: 11/2/2011

BECKY I. SHIPLEY
NOTARY PUBLIC
COMMISSION EXPIRES
NOVEMBER 2, 2011
STATE OF WASHINGTON

## LEGAL DESCRIPTION

PARCEL I:
Beginning at the intersection of the North line of Section Sixteen (16), TOWNSHIP FOURTEEN (14) SOUTH, RANGE TWELVE (12) EAST OF THE WILLAMETTE MERIDIAN, Deschutes County, Oregon, and the centerline of the Deschutes River; thence Southerly and Easterly along the said centerline of the Deschutes River to the East line of the Northwest Quarter of the Southwest Quarter (NW 1/4 SW 1/4) of Section 15, Township 14 South, Range 12, East of the Willamette Meridian, thence South along the East line of the Northwest Quarter of the Southwest Quarter (NW 1/4 SW 1/4) to the Southeast corner of the Northwest Quarter of the Southwest Quarter (NW 1/4 SW 1/4) of Section 15; thence West along the South line of the Northwest Quarter of the Southwest Quarter (NW 1/4 SW 1/4) to the West line of Section 15; thence South along the West line of Section 15 to the Southwest corner of Section 15; thence West along the South line of Section 16 to the Southwest corner of Section 16; thence North along the West line of Section 16 to the Northwest corner of Section 16; thence East along the North line of Section 16 to the North 1/4 corner corner of Section 16; thence North 39° 46' East, 375 feet; thence North 47° 20' East a distance of 300 feet; thence South 73° 20' East to the centerline of the Deschutes River; thence Southerly and Easterly along the centerline of the Deschutes River to the point of beginning, EXCEPT that portion lying within the right of way of Terrebonne Lower Bridge Road and West Lambert Road.

EXCEPTING THEREFROM: Commencing at a 3/4" pipe monumenting the Southwest corner of Section 16, Township 14 South, Range 12, East of the Willamette Meridian, the initial point as well as the TRUE POINT OF BEGINNING; thence North 00° 22' 25" West along the West line of the Southwest Quarter (SW 1/4) of said Section 16, 2644.67 feet to the West 1/4 corner of said Section; thence North 00° 04' 15" East along the West line of the Northwest Quarter (NW 1/4) of said Section 16, 1313.05 feet to the North line of the Southwest Quarter of said Northwest Quarter (SW 1/4 NW 1/4); thence North 89° 11' 14" East along said North line, 807.80 feet to a 1/2" pipe; thence South 22° 05' 17" West, 352.48 feet to a 1/2" pipe; thence South 15° 35' 01" West, 480.21 feet to a 1/2" pipe; thence South 47° 41' 02" West, 644.00 feet to a 1/2" pipe on the prolongation of an existing fence line; thence South 00° 31' 25" West partially along said fence, 862.33 feet to a 1/2" pipe in said fence; thence South 89° 45' 04" East, parallel with South line of said Southwest Quarter (SW 1/4), 1098.69 feet to a 1/2" pipe; thence South 00° 22' 25" East, parallel with the West line of said Southwest Quarter (SW 1/4), 1884.44 feet to a 1/2" pipe on the South line of said Southwest Quarter (SW 1/4); thence North 89° 45' 04" West along said South line, 1157.35 feet to the POINT OF BEGINNING.

ALSO EXCEPTING the following described parcel: Beginning at the Southeast corner of Section Sixteen (16); thence North along the East line of Section 16 to the South right-of-way of Northwest Tester Avenue; thence Westerly along said South right-of-way to the intersection with the Southerly right-of-way of Lower Bridge Market Road; thence Southerly along said right of way to the South line of said Section 16; thence Easterly along said South line to the POINT OF BEGINNING.

Deschutes County Title Co.
Do You Own the Property You Think You Own?

**EXHIBIT A**

NEWTON CONSULTANTS INC.
Earth, Water and Rock Specialists
Dam Removal Location
Deschutes County, Oregon
DESIGNED BY: D.Newton
DRAWN BY: S.Schenck
DATE: July 2008
PROJECT No. 1007-101-07
Exhibit B
NOTES
1. This map was prepared for the purpose of identifying the location of a dam removal project only and is not intended to provide legal dimensions or locations of property ownership lines.
SCALE: 1" = 1,320'
Quarter-Quarter Section Identifiers
Vicinity Map
Oregon
DAM TO BE REMOVED
PROPERTY BOUNDARY
Big Falls Ranch
Nolan, Wiegand, & Riemenschnieder
River Mile 131
River Mile 132
River Mile 133
Big Falls
Rapids
Strip Mine
Spring
Lower Bridge
Water Tank
Mine
STRIP MINE
LAMBERT ROAD
WEST
La Follette Butte
BM 2606
BM 2633
G:\1000\1007\101\07\Cad\Water\#1007101_07_Exh-B_PondRemov 09:32 07/11/2008 SS

NEWTON CONSULTANTS INC.
521 SW 6th Street, Suite 100
Redmond, Oregon 97756
541 504-9960 *fax* 541 504-9961

February 18, 2006
Project No. 1007-101-05

Mr. Kameron Delashmutt
Thornburgh Resorts, LLC
P.O. Box 264
Bend, OR 97709

**BIG FALLS RANCH WATER RIGHTS;**
**SUMMARY REPORT ON DUE DILIGENCE EVALUATION**

Dear Kameron:

We have completed evaluation of water rights on the Big Falls Ranch near Lower Bridge relative to potential purchase of the rights for use by the proposed Thornburgh Resort. If purchased, the water rights are planned for mitigation use by the proposed resort in connection with new ground water permits being obtained by the resort. The summary report of findings is attached.

In summary, we found nothing in discussions with Oregon Water Resources Department (OWRD) personnel, file reviews, discussions with Mr. Rex Barber of Big Falls Ranch, and site observations that would preclude use of the water rights for mitigation purposes.

Based on our findings, certificate 76371 for 157.1 acres of irrigation water rights could be transferred for a maximum of 282.78 mitigation credits. Water rights under Transfer Application T-6854 for 307.8 acres of irrigation water rights could also be transferred for a maximum of 554.04 credits after a certificate is issued by the OWRD. Total potential mitigation credits are 836.82. Transfer T-6854 has been approved by OWRD and the certificate is pending completion of the certificate application processing. This could take months, to years for completion.

We recommend completion of the certification process under the Reimbursement Authority program. This program expedites the review and certification process. It is possible that the certificate could be issued within 3 to 4 months after review begins under the program.

Please contact me at (541) 504-9960 extension 211 if you have any questions.

Sincerely,

NEWTON CONSULTANTS, INC.

David J. Newton, P.E., C.W.R.E., C.E.G.
Principal

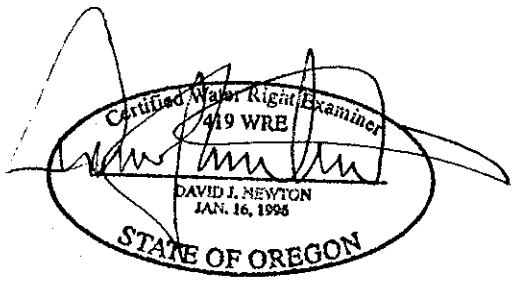
Cc: Martha Pagel

# SUMMARY REPORT

# EVALUATION OF WATER RIGHTS

# BIG FALLS RANCH

**February 18, 2006**




*Prepared for:*

**Thornburgh Resorts, LLC**
**P.O. Box 264**
**Bend, OR 97709**

*Prepared by:*

**Newton Consultants, Inc.**
**521 SW 6th Street, Suite 100**
**Redmond, OR 97756**

**Project No. 1007-101-05**

# SUMMARY REPORT ON EVALUATION

# OF

# BIG FALLS RANCH SURFACE WATER RIGHTS

**February 18, 2006**

## PURPOSE

This report summarizes findings from evaluation of certain Big Falls Ranch, Co. (the Ranch) surface water rights by Newton Consultants, Inc., for possible purchase by the Thornburgh Group, LLC. The evaluation was conducted for due diligence purposes according to terms of the Agreement between Thornburg Group, LLC and the Ranch for the potential purchase of the water rights. If purchased, the water rights are planned for mitigation use in connection with new ground water permits being obtained for the proposed Thornburgh Resort.

## SUMMARY OF FINDINGS

The findings indicate the water rights subject to potential transfer under the Agreement can be used for mitigation in connection with ground water permits being purchased for the proposed Thornburgh Resort. Of 464.9 acres of water rights, 157.1 acres are certificated and useful for mitigation purposes after transfer for this purpose. The remaining 304.8 acres of rights are being processed for a certificate by OWRD. The certificate must be issued prior to transferring these rights to mitigation use.

Information upon which these findings are based was collected by discussing use of the water rights for mitigation with Oregon Water Resources Department (OWRD) representatives, review of OWRD files, review of material provided by Rex Barber, manager of the Big Falls Ranch, Co. and onsite observation of pumps, water distribution system and sprinkler systems at the Ranch. Finding details are summarized below.

## Water Rights

The Ranch water rights subject to the Agreement authorize appropriation of water for irrigation use from Deep Canyon Creek, tributary of the Deschutes River. The water rights are summarized as follows:

1. Remaining water right Certificate No. 76371, 157.1 acres, priority date 4/13/1967, source Deep Canyon Creek; and

2. Transfer No. T-6654 Special Order Volume 54 Page 30, 307.8 acres, source Deep Canyon Creek.

These water rights authorize use of water to irrigate up to 464.9 acres of land on the Ranch at the locations shown on the attached FINAL PROOF MAP of water rights prepared by Anderson Engineering and Surveying, Inc. of Redmond. The maximum total diversion rate for both rights is 5.5 cubic feet per second (cfs). The attached EXHIBIT A summarizes the water rights, including authorized place of use, authorized irrigation acreage, maximum diversion rate and maximum volume of use over the irrigation season. The attached EXHIBIT B is the certificate 76371 for the 157.1 acres of water rights involved in the potential Agreement transaction.

The attached EXHIBIT C is the OWRD ORDER approving Transfer Application T-6854, which includes changing the 307.8 acres of water rights involved in the potential Agreement transaction from supplemental to primary irrigation. Only primary water rights can be used for the proposed mitigation purposes. In general, transfers must be completed, proof of beneficial use of the transferred water must be demonstrated to the OWRD and a certificate must be issued by the OWRD before an additional transfer of the rights can be done, such as for the Thornburgh Resort mitigation use. EXHIBIT C demonstrates that OWRD has approved the change of use, along with place of use; therefore, the 307.8 acres of water rights are now classified for primary irrigation.

Review of file information, site observations and discussion with Mr. Barber indicate the transfer in water use has been completed on the Ranch. Discussion with OWRD personnel indicates the OWRD has received the final proof map and claim of beneficial use report for the transfer application. These discussions, coupled with the ORDER of approval for Transfer T-6854, also suggest the transfer and proof of beneficial use requirements have been met for OWRD to issue the water right certificate.

## Use of the Water Rights

The priority date of the water rights is April 13, 1967. Mr. Barber attests that he used the rights regularly over this time and that the rights have never been regulated to protect other senior water rights. His knowledge base in this regard is 18 years (1988 through February 2006). Discussion of potential for regulation in favor of senior water rights with OWRD personnel finds that the rights are unlikely to be regulated since they are for flows on tributary streams to the Deschutes River, downstream from diversion points for other senior water rights. One senior water right is downstream from the Ranch; however, water availability puts risk of regulation at a very low probability level as evidenced by undisrupted use of water rights by the Ranch over the 18-year period of use by Mr. Barber.

## Irrigation System and Capacity

The authorized point of diversion for the irrigation water is in the Southwest ¼ of the Southeast ¼ of Section 19, Township 14 South, Range 12 East, W.M., 4,440 feet south and 3,020 feet east from the Northwest corner of Section 19, Deschutes County. Water is diverted for the authorized irrigation use from a concrete structure in Deep Canyon Creek.

Water is diverted up to the maximum authorized rate of 5.5 cfs (2,468gpm). The maximum total season diversion is within the authorized duty of 4.0 acre-feet per acre. Two 100 Hp US Motors drive two pumps that deliver water from the concrete structure through a 14 inch-diameter steel mainline to the irrigation system. The capacity of each pump is 1,250 gallons per minute (gpm), for a total pumping capacity of 2,500 gpm (5.57 cfs).

Irrigation is accomplished with four pivot systems with the following capacities 1) 900 gpm; 2) 700 gpm; 3) 400 gpm; and 4) 1,100 gpm. The irrigation system also includes four wheel lines with 105 Rainbird impact sprinklers. Sprinklers for the entire system are equipped with 9/64 inch-diameter nozzles.

Water pressure for operation of the pivots is controlled by pressure regulators. The maximum pressure reported by Mr. Barber is about 25 pounds per square inch (psi). He reports that wheel lines are operated at higher pressures from 40 to a maximum of 60 psi, depending on the system in operation. Based on these pressure ranges, the flow capacity of the 9/64$^{th}$ inch-diameter nozzles is about 2.6 gpm for the pivots and about 4 to 4.5 gpm for the wheel lines.

System capacity was calculated based on pumping lift, pump horsepower and irrigation pressures reported by Mr. Barber. The calculation was intended as a check on adequacy of capacity to deliver water at the full rate allowed by the water rights. Based on pump size, operating pressure ranges and approximate total maximum lift of 130 feet, system capacity is available to deliver the maximum flow rate of 5.5 cfs authorized by the water rights. This finding indicates that the system capacity is adequate to deliver the full water rights.

# CONCLUSIONS

Observation of the pump, pipe and sprinkler systems indicates that the Ranch has the capacity to fully use the subject water rights and is "ready, willing and able" to utilize the full amount of the water rights.

Based on evaluation of the water rights, system capacity and historic use, we conclude the Ranch water rights can be used for mitigation purposes in connection with ground water permits being purchased for the proposed Thornburgh Resort.

Presently, the water rights under certificate 76371 for 157.1 acres of irrigation could be transferred to mitigation use for the proposed Resort. Based on 1.8 credits per acre of water right, these rights could provide up to 282.78 mitigation credits based on 100 percent reliability of the rights. The OWRD will determine the actual amount of credits to be awarded.

The rights under transfer T-6854 are being processed by OWRD under an application for a water right certificate. The certificate for these rights must be issued by the OWRD prior to a transfer of the rights to Thornburgh Resort mitigation use. With a certificate, these rights could yield a maximum of 554.04 mitigation credits. The time required for this process could be several months to years. The time required can be reduced to about 3 to 4 months by completing processing of the application through the Reimbursement Authority program. The fee payable by the applicant for this process could range between $1,500 and $3,000, depending on complexity of the application.

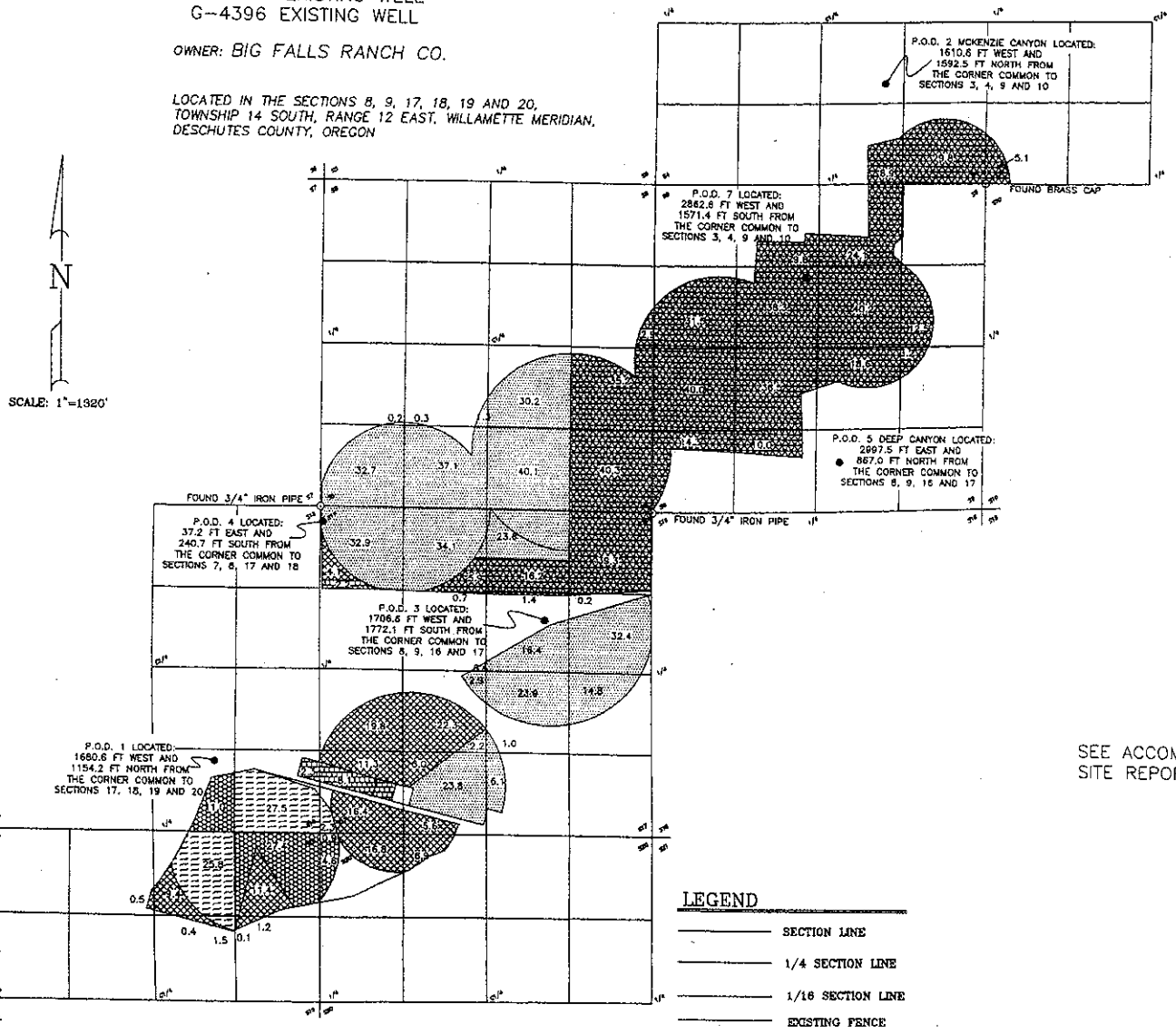
The total amount of water rights under certificate 76731 (157.1 acres) and a future certificate for Transfer T-6854 (307.8 acres) is 464.9 acres. The OWRD could award 836.82 mitigation credits for these water rights based on award of the full 1.8 credits per acre of water right (assumed 100 percent reliability factor at the 80 percent exceedance level used by OWRD for determining water availability).

Award of the full potential 836.82 mitigation credits by the OWRD would fulfill 88.8 percent of the mitigation requirements (942 credits) for the Thornburgh Resort.

# FINAL PROOF MAP
FOR: TRANSFER APPLICATION NO. T-6854
AND APPLICATION NO. G-11923
EFFECTING PERMITS: 32049 APRIL 13, 1967 DEEP CANYON
37392 OCTOBER 23, 1973 MCKENZIE CANYON
G-13362 MAY 15, 1984 NEW WELLS
G-4974 EXISTING WELL
G-4396 EXISTING WELL

OWNER: BIG FALLS RANCH CO.

LOCATED IN THE SECTIONS 8, 9, 17, 18, 19 AND 20, TOWNSHIP 14 SOUTH, RANGE 12 EAST, WILLAMETTE MERIDIAN, DESCHUTES COUNTY, OREGON




PRIMARY PERMIT 32049 APRIL 13, 1967 DEEP CANYON
SUPPLEMENTAL PERMIT G-13362 MAY 15, 1989 WELLS 1, 3, 4, AND 7
464.9 ACRES

PRIMARY PERMIT G-13362 MAY 15, 1984 NEW WELLS 1, 3, 4, AND 7
SUPPLEMENTAL PERMIT 37392 OCTOBER 23, 1973 MCKENZIE CANYON
356.4 ACRES

PRIMARY PERMIT G-4396, TRANSFER T-6854
EXISTING AND NEW WELLS 1, 3, 4, AND 7
43.1 ACRES

PRIMARY PERMIT G-4974 TRANSFER T-6854
EXISTING AND NEW WELLS 1, 3, 4, AND 7
58.0 ACRES

PRIMARY PERMIT G-13362 MAY 15, 1984 NEW WELLS 1, 3, 4, AND 7
SUPPLEMENTAL PERMIT 32049 APRIL 13, 1967 DEEP CANYON TRANSFER T-6854
12.6 ACRES

PRIMARY PERMIT G-13362 MAY 15, 1984 NEW WELLS 1, 3, 4, AND 7
132.1 ACRES

SEE ACCOMPANYING SITE REPORT

Certified Water Right Examiner # 005
Darryl J. Anderson
Nov.10, 1997
STATE OF OREGON
RENEWAL 12/31/2001

## LEGEND

- SECTION LINE
- 1/4 SECTION LINE
- 1/16 SECTION LINE
- EXISTING FENCE
- ⊙ LAND SURVEY MONUMENT
- ● POINT OF DIVERSION AS SHOWN

NOTE: PREPARATION OF THIS MAP IS FOR IDENTIFYING PROPOSED WATER RIGHTS ONLY. IT HAS NO INTENT TO PROVIDE LOCATIONS OR DIMENSIONS OF PROPERTY BOUNDARIES.

PREPARED FOR:
BIG FALLS RANCH CO.
P.O. BOX 434
TERREBONNE, OREGON 97760
(541) 548-8954

PREPARED BY:
ANDERSON ENGINEERING & SURVEYING, INC.
P.O. BOX 26
LAKEVIEW, OREGON 97630
(541) 947-4407
FAX 947-2321
P.O. BOX 419
REDMOND, OREGON 97756
(541) 923-4307
FAX 923-4308

| | |
|---|---|
| DATE: 6/25/01 | DWG. FILE:90-05R |
| JOB NO.:90-05R | SHEET 1 OF 1 |

LUBA #2008-203
00365

# EXHIBIT A

EXHIBIT A: BIG FALLS RANCH CO. WATER RIGHTS

2/14/2006

| App # | Permit # | Cert. | Priority | Use | Well # | Source | Area Acres | Rate cfs | Rate gpm | Duty ac-ft/ac | Current POU T | R | S | NE | NW | SW | SE | NE | NW | SW | SE | NE | NW | SW | SE | NE | NW | SW | SE | ACRES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SURFACE WATER (PRIMARY IRRIGATION)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 76371 | 4/13/1967 | IRR | | Deep Canyon Cr. | 157.1 | | | 4.0 | 14S | 12E | 3 | | | | | | | | | | | | | | | | | 1.4 |
| | | | | | | | | | | | | | 4 | | | | | | | | | | | | | | | | | 7.7 |
| | | | | | | | | | | | | | 8 | | | | | | | | | | | | | | | | | 10.9 |
| | | | | | | | | | | | | | 9 | | | 20.2 | 10.3 | | 9.8 | | | | | | | | | | | 130.5 |
| | | | | | | | | | | | | | 17 | 6.6 | | | | | | | | | | | | | | | | 6.6 |
| | T-6854 Sp. Or. Vol 54 P. 30 | | | IRR | | Deep Canyon Cr. | 307.8 | | | 4.0 | 14S | 12E | 3 | | | | | | | | | | | | | | | | | 157.1 |
| | | | | | | | | | | | | | 4 | | | | | | | | | | | | | | | | | 1.9 |
| | | | | | | **Total** | **464.9** | **5.5** | **2468** | **1860** | | | 8 | | | | 1.4 | | | | | | | | | | | | | 30.8 |
| | | | | | | | | | | | | | 9 | | | 6.5 40.0 | | | | 28.2 38.3 | | | 1.9 | | | | 4.3 26.5 | | 64.9 |
| | | | | | | | | | | | | | 17 | 33.0 27.2 | | | | | 6.0 | | | 2.2 | | 15.5 9.1 | | 30.5 | | 33.0 | | 144.0 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | 4.2 | | | | 66.2 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 307.8 |
| **SURFACE WATER (SUPPLIMENTAL IRRIGATION)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | T-6854 Sp. Or. Vol 54 P. 31 | | | IRR | | Deep Canyon Cr. | 12.6 | 0.315 | 141 | | 14S | 12E | 17 | | | | | | 1.6 | | | | | 8.8 | | | | | | | 10.4 |
| | | | | | | | | | | | | | 18 | | | | | | | | | | | | | | | 2.2 | | 2.2 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 12.6 |
| | | 76372 | 10/23/1973 | SUP | | McKenzie Canyon | 149.8 | 3.745 | 1681 | 4.0 | 14S | 12E | 8 | | | | | | | | | 0.4 | | 34.0 | | | 28.0 39.0 | | | | 101.4 |
| | | | | | | | | | | | | | 17 | | | 13.6 | | | 34.8 | | | | | | | | | | | 48.4 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 149.8 |





CONFIDENTIAL: Attorney-Client Privileged

STATE OF OREGON EXHIBIT B

COUNTY OF DESCHUTES

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

DESCHUTES VALLEY FARMS
PO BOX 166
CULVER, OREGON 97734

confirms the right to use the waters of DEEP CANYON CREEK, a tributary of THE DESCHUTES RIVER, for IRRIGATING 157.1 ACRES.

This right was perfected under Permit 32049. The date of priority is APRIL 13, 1967. The amount of water to which this right is entitled is limited to an amount actually beneficially used and shall not exceed 1.81 CUBIC FEET PER SECOND or its equivalent in case of rotation, measured at the point of diversion from the source.

The point of diversion is located as follows:

SW¼ SE¼, SECTION 9, T. 14 S., R. 12 E., W.M.; 4440 FEET SOUTH AND 3020 FEET EAST FROM THE NW CORNER OF SECTION 9.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, is limited to ONE-FORTIETH of one cubic foot per second per acre, or its equivalent for each acre irrigated and shall be further limited to a diversion of not to exceed 4.0 acre-feet for each acre irrigated during the irrigation season of each year.

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use to which this right is appurtenant is as follows:

| | |
|---|---|
| SW¼ SW¼ | 1.4 acres |
| Section 3 | |
| SW¼ SE¼ | 7.7 acres |
| Section 4 | |
| NE¼ SE¼ | 3.3 acres |
| SE¼ SE¼ | 7.6 acres |
| Section 8 | |
| NW¼ NE¼ | 20.2 acres |
| SE¼ NE¼ | 10.3 acres |
| NE¼ NW¼ | 9.8 acres |
| NE¼ SW¼ | 35.0 acres |
| NW¼ SW¼ | 40.0 acres |
| NE¼ SE¼ | 1.6 acres |
| NW¼ SE¼ | 13.6 acres |
| Section 9 | |
| NE¼ NE¼ | 6.6 acres |
| Section 17 | |

Township 14 South, Range 12 East, W.M.

EXHIBIT B

This certificate describes that portion of the water right confirmed by Certificate 44281, State Record of Water Right Certificates, NOT modified by the provisions of an order of the Water Resources Director entered JAN 1 1 2000, approving Transfer Application 6854.

The issuance of this superseding certificate does not confirm the status of the water right in regard to the provisions of ORS 540.610 pertaining to forfeiture or abandonment.

The right to the use of the water for the above purpose is restricted to beneficial use on the lands or place of use described. The use confirmed herein may be made only at times when sufficient water is available to satisfy all prior rights, including rights for maintaining instream flows.

WITNESS the signature of the Water Resources Director, affixed JAN 1 1 2000.

/s/ Thomas J Paul (for)
Martha O. Pagel, Director

Recorded in State Record of Water Right Certificates numbered 76371.

T-6854.BWB

EXHIBIT C

**ORDER APPROVING CHANGES IN USE, PLACES OF USE, ADDITIONAL POINTS OF APPROPRIATION, AND CANCELLATION OF WATER RIGHTS**

Pursuant to ORS 540.510 to 540.530 and ORS 537.705, after notice was given and no objections were filed, and finding that no injury to existing water rights would result, this order approves, as conditioned or limited herein, TRANSFER 6854 submitted by

BIG FALLS RANCH COMPANY
PO BOX 434
TERREBONNE, OREGON 97760

This transfer requests modifications to portions of four water rights. The authorized uses and places of use, and the requested changes are shown in the following tables.

The first right to be modified, as evidenced by a portion of Certificate 44281, was perfected under Permit 32049, with a date of priority of APRIL 13, 1967. The right allows the use of DEEP CANYON CREEK, a tributary of the DESCHUTES RIVER, for IRRIGATION of 16.1 ACRES and SUPPLEMENTAL IRRIGATION of 304.3 ACRES. The amount of water to which this right is entitled is limited to an amount actually beneficially used and shall not exceed 5.5 cubic feet per second, provided the total quantity of water diverted under all rights perfected under Permit 32049 shall not exceed 5.5 cfs, if available at the authorized point of diversion: SW¼ SE¼, SECTION 9, T 14 S, R 12 E, W.M.; 4440 FEET SOUTH AND 3020 FEET EAST FROM THE NW CORNER, SECTION 9.

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for review must be filed within the 60 day time period specified by ORS 183.484(2).

Pursuant to ORS 536.075 and OAR 137-004-080 and OAR 690-01-005, you may either petition for judicial review or petition the Director for reconsideration of the order.

EXHIBIT C

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, is limited to ONE-FORTIETH of one cubic foot per second per acre or its equivalent for each acre irrigated and shall be further limited to a diversion of not to exceed 4.0 acre-feet for each acre irrigated during the irrigation season of each year.

The applicant proposes to change the use from supplemental to primary irrigation, and place of use, as described in the following table:

TABLE 1
PERMIT 32049

| | | | | AUTHORIZED LOCATION | | REQUESTED LOCATION | |
|---|---|---|---|---|---|---|---|
| TWN (S) | RNG (E) | SEC | Q/Q | PRI | SUPP | PRI | SUPP |
| 14 | 12 | 3 | SWSW | | | 1.9 | |
| 14 | 12 | 4 | SWSE | | | 4.3 | |
| 14 | 12 | 4 | SESE | 0.8 | 30.0 | 26.5 | |
| 14 | 12 | 8 | SENE | | 1.5 | 1.4 | |
| 14 | 12 | 8 | NESE | | 29.0 | 30.5 | |
| 14 | 12 | 8 | SESE | | 33.0 | 33.0 | |
| 14 | 12 | 9 | NWNE | | | 6.5 | |
| 14 | 12 | 9 | SWNE | | 40.0 | 40.0 | |
| 14 | 12 | 9 | SENE | 1.2 | | | |
| 14 | 12 | 9 | SWNW | | 25.0 | 28.2 | |
| 14 | 12 | 9 | SENW | | 37.1 | 38.3 | |
| 14 | 12 | 9 | NESW | | | 2.2 | |
| 14 | 12 | 9 | SWSW | | | 15.5 | |

EXHIBIT C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 14 | 12 | 9 | SESW | | | 9.1 | |
| 14 | 12 | 9 | NWSE | | | 4.2 | |
| 14 | 12 | 10 | NWNW | .4 | | | |
| 14 | 12 | 17 | NENE | | 33.0 | 33.0 | |
| 14 | 12 | 17 | NWNE | | | 27.2 | |
| 14 | 12 | 17 | SWNE | 13.2 | | | |
| 14 | 12 | 17 | SENE | | 31.1 | | |
| 14 | 12 | 17 | NENW | | | 6.0 | |
| 14 | 12 | 17 | NWNW | | | | 1.6 |
| 14 | 12 | 17 | SENW | 0.5 | | | |
| 14 | 12 | 17 | NESW | | 4.1 | | |
| 14 | 12 | 17 | SWSW | | | | 8.8 |
| 14 | 12 | 17 | NESE | | 12.0 | | |
| 14 | 12 | 17 | NWSE | | 28.5 | | |
| 14 | 12 | 18 | SESE | | | | 2.2 |
| | | | TOTAL | 16.1 | 304.3 | 307.8 | 12.6 |

The second right to be modified, as evidenced by a portion of Certificate 44283, was perfected under Permit 37392, with a date of priority of OCTOBER 23, 1973. The right allows the use of AN UNNAMED STREAM (McKENZIE CANYON), a tributary of THE DESCHUTES RIVER, for IRRIGATION OF 38.8 ACRES AND SUPPLEMENTAL IRRIGATION OF 167.8 ACRES. The amount of water to which this right is entitled is limited to an amount actually beneficially used and shall not exceed 4.5 cubic feet per second, provided the total quantity diverted by all right perfected under Permit 37392 does not exceed 4.5 cfs, if available at the authorized point of diversion: NW¼ SE¼, SECTION 4, T 14 S, R 12 E, W.M.; 1870 FEET NORTH AND 3700 FEET EAST FROM THE NW CORNER, SECTION 9.

EXHIBIT C

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, is limited to ONE-FORTIETH of one cubic foot per second per acre or its equivalent for each acre irrigated and shall be further limited to a diversion of not to exceed 4.0 acre-feet for each acre irrigated during the irrigation season of each year.

The applicant proposes to diminish the use from primary to supplemental irrigation, and to change place of use as described in the following table:

TABLE 2
PERMIT 37392

| | | | | AUTHORIZED LOCATION | | REQUESTED LOCATION |
|---|---|---|---|---|---|---|
| TWN (S) | RNG (E) | SEC. | Q/Q | PRI | SUPP | SUPP |
| 14 | 12 | 4 | SWSE | | 7.7 | |
| 14 | 12 | 8 | NESW | | 5.3 | |
| 14 | 12 | 8 | NWSW | | 0.2 | |
| 14 | 12 | 8 | SWSW | 16.1 | | 31.0 |
| 14 | 12 | 8 | SESW | 2.0 | 1.4 | 2.4 |
| 14 | 12 | 8 | NWSE | | 1.4 | 1.2 |
| 14 | 12 | 8 | SWSE | 1.6 | | 1.6 |
| 14 | 12 | 9 | NWNE | | 20.2 | |
| 14 | 12 | 9 | NENW | | 9.8 | |
| 14 | 12 | 9 | NESW | | 35.0 | |
| 14 | 12 | 9 | NWSW | | 40.0 | |
| 14 | 12 | 9 | SWSW | 10.0 | | |
| 14 | 12 | 9 | SESW | 9.1 | | |

EXHIBIT C

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | 12 | 9 | NWSE | | 13.6 | |
| 14 | 12 | 17 | NWNE | | 27.2 | |
| 14 | 12 | 17 | SWNE | | | 16.1 |
| 14 | 12 | 17 | SENE | | | 32.7 |
| 14 | 12 | 17 | NENW | | 6.0 | |
| 14 | 12 | 17 | NWNW | | | 34.0 |
| 14 | 12 | 17 | SENW | | | 0.6 |
| 14 | 12 | 17 | NESW | | | 9.9 |
| 14 | 12 | 17 | SWSW | | | 1.5 |
| 14 | 12 | 17 | SESW | | | 25.8 |
| 14 | 12 | 17 | NESE | | | 15.9 |
| 14 | 12 | 17 | NWSE | | | 27.1 |
| 14 | 12 | 17 | SWSE | | | 6.8 |
| | | | TOTAL | 38.8 | 167.8 | 206.6 |

The third right to be modified, as evidenced by a PORTION of Certificate 75761, was perfected under Permit G-4974 with a date of priority of MARCH 13, 1972. The right allows the use of WELL 1, in the DESCHUTES RIVER BASIN, for IRRIGATION OF 58.0 ACRES. The amount of water to which this right is entitled to is limited to the amount actually beneficially used and shall not exceed 0.73 cubic foot per second, if available at the original well: SW¼ SE¼, SECTION 18, T 14 S, R 12 E, W.M.; WELL 1 - 1050 FEET NORTH AND 6980 FEET WEST FROM THE SE CORNER, SECTION 17, or its equivalent in case of rotation, measured at the well.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, is limited to a diversion of ONE-EIGHTIETH of one cubic foot per second (or its equivalent) and 3.0 acre-feet for each acre irrigated during the irrigation season of each year.

EXHIBIT C

The applicant proposes to change the place of use, and add additional points of appropriation described below, as shown in the following table:

TABLE 3
PERMIT G-4974

| TWN (S) | RNG (E) | SEC. | Q/Q | POU FROM | POU TO | POA ONLY |
|---|---|---|---|---|---|---|
| 14 | 12 | 18 | SE SE | 0.3 | | 23.9 |
| 14 | 12 | 19 | NE NE | | 2.8 | |
| 14 | 12 | 19 | NW NE | 7.2 | | 25.8 |
| 14 | 12 | 19 | NE NW | 0.8 | | |
| 14 | 12 | 20 | NW NW | | 5.5 | |
| | | | TOTAL | 8.3 | 8.3 | 49.7 |

The fourth right to be modified, as evidenced by a PORTION of Certificate 74150, was perfected under Permit G - 4396 with a date of priority of APRIL 15, 1969. The right allows the use of WELL 1, in the DESCHUTES RIVER BASIN, for IRRIGATION OF 3.0 ACRES AND SUPPLEMENTAL IRRIGATION OF 40.1 ACRES. The right is limited to 0.54 cubic foot per second, if available at the well; SW¼ SE¼, SECTION 18, T 14 S, R 12 E, W.M.; 1050 FEET NORTH AND 6980 FEET WEST FROM THE SE CORNER, SECTION 17, or its equivalent in case of rotation, measured at the well.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, is limited to a diversion of ONE-EIGHTIETH of one cubic foot per second (or its equivalent) and 3.0 acre-feet for each acre irrigated during the irrigation season of each year.

The applicant proposes to change the use from supplemental to primary irrigation, the place of use, and add additional points of appropriation described below, as shown in the following table:

EXHIBIT C

TABLE 4
PERMIT G-4396

| | | | | AUTHORIZED LOCATION | | AUTHORIZED LOCATION |
|---|---|---|---|---|---|---|
| TWN (S) | RNG (E) | SEC. | Q/Q | PRI | SUPP | PRI |
| 14 | 12 | 17 | SWSW | 1.6 | 14.4 | 1.8 |
| 14 | 12 | 17 | SESW | | 5.8 | |
| 14 | 12 | 18 | SWSE | | 9.4 | 9.4 |
| 14 | 12 | 19 | NENE | 1.4 | | 29.6 |
| 14 | 12 | 19 | SWNE | | 7.9 | 2.0 |
| 14 | 12 | 19 | SENE | | 2.2 | 0.3 |
| 14 | 12 | 19 | SENW | | 0.4 | |
| | | | TOTAL | 3 | 40.1 | 43.1 |

The applicant proposes to add points of appropriation for all of the rights served by Well 1, as listed in TABLE 3 and TABLE 4. The additional points of appropriation are located:

WELL 3 SW¼ NE¼, SECTION 17, T 14 S, R 12 E, WM; 1900 FEET SOUTH AND 1500 FEET WEST FROM THE NE CORNER, SECTION 17.

WELL 4 NW¼ NW¼, SECTION 17, T 14 S, R 12 E, WM; 120 FEET SOUTH AND 60 FEET EAST FROM THE NW CORNER, SECTION 17.

WELL 7 NE¼ NW¼, SECTION 9, T 14 S, R 12 E, WM; 1220 FEET SOUTH AND 2540 FEET EAST FROM THE NW CORNER, SECTION 9.

Affidavits were received from BIG FALLS RANCH COMPANY, the owner of certain land and the water rights appurtenant to it. The water rights have been abandoned and are requested to be canceled.

EXHIBIT C

The first abandoned water right is described by Certificate 74136, State Record of Water Right Certificates. The abandoned water right is for the use of 4.95 cubic feet per second from Squaw Creek, a tributary of The Deschutes River. The dates of priority is January 30, 1912 and January 24, 1913. The abandoned water right is for irrigation of 390.0 acres.

The second abandoned water right is a portion of the water right described by Certificate 74135, State Record of Water Right Certificates. The abandoned water right is for the use of 3.68 cubic feet per second from Squaw Creek, a tributary of The Deschutes River. The abandoned water right is for irrigation of 184.0 acres, being 16.6 acres with a priority date of 1903, and 167.4 acres with a priority date of 1904.

A description of the place of use of the abandoned right is as follows:

SE¼ SW¼ 15.4 ACRES OF 1903
SE¼ SW¼ 20.0 ACRES OF 1904
NE¼ SE¼ 29.0 ACRES OF 1904
SW¼ SE¼ 39.0 ACRES OF 1904
SECTION 8

NW¼ NE¼ 0.4 ACRE OF 1903
NW¼ NE¼ 10.4 ACRES OF 1904
NE¼ NW¼ 0.8 ACRE OF 1903
NE¼ NW¼ 40.0 ACRES OF 1904
SECTION 17

SW¼ SE¼ 18.5 ACRES OF 1904
SECTION 18

SW¼ NE¼ 7.9 ACRES OF 1904
SE¼ NE¼ 2.2 ACRES OF 1904
SE¼ NW¼ 0.4 ACRE OF 1904
SECTION 19
TOWNSHIP 14 SOUTH, RANGE 12 EAST, W.M.

ORS 540.621 provides: "Whenever the owner of a perfected and developed water right certifies under oath to the Water Resources Commission that the water right has been abandoned by the owner and that the owner desires cancellation thereof, the commission shall enter an order canceling the water right."

EXHIBIT C

THESE CHANGES TO EXISTING WATER RIGHTS MAY BE MADE PROVIDED THE FOLLOWING CONDITIONS ARE MET BY THE WATER USER:

1. The proposed changes shall be completed on or before October 1, 2001.

2. The quantity of water diverted at the new points of appropriation (wells), together with that diverted from the original point of appropriation, shall not exceed the quantity of water available from the original point of appropriation.

3. The water user shall install in-line flow meters or other suitable devices for measuring and recording the quantity of water used. The type and plans of the measuring devices must be approved by the Department prior to beginning construction and shall be installed under the general supervision of the Department.

4. Water shall be acquired from the same aquifer as the original point of appropriation.

5. The former places of use shall no longer be irrigated as part of these water rights.

The rights requested to be canceled herein are canceled. Certificates 44278, 44281, 44283, 65147, AND 74150 are canceled. New certificates will be issued to confirm those portions of the rights NOT involved in this transfer and cancellation proceeding. When satisfactory proof of the completed changes is received, new certificates confirming these water rights will be issued.

WITNESS the signature of the Water Resources Director, affixed JAN 1 1 2000.

For Martha O. Pagel, Director

SCHWABE, WILLIAMSON & WYATT
ATTORNEYS AT LAW

Equitable Center, 530 Center St., NE, Suite 400, Salem, OR 97301 | Phone 503.540.4262 | Fax 503.399.1645 | www.schwabe.com

**MARTHA O. PAGEL**
**Admitted in Oregon and Washington**
**Direct Line: Salem 503-540-4260; Portland 503-796-2872**
**E-Mail: mpagel@schwabe.com**

August 11, 2008

Anne Corcoran Briggs
Hearings Officer
c/o Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, OR 97701

Re: Clarification/Modification of Addendum to Fish and Wildlife Mitigation Plan Relating to Potential Impacts of Ground Water Withdrawals on Fish Habitat
Our File No.: 112188/138798

Dear Ms. Briggs:

This letter is provided on behalf of our client, Thornburgh Resort, to confirm modifications to the Thornburgh Fish and Wildlife Mitigation Plan in response to comments from the Oregon Department of Fish and Wildlife (ODFW), and to respond to comments received during the public hearing process about the possible need for additional mitigation on Whychus Creek.

**Modification of Mitigation Plan:**

Following Thornburgh's submission of its Addendum Relating to Ground Water Withdrawals in April, 2008 ("Addendum"), ODFW requested modification of the plan to include removal of two existing dams/impoundment structures on Deep Canyon Creek. The April Addendum described plans for removing only one dam in connection with acquisition of the water rights from Big Falls Ranch for mitigation purposes. In reviewing and commenting on the Addendum, ODFW requested that Thornburgh seek authorization to remove a second dam located just upstream of the Big Falls Ranch dam, on property owned by other parties.

During the public hearing process on Thornburgh's Final Master Plan, Thornburgh indicated its willingness to remove the second dam as part of its Fish and Wildlife Mitigation Plan. This letter confirms that intention and so modifies the Addendum. Thornburgh is also submitting into the hearing record documentation of its agreement with the owners of the second dam to authorize the dam removal.

**Possible Additional Modification Relating to Mitigation on Whychus Creek:**

During the hearing process, much attention was devoted to asserted impacts to Whychus Creek. The Yinger Report indicates a potential annual reduction of 106 acre-feet of flow in Whychus Creek (assuming 100% consumptive use) as a result of the proposed new ground water development for Thornburgh. Although Thornburgh disagrees with this contention – as described in detail other materials we have submitted for the record – Thornburgh does not want to be caught short if you determine that additional mitigation is required for possible impacts to Whychus Creek. Therefore, we are providing evidence to demonstrate that it would be feasible for Thornburgh to provide additional flow of 106 acre-feet per year in Whychus Creek, if needed to meet the county approval standard. This would be in addition to the amount of mitigation water already described in Thornburgh's Addendum. We have submitted into the record a letter from Marc Thalacker, Manager of the Three Sisters Irrigation District, describing a proposed conservation project by the district that is expected to generate up to 500 acre-feet of water that will be protected as instream flow. This will be the final stage of a multi-phased project by the district that has already demonstrated proven results in restoring stream flow in Whychus Creek by reducing irrigation diversions. Mr. Thalacker's letter confirms that Thornburgh could participate in this effort by providing funding to offset the creation of 106-acre feet of water for instream flow through the conservation project.

Thornburgh strongly believes that all potential impacts to surface water resources and fish habitat are already completely mitigated under the terms and conditions of Thornburgh's water right approval, coupled with the additional measures described in the Addendum (as modified above by the commitment to remove the second dam on Deep Canyon Creek). Acquiring additional flow mitigation will be very costly – approximately $300,000 – and this offer is being made solely to preclude the possibility of application denial on the basis of a finding that the mitigation Thornburgh has already proposed is insufficient. If you are persuaded that additional mitigation is required for impacts specific to Whychus Creek in order to meet the county approval standard, Thornburgh can provide such mitigation by participating in the Three Sisters Irrigation District project.

Sincerely,

Martha O. Pagel

MOP:kdo

Testimony of Kyle Gorman
Thornburgh Hearing July 15, 2008

| | |
|---|---|
| Gorman (@ approx. 3hr. 24min) | Alright, thank you. My name is Kyle Gorman and my timing isn't that great but I'm neither a proponent nor an opponent to this project but I do work for the Oregon Water Resources Department, I'm the region manager for the south central region, and one of my tasks as region manager is to make sure that the mitigation program that the department has put in place in the Deschutes Basin is working. There's been lots of testimony about the modeling effects and how the department does or does not use the model and what the model says and I think that one of the greatest misconceptions that may be discussed tonight is the fact that really the Yinger report and what our department found as far as impacts are the same. They're not opposing, our department, if we ran the model we wouldn't find that the impacts would be in the Sandy river we'd find that they would be in the exact same place that Yinger found. What our department has to do is look at administrative rules and look at how those very prescriptive rules describe the department's task in that making sure that where the impacts occur what happens, whether to deny or approve that application. And I don't want to get into the details of the rules but they're very prescriptive and the person that reviews water rights in this basin is one of the authors of the USGS Groundwater Study. So, I'm trying to think an analogy of how this, how our department looks at this and the thing is that a model is a model it's only as good as what you put into it. If someone were to do surgery we wouldn't want a machine doing surgery but we'd rather have a human doing surgery. Ken Light is that human doing surgery on reviewing groundwater applications, so I think that there's even a higher level of review and consideration for impacts in the basin when actually our department personnel is reviewing those applications. So, the models I don't think are competing against each other I think they link up very well. As far as the mitigation consumptive use factors that sort of thing I participated in every meeting from the beginning on the mitigation program back in 1998. And we had many, many hours of discussion about consumptive uses the process was very public and in the end we ended up using the department's water availability modeling for the consumptive use figures. Now, if during the very public process that a water application goes through if someone thinks that our department is not applying the correct consumptive use figures they have the opportunity to protest and that's exactly what Water Watch of Oregon did. Now, I would rate Water Watch's staff folks on par if not better than most department staff as far as their knowledge about water rights. So, in that negotiation I say that Water Watch probably did a fairly good job figuring out what they could live with as far as the consumptive use and the amount of water that needed to be mitigated for this Thornburgh Development. So, I don't disagree with the numbers. In the permit itself if people still think that the mitigation is not adequate, we have a paragraph and I'll read it to you.<br><br>"The permittee shall provide additional mitigation if the department determines that the average annual consumptive use of the subject appropriation has increased |

| | |
|---|---|
| | beyond the originally mitigated amount."<br><br>So built into the permit itself is the opportunity for the department to require additional mitigation in the future. It was also mentioned in an earlier testimony that maybe the county should be looking at consumptive use. Our department would take exception if the county decided that they were going to be the authority on issuing water rights in the state. The department does, is granted that authority and we take it seriously, so, I know that people could argue that the land use and water use process could be linked up a little better I agree but for now the department will handle water use authorizations. And I know it was also mentioned that maybe there's this COI water right out there that might be used for mitigation. In the review for determining mitigation water, where it's put in place, the effects of it, the department goes through a rigorous evaluation. We know exactly what acre is going to be put in stream, whether or not it's going to be effective mitigation that sort of thing, so we definitely have a very thorough and rigorous evaluation of any mitigation project. And I want to make sure that the county understands that it's not happenstance or its not reviewed at all but we do, do a very thorough job of reviewing every acre that goes in stream for mitigation purposes. And that is all I wanted to clarify. |
| Chair | Thank you. |

NEWTON CONSULTANTS INC.

August 12, 2008
Project No. 1007-101-07

Anne Corcoran Briggs
Hearings Officer
c/o Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, OR 97701

**THORNBURGH RESORT FINAL MASTER PLAN; FISH AND WILDLIFE MITIGATION PLAN**

**RESPONSE TO PAUL DEWEY SUBMITTAL OF TECHNICAL MEMORANDUM PREPARED BY CLEARWATER BIOSTUDIES, INC. DATED JULY 25, 2008**

Dear Ms. Briggs:

This letter is submitted on behalf of the applicant in response to a submittal by Mr. Paul Dewey, which included a technical memorandum prepared by Clearwater BioStudies, Inc. (Clearwater). The Clearwater memorandum included the following assertions (shown in italics):

**Issue 1**

*The amounts of mitigation water associated with the Thornburgh Resort, or at least how the project's proponents or consultants are characterizing them, have again changed. The sequence of changes in documents you have provided me is outlined in Table 1.*

*Table 1*

| *Average total amount of added surface flow during summer* | *Average amount of COID water reaching Lower Bridge* | *Average amount of relatively cold water entering at Deep Canyon Creek* | *Date/source of information* |
|---|---|---|---|
| *Approximately 7.5-10.4 cfs* | *Approximately 2.0-4.9 cfs* | *5.5 cfs* | *21 April 2008 (NCI 2008b Pages 9-10)* |
| *7.35cfs* | *4.9 cfs* | *2.35 cfs* | *May 2008 (TtEC 2008d, Pages 13-14)* |
| *3.19 cfs* | *1.22 cfs* | *1.97 cfs* | *02 & 08 July 2008 (TtEC 2008a, Page 2; TtEC 2008b, page 3)* |

**Response to Issue 1**

**Deep Canyon Creek Water**

Relative to the average amount of water entering at Deep Canyon Creek (3rd column in Table 1), the 5.5 cubic feet per second (cfs) figure is the actual flow rate specified in the Big Falls Ranch water right for Deep Canyon Creek.

In the May 2008 Tetra Tech document, the 2.35 cfs figure was derived using Oregon Water Resources Department (OWRD) general practice for transferring surface irrigation water rights to in-stream water rights. OWRD allows only 1.8 acre-feet of water per acre of surface irrigation to be transferred to in-stream mitigation. OWRD considers that 60% of the irrigation water is consumed; the remaining 40% returns to the system. OWRD assumes that 3 feet of water is applied annually on irrigated land in the Upper Deschutes Basin. Sixty percent (60%) of 3 acre-feet is 1.8 acre-feet.

The total acreage from Big Falls Ranch related to its Deep Canyon Creek water right is 464.9 acres. At 1.8 acre-feet per acre, this is 836.8 acre feet of water. Generally, irrigation is practiced in the Upper Deschutes Basin from April 15 to October 15 or 180 days. Dividing 836.8 acre feet over the irrigation period arrives at 2.35 cfs.

The 1.97 cfs cited from the July, 2008 Tetra Tech document is the mitigation flow provided by ODFW in its letter dated June 13, 2008. This number is lower because ODFW used an irrigation period of 214 days (April 1 to October 31) which is the actual period of diversion allowed on the water right for the Upper Deschutes Basin. In actual practice however, the irrigation period is April 15 to October 15.

**COID Water**

Relative to the average amount of COID (Central Oregon Irrigation District) water reaching Lower Bridge (2nd column in Table 1), the April 21, 2008 NCI document cited the amount of flow dedicated to in-stream flow by the OWRD. In the Upper Deschutes Basin, OWRD dedicates in-stream water right flow based upon the number of acres removed from irrigation. When the irrigation water is from COID's distribution system, OWRD uses a special calculator that is available on their website (http://apps2.wrd.state.or.us/apps/wr/calculator_coid/) to determine the amount of water dedicated to an in-stream water right. The in-stream flow amount varies by season, of which there are three for COID water rights. Relative to Thornburgh, the resort has identified a plan to acquire 288.5 acres of COID water rights for mitigation purposes. Inserting this acreage into OWRD's COID calculator, the in-stream water rights for seasons 1 through 3 (rounded to two significant figures) are: 2.0, 2.6 and 4.9 cfs, respectively. These are the basis of the in-stream flows cited in the April 21, 2008 NCI document.

In the Tetra Tech document, dated May, 2008, the 4.9 cfs figure was used for determining river temperature impacts. A flow of 4.9 cfs as used in the analysis is conservative and yields the greatest potential temperature impact to the river.

In the July, 2008 Tetra Tech document, Tetra Tech used the flow figures calculated by the ODFW (1.22 and 1.97 cfs for COID and Deep Canyon Creek, respectively) as described in its June 13, 2008 letter. As with Deep Canyon Creek, ODFW used 214 days to derive the instantaneous flow that it used in its analysis of impacts and mitigation.

Regardless of the instantaneous flow values used, it should be recognized that water rights for irrigating 288.5 acres of land under COID jurisdiction and 464.9 acres on Big Falls Ranch will be converted to in-stream water rights. That water will remain in the Deschutes River to mitigate for Thornburgh water pumping.

**Issues 2, 3 and 4**

> *These three comments, in summary, express a concern that there are very minor increases in water temperature and decreases in cold water refugia in both the Deschutes River and Whychus Creek due to Thornburgh pumping. Further, that these changes in temperature and cold water refugia are not mitigated by Thornburgh.*

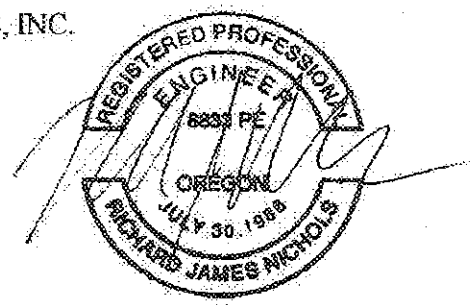
**Response to Issues 2, 3 and 4**

These comments are limited to the very minor physical changes in the river itself, but do not provide any information that these minor changes are, in fact, detrimental to the fishery resource. Both Tetra Tech and ODFW have reviewed the impacts of Thornburgh pumping and have concluded that the mitigation of both flow and temperature from Deep Canyon Creek have fully mitigated the impacts to the fishery resources in the Deschutes River. Further, both Tetra Tech and ODFW indicate that there is no detrimental impact to the fishery resources in Whychus Creek due to very minor temperature increases and reduction of cold water refugia.

Please contact us if you have any questions.

Sincerely,

NEWTON CONSULTANTS, INC.




Richard J. Nichols, P.E.
Senior Water Quality Engineer

Expiration Date 12-31-09

Cc: Kameron DeLashmutt – Thornburgh Resorts
Martha Pagel – Schwabe, Williamson and Wyatt

NEWTON CONSULTANTS INC.

August 06, 2008
Project No. 1007-101-07

Anne Corcoran Briggs
Hearings Officer
c/o Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, OR 97701

**THORNBURGH RESORT FINAL MASTER PLAN; FISH AND WILDLIFE MITIGATION PLAN**

**RESPONSE TO COMMENTS CONCERNING IMPACTS TO DESCHUTES RIVER AND WHYCHUS CREEK**

Dear Ms. Briggs:

This letter is submitted by Newton Consultants Inc. (NCI) on behalf of the applicant in response to testimony provided by the opponents to the proposed Thornburgh Resort at the continued hearing held on July 15, 2008. We respond to the following assertions made by project opponents, based on information contained in the Yinger report:

- Use of the USGS groundwater model to predict impacts clearly shows that Thornburgh pumping will have a detrimental effect on aquatic resources in the Deschutes River and Whychus Creek.

- Basing mitigation flows on only consumed water is inappropriate and understates the significance of the impact of the Thornburgh pumping.

- Thornburgh pumping will impact the "mixing zones" of the springs and have a detrimental effect of fishery resources in the Deschutes River and Whychus Creek.

**Use of USGS Model**

The Yinger report uses the USGS groundwater model to predict flow reductions in the Deschutes River and tributaries, including springs. As described in materials submitted into the record at the hearing on July 15, NCI does not object to the use of the model, *per se*, to evaluate potential flow impacts. However, it is important to clarify the inputs used in running the model and to identify a point of significant disagreement with the Yinger approach. As discussed at the July 15 hearing, in running the model, Mr. Yinger assumed 100% consumptive use by Thornburgh. This approach is not consistent with

comments contained in the USGS report, or with the approach taken by the Oregon Water Resources Department (OWRD) in evaluating potential impacts of new pumping projects. An assumption of 100% consumptive use results in an over-statement of potential impacts and would necessarily affect the location and quantity of impact shown as an output of the model.

With that stipulated, the model and the Yinger Report itself does not attempt to predict or quantify impacts on stream temperature or fishery resources as a result of pumping. The Yinger report, using the USGS model and using an assumption of 100% consumptive use predicts only the location of a reduction in spring flow in Whychus Creek and the Deschutes River. The report, however, does not extend the analysis to actually quantify impacts on stream temperature or fisheries. On behalf of Thornburgh, NCI and TetraTech have quantified the potential impacts on temperature and fisheries and have provided the information to Deschutes County and to the Oregon Department of Fish and Wildlife (ODFW). The conclusions of NCI and TetraTech are consistent with those of ODFW which has provided a letter to Deschutes County stating their determination that the proposed mitigation "should mitigate for potential impacts on springs and seeps and provide a net benefit to the resource."

**Impacts Based on 100% Consumptive Use**

As noted above, the Yinger report assumes 100% consumptive use by Thornburgh, even though this assumption is contrary to the approach taken by OWRD and USGS. However, to address the Yinger assertions, NCI and TetraTech evaluated the potential impact on temperature based on the Yinger report. Even if all of the water pumped from the Thornburg Resort wells were consumed (i.e. no portion of the total amount pumped were returned to the groundwater aquifer), the impact on stream temperature would not change measurably over the predicted water temperature assuming only a portion of the pumped water is returned to the aquifer. Table 1 shows what the temperature impacts would be if the temperature analysis only considers non-consumptive use versus assuming all of Thornburgh pumping were consumed.

As shown in the table, even if all of the water was considered lost to the groundwater aquifer, the difference in potential impact on water temperature in the Deschutes River is virtually immeasurable from that if only consumptive use is considered. Further, although there is a very slight increase in water temperature from the pumping (whether total consumption is considered or not), the mitigation water provided during the irrigation season, according to ODFW's letter, provides "a net benefit in instream flow in the Deschutes River."

**Table 1.** Water temperature conditions and temperature impact analysis based on only considering non-consumptive use versus assuming all pumped water is consumed.

| Scenario | Below Lower Bridge, °C 2007 | Steelhead Falls, °C 2007 | Below Whychus Creek, °C 2005 |
|---|---|---|---|
| Actual Maximum7 Day Average Maximum Temperature | 22.31* | 18.27 | 15.1 |
| Maximum 7 Day Average Maximum Temperature Considering Non-consumptive Use | 22.30 | 18.40 | 15.21 |
| Maximum 7 Day Average Maximum Temperature Assuming All Pumped Water Consumed | 22.31 | 18.42 | 15.22 |

*This temperature is calculated from thermister data at Lower Bridge. No thermister data is available below Lower Bridge.

The Thornburgh temperature impact analysis on Whychus Creek is independent of the consumption issue. The analysis on Whychus Creek does not change because the analysis incorporated Yinger's flow reduction number, which considered all pumped water as consumed or lost to the system.

**Mixing Zones**

Project opponents asserted the proposed Thornburgh pumping would have a negative impact on "mixing zones." The term "mixing zone" is a regulatory term that typically has specific meaning for regulatory agencies in implementing the federal Clean Water Act waste discharge permit program. The issue behind this comment, we believe, is the potential reduction in cold water refugia due to reduced spring flow. This issue was also an original concern of the ODFW and has been addressed in the Thornburgh mitigation plan. Even if it is assumed that all of Thornburgh pumped water is consumed, the overall reduction in spring flow is less than 1%. ODFW determined that this reduction was fully mitigated under the Thornburgh plan by the addition of cold water from Deep Canyon Spring under the Big Falls water rights. Specifically, ODFW stated in their letter provided to Deschutes County that the proposed plan "should mitigate for potential impacts on springs and seeps and provide a net benefit to the resource."

Additional technical information regarding the Thornburgh mitigation plan has already been submitted into the record and is available to provide further details on these issues. NCI's general response to the opponents issues can be summarized as follows:

- The water-related component of the Thornburgh mitigation plan was developed in coordination with ODFW and ODFW has confirmed that it believes the plan complies with the county mitigation standard.

- The Thornburgh mitigation plan was based on the projected location and quantity of impacts identified by OWRD in connection with its review of the Thornburgh water right application, and following standard OWRD practices for doing so.

- In response to criticism from project opponents, Thornburgh re-evaluated the potential impacts using the conclusions drawn in the Yinger report regarding the potential location and quantity of impact. The Yinger report also asserted impacts to water temperature but did not attempt to quantify any such impacts.

- Even assuming the Yinger results, the technical evaluations submitted on behalf of Thornburgh demonstrate that potential impacts to flow quantity and temperature will be fully mitigated.

Sincerely,

NEWTON CONSULTANTS, INC.

REGISTERED PROFESSIONAL ENGINEER 8833 PE OREGON JULY 30, 1986 JAMES D. NICHOLS

Richard J. Nie[illegible]
Senior Water Quality Officer

12-31-08

Cc: Kame[illegible] – Thornburgh Resorts
Martha Pagel – Schwabe, Williamson and Wyatt

NEWTON CONSULTANTS INC.

August 06, 2008
Project No. 1007-101-07

Anne Corcoran Briggs
Hearings Officer
c/o Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, OR 97701

**THORNBURGH RESORT FINAL MASTER PLAN; FISH AND WILDLIFE MITIGATION PLAN**

**RESPONSE TO COMMENTS MADE AT THE JULY 15 HEARING AND IN A LETTER DATED JULY 23, 2008, FROM MARK YINGER TO STEVE MUNSON CONCERNING CONDITIONS IN THE WATER POLLUTION CONTROL FACILITIES PERMIT ISSUED BY THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY TO THORNBURGH RESORTS**

Dear Ms. Briggs:

The following comments are offered on behalf of the applicant in response to comments made at the July 15, 2008 hearing and a subsequent submittal (letter from Mark Yinger to Steve Munson dated July 23, 2008) entered into the record concerning the conditions of the Water Pollution Control Facilities (WPCF) permit issued by the Oregon Department of Environmental Quality (ODEQ) to Thornburgh Resorts (Thornburgh).

In summary, comments by opponents to Thornburgh Resorts have asserted that the ODEQ WPCF prohibits any sewage effluent to seep into the ground and, consequently, Thornburgh should have to mitigate for all water pumped from groundwater, not just that amount which will be consumed.

Attached with this letter is a copy of the WPCF permit issued by ODEQ. Condition II, 1.e. of the permit states, as follows:

> *e. All reclaimed water that is irrigated shall be distributed on land, **for dissipation by evapotranspiration and controlled seepage*** (emphasis provided) *by following sound irrigation practices so as to prevent:*
>
> *(1) Prolonged ponding of reclaimed water on the ground surface;*
>
> *(2) Surface runoff or subsurface drainage through drainage tile;*
>
> *(3) The creation of odors, fly and mosquito breeding or other nuisance conditions;*
>
> *(4) Overloading of land with nutrients, organics or other pollutants; and,*
>
> *(5) Impairment of existing or future beneficial uses of groundwater.*

Clearly, the WPCF permit allows for effluent to seep into the ground.

Please contact us if you have any questions.

Sincerely,

NEWTON CONSULTANTS, INC.

Richard J. Nichols, P.E.
Senior Water Quality Engineer

REGISTERED PROFESSIONAL ENGINEER 8834 PE OREGON JULY 30, 1986 RICHARD JAMES NICHOLS

Expiration Date 12-31-08

Enclosure
Cc: Kameron DeLashmutt – Thornburgh Resorts
Martha Pagel – Schwabe, Williamson and Wyatt

# WATER POLLUTION CONTROL FACILITIES PERMIT

Department of Environmental Quality
2146 NE 4th Street, Suite 104, Bend, OR 97701
Telephone: (541) 388-6146
Issued pursuant to ORS 468B.050

**ISSUED TO:**

Thornburgh Resort Company, LLC
P.O. Box 264
Bend, Oregon 97709

**SOURCES COVERED BY THIS PERMIT:**

| Type of Waste | Method of Disposal |
|---|---|
| Domestic Wastewater | Soil Absorption |
| | Land Application/Reuse |

**SYSTEM TYPE AND LOCATION:**

Septic Tanks, Biological Treatment Plant, Land Irrigation and Soil Absorption Areas
**Thornburgh Resort**
7 Miles West of Redmond, OR

System Operator: Thornburgh Utility Company, LLC

**Treatment System Class: III**
**Collection System Class: II**

**RIVER BASIN INFORMATION:**

Basin: Deschutes
Sub-Basin: Middle Deschutes
LLID - 1209151456389-143.7 -N
County: Deschutes

Nearest surface stream which would receive waste if it were to discharge: Deschutes River

Issued in response to Application No. 977607 received July 27, 2006.

This permit is issued based on the land use findings in the permit record.

Eric Nigg, Manager
Bend Water Quality Section
Eastern Region - Bend

February 14, 2007
Date

## PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows: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| Schedule A - Waste Discharge Limitations not to be Exceeded | 2-3 |
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All direct discharges to surface waters or the surfacing of raw or treated sewage are prohibited.

## SCHEDULE A

I. Waste Disposal Limitations before a Sewage Treatment Plant is Constructed and On-line

1. The permittee is authorized to construct, operate, and maintain sewage collection, treatment and disposal systems constructed in accordance with plans and specifications approved by the Department and in accordance with the following conditions:

   a. The community wastewater absorption areas or cells shall not be hydraulically loaded in excess of their respective, Department-approved hydraulic load design capacities. Additional absorption areas or cells shall be constructed in accordance with approved plans and placed in operation as necessary to maintain compliance with the conditions of this permit.

   b. No discharge to state waters is permitted. All wastewater shall be distributed into individual or community on-site sewage soil absorption areas for dissipation by evapotranspiration and subsurface soil absorption so as to prevent:

      (1) Surfacing of wastewater onto the ground surface;

      (2) Surface runoff or subsurface drainage through drainage tile;

      (3) Impairment of existing or future beneficial uses of groundwater.

   c. The monthly average daily combined wastewater flow to the soil absorption areas shall not exceed 15,000 gallons per day in the north area and 15,000 gallons per day in the south area, for a total flow going into absorption areas at 30,000 gallons per day.

II. Waste Disposal Limitations after a Sewage Treatment Plant is Constructed and On-line

1. The permittee is authorized to construct, operate, and maintain sewage collection, treatment, disposal, storage and land application systems constructed in accordance with plans and specifications approved by the Department and in accordance with the following conditions:

   a. If the sewage treatment plant is constructed in phases, as each phase begins operation, the monthly average daily sewage flow to the plant shall not exceed the flow limitation set forth in the Department's approval letter for that phase of the facility. The Department may modify this permit to incorporate limitations and conditions for the system as it is expanded.

   b. After completion of the final phase of the sewage treatment plant the monthly average daily combined wastewater flow to the plant from the entire development at build-out shall not exceed 326,000 gallons per day.

   c. For beneficial reuse purposes requiring Level III treatment as defined in OAR 340-55, prior to land application, the wastewater shall be treated as required for Level III effluent pursuant to OAR 340-55 and the quality of reclaimed water shall not exceed the following effluent limitations:

| Parameter | Limitation |
|---|---|
| Total Coliform | Shall not exceed a 7 day median of 2.2 organisms /100 mls and no single sample shall exceed 23 organisms /100 mls. |

   d. For beneficial reuse purposes requiring Level IV treatment as defined in OAR 340-55, prior to land application, the wastewater shall be treated as required for Level IV effluent pursuant to OAR

340-55 and the quality of reclaimed water shall not exceed the following effluent limitations:

| Parameter | Limitation |
|---|---|
| Total Coliform | Shall not exceed a 7 day median of 2.2 organisms /100 mls and no single sample shall exceed 23 organisms /100 mls. |
| Turbidity | Shall not exceed a 24-hour mean of 2 NTU, and shall not exceed 5 NTU for more than 5% of time during a 24-hour period. |

e. All reclaimed water that is irrigated shall be distributed on land, for dissipation by evapotranspiration and controlled seepage by following sound irrigation practices so as to prevent:

(1) Prolonged ponding of reclaimed water on the ground surface;

(2) Surface runoff or subsurface drainage through drainage tile;

(3) The creation of odors, fly and mosquito breeding or other nuisance conditions;

(4) Overloading of land with nutrients, organics or other pollutants; and,

(5) Impairment of existing or future beneficial uses of groundwater.

f. Reclaimed water use shall comply with all provisions of a Reclaimed Water Use Plan approved by the Department pursuant to OAR 340-55.

g. Unless otherwise approved in writing by the Department, irrigation shall only occur during the period between April 1 and October 31. Unless otherwise approved by the Department, wastewater shall not be applied to land that is frozen, snow covered or saturated, or during precipitation periods.

h. The quantity of reclaimed water irrigated upon land shall not exceed that established in a reclaimed water use plan submitted to and approved by the Department.

i. No reclaimed water shall be applied to food crops destined for human consumption nor otherwise be made available for a use that is inconsistent with the uses provided for in OAR 340-55.

## SCHEDULE B

1. Minimum Monitoring and Reporting Requirements

The permittee shall monitor the operation and efficiency of all treatment, disposal and land application facilities. Unless otherwise agreed to in writing by the Department of Environmental Quality, data collected, and submitted shall include but not necessarily be limited to the following parameters and minimum frequencies:

a. Prior to construction and start-up of a sewage treatment plant.

(1) Influent to community soil absorption areas:

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Total Flow (MGD) | Daily | Measurement |
| $BOD_5$ | Semi-Annually | Composite (See note 1/) |
| TSS | Semi-Annually | Composite (See note 1/) |
| pH | 2/week | Grab |

(2) Other parameters

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Unusual occurrences affecting operation or performance | Each occurrence | Record |
| Tanks pumped (septic, dosing, and grease interceptors | Each occurrence | Record total, no., type, and gallons pumped |
| Test dosing tank pumps and alarms | Quarterly | Visual/Audible |
| Inspect dosing tank pump screens | Quarterly | Visual |
| Inspect and clean hydrasplitters if present | Quarterly | Visual |
| Inspect soil absorption monitoring ports | Weekly | Measurement of effluent depth |

b. After construction and start-up of a sewage treatment plant.

(1) Influent to the sewage treatment plant:

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Total Flow (MGD) | Daily | Measurement |
| Flow meter calibration | Annually | Verification |
| $BOD_5$ | Monthly | Composite (See note 1/) |
| TSS | Monthly | Composite (See note 1/) |
| pH | 2/week | Grab |

(2) Effluent at the discharge from storage lagoon (when irrigating):

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| pH | 2/week | Grab |
| $NO_3$-N | Monthly | Composite (See note 1/) |
| TKN | Monthly | Composite (See note 1/) |
| UV Radiation Intensity | Daily when irradiating | Reading (See note 2/) |
| Chlorine residual | Daily when chlorinating | Grab |

(3) Reclaimed water for storage and/or land application meeting Level III criteria:

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Total coliform | 3/week (See note 3/) | Grab (See note 4/) |

(4) Reclaimed water for storage and/or land application meeting Level IV criteria:

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Total coliform | Daily (See note 3/) | Grab (See note 4/) |
| Turbidity (See note 5/) | Continuous | Measurement (See note 4/) |

(5) Reclaimed water for land application/reuse:

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Acreage irrigated | Daily when irrigating | Measurement |
| Quantity irrigated (gallons) | Daily when irrigating | Measurement |
| Nitrogen application rate (pounds/acre) | Annually | Calculation |
| Quantity for Water Features/Reuse (gallons) | Daily | Measurement |

(6) Biosolids are to be collected and processed by a licensed sewage disposal service business approved to handle biosolids. Biosolids must be managed under a Department approved Biosolids Management Plan.

**NOTES:**

1/ Composite samples shall consist of no less than four (4) samples collected over an 8-hour period, between 6 a.m. and 6 p.m., and apportioned according to the volume of flow at the time of sampling.

2/ The intensity of UV radiation passing through the water column will affect the systems ability to kill organisms. To track the reduction in intensity, the UV disinfection system must include a UV intensity meter with a sensor located in the water column at a specified distance from the UV bulbs. This meter will measure the intensity of UV radiation in mWatts/cm$^2$. The daily UV intensity would be determined by reading the meter each day.

3/ If two consecutive samples exceed 23 Total Coliform per 100 milliliters, then five consecutive re-samples shall be taken at four hour intervals beginning as soon as practicable (preferably within 28 hours) after the original samples were taken.

4/ The sample measurement shall be taken at the discharge from the sewage treatment plant prior to the storage lagoon.

5/ There must be an approved notification system in operation to notify an operator when effluent turbidity exceeds 2 NTU and may possibly exceed a 24-hour mean greater than 2 NTU, or if the effluent approaches 5 NTU for more than 5% of time during a 24-hour period.

2. Reporting Procedures

a. Monitoring results shall be reported on Department approved forms. Monitoring reports shall identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Until the biological treatment plant comes on-line the reporting period is the calendar year. Reports shall be submitted once a year to the Department's Bend office by January 15 of the following year. Once the biological treatment plant is on-line the reporting period is the calendar month. Reports shall be submitted monthly to the Department's Bend office by the 15th day of the following month.

b. By no later than January 15 of each year following completion and start-up of the reclaimed water use system, the permittee shall submit to the Department an annual report describing the effectiveness of the reclaimed water system to comply with the approved reclaimed water use plan, the rules of OAR 340-55, and the limitations and conditions of this permit applicable to reuse of reclaimed water.

## SCHEDULE C

Compliance Conditions and Schedules

1. Prior to exceeding a monthly average sewage flow of 15,000 gallons per day to either of the two subsurface sewage absorption systems, the permittee shall install and commence operation of a Department-approved biological sewage treatment plant.

2. Prior to start-up of the sewage treatment plant, the permittee shall submit a biosolids management plan that complies with all requirements of Section 503 of the federal Clean Water Act regulations and Oregon Administrative Rule (OAR) 340-50.

3. Ninety (90) days prior to start-up of the land application system, the permittee shall submit to the Department for approval a Reclaimed Water Use Plan. The management plan shall be in accordance with Oregon Administrative Rules, Chapter 340, Division 55, "Regulations Pertaining to the Use of Reclaimed Water (Treated Effluent) from Sewage Treatment Plants". Upon approval of the plan by the Department, the plan shall be implemented by the permittee. No substantial changes shall be made in the approved plan without written approval of the Department

4. The permittee is expected to meet the compliance dates which have been established in this schedule. Either prior to or no later than 14 days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director or his/her authorized representative may revise a schedule of compliance if s/he determines good and valid cause resulting from events over which the permittee has little or no control.

## SCHEDULE D

Special Conditions

1. Prior to constructing or modifying any sewage collection, treatment, or disposal facilities, detailed plans and specifications shall be approved in writing by the Department. After approval of the plans, all construction shall be in strict conformance with the plans unless otherwise approved in writing by the Department.

2. Prior to placing the treatment, disposal and land application facilities into operation, the permittee's design consultant shall certify in writing to the Department that all work conforms to the approved plans, specifications, applicable standards and all Department approved changes thereto.

3. Each individual on-site system and all other sewerage facilities covered by this permit shall be under the ownership of the permittee. The permittee shall have authority to access all areas of Lots and Common Areas within the development on which sewerage facilities may be located, for the purpose of constructing, operating, maintaining, inspecting, repairing, or modifying sewerage facilities.

4. Within sewerage facility easements, no structure, planting or other material shall be placed or permitted to remain which may damage or interfere with the installation or maintenance of sewerage utilities.

5. Septic tanks used for the initial development phase will be adapted for hook up to the STEP/STEG collection system. Any septic tanks that are taken completely out of service shall either be removed or decommissioned in accordance with OAR 340-071-0185.

6. The community and individual on-site system soil absorption areas and replacement areas shall be kept vacant and free of vehicular or heavy equipment storage or traffic and shall not be subject to any other activity that would adversely affect the soil or functioning of the system including covering with asphalt or concrete, filling, cutting or other soil modification. The extreme corners of each community soil absorption area unit or cell shall be marked with an iron pipe or monument of durable material.

7. An adequate contingency plan for prevention and handling of spills and unplanned discharges shall be in force at all times. A continuing program of employee orientation and education shall be maintained to ensure awareness of the necessity of good inplant control and quick and proper action in the event of a spill or accident.

8. Unless otherwise provided for in a DEQ-approved biosolids management plan, all septage shall be managed by a sewage disposal service which is licensed in accordance with Oregon Administrative Rule 340-71-600. The permittee shall retain a copy of the contract between the sewage disposal service and the permittee. This contract shall be kept on file by the wastewater treatment system owner and be made available to the Department for inspection.

9. After startup of the sewage treatment plant all biosolids shall be managed in accordance with a current biosolids management plan approved by the Department. No substantial changes shall be made in biosolids management activities which significantly differ from operations specified under the approved plan without prior written approval of the Department.

10. The permittee shall meet the requirements for use of reclaimed water under OAR 340-55, including the following:

    a. All reclaimed water shall be managed in accordance with an approved reclaimed water use plan. No substantial changes shall be made in the approved plan without written approval of the

Department.

b. No reclaimed water shall be made available to a person proposing to use reclaimed water unless that person certifies in writing that they have read and understand the provisions in these rules. This written certification shall be kept on file by the wastewater treatment system owner and be made available to the Department for inspection.

c. No reclaimed water shall be released by the permittee to another person, as defined in ORS 468.005, for use unless there is a valid contract between the permittee and that person that meets the requirements of OAR 340-55-015(9).

d. The permittee shall notify the Department within 24 hours if it is determined that the treated effluent is being used in a manner not in compliance with this permit and associated plans or other requirements of OAR 340-55. When the Department offices are not open, the permittee shall report the incident of non-compliance to the Oregon Emergency Response System (phone 1-800-452-0311).

11. The permittee shall comply with OAR 340-49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

a. When the operation of the biological sewage treatment plant begins as required in Condition 1 of Schedule C of this permit, the permittee shall have its wastewater system supervised by one or more operators who are certified in a classification and grade level (equal to or greater) that corresponds with the classification (collection and/or treatment) of the system to be supervised.

**Note: A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge permit. "Supervise" means responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.**

b. The permittee's wastewater system shall not be without supervision (as required by Special Condition 11.a. above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee shall make available another person who is certified in the proper classification and grade level I or higher.

c. If the wastewater system has more than one daily shift, the permittee shall have the shift supervisor, if any, certified at no less than one grade lower than the system classification.

d. The permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

e. The permittee shall notify the Department of Environmental Quality in writing within thirty (30) days of replacement or redesignation of certified operators responsible for supervising wastewater system operation. The notice shall be filed with the Water Quality Division, Operator Certification Program at 811 S.W. Sixth Avenue, Portland, Oregon 97204. This requirement is in addition to the reporting requirements contained under Schedule B of this permit.

f. Upon written request, the Department may grant the permittee reasonable time, not to exceed 120 days, to obtain the services of a qualified person to supervise the wastewater system. The written request shall include justification for the time needed, a schedule for recruiting and hiring, the date

the system supervisor availability ceased and the name of the alternate system supervisor(s) as required by 11.b. above.

12. The permittee shall immediately notify the DEQ Bend office (phone 388-6146) of any occurrence of surfacing sewage so corrective action can be coordinated between the permittee and the Department. When the Department offices are not open, the permittee shall report the incident to the Oregon Emergency Response System (phone 1-800-452-0311).

13. For the purpose of this permit Soil Absorption Area means a drainfield, a cell of disposal trenches, or a subsurface drip emitter system

## WPCF GENERAL CONDITIONS
## (SCHEDULE F)

### SECTION A. STANDARD CONDITIONS

1. Property Rights

Issuance of this permit does not convey any property rights in either real or personal property or any exclusive privileges, nor does it authorize any injury to private property, any invasion of personal rights, or any infringement of federal, state, or local laws or regulations.

2. Liability

The Department of Environmental Quality or its officers, agents, or employees may not sustain any liability on account of the issuance of this permit or on account of the construction or maintenance of facilities or systems because of this permit.

3. Permit Actions

After notice by the Department, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including but not limited to the following:

a. Violation of any term or condition of this permit, any applicable rule or statute, or any order of the Commission;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts.

4. Transfer of Permit

This permit may not be transferred to a third party without prior written approval from the Department. The Department may approve transfers where the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of this permit and the rules of the Commission. A transfer application and filing fee must be submitted to the Department.

5. Permit Fees

The permittee must pay the fees required with this permit application and annually for permit compliance determination by Oregon Administrative Rules.

### SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

At all times the permittee must maintain in good working order and properly operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to comply with the terms and conditions of this permit.

2. Standard Operation and Maintenance

All waste collection, control, treatment, and disposal facilities or systems must be operated in a manner consistent with the following:

a. At all times, all facilities or systems must be operated as efficiently as possible in a manner that will prevent discharges, health hazards, and nuisance conditions.

b. All screenings, grit, and sludge must be disposed of in a manner approved by the Department to prevent any pollutant from the materials from reaching waters of the state, creating a public health hazard, or causing a nuisance condition.

c. Bypassing untreated waste is generally prohibited. Bypassing may not occur without prior written permission from the Department except where unavoidable to prevent loss of life, personal injury, or severe property damage.

3. Noncompliance and Notification Procedures

If the permittee is unable to comply with conditions of this permit because of surfacing sewage; a breakdown of equipment, facilities or systems; an accident caused by human error or negligence; or any other cause such as an act of nature, the permittee must:

a. Immediately take action to stop, contain, and clean up the unauthorized discharges and correct the problem.

b. Immediately notify the Department's Regional office so that an investigation can be made to evaluate the impact and the corrective actions taken, and to determine any additional action that must be taken.

c. Within 5 days of the time the permittee becomes aware of the circumstances, the permittee must submit to the Department a detailed written report describing the breakdown, the actual quantity and quality of waste discharged, corrective action taken, steps taken to prevent a recurrence, and any other pertinent information.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or liability for failure to comply.

4. Wastewater System Personnel

The permittee must provide an adequate operating staff that is duly qualified to carry out the operation, maintenance, and monitoring requirements to assure continuous compliance with the conditions of this permit.

## SECTION C. MONITORING AND RECORDS

1. Inspection and Entry

The permittee must at all reasonable times allow authorized representatives of the Department of Environmental Quality to:

a. Enter upon the permittee's premises where a waste source or disposal system is located or where any records are required to be kept under the terms and conditions of this permit;

b. Have access to and copy any records required by this permit;

c. Inspect any treatment or disposal system, practices, operations, monitoring equipment, or monitoring method regulated or required by this permit; or

d. Sample or monitor any substances or permit parameters at any location at reasonable times for the purpose of assuring permit compliance or as otherwise authorized by state law.

2. Averaging of Measurements

Calculations of averages of measurements required for all parameters except bacteria must use an arithmetic mean; bacteria must be averaged as specified in the permit.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures specified in the most recent edition of **Standard Methods for the Examination of Water and Wastewater**, unless other test procedures have been approved in writing by the Department and specified in this permit.

4. Retention of Records

The permittee must retain records of all monitoring and maintenance information, including all calibrations, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. The Department may extend this period at any time.

## SECTION D. REPORTING REQUIREMENTS

1. Plan Submittal

Pursuant to Oregon Revised Statute 468B.055, unless specifically exempted by rule, construction, installation, or modification of disposal systems, treatment works, or sewerage systems may not commence until plans and specifications are submitted to and approved in writing by the Department. All construction, installation, or modification shall be in strict conformance with the Department's written approval of the plans.

2. Change in Discharge

Whenever a facility expansion, production increase, or process modification is expected to result in a change in the character of pollutants to be discharged or in a new or increased discharge that will exceed the conditions of this permit, a new application must be submitted together with the necessary reports, plans, and specifications for the proposed changes. A change may not be made until plans have been approved and a new permit or permit modification has been issued.

3. Signatory Requirements

All applications, reports, or information submitted to the Department must be signed and certified by the official applicant of record (owner) or authorized designee.

## SECTION E. DEFINITIONS

1. *$BOD_5$* means five-day biochemical oxygen demand.
2. *TSS* means total suspended solids.
3. *FC* means fecal coliform bacteria.
4. *$NH_3$-N* means Ammonia Nitrogen.
5. *$NO_3$-N* means Nitrate Nitrogen.

6. *$NO_2$-N* means Nitrite Nitrogen.
7. *TKN* means Total Kjeldahl Nitrogen.
8. *Cl* means Chloride.
9. *TN* means Total Nitrogen.
10. "*Bacteria*" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and E. coli bacteria.
11. *Total residual chlorine* means combined chlorine forms plus free residual chlorine.
12. *mg/l* means milligrams per liter.
13. *ug/l* means micrograms per liter.
14. *kg* means kilograms.
15. *GPD* means gallons per day.
16. *MGD* means million gallons per day.
17. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.
18. *Composite sample* means a combination of samples collected, generally at equal intervals over a 24-hour period, and apportioned according to the volume of flow at the time of sampling.
19. *Week* means a calendar week of Sunday through Saturday.
20. *Month* means a calendar month.
21. *Quarter* means January through March, April through June, July through September, or October through December.

TETRA TECH EC, INC.

# Memorandum

Date: August 8, 2008

To: Anne Corcoran Briggs, Hearing Officer

From: Tetra Tech EC, Inc.

RE: Response NWLW letter dated June 17, 2007[8] of the Tetra Tech 2008 Report and Summary of Responses to Opponents' Comments

Tetra Tech submits this memorandum on behalf of the applicant in response to the Northwest Land and Water Inc. (NWLW) letter to the hearing officer dated June 17, 2007[8]. The NWLW letter was submitted into the record on behalf of project opponents reflecting NWLW comments on the Tetra Tech 2008 report "Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat", May, 2008 (TetraTech 2008 Report).

Following the responses to NWLW includes a summary of Tetra Tech's responses to significant rebuttals.

## I. NWLW Comments and Tetra Tech Responses

NWLW Comment No. 1

NWLW made the following statement:

> "TtEC's assertion No. 1: TtEC finds that the Yinger and NWLW report does not appear to properly address site-specific pumping scenarios for the proposed water supply wells because it is not appropriate to apply the USGS regional model for the Upper Deschutes Basin to determine localized impacts from pumping." (Page 1 of NWLW letter dated June 17, 2007[8])

Tetra Tech Response:

The USGS report (2004) states that the USGS model was designed to simulate and study **regional** hydrology and groundwater flow, and not localized hydrology and groundwater flow.

"When evaluating the results of these or any simulations, it is important to remember that model predictions reflect the error and uncertainty in the model. Model predictions are best used as general guides to help understand how the ground-water system will respond to new stresses and should not be considered exact." USGS 2004

This conclusion is also reflected in the OWRD mitigation program. As described in oral testimony provided by OWRD Region Manager Kyle Gorman at the hearing on July 15, 2008,

OWRD does not use the model for evaluating individual project impacts in connection with its review of water right applications. Instead, OWRD relies on the professional expertise of its staff in considering generalized data from the model and conducting a ground water review for each application.

Notwithstanding this general concern regarding use of the model to predict site-specific impacts of a single project, for purposes of responding to the Yinger and NWLW report, Thornburgh has provided additional analysis based on an assumption of Yinger's model conclusions. The results of that additional analysis were included in a response in a memorandum submitted to the hearing officer at the July 15, 2008 hearing (Tetra Tech 2008c). This memorandum shows that given Yinger's conclusions, if all water was consumed, the temperature difference in the Deschutes River is negligible, and the overall reduction in spring flow is less than 1 percent. The barely measurable temperature difference and flow is fully mitigated with the addition of cold water from Deep Canyon Spring, as is stated by ODFW (2008): "ODFW has determined that providing the proposed mitigation outlined in the ODFW June 2008 letter should mitigate for potential impacts on springs and seeps and provide a net benefit to the resource."

NWLW Comment No. 2

NWLW made the following statement regarding the Tetra Tech 2008 report:

> TtEC's assertion No. 2: Treating the formation as single homogenous unit, or breaking it down into only a few horizontal layers (as accomplished in the USGS model), is not appropriate for use at the small-scale proposed Thornburgh Resort project. (Page 1 of NWLW letter dated June 17, 2007[8])

Tetra Tech Response:

NWLW stated *"The hydraulic properties within each zone are the same (homogeneous) but the properties vary from zone to zone and from layer to layer…"* The zones near the resource area (6 pumping wells) cover large-scale areas; calibrated homogeneous (for regional) hydraulic properties may not be representative for site-specific conditions.

Regardless of the disagreement on the use of a regional model for a small scale local area, Thornburgh has shown that the pumping of water, whether using consumptive use volumes or total pumping volumes, are fully mitigated as verified in the ODFW letter dated June 13, 2008 (ODFW 2008) and as described in the Tetra Tech July memoranda (Tetra Tech 2008b, c) and Newton Consultants (2008) letter submitted to the hearing officer on July 15.

## II. Summary of Tetra Tech Responses to Comments by Opponents

Tetra Tech has responded in various submissions to comments by Yinger, NWLW and others. The following is a summary of key points:

- The Yinger and Northwest Land and Water, Inc. (NWLW) report (2008) use of the USGS model MODFLOW is useful for evaluating the hydrology on a regional basis. Additional site-specific data is required to determine potential impacts of pumping in the vicinity of the proposed resort.

- The Yinger and NWLW report (2008) demonstrates diminished stream flow, from utilizing MODFLOW, in a number of stream segments for the Deschutes River and Lower Whychus Creek, but does not provide a quantitative evaluation of changes to habitat quantity and quality as it relates to fisheries resource. However, the Tetra Tech 2008 report provides a quantitative evaluation on changes of habitat quantity and quality as it relates to fisheries resource due to the diminished stream flow in each segment.

- Based on the Tetra Tech and Newton Consultants Inc. (NCI) evaluations (Tetra Tech 2008a, b, and c, NCI 2008,) for mitigation for consumptive use, as well as mitigation assuming all water was consumed (Tetra Tech 2008a, b, c and NCI 2008), it was determined that the Thornburgh pumping activities, as mitigated, are unlikely to have an adverse effect on fish habitat quantity or quality, or to result in a net loss or net degradation of the resource. These mitigation flows benefit segments of the Deschutes River from Bend to nearly Lake Billy Chinook. Mitigation provided by Deep Canyon Creek compensates for reduction in cold water refugia due to spring flow reduction in Deschutes River.

- Lastly, USGS stated "When evaluating the results of these or any simulations, it is important to remember that model predictions reflect the error and uncertainty in the model. Model predictions are best used as general guides to help understand how the ground-water system will respond to new stresses and should not be considered exact." (USGS 2004) Tetra Tech fully agrees with this statement by the USGS and believes that the analyses and evaluation that have been performed by all consultants involved in this process offer only a general guide in determining the impact and necessary mitigation. Despite the level (i.e., theoretical or calculated) and form (model or mass balance) of analyses and evaluations provided by any of the consultants involved in this process, Yinger and NWLW, Clearwater BioStudies, Inc., Tetra Tech EC, or Newton Consultants Inc., the State of Oregon agencies responsible for assisting in the evaluation of impacts and mitigation for resources, the OWRD and the ODFW, have approved the required mitigation and determined that at the spatial scale at which the mitigation is implemented "should mitigate for potential impacts on springs and seeps and provide a net benefit to the resource." (ODFW 2008)

**REFERENCES**


Newton Consultants 2008. Newton Consultants July 15, 2008 Letter: Response to Anne Corcoran Briggs, Hearing Officer Relative to the Methodology for Determining Impacts to Deschutes River and Whychus Creek.

NWLW, 2008. Letter to Deschutes County Community Development Department, dated on June 17, 2008.

ODFW (Oregon Department of Fish and Wildlife). 2008. Letter to Ruth Wahl at Deschutes County Community Development Department from Amy Stuart, Deschutes District Watershed Manager at Oregon Department of Fish and Wildlife dated June 13, 2008.

Tetra Tech 2008a. Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat. Prepared for Thornburgh Resort Co. LLC. May 2008

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**THREE SISTERS IRRIGATION DISTRICT**

P. O. BOX 2230
SISTERS, OR 97759

541-549-8815 (OFFICE)
541-549-8070 (FAX)

August 11, 2008

Ruth Herzer
Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, OR 97701

Re: Thornburgh Resort Application

Dear Ms. Herzer:

I have been asked by Thornburgh Resort LLC to provide this letter for the county record on the Thornburgh application. Specifically, I wish to confirm that the Three Sisters Irrigation District (District) is willing to work with Thornburgh in providing 106 acre-feet of protected flow restoration in Whychus Creek, if additional mitigation is determined to be required for the resort. During 2009 to 2010 the District intends to proceed with the final phase of a multi-phase project for implementing water-saving conservation practices under the state's Allocation of Conserved Water Program. The water saved through the process will be transferred to the state for protection as instream flow in Whychus Creek. This restoration flow would be from water that is currently used for irrigation. By implementing efficiency measures, the "saved" water can be made available for instream flow restoration. The District has already implemented conservation measures resulting in approximately 3,000 acre-feet of water for instream flow under this program.

The final phase of the project is expected to provide approximately 500 acre-feet of additional water to restore and enhance stream flow in Whychus Creek. However, full funding for the final phase of the project has not yet been secured. If Thornburgh were required to provide additional mitigation on Whychus Creek, the District would welcome Thornburgh's contribution of funding for the planned conservation project in an amount reflecting the proportionate share of costs for 106 acre-feet of the total amount of conserved water.

The purpose of this letter is to confirm that it would be feasible for Thornburgh to work with the Three Sisters Irrigation District to obtain 106 acre-feet of mitigation water on Whychus Creek.

Sincerely,

Marc Thalacker,
Manager

## Kameron DeLashmutt

**From:** Deboodt, Tim [tim.deboodt@oregonstate.edu]
**Sent:** Monday, August 11, 2008 5:40 PM
**To:** John_Swanson@blm.gov; Kameron DeLashmutt
**Cc:** Bill_Dean@or.blm.gov; Greg_Currie@or.blm.gov; lynn.sharp@tteci.com; Pagel, Martha
**Subject:** RE: Juniper Info

Kameron,

Thanks for your interest in our research project and its implications to water use and policy. There are several publications that have taken research done on individual tree water use (transpiration for plant growth) and canopy interception (and subsequent evaporation) and attempted to extrapolate it to a landscape level.

In the publications below, you will find references to individual tree water use (30 - 50 gallons per day for trees > 12 inches dbh if soil moisture is available). Canopy interception is estimated to be an additional 20 - 50 percent of the annual precipitation for the site.
This information is then extrapolated to a per acre use and it is estimated that 9 - 35 large trees per acre can utilize or incept all the water delivered to a site in a 13 inch precipitation zone.

Our work on the Camp Creek Paired Watershed Study (north of Brothers, OR) has shown for the first two years after tree removal, we have observed significant (positive) changes in spring flow during late summer (the driest part of the year), an increase in the number of days of recorded ground water in shallow wells (19 - 27 ft deep) and an increase in late fall deep soil moisture (24 - 30 inches below soil surface). This study involves the long term monitoring of two sites, one control (no trees cut) and the other where we cut the trees after 12 years of pre-treatment monitoring. Both areas are approximately 250 acres in size. In the treated area we cut all post-European aged trees (140 year of age or less) and left the old growth trees. Our tree density ranged from 30 to 300 trees (taller than 4 feet) per acre.
These numbers have not been calculated to acre feet of water but the spring flow has increased approximately 3 - 6 gallons per minute in the late season (July - Sept) and ground water availability increased an average of 41 days per well since the trees were cut.

Here are the links to those publications.

I am going to recommend two on-line publications to you. The U.S. Forest Service, PNW Research Station has estimated acreage, biomass, and a whole lot of other gross data that tries to describe the "state of the state" for western Juniper. These publications also reference water use. I think these references will give you some of the answers you need.
http://www.fs.fed.us/pnw/pubs/pnw_rb249.pdf
http://www.fs.fed.us/pnw/pubs/gtr_464.pdf

Rick Miller's recent publication, "Biology, Ecology and Management of Western Juniper" Tech Bulletin 152, OSU Agricultural Experiment Station, 2005 is the most recent review of all the reported research on ecological impacts of western Juniper. Here is a summary of that publication:
http://www.ars.usda.gov/research/publications/publications.htm?SEQ_NO_115=174262

The on-line version of the whole publication is:
http://extension.oregonstate.edu/catalog/html/tb/tb152/tb152.pdf

The results of our study are published only in a dissertation. We will be working on

getting the results published in peer reviewed publications this fall. If you would like to read the dissertation I can send you a copy of it.

I hope that this information helps to answer your question. If other questions arise, don't hesitate to ask.

Tim

Tim Deboodt, Staff Chair
OSU Crook County Extension Agent
498 SE Lynn Blvd.
Prineville, OR 97754
541-447-6228
541-416-2115 (FAX)
tim.deboodt@oregonstate.edu

-----Original Message-----
From: John_Swanson@blm.gov [mailto:John_Swanson@blm.gov]
Sent: Monday, August 11, 2008 6:49 AM
To: Kameron DeLashmutt
Cc: Bill_Dean@or.blm.gov; Greg_Currie@or.blm.gov; lynn.sharp@tteci.com; Pagel, Martha; Deboodt, Tim
Subject: RE: Juniper Info

Kameron, I'll defer to Dr. Deboodt on this one. The questions you pose relate directly to his field of study for several years.

Thanks!

| | | |
|---|---|---|
| | "Kameron DeLashmutt" <kameron@bendcable.com> | |
| To | | <John_Swanson@blm.gov>, <tim.deboodt@oregonstate.edu> |
| | 08/10/2008 09:16 AM | |
| cc | | <Greg_Currie@or.blm.gov>, <lynn.sharp@tteci.com>, <Bill_Dean@or.blm.gov>, "Pagel, Martha" <MPagel@SCHWABE.com> |
| Subject | | RE: Juniper Info |

shrub/graminoid/forb, sage grouse habitat changes, or erosion reduction), I got pictures showing these outcomes from active rehabilitation activities on public juniper-occupied lands.

If there's people who don't believe that this juniper expansion thing in Central Oregon is real, I (as well as Dr. Deboodt) got pictures showing otherwise.

If you and/or your customers want the whole juniper story...from the many wonderful values of Old Growth Juniper... to the bio-physical/socio-economic risks that Post-European Settlement Juniper occupation can present.....without having to read through a dozen science articles..... I would encourage you all to view the Oregon-grown DVD titled "The Quiet Invasion". Either Dr. Deboodt or I can loan you (or your customers) a copy of this DVD to view.

Also, there's some very nice, easy-reading Juniper Ecology and Management pubs that Oregon State University/Eastern Oregon Ag Research Center has put out. If people want to delve into this topic more deeply.

Water is Life.

Thanks for asking.

John Swanson
416-6726 (Office)
447-1735 (Home)

"Glen Ardt"
<Glen.T.Ardt@state.or.us>
07/28/2008 10:02 AM

To "Paul Dewey" <pdewey@bendcable.com>
cc "<Lynn.Sharp@tteci.com>, "Steven George" <Steven.W.George@state.or.us>, "Amy Stuart" <Amy.M.Stuart@state.or.us>, <ruthw@co.deschutes.or.us>
bcc
Subject Eagle Crest Phase III

Paul,
You requested via a phone message a copy of the habitat assessment field inventory for the Eagle Crest Phase III development. I don't have a copy of it, Deschutes County might have it in their file. What the developer's consultant and ODFW did was to select evaluation species, conduct a field tour to assess habitat conditions, and then collectively assign a suitability index for each of the evaluation species for existing conditions. After information was provided as to the development footprint we collectived assigned a post development suitability index for each evaluation species. Then after mitigation measures were determined a post development with enhancement suitability index was assigned for each evaluation species to determine if "no net loss, net degradaton" was met. If not, additional mitigation measures were included.

As I mentioned before, we didn't request a full HEP with models and field measurements since our experience with Running Y in Klamath County, where we worked with the developer on a full HEP, resulting in the collaborative group tweaking the models and results until we got numbers that made sense. The Delphi method was used to adjust the models until the group obtained results that made sense. Each evaluation species model weights different habitat characteristics based on overall importance to the species, hence the tweaking until it made sense. If you want to review the Running Y HEP models, etc. I would think they would be in Klamath County's file. I also have a copy of the HEP here in the office if you want to stop by and review it sometime.

Glen Ardt - ODFW
Wildlife Habitat Biologist
61374 Parrell Road
Bend, Oregon 97702
541-388-6444 ex 230
541-388-6049 fax

# United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Prineville District Office
3050 N.E. 3rd Street
Prineville, Oregon 97754

IN REPLY REFER TO:

OR61170

Anne Corcoran Briggs
Deschutes County Hearings Officer
Deschutes County Community Development Department
117 NW Lafayette Avenue
Bend, OR 97701

Dear Ms. Briggs:

This letter provides a summary of the consultation and coordination between the Prineville District, Bureau of Land Management and Thornburgh Resort Company, LLC (TRC) and its affiliates with regards to TRC's Off-Site Habitat Mitigation and Monitoring Report.

Currently, the BLM is finalizing the Environmental Assessment for the Cline Buttes Recreation Area Plan (CBRAP), which is an implementation plan tiered to the Upper Deschutes Resource Management Plan, Final Environmental Impact Statement (UDRMP/FEIS). The CBRAP includes site specific implementation actions such as different vegetation treatment methods to maintain or restore desired wildlife habitat, designated road and trail systems, identification of routes to be decommissioned, and access controls/trailheads. The final version of the document is anticipated by late 2008, pending public review.

The BLM has provided input to TRC and the County on the types of mitigation actions that would be suitable to occur on BLM administered public lands. There are several areas within the 50-square mile Cline Buttes Recreation Area that are suitable for the types of habitat treatments and motor vehicle use management proposed by TRC in its off-site mitigation plan. These include the 4,099 acre Maston Area, which is designated closed to motor vehicles in the UDRMP, and the 4,200 acre area of canyons located east of Fryrear Road. These areas were designated as Primary and Secondary Wildlife Emphasis respectively in the UDRMP, which directs that management activities benefit wildlife habitat in these areas.

BLM has provided TRC with input on potential areas for mitigation, habitat treatments used during mitigation and monitoring to track effectiveness of vegetative treatments. The BLM believes that the vegetation management details provided to TRC, which are included in their Off-Site Habitat Mitigation and Monitoring Plan, would meet the wildlife and habitat resource management objectives of the UDRMP, and would help to ensure successful implementation of the CBRAP. As stated in our letter to Ruth Wahl, Deschutes County Community Development Department, dated April 21, 2008, the BLM anticipates the possibility that any support of funding provided for mitigation actions may be used as a match for additional grant funding, to allow larger scale benefits for public land management in the area.

Sincerely,

acting For

Molly M. Brown
Field Manager, Deschutes Resource Area

# OFF-SITE HABITAT MITIGATION AND MONITORING PLAN FOR THE THORNBURGH DESTINATION RESORT PROJECT

**August 2008**

**Prepared by:**

TETRA TECH

**1750 SW Harbor Way, Suite 400**
**Portland, OR 97201**

**For:**

**Thornburgh Resort Company, LLC**

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TETRA TECH

LUBA #2008-203

00417

## 1.0 Overview

The Thornburgh Resort Company, LLC (TRC) intends to develop a 1,970-acre Destination Resort in Deschutes County, approximately 4 miles west of Redmond, Oregon. Development of the resort will include the development of approximately 9 acres of associated access roads and transmission lines on public lands. Pursuant to the decision made by the Board of County Commissioners of Deschutes County approving the Conceptual Master Plan, TRC is required to submit to the Planning Division a wildlife habitat mitigation plan and written documentation from the Oregon Department of Fish and Wildlife ("ODFW") that the Plan satisfies the "no net loss or degradation" standard in Deschutes County Code ("DCC") Section 18.113.070(D). The Wildlife Mitigation Plan dated April 15, 2008 achieves that goal by imposing mitigation measures on the Destination Resort to ensure no net loss or net degradation of the affected wildlife resource. This Off-site Mitigation and Monitoring Plan is a supplement to the original Mitigation Plan and provides greater detail regarding how off-site habitat mitigation will be implemented and monitored to determine success.

This Mitigation and Monitoring Plan (Plan) has been developed in coordination with the Bureau of Land Management (BLM), Prineville Field Office. Currently, the BLM is in the process of finalizing the Cline Buttes Recreation Area Plan (CBRAP), which provides management direction to over 50 square miles of public land in the Cline Buttes region. Because the CBRAP is not yet final, the exact location where the proposed mitigation will take place could not be identified.[1] However, a broad, adaptive management approach, consistent with BLM policy and management objectives was used to structure this Plan. The objective of this Plan is to 1) outline the methods that will be used to characterize existing habitat conditions in the area proposed for mitigation, 2) specify the types of habitat treatments used to enhance habitat for wildlife, and 3) develop a monitoring plan that will monitor the effectiveness of the habitat treatments through either direct or indirect means. The methods used in this Plan have been structured such that they could be applicable to any parcel of land within the Cline Buttes Recreation Area (CBRA) that the BLM determines is suitable for mitigation once the CBRAP has been finalized.

The Upper Deschutes Resource Management Plan (UDRMP) provided general guidance for habitat management within the planning area and serves as a basis on which the CBRAP and this plan have been structured. Habitat management will vary based on the specific management objectives for individual areas. Different levels of priority are given to wildlife habitat, recreational use, visual resources and mineral development, depending on the land use designations within the CBRA. Generally, management objectives proposed to enhance wildlife habitat include treatments such as the thinning of sapling and young junipers, a focused shrub and weed management strategy, decommissioning of excess roads and trails within the planning area, and better management of OHV use. Each mitigation action is designed to enhance a specific habitat type including: juniper woodlands, juniper woodland with shrub understory, and shrub-grassland habitats.

[1] Unless otherwise stated, all further references to the CBRAP are to the draft CBRAP.

The BLM intends to restructure the off-road and trail network found throughout the planning area to redistribute vehicle and recreational use in order to minimize the impacts to native plants and restore habitat for wildlife. This Plan includes this type of treatment as a suitable form of mitigation that is consistent with the directives outlined in the UDRMP and objectives outlined in the draft CBRMP.

## 2.0 Cline Buttes Recreation Area Description

The CBRA is managed for a variety of land use purposes. The management actions emphasize ecosystem sustainability and health throughout the planning area while managing the expected increases in human population and use levels. The specific management actions are dependent on the land use designation and management objectives for the specific area. In areas where the maintenance or improvement of habitats to support healthy wildlife or plant communities has been designated as a management objective, the CBRAP (in accordance with the UDRMP) recognizes three levels, Primary Wildlife Emphasis Areas, Secondary Wildlife Emphasis Areas and General Wildlife Emphasis Areas. The total size and management guidelines for each of these areas differ within the CBRAP (**Table 1**).

**Table 1.** Management designations and guidelines for Wildlife Emphasis Areas within the Cline Buttes Recreation Area (BLM 2005).

| Management Type | Management Guidelines |
|---|---|
| Primary Wildlife Emphasis Area | • Habitat effectiveness should advance toward 70 percent or greater. |
| | • Where possible, maintain large un-fragmented patches (1,000 to 2,000 acres). |
| | • Where possible, manage for low densities of open motorized travel routes (approximately <1.5 mi/mi2) |
| | • Rate as high priority for habitat restoration treatments. |
| | • Group use restrictions may be applied in some areas or during some seasons. |
| | • Seasonal closures. |
| Secondary Wildlife Emphasis Areas | • Habitat effectiveness should advance toward 50 percent or greater. |
| | • Maintain moderate size un-fragmented habitat patches (400 to 800 acres). |
| | • Target low to moderate densities of open motorized travel routes (approximately <2.5 mi/mi2) |
| General Wildlife Emphasis Areas | • Consider focused management effort to maintain or improve the condition of important habitat areas ( i.e., nest nests of special status species, or connectivity corridors of species of local importance) |
| | • When opportunities arise, employ management actions that will maintain or improve wildlife habitat conditions. |

In consultation with the BLM, three general areas within the CBRAP have been suggested for mitigation (**Figure 1**). Mitigation treatments may occur in one of the areas listed below or a combination of several, depending on the BLM management priorities at the time mitigation is implemented. The location and brief habitat description follows each of the areas tentatively identified by the BLM for mitigation.

- Maston Allotment (Primary Wildlife Emphasis Area) - The 4,100 acre Maston area lies between Cline Falls Highway and the Deschutes River, and between Newcomb Road to the south and Eagle Crest Resort to the north. The area contains old-growth juniper habitat that provides habitat to an assortment of avian species, small mammals and mule deer habitat. Designated solely for non-motorized trail use in the UDRMP, the area may receive treatments that promote old-growth juniper, and enhance shrub and native grasses. Unauthorized roads and trails created by off-road vehicles may be decommissioned.

- Canyons Region (Secondary Wildlife Emphasis Area) - This 4,200 acre area is located adjacent to Fryrear Road, and includes Fryrear Canyon, Dry Canyon, and Deep Canyon south of State Highway 126. The area contains incised "slot" canyons that provide nesting habitat for raptors such as prairie falcons, golden eagles and provides critical winter habitat for the Metolius mule deer herd. The area may receive treatments that promote elk and deer habitat, raptor foraging and nesting habitat and decommissioning of unauthorized roads and trails created by off-road vehicles, as well as juniper removal and enhancement of herbaceous and shrub vegetation.

- Deep Canyon Region (General Wildlife Emphasis Area) - The 7,600 acre area north of State Highway 126 includes lands to the east and west of Buckhorn Road. This area was identified in the UDRMP for motorized use on designated roads and trails. The area may receive treatments that promote elk and deer habitat, raptors foraging and nesting habitat and restructuring the existing trail network to focus human use and minimize disturbance to wildlife and their habitats, as well as juniper removal and enhancement of herbaceous and shrub vegetation..

The scope and scale of each habitat treatment in the proposed Wildlife Emphasis Areas will differ and will depend on an *Ecological Site Inventory* (see *Section 3.0*) conducted in coordination with the BLM once specific areas for mitigation have been determined.

## 3.0 Baseline Data Survey

In order to effectively select the appropriate treatments within the area chosen for mitigation and to monitor the effectiveness of the habitat treatments, an initial baseline habitat survey will be conducted that inventories existing habitat conditions. The general methods used to collect baseline habitat conditions will follow methods used by the BLM to perform their *Ecological Site Inventory* assessments but will be altered, based on site-specific conditions (Habich 2001). The site-specific survey protocol and focal areas within the mitigation area will be selected during an initial site visit with BLM biologists. Vegetative production, species composition, canopy cover and composition by air-dry weight are common habitat variables used to conduct an ESI. General methods that will be used to characterize habitat conditions within the mitigation area will include some, but not necessarily all, of the following:

- Visual Estimates – The density of trees and shrubs may be estimated by evaluating the percent cover of the respective vegetation type over a predetermined area (i.e. acre). Ocular estimates may be interpreted by walking a

predetermined sample area and estimating the number of individuals of a certain age class ("mature" juniper trees over 11 feet, following Miller and Rose 1998 and Miller et al. 2005). The proportion of individuals of a certain vegetation type that occupies a specific area may be used to estimate percent cover within a sample plot. Experienced biologists may use this method to estimate the vegetative production of a particular plot (Habich 2001).

- Transects – Line transects or line intercept methods may be used to determine the density or percent cover of trees, shrubs or grasses. Density may be measured by counting the number of individuals of a species that touch the transect line while percentage cover can be estimated by measuring the length of the transect line that is occupied by each species (Bullock 2004). Depending on the number of soil-vegetation units within the mitigation are, transect design may be modified to included multi-legged transects.
- Frame Quadrats – The density, cover and frequency of occurrence of small shrubs and grasses may be estimated by placing frame quadrats throughout the sample area in a randomized arrangement.
- Direct Harvesting – To determine the productivity of vegetation using green or air-dried weight, a sample of shrubs, forbs or grasses may be taken and calculated by using the appropriate weight adjustment factor for that species (Habich 2001).

The number of samples (transects, quadrats) that would need to be replicated within the mitigation area to provide a statistically valid study will be determined once the specific mitigation area has been selected by the BLM. Data will be collected and reported using standardized procedures and data forms that are used by the BLM when conducting ESIs (Habich 2001).

## 4.0 Description of Mitigation Treatments

The desired conditions the habitat treatments in this mitigation plan aim to achieve have been outlined in the UDRMP, the draft CBRAP and during consultation with BLM field managers and biologists (BLM 2005, BLM unpublished, **Appendix A**). The BLM has proposed habitat management within three basic habitat types, old-growth juniper wood lands, shrub-steppe habitats with young juniper, and shrub-steppe habitats. Management actions within these habitat types will focus on four primary objectives including, 1) thinning young juniper trees from within old-growth juniper woodlands, 2) thinning young trees from shrub-steppe habitats, 3) reducing fuel loads (juniper trees and shrubs) within the Wildland Urban Interface (WUI), and 4) rehabilitation of heavily disturbed areas (e.g., unwanted roads, trails and parking areas). All methods used in these treatments would be designed to improve ecological condition and limit the amount and distribution of weeds and undesirable plants.

The proposed mitigation plan will use an adaptive approach to vegetation management that is consistent with the procedures outlined in the draft CBRAP. Adaptive management is described in the Bureau's Land Use Planning Handbook (H-1601-1) and the Department of Interior's Technical Guide on Adaptive Management. The BLM's Land Use Planning Handbook defines adaptive management as *"a system of management*

*practices based on clearly identified outcomes, monitoring to determine if management actions are meeting outcomes, and, if not, facilitating management changes that will best ensure that outcomes are met or to re-evaluate the outcomes."* An adaptive approach to vegetation management in the Cline Buttes Area is appropriate because, in some situations, there is a lack of information available to assist in accurately predicting the response of the existing plant communities to different types and levels of ground disturbing activities related to thinning woody plants, understory shrub enhancement and reducing fuel loadings (BLM unpublished). This method will give managers the ability to alter habitat treatments in space and time to adapt to the response of vegetation following treatments in order to successfully meet the desired habitat conditions for the area.

## 4.1 Process for Selecting Vegetation Treatment Methods

A variety of treatment methods will be used in the CBRA and will be specific to the location and depend on a variety of factors. The site-specific methods for each treatment will be selected based on three Decision Factors—vegetation type, Wildland Urban Interface (WUI) Band, and ecological condition of the particular site (BLM unpublished, **Table 2**). In addition, input from stakeholders, local residents, and adjacent communities will be sought during a comment period that will be initiated by the BLM (**Appendix B**). The Decision Factors are not mutually exclusive and cannot solely be considered as a determining factor that guides treatment methods.

**Table 2.** Decision Factors for determining treatment methods for vegetation enhancement within the Cline Buttes area (BLM unpublished).

| Decision Factors | | Definition | |
|---|---|---|---|
| Type and Amount of Woody Material | | *Old-growth juniper:* Located in areas where an average of six or more old growth trees per acre are present. Old-growth trees are 18 inches diameter at breast height. | |
| | | *Young juniper dominated shrub-steppe:* Located in areas within historically shrub-steppe habitats where young juniper dominates the canopy. | |
| | | *Shrub-steppe:* Located in areas where, on average, there are five or fewer old growth trees per acre present. | |
| Wildland Urban Interface (WUI) Bands | Band 1 | BLM administered public lands located within 600 feet of homes and private property (generally known as communities at risk). Band widths will vary according to site conditions. Will manage to prevent crown fire, and keep surface fuel flame lengths in the one to two foot range. | |
| | Band 2 | BLM administered public lands located approximately 600 feet to one-half mile of communities at risk). Band widths will vary according to site conditions. Will manage to reduce the occurrence, size, and intensity of fires, and keep surface fires with flame lengths in the three to four foot range. | |
| | Band 3 | BLM administered public lands located over one-half mile from communities at risk. Will manage these areas consistent with local Community Wildland Fire Protection Plans. Will manage to reduce the occurrence, size, and intensity of crown fires. Objectives place a higher emphasis on wildlife habitat. | |
| Ecological Condition | | Sites are categorized from 0-100% | Rates existing plant community composition against the Potential Natural Community (PNC) as determined from the NRCS ecological site descriptions. Ratings are a percentage from 0-100%. A rating of 0% means none of the plants in the potential natural community are present in the current plant community. A rating of 100% means all of the plants in the potential natural community are present in the current plant community, and in the same relative proportions. |
| | | 76-100% Excellent | |
| | | 51-75% Good | |
| | | 26-50% Fair | |
| | | 0-25% Poor | |

First, the decision process would begin by determining the vegetation type to manage. Vegetative types are generally divided into woodlands, shrublands, and areas where young junipers exist in shrub-dominated areas. Priority will be placed in areas with high densities of young juniper and/or thinning high densities of shrubs. However, some areas may require restoring degraded sites and not require thinning woody plants. The list of Performance Standards for vegetation treatments based on vegetation type is provided in **Appendix C**. The list of potential methods is to be used in conjunction with the WUI band and ecological condition of a particular site.

Next, the type of WUI Band where the proposed mitigation site is located would be considered. Based on the proximity to residential structures, the amount of fuels (woody debris) in WUI 1 and 2 would need to be low which may often require removing a larger amount of woody debris thus influencing the amount of ground disturbance. Unwanted woody debris would need to be physically removed from the site or burned on-site either in piles or by broadcast burns.

Finally, the ecological condition of a site will be considered. The ecological condition of each site will often direct the level of ground disturbance allowed and types of project design features used to minimize the negative effects of the management activities and aid the site toward recovery. The ecological condition of a site will be determined using BLM Prineville District's Ecological Site Inventory procedures (**Table 3**). The vegetation conditions outlined in this table have been developed by the Natural Resources Conservation Service (NRCS) and are used by the BLM to evaluate habitat Performance Standards that may guide future habitat treatments in the mitigation area.

**Table 3.** Ecological Site Descriptions from the Natural Resources Conservation Service‡ (NRCS, % Canopy Cover).

| Ecological Site | % Tree* | % Shrub | % Grass | Total |
|---|---|---|---|---|
| Droughty 8-12 | 8 | 19 | 47 | 74 |
| Droughty Pumice 9-12 | 0 | 13 | 57 | 70 |
| Lava Blisters 8-10 | 15 | 6 | 30 | 51 |
| Pumice Flat 10-12 | 23 | 19 | 58 | 100 |
| Sandy North 9-12 | 23 | 31 | 46 | 100 |
| South 10-12 | 15 | 13 | 48 | 76 |
| Shallow North 10-12 | 23 | 13 | 59 | 95 |
| Of 7 Woodlands Ave % = | 15 | 16 | 49 | 81 |

‡ *Source:* http://esis.sc.egov.usda.gov/Welcome/pgReportLocation.aspx?type=ESD
*Greater than or equal to 10% canopy cover and approximately 5 – 6 old growth juniper tree/acre = woodland.

***Public Involvement***

In addition to the Decision Factors, public input will be solicited by BLM through public outreach to partners, local residents, adjacent communities, and through the Community Wildfire Protection Plans (CWPP; see www.projectwildfire.org for the complete CWPP documents for central Oregon). Based on the outcome of the three Decision Factors and input from the public, selected tools/methods may be applied (**Appendix D**). The array of tools/methods available and associated disturbance ratings is provided in **Appendix E** while reference to the approved seeding mixtures for each disturbance rating is found in **Appendix F.**

Prior to treatment of habitats, the area will be evaluated using the three Decision Factors, considerations gathered from public comments and will be consistent with management objectives outlined in the UDRMP and CBRAP (BLM 2005, BLM unpublished). The habitat treatment will be coordinated with a comprehensive weed management strategy as discussed in *Section 4.5.*

The following describes the types of treatments that may occur within the general habitat types including their expected benefit to wildlife species.

### 4.2 Old-Growth Juniper Woodland

Old-growth juniper woodlands are defined as areas with an average of six or more old growth trees per acre that are at least 18 inches diameter at breast height. Sapling and young junipers are defined as trees less than 11 feet tall with intact crowns and vigor (following Miller and Rose 1998 and Miller et al. 2005). Thinning of young juniper that does not meet old-growth criteria is proposed throughout the Cline Buttes area to meet the desired habitat conditions for that area. In areas where the shrub understory is not fully developed and is composed primarily of bare ground, rock, mosses, lichen and sparse bunchgrasses, thinning of young junipers will reduce juniper dominance at local and community levels, thus allowing the establishment of understory shrub and grass communities by reducing the competition for water and nutrient resources. At least 75% and up to 95% of young junipers would be thinned per acre with several trees retained in order to promote stand recruitment or in order to fulfill other management objectives consistent with recreation management or visual resource management. The desired future conditions for shrub canopy cover would be 5-15%, while native grasses and other forbs would be managed between 25-50% canopy cover (BLM unpublished)

Slash and downed trees may be left in place to decompose or gathered in slash piles, burned, chipped or removed from the area, depending on the existing fuel loads and WUI band. On slopes where sediment runoff and erosion is a consideration, slash may be locally dispersed to counter nutrient and sediment loss. In addition to retaining nutrient and organic matter from felled junipers, coarse woody debris can act as cover objects for western fence lizards (*Sceloporus occidentalis*) and small mammals. Slash placed in areas of bare ground can help foster grass and forb growth by providing shelter and nutrients.

Thinning or removing juniper improves invertebrate food and vegetation cover for western fence lizards and small mammals, by increasing shrub and herbaceous recruitment and seed production which lizards and small mammals respond to positively (Willis and Miller 1999, Bates et al. 2000). Increased populations of insects, small mammals, and reptiles would provide an increased prey base for raptors, including the American kestrel (*Falco sparverius*) and red-tailed hawk (*Buteo jamaicensis*). In addition, the removal of young junipers will open the understory, increasing the distance between trees thus allowing more space for raptors such as red-tailed hawks to hunt. Increased herbaceous and shrub cover will also increase insect populations providing food for species such as mountain bluebirds (*Sialia currucoides*), Oregon dark-eyes juncos (*Junco hyemalis*), Townsend's solitaires (*Myadestes townsendi*), chipping sparrow (*Spizella passerina*) and northern flicker (*Colaptes auratus*). Snags are to be left standing as they provide optimal habitat for cavity-nest species such as kestrels, nuthatches, chickadees, bluebirds, flickers and other woodpeckers; and where possible, recreational trails designed cooperatively with the BLM will be routed to avoid snags and trees with nesting cavities.

### 4.3 Young Juniper Woodland with Shrub Understory

Thinning of young junipers will reduce juniper encroachment at community levels and promote understory shrub and grass communities by reducing the competition for water and nutrient resources. Primary areas to receive mitigation are areas historically

considered shrub-steppe habitat or where the shrub understory is currently established and is composed primarily of mountain big sagebrush (*Artemisia tridentata vaseyana*), rabbitbrush (*Chrysothamnus* spp.) bitterbrush (*Purshia tridentata*) and woody forbs and grasses. These areas are typically found along the interface of old-growth juniper woodlands and shrub-steppe habitat. Although this transition zone typically has an established shrub understory, juniper thinning is expected to further enhance these areas, as well as expand further into juniper woodlands. All juniper trees meeting the characteristic of old-growth trees will be retained. Removal of junipers to enhance shrub understory follows the same methods as those to enhance old-growth juniper woodlands.

By promoting a diverse shrub understory within woodlands, resources such as cover for a variety of reptiles, small mammals and ground-nesting birds will be enhanced. Invertebrates, seeds, fruits, and browse are expected to increase. Increased populations of prey species will in turn provide increased prey for predators.

Western fence lizards have been shown to respond positively to an increase in grass and forb production, coarse woody debris and cover objects (Block and Morrison 1998). In juniper woodland systems, Miller (2001) notes additional habitat characteristics such as anthills and rock outcrops have a greater influence on the abundance and diversity of reptiles than the presence or absence of juniper trees.

Maintaining low densities of juniper in portions of the Cline Buttes Area will increase the abundance, diversity and richness of avian and small mammal populations by improving food and cover resources during breeding and non-breeding seasons (Miller et al. 2005). Several studies underscore the importance shrub cover has on small mammal abundance such as: piñon mice (*Peromyscus truei*), deer mouse (*Peromyscus leucopus*) and Ord's kangaroo rat (*Dipodomys ordii*) (Elmore 1984), and the removal of juniper on small mammal abundance, provided the slash remains (Willis and Miller 1999).

Use of juniper woodlands by mule deer (*Odeocoieus hemionus*) during winter increases in central Oregon. The juniper woodlands provide thermal cover, forage and shelter (Leckenby and Adams 1986). Leckenby et al. (1982) defined optimal thermal cover for mule deer in western juniper zones as "stands of evergreen or deciduous trees or shrubs, at least 1.5 m tall, with crown closure greater than 75 percent." However, increased juniper dominance across the landscape has been shown to result in a decline of cover and browse resources, such as sagebrush and bitterbrush used by deer and elk (Schaefer et al. 2003). Leckenby and Adams (1986) found that juniper woodland communities with 30 percent tree canopy cover contained decadent shrubs and scarce forage. To provide suitable thermal cover for deer during winter while maintaining a density of junipers conducive for shrub propagation and growth; "islands" of trees with canopy cover may be considered, typically on northwest facing slopes.

### 4.4 Shrub-Steppe

The proposed treatment in this habitat would remove all young juniper trees currently growing in historically shrub-steppe habitats, and consequently increase the amount and distribution of shrub-steppe habitats. Throughout the CBRA, shrub-steppe habitats have young junipers growing in them that alter the ecosystem function of the habitat type. Removing young junipers from shrub steppe habitats will maintain the existing shrub-

steppe habitat or return areas back to a shrub-steppe habitat. This will reduce the chance for canopy fires and, when combined with shrub thinning, will reduce the potential for high intensity fires and increase the ability for fire fighters to safely fight wild fires. Reduction of shrub cover would be initiated when shrub canopy exceeds its natural density based on the NRCS Ecological Site Descriptions (**Table 3**). Shrub cover would be thinned when it approaches 25 percent, and the percent cover post treatment could range from 5 to 25 percent (average 16%). Also reducing the amount of shrub cover where it occurs in high amounts ($\geq$ 25%) will help move sites toward earlier seral stages and allow for greater grass and forb component to return, increase the structural and species diversity, and rejuvenate decadent shrubs (e.g., bitterbrush).

Reestablishment of native plant communities in these shrub and grassland enhancement areas may be done by seeding them with a combination of native grasses and forbs, following BLM-approved seeding mixtures (**Appendix F**). Short-term disturbance and temporary loss of forage for some species will occur, but this will not be significant, especially considering the long-term benefits of restoring native shrub-grassland habitat.

Several bird species benefit from a diverse matrix of shrub-grassland and juniper woodlands. In south central Oregon, mountain bluebird densities were greatest in shrub communities adjacent to old-growth juniper woodlands (Miller 2001). A host of bird species rely on juniper berries as food during the winter, including bluebirds whose densities during the winter are closely related to berry density (Solomonson and Balda 1977).

Patches of open, shrub-steppe habitat located adjacent to juniper woodlands provide wildlife with various benefits. Deer in southeast Oregon prefer open patches of mountain big sagebrush with a canopy cover greater than 23 percent as fawning habitat (Sheehy 1978). In Sheehy's study, the majority of fawning sites were within 164 feet of juniper woodland or aspen grove.

### *4.4 Unimproved Road and Trail*

The UDRMP and CBRAP describe a multi-use approach that includes management objectives that enhance both wildlife habitat and public recreation areas. Land use objectives within the UDRMP and consistent with the CBRAP will be considered during the selection and implementation of the habitat treatments. An extensive network of unauthorized and unimproved roads is present throughout much of the Cline Buttes area. Roads include single-tracks: those created by motorcycles, horses and hikers; and two-tracks: those created by all-terrain vehicles (ATV), and passenger vehicles such as trucks. Decommissioning excess roads, maintaining an established network of corridors used for recreation and reestablishing native vegetation in areas disturbed by ATV use will minimize the impact unauthorized recreational travel has on habitats and surrounding wildlife.

Excess roads can be identified as those that are parallel to established corridors, roads that dead end, many (3-4 roads) leading to the same location, or multiple loops in similar areas. Decommissioning of these roads may include blocking entrances with boulders or brush (possibly juniper slash), mechanical disruption of compacted soils, and seeding of native grasses and forbs during designated periods. Depending on each site's condition

and the potential for recovery using only native seed mixes, some non-native plants may be used to assist in the rehabilitation of the site and reduce the abundance of cheatgrass and rabbitbrush (BLM unpublished, **Appendix F**).

Prior to ground treatments, public notices including signage and pamphlets may be utilized in order to promote compliance. Signage posted at established trailheads and along trails to direct users may be posted and maintained. Maintenance of an established road system throughout the CBRA is crucial to preventing future unapproved roads from being created.

Benefits to all wildlife during the breeding and non-breeding seasons from removing excess roads and limiting motorized travel to established roads are expected and include: the decreased noise disturbance created by OHV, direct disturbance to vegetation from road widening and creation of new roads, and a decrease in habitat fragmentation. Benefits to wildlife from this treatment also include increased cover and browse created from the revegetation that is anticipated in these areas.

### *4.5 Weed Control*

There has been limited research on the relationships between western juniper expansion and weeds (Miller et al. 2005), however, in nearly every juniper and range management strategy, noxious weed treatment and management is identified as being vital to meeting management objectives (Bedell et al. 1993, Eddleman et al. 1994, Miller et al. 2005). Cheatgrass (*Bromus tectorum*), tall tumblemustard (*Sisymbrium altissimum*) and other non-native plant species have formed localized monocultures in many parts of the CBRA, particularly in woodland interspace, underneath individual juniper trees and interspersed within shrub-grassland habitats.

All treatments would be in accordance with the UDRMP (2005), *Prineville District Integrated Weed Management Environmental Assessment* (1994), and *Vegetation Treatment on Bureau of Land Management Lands in the Seventeen Western States Programmatic Environmental Report* (USDI-BLM 2007).

All ground-disturbing and prescribed fire activities would assess the risk of introducing or spreading weeds. Integrated weed management strategies would be incorporated into the planning, design, implementation, monitoring, and follow-up actions of all projects.

Integrated weed management strategies for noxious weeds would incorporate some or all of these elements: detection, inventory, prevention, containment, control, eradication. Strategies may also target other undesirable vegetation such as exotic annuals and rabbitbrush as appropriate and operationally feasible.

A balanced and integrated ecosystem approach for management of noxious weeds and other undesirable vegetation could include one or more of the following techniques: cultural, manual, mechanical, prescribed fire, competitive seeding, biological, and chemical.

The following actions would be common to all operations:

- Spot removal of localized weed infestations within woodland interspace and under juniper trees, using BLM approved herbicides;

- Prior to arriving at a fuels treatment unit, contractors would be required to wash vehicles and equipment to remove noxious weed seeds from the vehicle/equipment, including undercarriage. This would only apply to vehicles/equipment that has been outside the project area. Once the vehicle/equipment has been washed, no further washing would be required, so long as the vehicle remained in the project area;
- Contractors would be given noxious weed information at pre-work meetings and asked to report any populations of noxious weeds in or near work areas. Any weed sighting information would be forwarded to the District Noxious Weed Coordinator for follow-up action;
- When seeding with native or non-native seed occurs, seed lots would be obtained from a certified weed-free source;
- Preventing the introduction and spread of noxious weeds by performing periodic weed surveys and removing them;
- Treatments would be monitored for spread of weeds or new populations. If significant increases in weeds were detected, appropriate corrective action would be applied in consultation with the BLM.

## 4.6 Application of Best Management Practices During Habitat Treatments

Best management practices (BMP) are defined in the BLM Land Use Planning Handbook, H-1601-1, Glossary, as "*a suite of techniques that guide, or may be applied to, management actions to aid in achieving desired outcomes.*" The implementation of BMPs will be implemented during all treatments, mechanized and non-mechanized. They will include guidelines outlined in the UDRMP, CBRAP and BLM Land Use Planning Handbook and include construction measures that conserve threatened and endangered wildlife, vegetation, soil, water, recreation, cultural and aesthetic resources. These measures may include construction timing stipulations, spatial restrictions or other Project Design Features (PDF) outlined in federal documents listed above. A draft list of BMPs and PDFs is listed in **Appendix G**.

## 4.7 Additional Mitigation Measures

Additional offsite mitigation measures proposed are the funding for the maintenance of two existing wildlife guzzlers in the Cline Buttes area.

Under the Mitigation Plan, TRC would provide funds for the repair and maintenance for two existing wildlife guzzlers in the CBRA. Maintenance of the guzzlers would provide water resources to deer, elk, and other birds and mammals in the greater CBRA. The wildlife guzzler program would be included in the long-term annual maintenance program.

## 4.8 Mitigation Payment Schedule

TRC will provide $863,190 (based on a 2009 dollar value) for the implementation of wildlife habitat enhancement on lands within the Cline Buttes Planning Area, to mitigate

Resort development impacts to existing wildlife values that occur within the Property boundary and within 1 mile of the property boundary, plus an additional $20,000 to compensate for increased traffic on Cline Falls Highway and described in the on-site mitigation plan (TtEC 2008), for a total of $883,190. TRC will provide funding in phases, in order to maintain the no-net-loss and no-net-degradation standard on the Property, as set forth below. The amount of any unspent portion of the $883,190 shall be adjusted annually, according to the U.S. Bureau of Labor Statistics Consumer Price Index for all Urban Consumers for the Portland-Salem, Oregon area).

*Initial Funding for Mitigation.* As TRC develops each phase it will incur an obligation to provide a pro rata share of mitigation funds for that phase. The amount shall be calculated by taking the number of acres in the phase and multiplying by $448, which is the amount of mitigation funds per acre required on the Resort. This is calculated by dividing the total funds ($883,190) by the total acreage (1,970 acres). As an example, if a particular phase has 200 acres, then the mitigation funding needed for that phase is 200 acres x $448/acre or $89,664.

*Continuing Funding for Mitigation.* TRC shall have a transfer fee collected in perpetuity from both the seller and the buyer of real estate for each real estate transaction. This transfer fee will be $1,000, shared equally by buyer and seller at the time that the transaction closes. The transfer fee proceeds will be applied as needed to discharge in full TRC's obligation for ongoing mitigation.

## 5.0 Monitoring Plan

Following the habitat treatments, an annual monitoring plan will be implemented in order to determine the effects of the habitat treatments and to monitor progress. The proposed monitoring plan will use an adaptive approach to vegetation management consistent with the procedures and habitat Performance Standards outlined in the draft CBRAP. As previously mentioned, BLM defines adaptive management as *"a system of management practices based on clearly identified outcomes, monitoring to determine if management actions are meeting outcomes, and, if not, facilitating management changes that will best ensure that outcomes are met or to re-evaluate the outcomes."*

Monitoring will occur once annually for a period of five years following the habitat treatment. Five years represents a common monitoring period for many environmental monitoring studies, both terrestrial and aquatic. Monitoring surveys will be conducted during the growing season and use similar methods and be conducted at sample locations similar to those used during the initial ecological inventory survey of the mitigation site. Post-mitigation surveys will use the same methods as the pre-mitigation inventory to determine whether the desired, pre-established vegetative and other habitat characteristics of the mitigation area have been achieved. These standards will be based on the BLM UDRMP and the draft CBRAP.

Results of the monitoring surveys will be provided in an annual monitoring report, which will be submitted to the BLM and ODFW for annual review. A BLM or ODFW biologist may perform field verifications at the mitigation area to ensure treatments are within the Performance Standards outlined in the CBRAP. If habitat conditions are outside the Performance Standards outlined by the BLM, additional habitat treatments will occur

following consultation with the BLM. After five years, provided the habitat conditions in the mitigation area have stabilized, the interval between monitoring surveys will be reconsidered with BLM and ODFW.

### 5.1 Monitoring Payment Schedule

Funds that are estimated to initiate the mitigation plan and detailed in *Section 4.8* also includes a rough estimate of annual maintenance and monitoring, $41,000 per year, which TRC will also fund through the transfer fee described in *Section 4.8.* To demonstrate compliance with its mitigation obligations, TRC shall prepare an annual report for Deschutes County, BLM and ODFW by December 31, which describes the mitigation tasks completed and associated expenditures. TRC, Deschutes County, ODFW, and BLM will meet annually to review and confirm that mitigation is being implemented as designed until mitigation is fully completed and a funding source is in place to assure long-term maintenance is established. Any of these entities may perform an annual inspection upon request.

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**Figure 1.** BLM lands proposed to receive mitigation.





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# Figure 1. BLM Lands Proposed to Receive Mitigation




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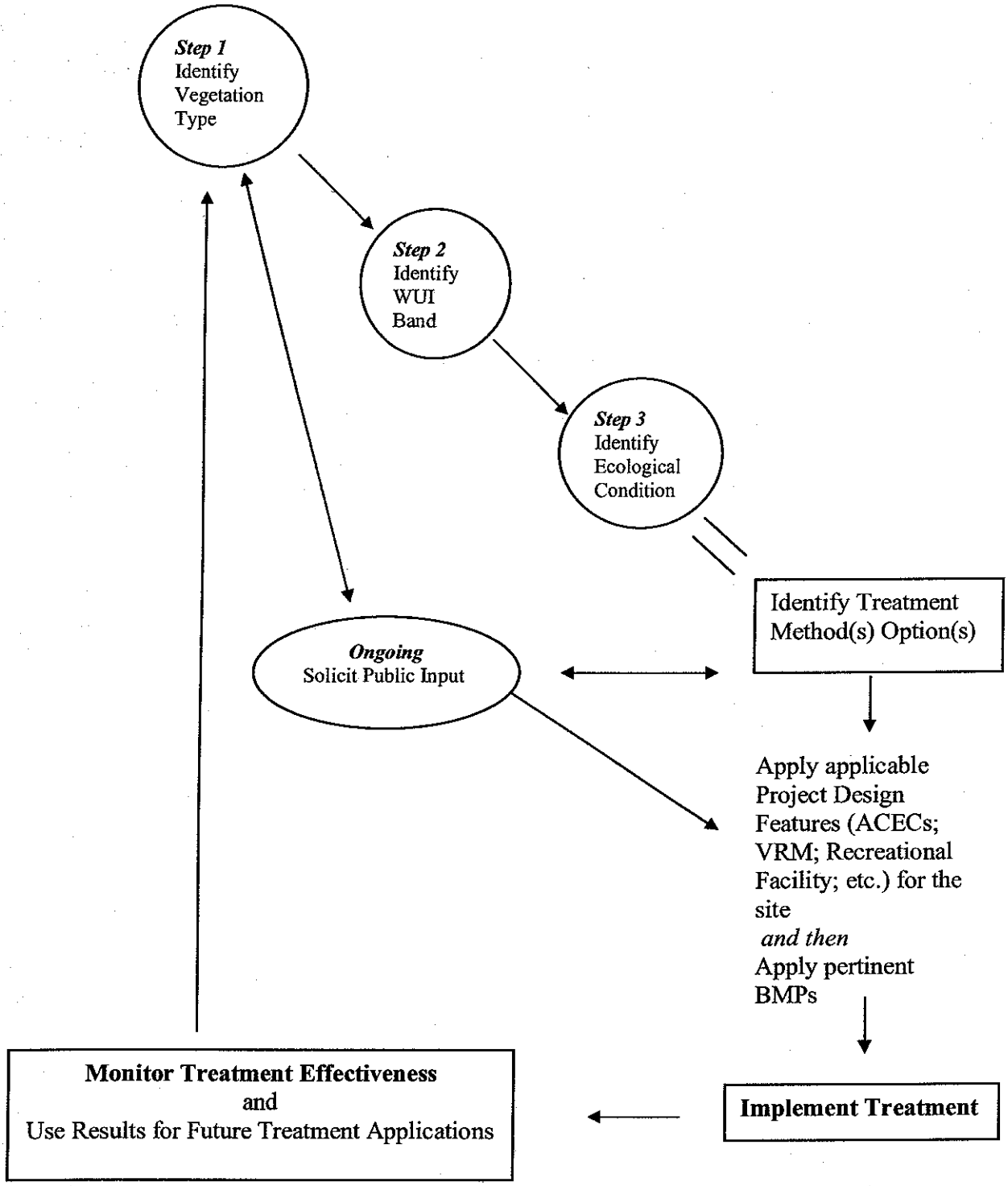
**Appendix A.** Individuals involved in developing the Thornburgh Off-Site Mitigation and Monitoring Plan.

| |
|---|
| **Bureau of Land Management** |
| Molly Brown<br>Deschutes Resource Area Manager |
| Bill Dean<br>Field Manager and Wildlife Biologist |
| Greg Currie<br>Recreational Resources Manager |
| Ed Horn<br>Soil Scientist and ESI Lead |
| **Tetra Tech EC, Inc.** |
| Lynn Sharp<br>Senior Ecologist and Project Manager |
| Erik Jansen<br>Wildlife Biologist |
| Eric Lubell<br>Geographic Information Systems Analyst |
| **The Thornburgh Resort Company** |
| Karmeron DeLashmutt<br>Project Developer |
| **Schwabe, Williamson & Wyatt** |
| Peter Livingston<br>Attorney |
| Myles Conway<br>Shareholder |
| Martha Pagel<br>Attorney |

**Appendix B.** Draft schematic for selecting a site-specific treatment (*Source*: BLM unpublished).



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**Appendix C.** Vegetation type, desired conditions and proposed habitat treatments.

| Vegetative Classification | Current Condition Ave. | Current Condition Range | Desired Future Conditions | Proposed Treatment Prescription |
|---|---|---|---|---|
| **Old Growth Juniper** | | | | |
| Total Canopy | 18% | 0 – 30% | 10-15% | Reduce tree canopy from approximately 3 to 15 percent. |
| Old growth juniper-Trees Per Acre (TPA) | 11 | 0 – 32 | Ave. 11 TPA: ranges from 0-32 TPA | Retain all old growth trees. |
| Young juniper- TPA | 39 | 0 – 96 | 01 TPA | Thin up to 95 trees per acre (tpa) or an average of approximately 38 tpa. Retain about one tps for recruitment purposes. |
| Shrub-percent cover | 21% | 6 – 78% | 5-25% | Manage for 5-15% canopy cover (CC). May maintain, decrease or increase depending on existing condition and ecological site. When CC approaches 25% consider reducing. Reduce canopy cover from approximately10 to 53 % CC. |
| Native grass and forbs-percent cover | 50% | 13 – 91% | 25-50% | Manage for ≥25-50% canopy cover of native grasses and forbs. May maintain, increase or change species composition depending on ecological site and existing conditions. |
| Cheatgrass- percent cover | 15% | 2 – 45% | 0-5% | Decrease by 2 to 45%. |
| Rabbitbrush-percent cover | 6% | 0 – 42% | 0-2% | Decrease when moderate to high amounts and maintain low amounts. |
| **Shrub-steppe**, dominated by young juniper | | | | |
| Total Tree Canopy | 7% | 0-23% | 0-1% | Decrease young tree cover by 1-23% |
| Old growth junipers-TPA | 1% | 0-8 | A few scattered trees (minor component) | Retain all old growth trees. |
| Young juniper-TPA | 47% | 9-104 | 0 | Thin between 9 to104 tpa. |
| Shrub-percent cover | 29% | 7-85% | 5-25 | Maintain, decrease or increase depending on existing. When % cc approaches 25% consider reducing. May reduce canopy to approximately 5-15%. |
| Native grass and forbs- percent cover | 42% | 5-81% | ≥40-50% | Manage for ≥40-50%. May maintain, increase or change species composition depending on ecological site and existing conditions. |
| Cheatgrass- % cover | 23% | 1-64% | 0-5 % | Decrease % CC by 1-64%. |
| Rabbitbrush-percent cover | 9 | 0-66 | 0.5-1.5% | Decrease when moderate to high amounts and maintain low amounts. |
| **Shrub-steppe**, dominated by shrubs and grasses | | | | |
| Total tree canopy-percent cover | 5 | 0-11 | Existing | Thin all young trees. |
| Old growth juniper-TPA | 1 | 0-4 | Maintain existing | Retain all old growth trees. |
| Young juniper- TPA | 22 | 0-56 | 0 | Thin between 1-56 tpa. |
| Shrubs- percent cover | 33% | 4-50% | 5-25% | Maintain, decrease or increase depending on existing condition. When % CC approaches 25% consider reducing. May reduce canopy to 5-15%. |
| Native grass and forbs- percent cover | 31% | 9-74% | >40-50% | Manage for ≥40-50%. May maintain, increase or change species composition depending on ecological site and existing conditions. |
| Cheatgrass- % Cover | 35% | 8-64% | 0-5 % | Decrease by 8-64% CC |
| Rabbitbrush- % Cover | 14% | 0-30% | 0.5-1.5% | Decrease when moderate to high amounts and maintain low amounts. |



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**Appendix D.** Treatment methods based on Ecological Condition, Wildland Urban Interface (WUI) Band, & Disturbance Levels* (Source: BLM unpublished).

| Ecological Condition | WUI Band | Disturbance Levels and Management Options | | |
|---|---|---|---|---|
| **Excellent** | | **LOW** | **MODERATE** | **HIGH** |
| | 1 | All options, (S1,2) | All options except CR, FB, MP, SB, (S1-3) | No "High" options allowed. Defer to "Low" or "Moderate" options. (S1-3) |
| | 2 | All options, (S1,2) | All options except D, FB, M, MP (S1-3) | No "High" options allowed. Defer to "Low" or "Moderate" options. (S1-3) |
| | 3 | All options except SW (S1,2) | All options except FB, MP, WCP (S1,2) | No "High" options allowed. Defer to "Low" or "Moderate" options. (S1,2) |
| **Excellent/Good** | 1 | All options, (S1,2) | All options except CR, FB, MP, SB, (S1-3) | No "High" options allowed. Defer to "Low" or "Moderate" options in Table TM. (S1-3) |
| | 2 | All options, (S1,2) | All options except D, FB, M, MP (S1-3) | No "High" options allowed. Defer to "Low" or "Moderate" options. (S1-3) |
| | 3 | All options except SW (S1,2) | All options except FB, MP, WCP (S1,2) | No "High" options allowed. Defer to "Low" or "Moderate" options. (S1,2) |
| **Good** | 1 | All options, (S1-3) | All options except CR, FB, SB (S1-3) | All options except FB, SK (S1-3) |
| | 2 | All options, (S1-3) | All options except FB (S1-3) | All options except FB, SK (S1-3) |
| | 3 | All options, (S1-3) | All options except FB, WCP (S1-3) | All options except FB, SK (S1-3) |
| **Good/Fair** | 1 | All options, (S1-4) | All options except CR, MP, PB, SB (S1-4) | All options except CR, MP, SK (S1-4) |
| | 2 | All options, (S1-4) | All options except CR, MP, PB, SB (S1-4) | All options except CR, MP, SK (S1-4) |
| | 3 | All options except HP (S1-4) | All options except CR, MP, PB, SB (S1-4) | All options except CR, MP, SK (S1-4) |



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| | | | | |
|---|---|---|---|---|
| **FAIR** | 1 | All options except HP, (S1-5) | No "Moderate" options allowed. Defer to "Low." (S1-5) | No "High" options allowed. Defer to "Low." (S1-5) |
| | 2 | All options except HP (S1-5) | No "Moderate" options allowed. Defer to "Low." (S1-5) | No "High" options allowed. Defer to "Low." (S1-5) |
| | 3 | All options except HP (S1-4) | No "Moderate" options allowed. Defer to "Low" options in Table TM. (S1-4) | No "High" options allowed. Defer to "Low" options in Table TM. (S1-4) |
| | | | | |
| **FAIR/POOR** | 1 | All options except HP, (S1-5) | No "Moderate" options allowed. Defer to "Low." (S1-5) | No "High" options allowed. Defer to "Low." (S1-5) |
| | 2 | All options except HP (S1-5) | No "Moderate" options allowed. Defer to "Low." (S1-5) | No "High" options allowed. Defer to "Low." (S1-5) |
| | 3 | All options except HP (S1-5) | No "Moderate" options allowed. Defer to "Low." (S1-5) | No "High" options allowed. Defer to "Low." (S1-5) |
| | | | | |
| **POOR** | 1 | All options (S1-5) | All options (S1-5) | All options (S1-5) |
| | 2 | All options (S1-5) | All options (S1-5) | All options (S1-5) |
| | 3 | All options (S1-5) | All options (S1-5) | All options (S1-5) |

* Note – The level of disturbance associated with the use of a particular tool will vary depending upon the ecological condition of the site. For example, certain tools may be more appropriate to use in ecological conditions ranked "excellent" whereas the same tools would be less appropriate to use in ecological conditions ranked "fair." The disturbance level ratings for particular treatment methods are identified in **Appendix E and F.**



TETRATECH

LUBA #2008-203

00439

**Appendix E.** Treatment methods and disturbance levels rating. Reference letters coincide with proposed treatments outlined in Appendix D (*Source*: BLM unpublished).

| Low | Reference Letter | Moderate | Reference Letter | High | Reference Letter |
|---|---|---|---|---|---|
| ATV-broadcast seed | AB | ATV w/ arch | AA | | |
| Bundler | B | Prescribed Broadcast Burn | PB | | |
| Chainsaw (hand) | C | Crushing | CR | Crushing | CR |
| Chemical | CH | Drill & Harrow | D | | |
| Forwarder | F | Forwarder | F | | |
| | | Feller-Buncher | FB | Feller-Buncher | FB |
| Helicopter | H | Hydro-axe | HA | Hydro-axe | HA |
| Hand Brush Cutter | HB | Harvester | HV | | |
| Hand Pile Burn | HP | Mower | M | Mower | M |
| Hydro-seed | HS | Machine Pile Burn | MP | Machine Pile Burn | MP |
| Lop & Scatter | LS | | | | |
| Portable Chipper | PC | | | | |
| Skyline | S | | | | |
| Slash-buster | SB | Slash-buster | SB | | |
| Swamper Burn | SW | | | | |
| Wood Cutter (Commercial) | WCC | Wood Cutter (personal) | WCP | Skidder | SK |

**Appendix F.** Seeding mixtures for various levels of proposed ground disturbance. Seeding levels reference codes used in Appendix D (*Source*: BLM unpublished).

| Seeding Code | Seedling Type |
|---|---|
| S | Seeding mixture |
| 1 | no seeding |
| 2 | 100% native plants |
| 3 | More than 50% of seed will be native, and the rest could be non-native |
| 4 | Less than 50% of seed will be native the rest will be non-native |
| 5 | 100% of seed will be non-native |

**Appendix G.** Draft Best Management Practices

Below is a list of Best Management practices and Project Design Features that may be implemented during each of the proposed treatments in the Thornburgh Mitigation and Monitoring Plan. Best management practices are defined in the BLM Land Use Planning Handbook, H-1601-1, Glossary, as "*a suite of techniques that guide, or may be applied to, management actions to aid in achieving desired outcomes.*"

**BEST MANAGEMENT PRACTICES**

***Best Management Practices for Mechanized Operations:***

- Methods may have short-term negative effects to soil and vegetation, but would be designed to have long-term benefits to soil structure and productivity and desired future plant community development.

- Machine operations would be timed to minimize adverse impacts to resources or nearby residents or public land users. Timing of operations on a seasonal basis would address such concerns as sensitive soils, wildlife nesting/rearing, T & E species, grazing, road conditions, dust, etc. Timing of operations on a daily basis would address such concerns as noise, traffic, recreation, safety, etc.

- Trees that are cut should be felled away from all stream channels, including ephemeral draws, unless explicitly prescribed to be included into the channel network.

- To limit soil compaction and displacement, low impact techniques would be used. Techniques could include a combination of any of the following: designated skid trails; boom-mounted shears; harvester/forwarders; smaller, more maneuverable or low-ground pressure equipment; and operating during the dry season (normally between June 1 and October 31).

- Equipment operations would normally be limited to slopes of less than 35 %.

- Soil moisture conditions would be monitored and operations would be suspended before unacceptable limits of compaction or displacement occur.

- Landings would be the minimum size commensurate with safety and equipment requirements. Landings would be located to minimize conflicts with other resources such as raptor nests, residential areas, high traffic roads, cultural sites, sensitive soils, etc.

- Previously disturbed areas would be used where available to establish landing sites.

- Where machine piling is necessary, it would be accomplished using equipment with a brush rake type blade or grapple to minimize soil displacement and limit soil in piles.

- Designated recreation trails would be avoided during operations involving equipment to the maximum extent feasible. If avoidance is not possible, temporary trail closures would be implemented to ensure safety. Trails damaged during operations would be restored following operations.

- For ground-based yarding, main arterial trails (over 3 round-trip passes) would be designated at a spacing of 100 feet or more apart.

- Soil impacts from operations (compaction, displacement) would be limited to less than 20 percent of the total acreage within the treatment unit.

- Excessive maneuvering and sharp turns, particularly with tracked equipment, would be minimized.

- Landings, temporary access routes, and primary skid trails would be closed, rehabilitated, and/or disguised following use. Mounds and berms would be smoothed to the original contour. Rehabilitation methods for access routes, trails and landings could include seeding, scarification, and placing woody debris and/or boulders back onto the route.

***Best Management Practices for Roads:***

- Rutted, rocky, and degraded portions of main access routes would be improved or rerouted when needed for operations or if prescribed for long-term road network improvements.

- Access roads would be maintained to the prescribed standard needed for operations, with a final maintenance treatment at the conclusion of operations. Maintenance could include such measures as adding fill to level the grade/facilitate drainage, adding gravel to arterial roads, straightening tight radius curves, blading, and dust abatement.

**PROJECT DESIGN FEATURES**

The following Project Design Features (PDFs) may be included in the design of every vegetation treatment. The PDFs serve as a basis for resource protection in the implementation of the project and will be considered in the analysis of impacts. The PDFs are part of the proposed Action Alternative in the draft CBRAP.

- Throughout the project area the presence of Peck's milkvetch plants and adjacent suitable habitat would direct how an area is treated, but will not eliminate the possibility of vegetation management. Vegetative treatments will be designed to maintain or

enhance Peck's milkvetch populations or its habitat. Peck's milkvetch habitat can be maintained or enhanced by removing competing woody vegetation.

- Vegetation treatments in the Tumalo Canal ACEC will not impair historical and interpretive values and will be designed to enhance those values where possible. The presence of important historical and interpretive resources will direct how an area would be treated. Fire lines will not be constructed on or adjacent to the canal features and surface disturbance will be kept to a minimum amount necessary.

- Vegetation treatments will be designed to meet the fire/fuels objectives identified in the UDRMP.

- Fire/fuels treatments will follow the priority order for treatments as identified by the CWPPs in the WUI's.

- VRM – Vegetation treatments will be designed to meet or exceed VRM Class objectives over the long term. Treatment objectives in old growth juniper woodlands/savanna habitats will include enhancing foreground visual characteristics of the old growth juniper woodlands/savanna and the overall scenic quality of the area. Juniper woodland characteristics that are expected to generate high visual appeal include: healthy woodlands with large and old trees of various densities and structure; understories of diverse native shrub, grasses and forbs; a low occurrence of noxious weeds and non-native species and a high visual diversity with regard to vegetative and geologic features of the characteristic landscape.

- Proximity to Roads – Areas within 300 to 600 feet of roads and other suitable travel routes would usually be managed (thinning and removing unwanted woody material) using the existing travel system with wheeled or track vehicles. Generally, areas farther than 600 feet from an existing road would require developing additional travel routes when removing woody material from the site is desired. No new permanent roads are proposed for vegetation management and using existing travel routes will be emphasized. However, new temporary "primitive" travel routes may be used, but no road construction would be allowed except for thinning of woody plants and moving large rocks in order for haul vehicles to pass. Travel by haul vehicles would be limited to designated routes which would be seeded, when necessary, upon completion of the management action. Light maintenance of existing roads would occur where necessary to allow haul vehicles to use.

- Along some recreational trails a higher density of junipers could be retained within approximately 125 feet of each side of the trails to help manage the trail system. However, where other substrates (e.g., rocks) are present fewer or no trees would be retained for trail management.

Deboot email to DeLashmutt_Juniper treatment_benefits

"Deboodt, Tim" <tim.deboodt@oregonstate.edu>
08/11/2008 05:40 PM

To
<John_Swanson@blm.gov>, "Kameron DeLashmutt" <kameron@bendcable.com>
cc
<Bill_Dean@or.blm.gov>, <Greg_Currie@or.blm.gov>, <lynn.sharp@tteci.com>, "Pagel, Martha" <MPagel@SCHWABE.com>
Subject
RE: Juniper Info

Kameron,

Thanks for your interest in our research project and its implications to water use and policy. There are several publications that have taken research done on individual tree water use (transpiration for plant growth) and canopy interception (and subsequent evaporation) and attempted to extrapolate it to a landscape level.

In the publications below, you will find references to individual tree water use (30 - 50 gallons per day for trees > 12 inches dbh if soil moisture is available). Canopy interception is estimated to be an additional 20 - 50 percent of the annual precipitation for the site. This information is then extrapolated to a per acre use and it is estimated that 9 - 35 large trees per acre can utilize or incept all the water delivered to a site in a 13 inch precipitation zone.

Our work on the Camp Creek Paired Watershed Study (north of Brothers, OR) has shown for the first two years after tree removal, we have observed significant (positive) changes in spring flow during late summer (the driest part of the year), an increase in the number of days of recorded ground water in shallow wells (19 - 27 ft deep) and an increase in late fall deep soil moisture (24 - 30 inches below soil surface). This study involves the long term monitoring of two sites, one control (no trees cut) and the other where we cut the trees after 12 years of pre-treatment monitoring. Both areas are approximately 250 acres in size. In the treated area we cut all post-European aged trees (140 year of age or less) and left the old growth trees. Our tree density ranged from 30 to 300 trees (taller than 4 feet) per acre. These numbers have not been calculated to acre feet of water but the spring flow has increased approximately 3 - 6 gallons per minute in the late season (July - Sept) and ground water availability increased an average of 41 days per well since the trees were cut.

Here are the links to those publications.

I am going to recommend two on-line publications to you. The U.S. Forest Service, PNW Research Station has estimated acreage, biomass, and a whole lot of other gross data that tries to describe the "state of the state" for western Juniper. These publications also reference water use. I think these references will give you some of the answers you need.
http://www.fs.fed.us/pnw/pubs/pnw_rb249.pdf
http://www.fs.fed.us/pnw/pubs/gtr_464.pdf

Rick Miller's recent publication, "Biology, Ecology and Management of Western Juniper" Tech Bulletin 152, OSU Agricultural Experiment Station, 2005 is the most recent review of all the reported research on ecological impacts of western Juniper. Here is a summary of that publication:
http://www.ars.usda.gov/research/publications/publications.htm?SEQ_NO_115=174262

Deboot email to DeLashmutt_Juniper treatment_benefits

The on-line version of the whole publication is:
http://extension.oregonstate.edu/catalog/html/tb/tb152/tb152.pdf

The results of our study are published only in a dissertation. We will be working on getting the results published in peer reviewed publications this fall. If you would like to read the dissertation I can send you a copy of it.

I hope that this information helps to answer your question. If other questions arise, don't hesitate to ask.

Tim

Tim Deboodt, Staff Chair
OSU Crook County Extension Agent
498 SE Lynn Blvd.
Prineville, OR 97754
541-447-6228
541-416-2115 (FAX)
tim.deboodt@oregonstate.edu

-----Original Message-----
From: John_Swanson@blm.gov [mailto:John_Swanson@blm.gov]
Sent: Monday, August 11, 2008 6:49 AM
To: Kameron DeLashmutt
Cc: Bill_Dean@or.blm.gov; Greg_Currie@or.blm.gov; lynn.sharp@tteci.com; Pagel, Martha; Deboodt, Tim
Subject: RE: Juniper Info

Kameron, I'll defer to Dr. Deboodt on this one. The questions you pose relate directly to his field of study for several years.

Thanks!

| | | |
|---|---|---|
| | "Kameron DeLashmutt" <kameron@bendcable.com> | |
| To | | <John_Swanson@blm.gov>, <tim.deboodt@oregonstate.edu> |
| | 08/10/2008 09:16 AM | |
| cc | | <Greg_Currie@or.blm.gov>, <lynn.sharp@tteci.com>, <Bill_Dean@or.blm.gov>, "Pagel, Martha" <MPagel@SCHWABE.com> |
| Subject | | RE: Juniper Info |

Mr. Swanson or Mr. Deboodt,
At the end of the attached email it is stated that "Water is Life". Are there any materials available that quantify what kind of reductions in water usage that can be expected on a per acre basis from this type of restoration to pre-european settlement? Or on a per tree basis, or anything of the sort?

I appreciate any help or direction you can offer.

Thank you,

Kameron DeLashmutt
O) 541-318-9950 ext 104
C) 541-350-8479
F) 541-318-9954
E) kameron@bendcable.com

This communication is confidential and intended only for the addressee(s).
If you receive this in error please advise the sender and destroy the electronic file that are included in this communication. Unless you have been given the express permission to forward this on or transmit it to others please do not do so.

-----Original Message-----
From: John_Swanson@blm.gov [mailto:John_Swanson@blm.gov]
Sent: Monday, August 04, 2008 3:39 PM
To: Bill_Dean@or.blm.gov
Cc: Greg_Currie@or.blm.gov; kameron@bendcable.com; lynn.sharp@tteci.com; tim.deboodt@oregonstate.edu
Subject: Juniper Info

Bill:

I understand that you and perhaps some of your customers were looking for
examples of successful restoration of juniper-occupied public lands. We
have oodles of examples, but probably the Camp Creek Paired Watershed Study
(here in Crook County)...led by Dr. Tim Deboodt.....is my favorite. Here
it is:

Deboot email to DeLashmutt_Juniper treatment_benefits
(See attached file: Final Water Poster.pdf)(See attached file: Louisville poster SRM36-56.pdf)

Since this info has been presented at several professional scientific gatherings, it is public information and can be shared widely. But, if folks do intend to share the info, I always ask them (as a courtesy) to contact Dr. Deboodt beforehand, so he doesn't get those surprise phone calls. He can be reached at the above e-mail address, or here in Prineville at 447-6228.

The neat thing is, Dr. Deboodt stays abreast of private, National Forest and public land juniper management and research activities throughout Oregon and elsewhere. He is one of a very small handful of juniper ecology and management gurus in the State of Oregon.

The Camp Creek study is focused primarily on water flow timing and delivery. If you need other kinds of examples (such as native shrub/graminoid/forb, sage grouse habitat changes, or erosion reduction), I got pictures showing these outcomes from active rehabilitation activities on public juniper-occupied lands.

If there's people who don't believe that this juniper expansion thing in Central Oregon is real, I (as well as Dr. Deboodt) got pictures showing otherwise.

If you and/or your customers want the whole juniper story...from the many wonderful values of Old Growth Juniper... to the bio-physical/socio-economic risks that Post-European Settlement Juniper occupation can present.....without having to read through a dozen science articles..... I would encourage you all to view the Oregon-grown DVD titled
"The Quiet Invasion". Either Dr. Deboodt or I can loan you (or your customers) a copy of this DVD to view.

Also, there's some very nice, easy-reading Juniper Ecology and Management pubs that Oregon State University/Eastern Oregon Ag Research Center has put out. If people want to delve into this topic more deeply.

Water is Life.

Thanks for asking.

John Swanson
416-6726 (Office)
447-1735 (Home)

# Camp Creek Paired Watershed Monitoring Project: Treatment Phase

**Tim Deboodt, M. P. Fisher, J. C. Buckhouse and J. Swanson**

**OSU Crook County Extension Service, Central Oregon Community College, Oregon State University Department of Rangeland Ecology and Management, and Prineville District, Bureau of Land Management**

LUBA #2006-00448

## Abstract

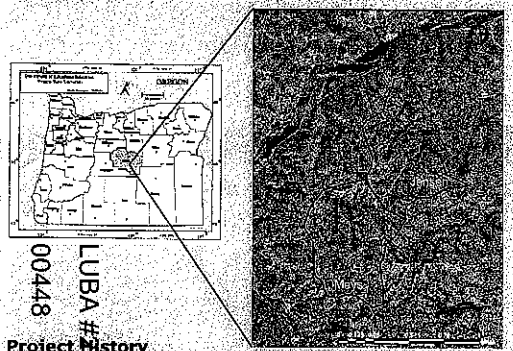
Eastern Oregon landscapes occupied by western juniper (*Juniperus occidentalis*) now exceed 6 million acres, a 5 fold increase from the 1930s. Western juniper water use models show that as few as 9 trees per acre can capture most of the available soil moisture over a given area. Studies show that juniper canopies can intercept 50 - 74 percent of precipitation and evaporate it back into the atmosphere. Anecdotal information underpins the hypothesis that western juniper expansion may negatively impact watershed function by reducing ground and surface water production and increasing overland flow, posing risks to agricultural, urban and wild lands.

Since limited research existed addressing these risk, a Paired Watershed Study in Central Oregon was initiated in 1994 in the Camp Creek watershed, a tributary of the Crooked River Basin. Data collection and calibration has occurred since then. In October, 2005, the process of mechanically removing juniper in one watershed was begun. The other watershed was left uncut as a control. Hydrologic attributes including depth to ground water, timing of ground water, flow changes in spring outputs, channel flow and soil moisture are being measured. An initial review of collected data indicates hydrologic changes associated with the treatment. Through continued, comparative data analysis this case study will help determine if juniper expansion has a negative impact on hydrologic function, and, if so, whether juniper reduction is a viable option for addressing these impacts.

## PROJECT OBJECTIVES

- Evaluate hydrologic changes following post-European aged juniper removal
- Evaluate changes in hill slope erosion and channel morphology following post-European aged juniper removal

aluate changes in plant community composition following post-European aged juniper removal



## Project History

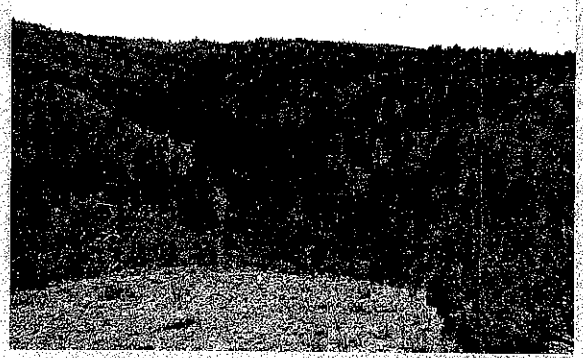
✓ 1994-2005: Analysis and classification of vegetation, soil, topography, geology, channel morphology, channel flow, weather patterns, and erosion processes. Significant differences were found in scour and deposition parameters of channel morphology. Channel flow measurements displayed no relationship between flows in Mays and Jensen.

✓ 2004-2005: Monitoring of ground water, spring flow output and soil moisture added to the study.

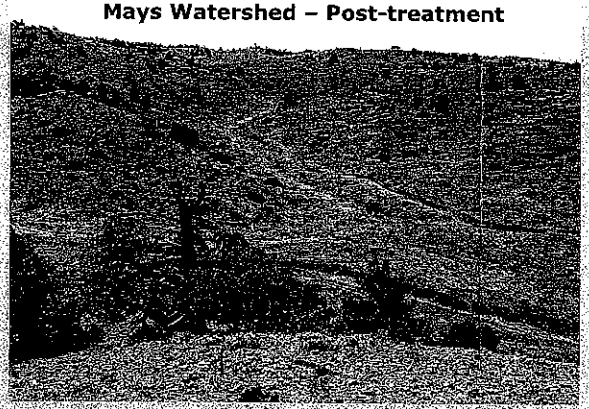
✓ Treatment of Mays Watershed: All post-European aged juniper cut with chainsaw. Cutting started October, 2005, completed April, 2006.

✓ 2006: Post treatment monitoring begins.

## Mays Watershed – Pre-treatment



## Mays Watershed – Post-treatment

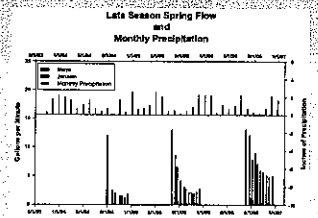


## The Paired Watershed Approach

The paired watershed approach to monitoring water yield response to vegetative treatments is well documented in forest research. It has had limited application in rangeland hydrology. The paired approach includes a period of pretreatment calibration which attempts to establish relationships between the control and treatment areas. Following the calibration phase, a treatment is applied to one watershed while the other is used as a control. Analysis of post treatment monitoring compares changes in the established relationships. For this study, Jensen is the control watershed and Mays is the treated watershed.

## Post treatment preliminary summary

Annual precipitation can be highly variable. For the last 3 years, annual precipitation has varied from 97 percent to 126 percent of the 30 year average. Timing of precipitation has also been highly variable. In 2004 (13.47 inches) and 2006 (17.25 inches), snow pack averaged 18 inches from January to March. In 2005 (13.39 inches), snow pack did not exist but spring rain (Late March thru May) accounted for 5.8 inches. Late season (base flow) spring flow is illustrated for the years 2004 thru 2006. Despite differences in precipitation timing and amount, differences in late season spring flow between Mays and Jensen are very similar for 2004 and 2005. 2006 (post–treatment) shows indications that the difference is now greater.



Hydrologic responses may not always occur above ground. In November, 2003, 6 peizometer wells where established at the bottom of each watershed. Measured every two to three weeks, depth to water is recorded.

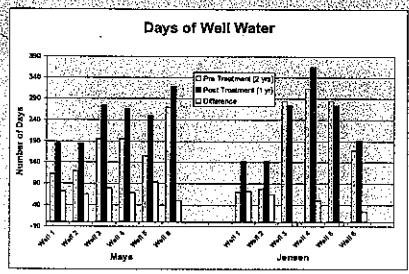
### Jensen

In reviewing patterns of behavior, Jensen ground water hydrograph shows little change in the shape of the curve for each well for the 3 years displayed (2004, 2005 and 2006). Differences in actual measurements between years reflect amount and timing of precipitation.

### Mays

Mays well patterns are different than Jensen. The years 2004 and 2005 maintain a similar shape. Precipitation amount and timing change the height of each curve and the time of year that maximum height occurs. Following treatment, all 6 wells illustrate a change in shape and timing. Even with increased precipitation (2006) height of the curve is dampened and length of the curve is extended.

Well Data, in addition to depth measured, provides insight to the timing of water. Timing of water (length of availability) could be an indicator of improved watershed function. A preliminary review of the data (t-test) indicates that changes in the number of days in which water was recorded in the wells increased in Mays as a result of the treatment (p-value = .0217). Using a Wilcoxon rank test, the wells in Mays after treatment recorded a greater increase in the number of days water was recorded when compared to the control watershed – Jensen (p-value 0.0223).




Average Number of Days of Well Water

| Watershed | Well | Pretreatment | Pretreatment | Difference | Mean | Std Dev |
|---|---|---|---|---|---|---|
| Mays | Well 3 | 112.5 | 185 | 72.5 | | |
| Mays | Well 2 | 119.5 | 188 | 68.5 | | |
| Mays | Well 5 | 195.5 | 275 | 79.5 | | |
| Mays | Well 4 | 149.5 | 255 | 89.5 | | |
| Mays | Well 1 | 156.5 | 236 | 84.0 | | |
| Mays | Well 6 | 206.5 | 302 | 95.5 | 17.97 M | 13.2977 |
| Jensen | Well 3 | 72.5 | 143 | 70.5 | | |
| Jensen | Well 2 | 73.5 | 152 | 84.0 | | |
| Jensen | Well 5 | 263.5 | 273 | 9.5 | | |
| Jensen | Well 4 | 214.5 | 260 | 55.5 | | |
| Jensen | Well 1 | 263.5 | 273 | 9.5 | | |
| Jensen | Well 6 | 157.5 | 192 | 34.5 | 33.1389 | 33.3966 |

| Pooled Sample T-test | |
|---|---|
| Reference | 2.8979 |
| One-tailed Probability ( t > t crit ) | 0.0193 0.0217 |

| Two-sample Wilcoxon test | |
|---|---|
| Statistic | 2.0056 |
| One-tailed Probability | 0.0223 |

## PROJECT PARTNERS

**Prineville BLM District, BLM Science Grant, Oregon Watershed Enhancement Board, Secure Rural Schools and Community Self-Determination Act of 2000: Title II, Crook County Taylor Grazing Board, Ochoco National Forest, OSU Rangeland Ecology and Management Department, WyEast RC&D, OSU Extension Service, Crook County Extension Service District, Hatfield High Desert Ranch, EPA, Crook County Soil and Water Conservation District, Crooked River Watershed Council**

# Camp Creek Paired Watershed Monitoring Project: The Response

**Tim Deboodt, M. P. Fisher, J. C. Buckhouse and J. Swanson**

**OSU Crook County Extension Service, Central Oregon Community College, Oregon State University Department of Rangeland Ecology and Management, and Prineville District, Bureau of Land Management**

LUBA 2008-029
00449

## Abstract

Western juniper (*Juniperus occidentalis)* has been implicated in causing the loss of native herbaceous plant communities and the bird and animal species that rely on them, increased soil loss and reduced infiltration. USDA Forest Service inventory analysis indicates that since 1934, western juniper's dominance on eastern Oregon's rangelands has grown from 1.5 million to over 6 million acres. In 1993, a paired watershed study was initiated in the Camp Creek drainage, a tributary of the Crooked River of central Oregon, to evaluate the impacts of cutting western juniper on the hydrologic function of a site. The study involves a paired watershed approach for evaluating changes in a system's water budget following the reduction of western juniper. Water budget is measured in terms of inputs (precipitation) and outputs (soil moisture, runoff, groundwater recharge and evapotranspiration). Watershed impacts include changes in water budget as well as vegetation composition and cover changes and altered erosion rates.

Juniper was cut from the treatment watershed (Mays) in 2005 following 12 years of pretreatment monitoring on 2, 110 hectare watersheds (Mays and Jensen). Post-treatment vegetative responses were evaluated in 2007. Hydrologic responses including changes in depth to ground water, spring flow, channel flow and soil moisture were assessed. Analysis indicates that juniper reduction increased late season spring flow, increased days of recorded ground water and increased the relative availability of soil moisture at the deeper soil depths. Precipitation received from October through May accounts for 70 percent of the annual precipitation and directly impacts actual water yields.

## Project Objectives

Evaluate hydrologic changes following the cutting of post-European aged juniper (trees established since mid-1800s).

Evaluate changes in hill slope erosion and channel morphology following the cutting of post-European aged juniper.

Evaluate changes in plant community composition following the cutting of post-European aged juniper.

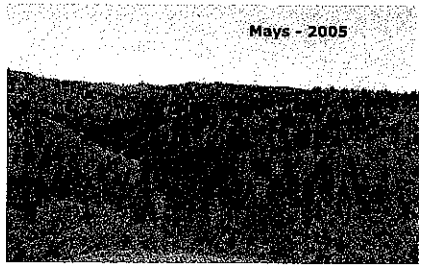
## Project History

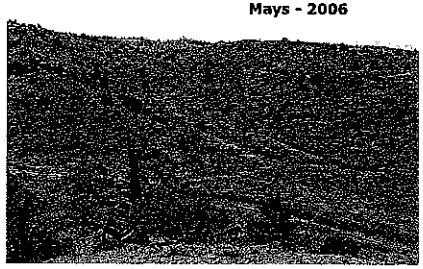
1994-2003: Analysis and classification of vegetation, soil, topography, geology, channel morphology, channel flow, weather patterns, and erosion processes. Significant differences were found in scour and deposition parameters of channel morphology. Analysis of channel flow identified a weak relationship between the flows of Mays and Jensen.

2004: Monitoring of ground water, spring flow output and soil moisture were added to the study.

2005: Treatment of Mays Watershed: All post-European aged juniper cut with chainsaw. Cutting started October, 2005, and was completed April, 2006.

2006: Post treatment monitoring begins.



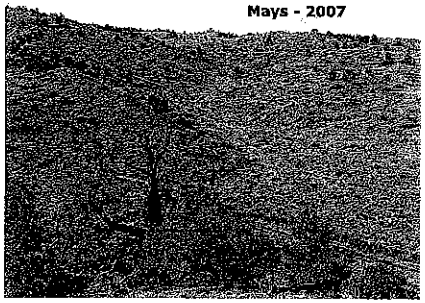




Figure 1
Mays Watershed
Soil Moisture - Lowest reading of the year
Bottom Profile

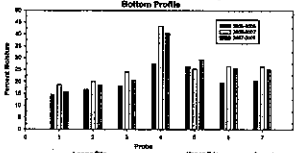



Figure 2
Jensen Watershed
Soil Moisture - Lowest reading of the year
Bottom Profile

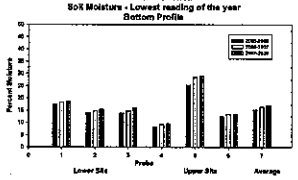



Figure 3
Late Season Spring Flow and
Monthly Precipitation

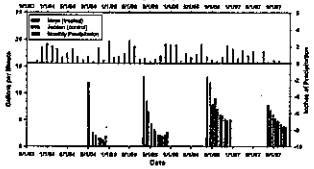
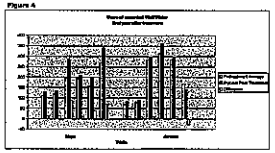



Figure 4



## Soil Moisture

Studies have shown that the availability of soil moisture can be increased by treating or modifying the plant community (Larsen 1993; Hibbert 1983). Continuous recording soil moisture probes have been monitoring soil moisture in the watersheds since May, 2005. Probes were installed at 3 locations per site, with 2 sites located in each watershed (36 total probes). The AQUA-TEL-TDR© probe was used for this study. The AQUA-TEL-TDR© probe measures soil moisture reliably in all types of soils at all moisture levels (Automata Service Manual 2005). Overall probe length is 0.7 m in length (sensor length is 0.48 m). Probes were installed at soil depths of 0.2m, 0.45m, and 0.76m.

Observing the lowest readings of the year within each watershed illustrates the amount of "water savings" that is carried over from one year to the next. Evaluating the change in "water savings" over years helps to see if that change is associated only with precipitation, or if increases might be due to the lack of deep rooted vegetation (the cutting of the juniper). Excess soil moisture can move through the soil profile and into sub-surface water storage and flow.

Individual probe readings were averaged by location within the soil profile and by site for each watershed. Figures 1 and 2 show the lowest annual recorded probe readings for the deepest probes, 0.76m. ANOVA shows that the observed increase is significant (Alpha = .1*) for the difference between 2006 and 2005 and for the average increase difference of 2006-07 combined and 2005 when comparing Mays with Jensen. Table 1 shows the results of this test for the combined years 2006-07 compared to 2005.

Table 1.

| Year | Profile Location | Prob t Difference |
|---|---|---|
| 2006-07 vs. 05 | Bottom (0.76 m) | .1002* |
| 2006-07 vs. 05 | Middle (0.45 m) | .1796 |
| 2006-07 vs. 05 | Top (0.2 m) | .6132 |

## Spring Flow

Figure 3 illustrates the differences in output between the two springs and the differences between years. Spring flow is dependent on timing, type and amount of precipitation. Base flow, that flow which is least likely to be influenced by a recent precipitation event or snow melt period, is the late season flow. Late season flow is defined as the period between July and November. Table 2 (below) shows the t-test results for comparisons of late season flow (lowest flow recorded) between the two watersheds and the pre and post treatment years. The one tailed P-value is significant at alpha = .05**.

Table 2. T-Test for Spring Flow Data, lowest flow recorded (GPM)

| Treatment | Year | Watershed | | Difference | Mean | Variance |
|---|---|---|---|---|---|---|
| | | Mays | Jensen | | | |
| Pre | 2004 | 1.87 | 0.20 | 1.67 | | |
| Pre | 2005 | 1.90 | 0.13 | 1.77 | 1.720 | 0.00500 |
| Post | 2006 | 4.80 | 0.23 | 4.57 | | |
| Post | 2007 | 3.6 | 0.00 | 3.60 | 4.085 | 0.47045 |
| | | | Difference | | 2.365 | |
| | | | Standard error | | 0.4875705 | |
| | | | t-test | | 4.8505805 | |
| | | | One tailed P-value | | 0.0199857 ** | |

## Ground Water

Well data, in addition to depth measured, provides insight to the timing or availability of subsurface water. The length of availability could be an indicator of watershed function (Figure 4). Increases in length would indicate an improved hydrologic condition. A review of the data (t-test) indicates that changes in the average number of days in which water was recorded in the wells increased in Mays as a result of cutting the trees (p-value = .0152). Using a Wilcoxon rank test the wells in Mays post-treatment, recorded a greater increase in the number of days that water was recorded when compared to the control watershed – Jensen (p-value 0.013).

## Conclusion

A healthy, functioning watershed is one that captures, stores and safely releases the precipitation that is delivered to the site. Land management decisions should include looking for ways to increase opportunities for precipitation to infiltrate into the soil profile (vegetation management), moving excess moisture into sub-surface storage and ground water, slowly releasing that water to minimize the risk of soil loss and channel bank and bed instability (Fisher et al. 2008). Hibbert (1983) and others have suggested that there would be no water yield increase as a result of vegetation manipulation (juniper cutting) in precipitation zones where annual precipitation was less than 4300 mm (17 inches). Any change to the water budget would only yield an increase in soil moisture, improving herbaceous vegetative production. The 30 year average annual precipitation at Barnes Station (USGS weather station) located approximately 10 miles east of the study site is 3492 mm (13.75 inches). Precipitation over the last 4 years on the study site has ranged from 2781 mm (10.95 in., 80 percent of average) and 4491 mm (17.68 in., 129 percent of normal). Both the high and low precipitation years occurred during the post-treatment phase of the study.

A review of the data collected over the course of the last 13 years indicates that the cutting of post-European aged juniper has changed the water balance equation. Analysis of the first two years following treatment has shown that spring flow, ground water and soil moisture have all increased when compared to pre-treatment levels. Comparisons of ephemeral channel flows do not show as clear a trend (data not presented here). Ephemeral channels tend to be more influent in relation to the ground water, contributing to ground water rather than ground water contributing to channel flow. Management implications point to the opportunity to increase spring flow for livestock, wildlife and domestic use along with some mitigation of water diversion. Late season low flows limit land management alternatives. Increasing flows by cutting juniper could partially offset this limitation. Changes in ground water may have downstream impacts, delaying the time water is moved through the system and by adding to channel or perennial stream flow downslope.

### Literature Cited:

Automata Service Manual. 2005. Sensors. In: Automata, Inc. Data Lynx Data Management Tools. 75 p.
Fisher, M.P., T. Deboodt, J. Buckhouse. 2008. Channel Geomorphological Changes and Hillslope Soil Movement Following Juniper Treatment on Camp Creek Paired Watershed Study. Poster Presentation. 61st Annual Meeting, SRM Louisville.
Hibbert, A.R. 1983. Water yield improvement potential by vegetation management on western rangelands. Water Resources Bulletin 19(3):375-381.
Larsen, R.E. 1993. Interception and water holding capacity of western juniper. PhD. Dissertation. Oregon State Univ. Corvallis, OR. 172 p.

# Shepherds Flat Wind Farm: Revegetation Plan

[JULY 25, 2008]

## I. Introduction

This plan describes methods and standards for restoration of areas of construction disturbance. This plan applies to the areas surrounding the permanent facility components of the Shepherds Flat Wind Farm.[1] The objective of revegetation is to restore the disturbed areas to pre-disturbance condition or better. The site certificate for the facility requires restoration of these areas. This plan has been developed in consultation with the Oregon Department of Fish and Wildlife (ODFW).

The areas of construction disturbance include cultivated or otherwise developed agricultural land (cropland) as well as areas of grassland, shrub-steppe habitat and other habitat subtypes (wildlife habitat areas). The intensity of construction impact will vary. In some areas, the impact will be relatively light, but in other areas, heavy construction activity will remove all vegetation, remove topsoil and compact the remaining subsoil. Where vegetation has been damaged or removed during construction, the certificate holder must restore suitable vegetation. In addition, the certificate holder shall maintain erosion and sediment control measures put in place during construction until the affected areas are restored as described in this plan and the risk of erosion has been eliminated. The plan specifies monitoring procedures to evaluate revegetation success of disturbed wildlife habitat areas. Remedial action may be necessary for wildlife habitat areas that do not show revegetation progress. Additional mitigation may be necessary if revegetation is unsuccessful.

## II. Description of the Project Area

Most of the area within the site boundary lies within Gilliam County (approximately 17,943 acres). Approximately 3,975 acres within the site boundary lie within Morrow County. Habitat in the northern section of the site boundary area (within Gilliam County) is characterized by shallow soils. The area is used primarily for grazing of sheep, but low rainfall (approximately 9 inches of precipitation annually) limits forage, and sheep are typically removed from the area from May to November. The northern section contains areas of bare sand, exposed rock and bare soil, and there are numerous unimproved roads and off-road vehicle tracks as well as several electrical transmission line corridors. Some locations are highly disturbed from congregation of sheep around watering and transport sites. Invasive species (such as cheatgrass and spring-Whitlow grass) are the predominant grass species in most areas, but native species (such as Sandberg's bluegrass, needle-and-thread grass, bluebunch wheatgrass and six-weeks fescue) are also present. Portions of Eightmile Canyon lie within or near the site boundary in the northern section. Eightmile Canyon contains an intermittent stream and is cultivated in some areas.

The southern section of the site boundary area (within Gilliam and Morrow Counties) contains deeper soils. Most of the area is cultivated for dryland wheat farming. Portions of the southern section are enrolled in the Conservation Reserve Program. Some slopes contain small

[1] This plan is incorporated by reference in the site certificate for the Shepherds Flat Wind Farm and must be understood in that context. It is not a "stand-alone" document. This plan does not contain all mitigation required of the certificate holder.

stands of big sagebrush in good condition. Fourmile Canyon passes through the south area and contains an ephemeral stream and a diversity of plant species.

## III. Revegetation Methods

The certificate holder shall begin restoration of disturbed areas as soon as possible after completion of facility construction activity in the area to be restored. Restoration measures include soil preparation and seeding as described below. Planting should be done at the appropriate time of year to facilitate seed germination, based on weather conditions. The certificate holder shall choose planting methods based on site-specific factors such as slope, erosion potential and the size of the area in need of revegetation.

### 1. Correction for Compaction

In the northern section, soils are generally too shallow to become compacted by construction activities. Deeper soils in the southern section may become compacted. The certificate holder shall examine disturbed areas as soon as construction is finished in the area. Areas that appear to be affected by compaction will be treated by deep tillage or ripping (scarification) using the method preferred by the landowner. In some areas, compaction might not become evident until vegetation indicates the condition through poor seed sprouting, stunting or plant death. Where that occurs, the area will be tilled or ripped and then re-seeded.

### 2. Revegetation of Cropland

In the dryland wheat areas, ground disturbance is likely to include off-road trenching for transmission and communication lines, leveling of portions of the crane pads and disturbance by the off-road crane tread paths. Areas disturbed by off-road trenching and crane paths and ground disturbance around power poles and meteorological towers are limited in area and width, with low risk for wind or water erosion of soils. Larger disturbed areas will be cultivated as soon as possible after construction work is done. If it is the proper season for wheat planting and the disturbed area is within a field that is not intended to remain fallow, the area will be planted with a wheat variety selected by the landowner. Otherwise, cultivation and planting will occur on the same schedule as in surrounding fields. The certificate holder will reimburse landowners for the work if landowners prefer to perform the plowing and planting themselves.

### 3. Revegetation of Wildlife Habitat Areas

The predominant wildlife habitat subtype that will be disturbed by facility construction is grassland. The seed mix used for revegetation in these areas will contain a mixture of species expected to perform well in the affected soils and including, as available, seed adapted to the local environment. The certificate holder will select a seed mix through consultation with the parcel landowner and the grazing right lessee, ODFW, the Oregon State University Extension Service, the Oregon Department of Agriculture, The Nature Conservancy and the Oregon Department of Energy (Department). The certificate holder shall use seed provided by a reputable supplier and complying with the Oregon Seed Law.

After construction activities are completed, disturbed areas will be evaluated to determine whether restoration seeding is needed. In some areas where existing vegetation has been crushed but not removed during construction, recovery is likely to occur in a reasonable time without

intervention. Seeding will not be done in areas where the pre-construction condition was exposed rock, bare soil or sand that is unlikely to support vegetation.

Narrow areas of soil disturbance due to off-road trenching, off-road crane paths and other limited disturbance may be seeded and left without mulch. Hand seeding, rather than mechanical seeding, will be used in small areas where the use of planting equipment is likely to increase the area of disturbance. Larger disturbed areas will be seeded followed by application of weed-free straw or other mulch to protect against erosion and preserve moisture. No-till methods, such as drilling or broadcast seeding, will be employed.

In the arid climate of the site, successful seeding is limited to mid-fall through very early spring. If seeding of large disturbance areas cannot be accomplished within this optimal seeding period within two months after construction disturbance, the areas will be mulched or otherwise treated to minimize erosion until seeding can be done in the fall.

### 4. Weed control

In the spring and early summer (approximately April through June), weeds commonly found on the site can be identified before they seed. After construction, all disturbed areas (except areas of exposed rock, bare soil and sand) will be evaluated annually in the spring for the presence of invasive weed species. The certificate holder shall implement weed control measures recommended by Gilliam County and Morrow County weed control authorities. Annual weed inspection and treatment of revegetation areas will be discontinued in areas that are determined to be successfully revegetated, but the certificate holder shall continue to implement a weed control program during facility operation, as required by Condition 38 of the site certificate.

## IV. Monitoring

### 1. Revegetation Record

The certificate holder shall maintain a record of revegetation work for both cropland and wildlife habitat areas. In the record, the certificate holder shall include the date that construction activity was completed in the area to be restored, a description of the affected area (location, acres affected and pre-disturbance condition), the date that revegetation work began and a description of the work done within the affected area. The certificate shall update the revegetation records from time to time, as revegetation work occurs. The certificate holder shall provide copies of these records to the Department at the time of submitting the annual report required under the site certificate.

### 2. Monitoring Procedures

*Cropland*

During the first growing season following planting of cropland previously disturbed by facility construction, the certificate holder shall consult with the landowners on soil compaction, construction-related erosion or poor crop growth in disturbed areas. The certificate holder may rely on the judgment of the landowner regarding any corrective measures needed.

*Wildlife Habitat Areas*

The certificate holder shall monitor the revegetation of wildlife habitat areas as described in this section, unless the landowner has converted the area to a use inconsistent with the success

criteria. The certificate holder shall employ a qualified investigator (an independent botanist or revegetation specialist) to examine all non-cropland revegetation areas to assess vegetation cover (species, structural stage, etc.) and progress toward meeting the success criteria described below in subsection (3). Within representative sample plots, the investigator will estimate the percentages of the area that are covered by bare soil, desirable native vegetation or invasive weed species. The investigator will qualitatively assess the degree of erosion at each site. The investigator will compare the sample plots with representative reference plots of the same habitat category and subtype.

The investigator will survey at least 20 percent of the disturbed area. The investigator will select sample plots that are representative of all habitat subtypes disturbed. Sample plots must proportionally represent areas of light disturbance (crushed vegetation) and areas of heavier disturbance (scraped or heavily compacted soil). Reference plots will be selected from nearby undisturbed areas within the same habitat subtype and category. Reference plots should have similar slopes, soil depth and prevalence of rock outcrops as the sample plots to which they will be compared.

The investigator shall use the same reference and sample plots for every survey, unless the investigator finds that a plot is no longer suitable for survey purposes. If the investigator finds a plot is no longer suitable, the investigator will select a suitable replacement plot and report the reasons for the replacement to the certificate holder, the Department and ODFW.

Revegetation monitoring surveys will be conducted annually beginning one year after initial restoration seeding and continuing until there is sufficient evidence of progress for the Department to conclude that additional revegetation efforts in the area are not necessary. Thereafter, the restored areas will be surveyed at five-year intervals for the life of the facility.[2]

The investigator will report to the certificate holder, the Department and ODFW following each inspection. In the report, the investigator shall include an assessment of whether the revegetated areas are trending toward meeting the success criteria. The investigator will include in the report any remedial actions recommended. The investigator shall include a report on the success of weed control measures.

Within each revegetation area, the investigator shall evaluate the progress of habitat recovery in comparison to the reference area. The investigator shall evaluate the following site conditions (both within the revegetation area and within the reference area):

- Degree of erosion due to disturbance activities (high, moderate or low).
- Vegetation density.
- Relative proportion of desirable vegetation as determined by the average number of stems of desirable vegetation per square foot or by a visual scan of the area, noting overall recovery status.
- Species diversity of desirable vegetation.

[2] As used in this plan, "life of the facility" means continuously until the facility site is restored and the site certificate is terminated in accordance with OAR 345-027-0110.

## 3. Success Criteria

*Cropland*

Cropland areas are successfully revegetated when the replanted areas achieve crop production comparable to adjacent non-disturbed cultivated areas. The certificate holder shall consult with the landowner or farmer to determine whether these areas have been successfully revegetated and shall report to the Department on the success of revegetation in these areas.

*Wildlife Habitat Areas*

A wildlife habitat area is successfully revegetated when its habitat quality is equal to, or better than, the habitat quality of the reference area as measured by the site conditions listed above in subsection (2). When the Department finds that the condition of a revegetated wildlife habitat area satisfies the criteria for revegetation success, the Department will conclude that the certificate holder has met its restoration obligations for that area. If the Department finds that the landowner has converted a wildlife habitat area to a use that is inconsistent with the success criteria, the Department may conclude that the certificate holder has no further obligation to restore the area for wildlife habitat uses.

Revegetation will be considered successful when:

1. The percentage of vegetation cover by desirable native species in the sample plot is greater than or equal to the percentage of desirable native species cover in the reference plots.
2. The percentage of cover by invasive weed species in the sample plot is less than 10 percent; and
3. The percentage of bare soil in the sample plot is not greater than the percentage of bare soil in the reference plot, unless the percentage of desirable native species cover in the sample plot exceeds the percentage of desirable native species cover in the reference plots as described in #4 below.
4. If the percentage of desirable native species cover in the sample plot exceeds the percentage of desirable native species cover in the reference plots by 10 percent or more, then the percentage of bare soil in the sample plot may exceed the percentage of bare soil in the reference plot by up to 20 percent.

## 4. Remedial Action in Wildlife Habitat Areas

After each monitoring visit, the certificate holder's qualified investigator shall report to the certificate holder regarding the revegetation progress of each wildlife habitat area. The investigator shall make recommendations to the certificate holder for reseeding or other remedial measures for areas that are not showing progress toward achieving revegetation success.

Indications that an area is not showing progress toward achieving revegetation success include emergence of comparatively few plants one year after disturbance or low vegetation cover in the second monitoring year compared to reference plots and little increase in vegetation between the first and second monitoring year.

The certificate holder shall take appropriate action to meet the objectives of this revegetation plan. If soil compaction is suspected as the reason for lack of progress, the

compacted areas may be deep tilled or scarified to reduce compaction, followed by re-seeding. The certificate holder's qualified investigator shall assess the vegetation that has appeared in the disturbed area to determine specific recommendations for remediation.

On an annual basis as part of the annual report on the facility, the certificate holder shall report to the Department the investigator's recommendations and the remedial actions taken. The Department may require re-seeding or other remedial measures in those areas that do not meet the success criteria.

If a wildlife habitat area is damaged by wildfire, the certificate holder shall work with the landowner to restore the damaged area. The certificate holder shall report to the Department on the damage caused by wildfire and the cause of the fire, if known. The certificate holder shall continue to report on revegetation progress as described in this plan.

If an area is not trending toward meeting the success criteria by the fifth monitoring year (and has not been converted by the landowner to an inconsistent use), the certificate holder may conclude that revegetation of the area was unsuccessful and propose appropriate mitigation for the loss of habitat quality or quantity. The certificate holder shall carry out mitigation actions approved by the Department, subject to review by the Oregon Energy Facility Council (Council).

## V. Amendment of the Plan

This Revegetation Plan may be amended from time to time by agreement of the certificate holder and the Council. Such amendments may be made without amendment of the site certificate. The Council authorizes the Department to agree to amendments to this plan. The Department shall notify the Council of all amendments, and the Council retains the authority to approve, reject or modify any amendment of this plan agreed to by the Department.

# Shepherds Flat Wind Farm: Habitat Mitigation Plan

[JULY 25, 2008]

## I. Introduction

This plan describes methods and standards for preservation and enhancement of an area of land near the Shepherds Flat Wind Farm (SFWF) to mitigate for the impacts of the facility on wildlife habitat.[1] This plan addresses mitigation for both the permanent impacts of facility components and the temporal impacts of facility construction. The certificate holder shall protect and enhance the mitigation area as described in this plan. This plan specifies habitat enhancement actions and monitoring procedures to evaluate the success of those actions. This plan does not address additional mitigation that might be required under the Shepherds Flat Wind Farm Wildlife Monitoring and Mitigation Plan.

## II. Description of the Impacts Addressed by the Plan

The SFWF footprint (area covered by permanent facility components) occupies areas of Category 3 and Category 4 grassland and shrub-steppe vegetation, Category 5 habitat (predominantly cultivated cropland) and Category 6 habitat. In compliance with a site certificate condition, the certificate holder would avoid any permanent or temporary impact on Category 1 and 2 habitat.

In addition to the areas affected by the SFWF footprint, construction would temporarily affect areas of Category 3, 4, 5 and 6 habitat. After disturbance, the recovery of temporarily disturbed Category 3 and 4 grassland areas to a mature stage might take two to four years; recovery of shrub-steppe vegetation might take ten to 30 years to reach maximum height and vertical branching. During the period needed to achieve full recovery of these habitat subtypes, habitat quality is temporarily degraded until recovery is successful (temporal impact).

## III. Calculation of the Size of the Mitigation Area

The habitat mitigation area (HMA) must be large enough to achieve, within a reasonable time, the habitat mitigation goals and standards of the Oregon Department of Fish and Wildlife (ODFW) described in OAR 635-415-0025. The ODFW goals require mitigation to achieve "no net loss" of habitat in Categories 3 and 4 (acre-for-acre mitigation). For Category 5 impacts, mitigation is achieved by a "net benefit in habitat quantity or quality." To mitigate for Category 5 impacts, ODFW recommends that "the applicant enhance at least ½ acre of Category 3, 4, or 5 habitat" for every acre of impact on Category 5 habitat.[2] For Category 6, mitigation is achieved by actions that minimize direct habitat loss and avoid impacts to off-site habitat.

The actual SFWF footprint and construction disturbance areas cannot be determined until the final design layout of the facility is known. Before beginning construction of the facility, the certificate holder must provide to the Oregon Department of Energy (Department) and ODFW a map showing the final design configuration of the facility and a table showing the acres of permanent impacts and construction area impacts on habitat (by category, habitat types and

[1] This plan is incorporated by reference in the site certificate for the Shepherds Flat Wind Farm and must be understood in that context. It is not a "stand-alone" document. This plan does not contain all mitigation required of the certificate holder.

[2] Email from Jon Germond, ODFW, February 26, 2008.

habitat subtypes). The certificate holder shall calculate the size of the HMA, as illustrated below, based on the final design configuration of the facility.

For the footprint impacts, the HMA must include at least one acre for every acre of footprint impacts to Category 3 and Category 4 habitat (a 1:1 ratio). To mitigate for the impact to Category 5 habitat, the HMA must include ½ acre for every acre of impact (a 0.5:1 ratio).

To address the temporal loss of habitat quality during the recovery of Category 3 shrub-steppe-sage (SS-S) habitat temporarily disturbed during construction of the SFWF (outside the footprint), the HMA must include ½ acre for every acre of Category 3 SS-S habitat affected (a 0.5:1 ratio). To address the temporal loss of habitat quality during the recovery of Category 3 shrub-steppe-purshia (SS-P) habitat temporarily disturbed during construction, the HMA must include ½ acre for every acre of SS-P habitat affected. If the revegetation success criteria are not met in the affected areas of temporarily disturbed SS-S and SS-P habitat, as determined under the SFWF Revegetation Plan, then the Council may require the certificate holder to provide additional mitigation.

Based on worst-case estimates, the SFWF would have the following footprint impacts:[3]

| Habitat Category | Footprint Impact (acres) |
|---|---|
| Category 3 | 124.34 |
| Category 4 | 33.789 |
| Category 5 | 13.117 |
| Category 6 | 2.01 |
| Total area | 173.256 |

For the purpose of illustrating the calculation of the overall size of the HMA, the area of impact within each affected habitat category and the corresponding mitigation area requirements, sample calculations are shown below, based on the worst-case estimates in the table above:

Category 3
Footprint impacts: 124.34 acres
Temporal impacts to SS-S and SS-P: 3.276 acres
Mitigation area requirement: 124.34 acres + (3.276 acres x 0.5) = 125.978 acres

Category 4
Footprint impacts: 33.789 acres
Mitigation area requirement: 33.789 acres

Category 5
Footprint impacts: 13.117 acres
Mitigation area requirement: 13.117 x 0.5 = 6.559 acres of Category 3, 4, or 5 habitat[4]

**Total mitigation area (rounded to nearest whole acre): 166 acres**

[3] Estimates of the area that the facility components would occupy are shown in Tables 11 and 12 of the Final Order on the Application.
[4] ODFW has advised the Department that the Category 5 "net benefit" goal "recognizes that Category 5 habitats are generally in a 'degraded' state, but have high restoration potential" and that "fish and wildlife species would not benefit much from mitigation taking place on Category 5 habitat" (email from Jon Germond, ODFW, February 26, 2008).

Based on the sample calculations shown above, the size of the HMA would be 166 acres. Before beginning construction, the certificate holder shall determine the final size and boundaries of the mitigation area in consultation with ODFW and the affected landowners and subject to the approval of the Department. Before beginning construction of the facility, the certificate holder shall acquire the legal right to create, maintain and protect the HMA for the life of the facility by means of an outright purchase, conservation easement or similar conveyance and shall provide a copy of the documentation to the Department.[5]

## IV. Description of the Mitigation Area

The ODFW standards require mitigation for Category 3 impacts to be "in proximity" to the SFWF, and the HMA must be located where habitat protection and enhancement are feasible consistent with this plan.[6] The applicant identified a 435-acre parcel in proximity to the SFWF but outside the site boundary. The baseline habitat characteristics of the 435-acre parcel are described in Section IV.4(b)(F) of the Final Order on the Application. Based on the applicant's preliminary assessment, the parcel includes 250 acres of Category 3 or better habitat, 135 acres of Category 4 habitat, 48 acres of Category 5 habitat and 2 acres of Category 6 habitat.

## V. Habitat Enhancement Actions

The certificate holder shall implement the habitat enhancement actions described in this plan. The objectives of the plan are to protect the habitat within the HMA for the life of the facility and to enhance the baseline condition of the habitat to meet the ODFW mitigation goals.

To achieve "no net loss" of habitat quantity or quality to mitigate for the permanent impacts of the SFWF in Category 3 and 4 habitats and to achieve a "net benefit in habitat quantity or quality" to mitigate for the permanent impacts in Category 5 habitat, the certificate holder shall protect the habitat within the HMA for the life of the facility and shall implement the enhancement actions.[7] The certificate holder shall, without unreasonable delay, begin the enhancement actions described in this section after the final design configuration of the SFWF is known and the size and boundaries of the HMA have been determined and approved by the Department. Specific enhancement actions are described below.

1. Elimination of Livestock Grazing. The certificate holder shall install and maintain fencing, as necessary, to eliminate grazing within the habitat mitigation area. Removing livestock from the mitigation area will enable recovery of native bunchgrass and sagebrush in areas where past grazing has occurred, resulting in better vegetative structure and complexity for wildlife.

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[5] As used in this plan, "life of the facility" means continuously until the facility site is restored and the site certificate is terminated in accordance with OAR 345-027-0110.

[6] OAR 635-415-0005 defines "in-proximity habitat mitigation" as follows: "habitat mitigation measures undertaken within or in proximity to areas affected by a development action. For the purposes of this policy, 'in proximity to' means within the same home range, or watershed (depending on the species or population being considered) whichever will have the highest likelihood of benefiting fish and wildlife populations directly affected by the development."

[7] ODFW has advised the Department that protection of habitat alone (without enhancement activity) will not meet the intent of ODFW's Fish and Wildlife Mitigation Policy (Letter from Rose Owens, November 9. 2006, in reference to the Leaning Juniper II Wind Power Facility).

2. Weed Control and Area Seeding. The certificate holder shall implement a weed control program. Under the weed control program, the certificate holder shall monitor the mitigation area to locate weed infestations. The certificate holder shall continue weed control monitoring, as needed, for the life of the facility. As needed, the certificate holder shall use appropriate methods to control weeds. Weed control on the mitigation site will reduce the spread of noxious weeds within the habitat mitigation area and on any nearby grassland, CRP or cultivated agricultural land. Weed control will promote the growth of desirable native vegetation. Where substantial areas of soil (greater than 100 $ft^2$) are left bare from weed control activities, the certificate holder shall hand-seed the area in the appropriate time of year with a mixture containing native grass and shrub seeds. The certificate holder may consider weeds to be successfully controlled when weed clusters have been eradicated or reduced to a non-competing level. Weeds may be controlled with herbicides or hand-pulling. The certificate holder shall notify the landowner of the specific chemicals to be used on the site and when spraying will occur. To protect locations where young desirable forbs may be growing, spot-spraying may be used instead of total area spraying.

3. Fire Control. The certificate holder shall implement a fire control plan for wildfire suppression within the HMA. The certificate holder shall provide a copy of the fire control plan to the Department before starting habitat enhancement actions. The certificate holder shall include in the plan appropriate fire prevention measures, methods to detect fires that occur and a protocol for fire response and suppression. The certificate holder shall maintain fire control for the life of the facility. If wildfire damages any part of the HMA during the life of the facility, the certificate holder shall assess the extent of the damage and implement appropriate actions to restore habitat quality in the damaged area.

4. Erosion Control. The certificate holder shall monitor the HMA to locate sites at which past livestock grazing or vegetation loss has caused soil erosion. As needed, the certificate holder shall control erosion by a combination of sediment barriers (such as hay bales, mulch or native rock) and seeding the affected area with a mixture containing native grasses and shrub seeds. The certificate holder may consider erosion control to be successful when eroded areas can support vegetation and no indications of new soil loss are evident.

5. Habitat Protection. For the life of the facility, the certificate holder shall restrict uses of the HMA that are inconsistent with achieving the habitat mitigation goals.

## VI. Monitoring

### 1. Monitoring Procedures

The certificate holder shall hire a qualified investigator (an independent botanist, wildlife biologist or revegetation specialist) to conduct a comprehensive monitoring program for the HMA. The purpose of monitoring is to evaluate the protection of habitat quality, the results of enhancement actions and the use of the area by avian and mammal species, especially during the wildlife breeding season. The investigator shall conduct HMA monitoring beginning in the first year after enhancement actions begin and continuing for the life of the facility. The investigator shall visit the site as necessary to carry out the following monitoring procedures:

1) Annually assess the general quality of vegetation cover (species, structural stage, etc).

2) Annually assess progress toward meeting the success criteria.

3) Annually record environmental factors (such as precipitation at the time of surveys and precipitation levels for the year).

4) Annually record any wildfire that occurs within the HMA and any remedial actions taken to restore habitat quality in the damaged area.

5) Annually assess the success of the weed control (including area seeding) and erosion control programs and recommend remedial action, if needed.

6) Assess the recovery of native bunchgrass and natural recruitment of sagebrush resulting from removal of livestock grazing pressure by comparing the quality of bunchgrass and sagebrush cover at the time of each monitoring visit with the quality observed in previous monitoring visits and as observed when the HMA was first established. The investigator shall establish photo plots of naturally recovering sagebrush and native bunchgrass during the first year following the beginning of enhancement actions. The investigator shall take comparison photos in the first year and every two years thereafter until desirable vegetation has achieved mature stature. The investigator shall determine the extent of successful recovery of native bunchgrass based on measurable indicators (such as signs of more abundant seed production) and shall report on the progress of recovery within in the monitoring plots.

7) Between April 21 and May 21 beginning in the first spring season after the beginning of construction of the SFWF, conduct an area search survey of avian species. An "area search" survey consists of recording all birds seen or heard in specific areas (for example, square or circular plots that are 5 to 10 acres in size). Area searches will be conducted during morning hours on days with low or no wind. The investigator shall determine the number searches and the number of search areas in consultation with ODFW. The investigator shall repeat the area search survey every five years during the life of the facility.

8) Beginning in the first year after the beginning of construction of the SFWF and repeating every five years during the life of the facility, the investigator shall record observations of special status plant and wildlife species (federal or State threatened or endangered species and State sensitive species) during appropriate seasons for detection of these species.

## 2. Reporting

The certificate holder shall report the investigator's findings and recommendations regarding the monitoring of the mitigation area to the Department and to ODFW on an annual basis. The certificate holder shall describe all habitat mitigation actions carried out during the reporting year and all additional work performed based on recommendations of the qualified investigator. The report shall include an evaluation of mitigation success, based on the success criteria described below, and a description of the methods used to perform the evaluation. The report to the Department may be included as part of the annual report on the SFWF.

### 3. Success Criteria

Mitigation of the permanent and temporal habitat impacts of the facility may be considered successful if the certificate holder protects and enhances sufficient habitat within the mitigation area to meet the ODFW goals of no net loss of habitat in Categories 3 and 4 and a "net benefit" for impacts to habitat in Category 5. The certificate holder must protect the quantity and quality of habitat within the HMA for the life of the facility. The mitigation goals are successfully achieved when the HMA contains a sufficient quantity of habitat in each category to meet the mitigation area requirements calculated under Section III. The certificate holder may count habitat of higher value toward meeting the acreage requirements for Category 3, 4 and 5 habitat. The certificate holder shall determine the actual mitigation area requirements, subject to Department approval, before beginning construction of the SFWF.

The certificate holder may demonstrate enhancement of habitat quality based on evidence of indicators such as increased avian use by a diversity of species, more abundant seed production of desirable native bunchgrass, natural recruitment of sagebrush and successful weed control.

If the certificate holder cannot demonstrate that the HMA is trending toward meeting the success criteria within five years after the date construction of the SFWF begins, the certificate holder shall propose remedial action. The Department may require supplemental planting or other corrective measures, which may include increasing the size of the HMA.

## VII. Amendment of the Plan

This Habitat Mitigation Plan may be amended from time to time by agreement of the certificate holder and the Oregon Energy Facility Siting Council ("Council"). Such amendments may be made without amendment of the site certificate. The Council authorizes the Department to agree to amendments to this plan. The Department shall notify the Council of all amendments, and the Council retains the authority to approve, reject or modify any amendment of this plan agreed to by the Department.

## Ash, Pilar

**From:** Lynn.Sharp@tteci.com
**Sent:** Monday, August 11, 2008 6:25 PM
**To:** Ash, Pilar
**Subject:** Fw: Juniper info to be added to the TB record

Lynn Sharp/CEPM/CSQ
08/11/2008 05:57 PM

To: Myles Conway, Erik Jansen/SCI/CSQ
cc:

Subject: Juniper info to be added to the TB record

Myles please print this email and add it to the record. Thanks.

Lynn Sharp | Senior Ecologist and Project Manager
Direct: 503.222.4546 | Main: 503.221.8636 | Fax: 503.227.1287 | Cell: 503.702.3198
Lynn.Sharp@tteci.com

Tetra Tech EC |
1750 SW Harbor Way, Suite 400 | Portland, OR 97201 | www.tteci.com

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----- Forwarded by Lynn Sharp/CEPM/CSQ on 08/11/2008 05:58 PM -----

"Deboodt, Tim" <tim.deboodt@oregonstate.edu>
08/11/2008 05:40 PM

To: <John_Swanson@blm.gov>, "Kameron DeLashmutt" <kameron@bendcable.com>
cc: <Bill_Dean@or.blm.gov>, <Greg_Currie@or.blm.gov>, <lynn.sharp@tteci.com>, "Pagel, Martha" <MPagel@SCHWABE.com>
Subject:

RE: Juniper Info

Kameron,

Thanks for your interest in our research project and its implications to water use and policy. There are several publications that have taken research done on individual tree water use (transpiration for plant growth) and canopy interception (and subsequent evaporation) and attempted to extrapolate it to a landscape level.

In the publications below, you will find references to individual tree water use (30 - 50 gallons per day for trees > 12 inches dbh if soil moisture is available). Canopy interception is estimated to be an additional 20 - 50 percent of the annual precipitation for the site.
This information is then extrapolated to a per acre use and it is estimated that 9 - 35 large trees per acre can utilize or incept all the water delivered to a site in a 13 inch precipitation zone.

Our work on the Camp Creek Paired Watershed Study (north of Brothers, OR) has shown for the first two years after tree removal, we have observed significant (positive) changes in spring flow during late summer (the driest part of the year), an increase in the number of days of recorded ground water in shallow wells (19 - 27 ft deep) and an increase in late fall deep soil moisture (24 - 30 inches below soil surface). This study involves the long term monitoring of two sites, one control (no trees cut) and the other where we cut the trees after 12 years of pre-treatment monitoring. Both areas are approximately 250 acres in size. In the treated area we cut all post-European aged trees (140 year of age or less) and left the old growth trees. Our tree density ranged from 30 to 300 trees (taller than 4 feet) per acre.
These numbers have not been calculated to acre feet of water but the spring flow has increased approximately 3 - 6 gallons per minute in the late season (July - Sept) and ground water availability increased an average of 41 days per well since the trees were cut.

Here are the links to those publications.

I am going to recommend two on-line publications to you. The U.S. Forest Service, PNW Research Station has estimated acreage, biomass, and a whole lot of other gross data that tries to describe the "state of the state" for western Juniper. These publications also reference water use. I think these references will give you some of the answers you need.
http://www.fs.fed.us/pnw/pubs/pnw_rb249.pdf
http://www.fs.fed.us/pnw/pubs/gtr_464.pdf

Rick Miller's recent publication, "Biology, Ecology and Management of Western Juniper" Tech Bulletin 152, OSU Agricultural Experiment Station, 2005 is the most recent review of all the reported research on ecological impacts of western Juniper. Here is a summary of that publication:
http://www.ars.usda.gov/research/publications/publications.htm?SEQ_NO_115=174262

The on-line version of the whole publication is:
http://extension.oregonstate.edu/catalog/html/tb/tb152/tb152.pdf

The results of our study are published only in a dissertation. We will be working on getting the results published in peer reviewed publications this fall. If you would like to read the dissertation I can send you a copy of it.

I hope that this information helps to answer your question. If other questions arise, don't hesitate to ask.

Tim

Tim Deboodt, Staff Chair
OSU Crook County Extension Agent
498 SE Lynn Blvd.
Prineville, OR 97754
541-447-6228
541-416-2115 (FAX)
tim.deboodt@oregonstate.edu

-----Original Message-----
From: John_Swanson@blm.gov [mailto:John_Swanson@blm.gov]
Sent: Monday, August 11, 2008 6:49 AM
To: Kameron DeLashmutt
Cc: Bill_Dean@or.blm.gov; Greg_Currie@or.blm.gov; lynn.sharp@tteci.com; Pagel, Martha; Deboodt, Tim
Subject: RE: Juniper Info

Kameron, I'll defer to Dr. Deboodt on this one. The questions you pose relate directly to his field of study for several years.

Thanks!

"Kameron DeLashmutt" <kameron@bendcable.com>

To: <John_Swanson@blm.gov>, <tim.deboodt@oregonstate.edu>

08/10/2008 09:16 AM

cc: <Greg_Currie@or.blm.gov>, <lynn.sharp@tteci.com>, <Bill_Dean@or.blm.gov>, "Pagel, Martha" <MPagel@SCHWABE.com>

Subject: RE: Juniper Info

Mr. Swanson or Mr. Deboodt,
At the end of the attached email it is stated that "Water is Life". Are there any materials available that quantify what kind of reductions in water usage that can be expected on a per acre basis from this type of restoration to pre-european settlement? Or on a per tree basis, or anything of the sort?

I appreciate any help or direction you can offer.

Thank you,

Kameron DeLashmutt
O) 541-318-9950 ext 104
C) 541-350-8479
F) 541-318-9954
E) kameron@bendcable.com

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If you receive this in error please advise the sender and destroy the electronic file that are included in this communication.
Unless you have been given the express permission to forward this on or transmit it to others please do not do so.

-----Original Message-----
From: John_Swanson@blm.gov [mailto:John_Swanson@blm.gov]
Sent: Monday, August 04, 2008 3:39 PM
To: Bill_Dean@or.blm.gov
Cc: Greg_Currie@or.blm.gov; kameron@bendcable.com; lynn.sharp@tteci.com; tim.deboodt@oregonstate.edu
Subject: Juniper Info

Bill:

I understand that you and perhaps some of your customers were looking for examples of successful restoration of juniper-occupied public lands.
We
have oodles of examples, but probably the Camp Creek Paired Watershed Study (here in Crook County)...led by Dr. Tim Deboodt.....is my favorite.
Here
it is:

(See attached file: Final Water Poster.pdf)(See attached file:
Louisville poster SRM36-56.pdf)

Since this info has been presented at several professional scientific
gatherings, it is public information and can be shared widely. But, if
folks do intend to share the info, I always ask them (as a courtesy) to contact Dr. Deboodt beforehand, so he doesn't get those surprise phone
calls. He can be reached at the above e-mail address, or here in
Prineville at 447-6228.

The neat thing is, Dr. Deboodt stays abreast of private, National Forest and public land juniper management and research activities throughout
Oregon and elsewhere. He is one of a very small handful of juniper ecology and management gurus in the State of Oregon.

The Camp Creek study is focused primarily on water flow timing and delivery. If you need other kinds of examples (such as native shrub/graminoid/forb, sage grouse habitat changes, or erosion reduction), I got pictures showing these outcomes from active rehabilitation activities on public juniper-occupied lands.

If there's people who don't believe that this juniper expansion thing in Central Oregon is real, I (as well as Dr. Deboodt) got pictures showing otherwise.

If you and/or your customers want the whole juniper story...from the many wonderful values of Old Growth Juniper... to the bio-physical/socio-economic risks that Post-European Settlement Juniper occupation can present.....without having to read through a dozen science articles..... I would encourage you all to view the Oregon-grown DVD titled "The Quiet Invasion". Either Dr. Deboodt or I can loan you (or your customers) a copy of this DVD to view.

Also, there's some very nice, easy-reading Juniper Ecology and Management pubs that Oregon State University/Eastern Oregon Ag Research Center has put out. If people want to delve into this topic more deeply.

Water is Life.

Thanks for asking.

John Swanson
416-6726 (Office)
447-1735 (Home)

Taken from: Miller et al. 2005

# Hydrology

## Impacts of Western Juniper on Hydrology and Erosion

The impacts of expanding western juniper woodlands or juniper control treatments on hydrology and water balance are not well understood. Variability in soils, geology, slopes, and spatial and temporal variations in climate and precipitation that occur across the range of western juniper make it difficult to generalize the hydrologic response from one watershed to another (Hawkins 1987). Little or no research has been conducted on how western juniper directly influences any of the specific components of the water budget for a given watershed. In the absence of pertinent research results, proxy and anecdotal evidence and research from other parts of the United States are commonly used to fuel the debate on important questions such as: (1) does western juniper intercept and/or transpire excessive moisture and thereby dry up springs and reduce stream flow; and (2) does western juniper increase surface runoff and erosion? The following is a discussion of the impacts of western juniper and western juniper control practices on effective precipitation, base stream/spring flow, and hillslope runoff and erosion.

### Effective precipitation

The amount of precipitation that enters the soil and is stored with the soil profile at a given point within a watershed is termed effective precipitation. This amount can be different than the amount of precipitation that falls from the sky. Effective precipitation is reduced in western juniper woodlands through leaf interception. The amount intercepted is determined by percent of tree canopy cover and the duration, intensity, and type of precipitation. The potential for interception of precipitation is greater in juniper woodland than in a shrub-steppe community (Eddleman et al. 1994). The reduction of precipitation reaching the ground directly beneath a mature western juniper canopy was 20 percent at the canopy edge and 50 percent halfway between the canopy edge and 70 percent at the trunk (Young et al. 1984). With 9.25 inches of precipitation, these authors estimated that 42 percent of the total was intercepted by the juniper canopy. However, storm intensities and duration were not accounted for in this study. In central Oregon, up to 74 percent of precipitation was intercepted when measured directly beneath the tree canopy (Eddleman 1986, Larson 1993). Stem flow represented a small portion of the total precipitation (Young et al. 1984). Larson (1993) reported stem flow was absent in small storm events (less than 0.26 inches of precipitation). Once the tree canopy reached saturation (at about 0.4 inches of rainfall), water started to flow down the stem. In a 1.0-inch event, stem flow accounted for up to 5 percent of the precipitation. The remaining moisture that does not reach the ground by throughfall or stem flow is lost to the atmosphere by way of evaporation or sublimation. Studies suggest the juniper canopy can significantly reduce the amount of precipitation reaching the soil surface.

In areas with significant snowfall, changes in vegetation density and structure associated with western juniper encroachment may significantly change how much snow is trapped and stored on different parts of the landscape, and may alter the timing and rate of snowmelt. To date, no work has documented the direct impact of western juniper woodlands on the dynamics of snow accumulation and melt. Studies from other plant communities have shown that change in vegetation height and distribution can strongly influence snow redistribution by wind. Sturges (1975) reported that removal of brush changed snow movement within sagebrush communities. On windy sites, snow accumulates to the height of the dominant vegetation, with additional snow being redistributed to other topographic positions or areas with taller or denser vegetation (Sturges and Tabler 1981, Pomeroy and Gray 1995).

### Stream/spring flow

The base water flow of a stream or spring comes from water moving laterally underground. The source of the water is from precipitation that infiltrates the soil and moves along an impermeable layer until it once again reaches the surface in a stream channel or spring. The source of such groundwater can come from areas great distances from the stream channel or spring. No watershed-scale studies have ever been conducted in western juniper areas to investigate the impact of western juniper on ground water flow. Only anecdotal evidence exists for streams, springs, and meadows that have dried up due to the increase of western juniper, or again began to flow following western juniper removal.

Two long-term studies in the Southwest demonstrated that removal of Utah juniper generated modest increases in base stream flow (Clary et al. 1974, Baker 1984). Over an 8-year period following treatment, annual stream flow increased by 157 percent. Stream flow returned to pretreatment levels after dead trees were removed from the watershed. Peak stream discharge from a



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Figure 29. Average cumulative runoff for juniper-dominated sites (n = 8) (Phase III) and sites where juniper had been removed for 10 years (n = 8). Rainfall was applied at 2.1 inches/hour, which approximates a 2-year return interval thunderstorm after 5 minutes and a 50-year return interval thunderstorm after 30 minutes. Site is a basin big sagebrush/ Thurber needlegrass plant association on Steens Mountain, Oregon.

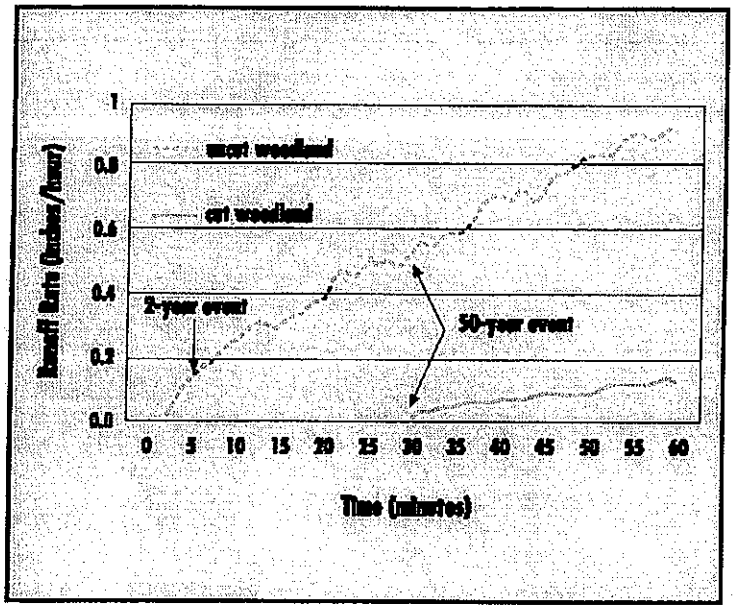
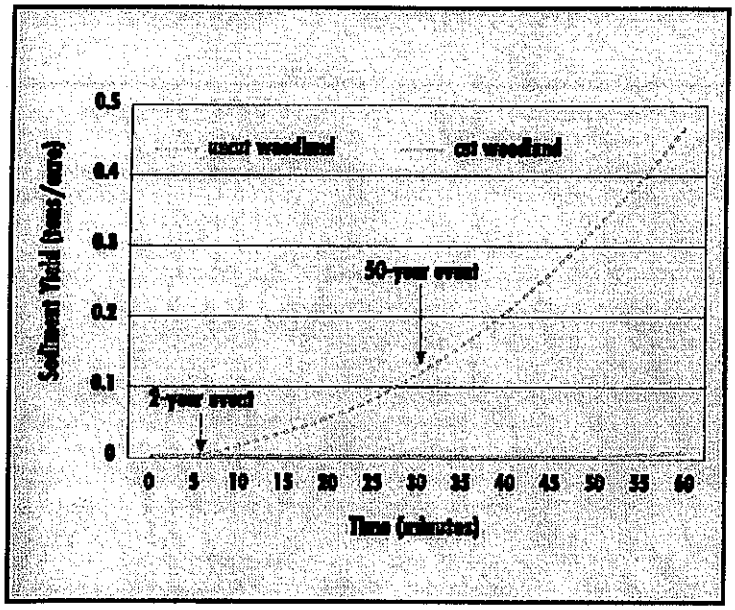



Figure 30. Average cumulative sediment yield for juniper-dominated sites (n = 8) and sites where juniper had been removed for 10 years (n = 8). Rainfall was applied at 2.1 inches/hour, which approximates a 2-year return interval thunderstorm after 5 minutes and a 50-year return interval thunderstorm after 30 minutes. Plant association is a basin big sagebrush/Thurber needlegrass plant association on Steens Mountain, Oregon.




large thunderstorm, however, was 1.3 times higher for the herbicide treated watershed compared to the woodland control. Wilcox (2002) summarized the relationship between Ashe juniper in Texas and Utah juniper in New Mexico and concluded that Ashe juniper control could increase stream flow based on two factors: (1) junipers have a high canopy interception of precipitation; and (2) junipers often exist on shallow soils underlain by permeable rock layers conducive to lateral movement of ground water. Hibbert (1983) evaluated the potential for increased water yield through vegetation management within different western rangeland plant communities. He concluded that little potential exists for increasing stream flow in watersheds receiving less than 18 inches of annual precipitation. In watersheds dominated by winter snow, the annual precipitation threshold for increasing water yield may be as low as 16 inches. The response of stream flows following the removal of western juniper is likely dependent upon amounts and timing of precipitation, geology, soil characteristics, size of the watershed, successional phase of the developing woodland, and area occupied by western juniper.

## Hillslope runoff and erosion

In semiarid environments, most surface overland flow and erosion is generated during thunderstorms when high-intensity rainfall rates exceed the infiltration, interception, and surface storage capacities of the soil and vegetation (Wilcox 2002). Pierson et al. (2002) studied the impact of high-intensity rainfall on hillslope hydrologic response within various rangeland plant communities across the western United States and concluded that most hillslope hydrologic responses were a result of complex vegetation-soil interactions. A change in the pattern and density of vegetation cover can alter soil properties and retention of overland flow resulting in changes in hillslope infiltration and surface runoff patterns (Wood 1988). Greater plant density, cover, and dispersion offer greater soil protection from raindrop impact and can slow the movement of water flowing across the soil surface, resulting in less erosion (Blackburn et al. 1994). Studies from sagebrush areas have shown that over time, shrubs produce modified microsites with decreased bulk density, increased soil organic matter, and increased aggregate stability that in turn cause a several-fold increase in infiltration capacity and dramatic decreases in erosion compared to the soil between shrubs. The areas between the shrub canopies have less herbaceous and litter cover, so the soil is more susceptible to raindrop impact that



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bare soil impacted by rainfall and can help to reduce the negative hydrologic impacts of mechanical treatments (Gifford and Skau 1967, Blackburn and Skau 1974, Blackburn 1983, Brown et al. 1985, Hutten and Gifford 1988).

### Chemical

Herbicides can be used to kill the overstory of juniper with little impact to the understory vegetation or the soil surface. Baker (1984) killed all the piñon-juniper on a 360-acre watershed in Arizona with herbicide. The treatment resulted in a 730-lb/acre increase in herbaceous biomass compared to the adjacent untreated watershed.

### Fire

Few studies have examined the impact of fire on rangeland hydrology. Most studies have shown an increase in runoff and erosion rates the first year following fire (prescribed or wild), and returning to pre-fire rates within 5 years (Wright and Bailey 1982). Roundy et al. (1978) studied the impact of prescribed fire on hillslope hydrology of a piñon-juniper woodland on loamy soils in eastern Nevada. They found that fire had the greatest impact on areas directly below the juniper and sagebrush canopies with high surface litter accumulations. Water repellency under unburned trees in the juniper duff was greater than where the duff layer had burned. Across the site fire had little effect on infiltration rates, but did significantly increase soil erosion. Pierson et al. (2003) summarized results of studies on the impact of fire within coarse-textured sagebrush-dominated systems and concluded that the greatest impact of the fire was on overland flow dynamics and rill erosion. Fire induced significant water repellency, particularly in areas dominated by shrubs with large accumulations of litter (Pierson et al. 2002). However, such systems were also found to have a high degree of natural water repellency when extremely dry (Pierson et al. 2001). The result is that burned or unburned woodlands will rapidly generate runoff under intense rainfall in the absence of vegetation in the tree canopy interspace. The immediate effect of fire is the reduction of ground surface barriers, which include shrub, herbaceous vegetation, and litter. The water then concentrates and increases in velocity resulting in greater erosive energy (Pierson et al. 2003). Water moves more rapidly down slope and ultimately into stream channels, impairing water quality and potentially causing downstream flood damage. An important component in evaluating the impacts of fire on the hydrology of a site is the vegetation response following fire, especially recovery of vegetation structure and surface litter.

John_Swanson@blm.gov
08/04/2008 03:39 PM

To Bill_Dean@or.blm.gov
cc Greg_Currie@or.blm.gov, kameron@bendcable.com, lynn.sharp@tteci.com, tim.deboodt@oregonstate.edu
bcc
Subject Juniper Info

Bill:

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(See attached file: Final Water Poster.pdf)(See attached file: Louisville poster SRM36-56.pdf)

Since this info has been presented at several professional scientific gatherings, it is public information and can be shared widely. But, if folks do intend to share the info, I always ask them (as a courtesy) to contact Dr. Deboodt beforehand, so he doesn't get those surprise phone calls. He can be reached at the above e-mail address, or here in Prineville at 447-6228.

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Water is Life.

Thanks for asking.

John Swanson
416-6726 (Office)
447-1735 (Home)

Final Water Poster.pdf

Louisville poster SRM36-56.pdf

## 5. A Habitat-Based Impact Assessment Technique

The USFWS (1980) has developed a procedure for documenting predicted impacts to fish and wildlife from proposed land and water resource development projects. The procedure is based on the concepts of habitat potential discussed in 101 ESM 4. The purpose of this concluding chapter is to briefly discuss the procedure and identify its strengths and limitations when used in the impact assessment process.

5.1 The Habitat Evaluation Procedures. The Habitat Evaluation Procedures (HEP) have been developed (USFWS 1980) in response to the need to document the nonmonetary value of fish and wildlife resources. HEP evolved from an assessment method developed in Missouri (Daniels and Lamaire 1974) and is based on the fundamental assumption that habitat quality and quantity can be numerically described. Numerical description permits options and alternatives to be compared when numerical changes are the essence of impact assessment.

HEP is a species-habitat approach to impact assessment, and habitat quality for selected evaluation species is documented with an index, the Habitat Suitability Index (HSI). This value is derived from an evaluation of the ability of key habitat components to supply the life requisites of selected species of fish and wildlife. Evaluation involves using the same key habitat components to compare existing habitat conditions and optimum habitat conditions for the species of interest. Optimum conditions are those associated with the highest potential densities of the species within a defined area. The HSI value obtained from this comparison thus becomes an index to carrying capacity for that species.

The index ranges from 0.0 to 1.0, and for operational purposes in HEP, each increment of change must be identical to any other. For example, a change in HSI from 0.1 to 0.2 must represent the same magnitude of change as a change from 0.2 to 0.3, and so forth. Therefore, HSI must be linearly related to carrying capacity. This is an operational restriction imposed by the use of HSI in HEP. However, it is a restriction easily complied with; if the relationship between HSI and carrying capacity is unknown, it is assumed to be linear. If the relationship is nonlinear, it is converted to a linear function.

HEP attempts to incorporate concepts from both the population and habitat theories by evaluating habitat quality for specific species. Prior to the 1980 edition of HEP, this was done subjectively based on the professional judgement of a team of biologists. The habitat quality values were multiplied by area and aggregated to obtain a "habitat" score. In the 1980 edition of HEP, HSI values are obtained for



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individual species through use of documented habitat suitability models employing measurable key habitat variables (e.g., percent canopy closure). The HSI values are multiplied by area of available habitat to obtain Habitat Units (HU's) for individual species. These values are used in the HEP system for comparative purposes. No aggregation of species' HSI (or HU's) occurs.

Many potential users tend to consider the HSI value as synonymous with the entire HEP system. This is not the case. HEP can be compared to a bookkeeping ledger; both passively display, and thereby document, values obtained from other sources. HEP is a data management system; it is the data it manages, i.e., the index of quality and the quantity of available habitat, which are of interest in impact assessment.

5.2 Attributes and limitations of the Habitat Evaluation Procedures. As with other approaches, HEP differs in its ability to meet the previously identified evaluation criteria (101 ESM 3.2) for an impact assessment methodology:

(1) Various forms are used in HEP to display and document HSI, area, and HU's for each evaluation species. Comparisons can be made either between two areas at one point in time, or for one area for several points in time, for any proposed action. However, the ability to document data and ultimately compare alternatives is not unique to the HEP system.

(2) The differences in quality (HSI) and quantity (area) between existing habitat conditions (baseline) and various projected future sets of conditions document project-related impacts to selected evaluation species. HEP currently does not provide guidance for performing future projections. Therefore, projected impacts are no better than the user's ability to predict future conditions.

(3) HEP can be applied at any level of assessment. However, data requirements and costs increase as more species are considered and their respective habitat models become more complex. HSI models not only provide an index value of quality, but also document which habitat variables were considered and their respective values. The level of detail for such "models" must fit the user's objectives for impact assessment.

(4) The identification of differing types and magnitudes of impacts is dependent on the validity and sensitivity of the HSI models used to generate data for HEP. As with other approaches, the results of an impact assessment employing HEP are no better than the reliability of resource data used.



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(5) HU's serve not only as the principal units of comparison in HEP, but also as a standard vehicle of communication, integrating both quality and quantity of habitat. Changes in HU's represent potential impacts from proposed actions. Such changes are annualized in order to be comparable with the action agencies' benefit/cost analyses. Applications of annualized HU's include impact assessments, compensation studies, and human use analyses. In such analyses, one HU lost for a species must be directly comparable to one HU gained for that species. The latter association explains the requirement for a linear relationship between HSI and carrying capacity.

(6) HEP is a species-habitat-based assessment methodology. It is applicable only for the species evaluated and does not directly relate that species with other ecosystem components. HEP conceptually addresses only the issues of species populations and habitat, among the four indicators of public interest identified in 101 ESM 2.3. However, the degree to which these indicators are addressed by HEP is dictated by the HSI models. Through improved HSI models, it may be possible to more completely treat the remaining issues of biological integrity and environmental values.

In summary, the HU data developed are the essence of the HEP methodology. The identified changes in habitat quality and quantity provide the basis for biologists to compare alternatives for the evaluation species selected. HEP is a convenient means of documenting and displaying, in standard units, the predicted effects of proposed actions. It is a tool available to resource managers who must make knowledgeable decisions. For further information, the reader should consult the "Habitat Evaluation Procedures" (102 ESM) and "Standards for the Development of Habitat Suitability Index Models for Use with the Habitat Evaluation Procedures" (103 ESM).



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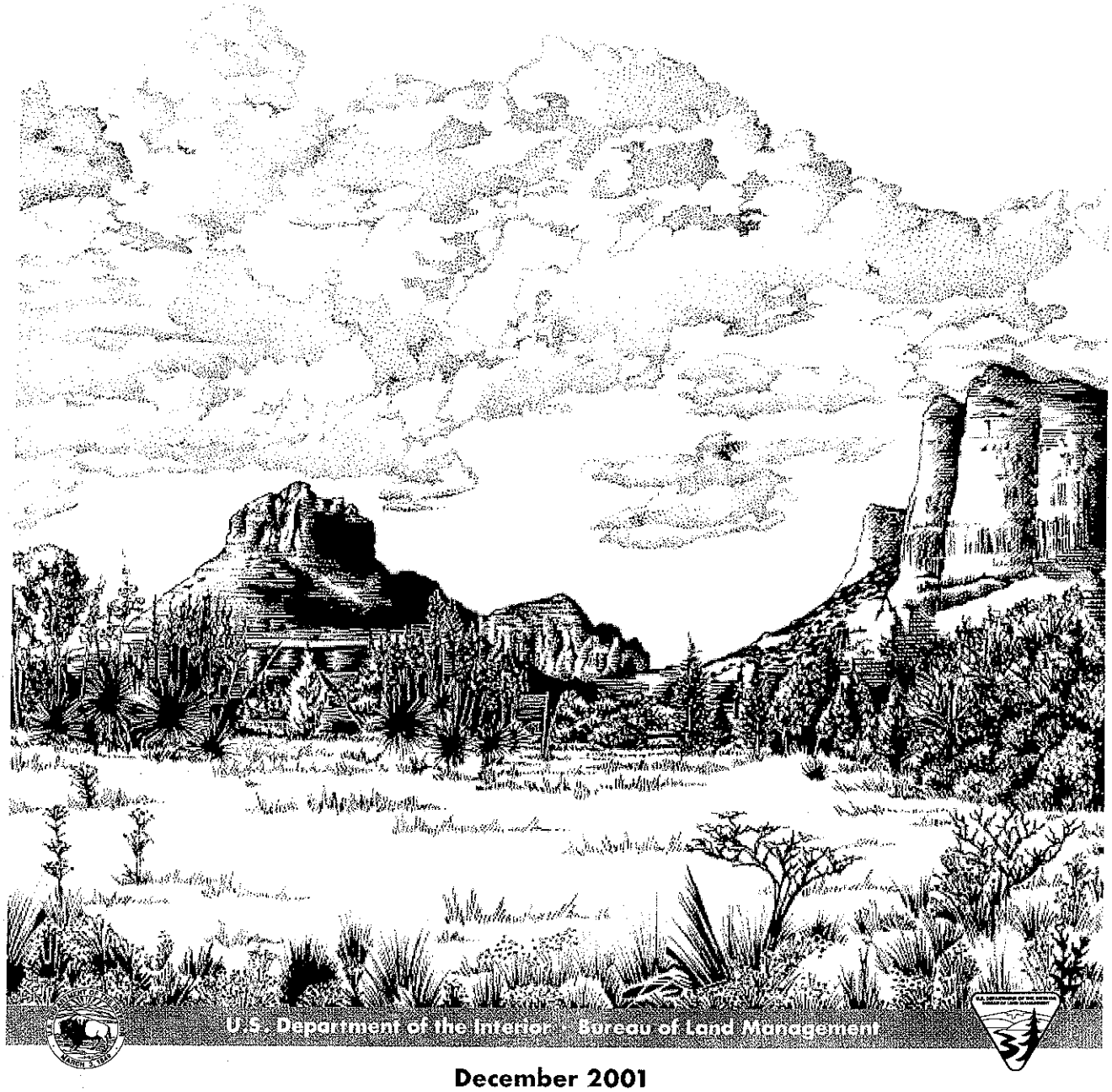
INVENTORY AND MONITORING
Technical Reference 1734-7

# Ecological Site Inventory

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Technical Reference 1734-7

# Ecological Site Inventory

**December 2001**

By:

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Denver, Colorado

U.S. Department of the Interior - Bureau of Land Management

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*"An ecological site is a distinctive kind of land with specific physical characteristics that differs from others kinds of land in its ability to produce a distinctive kind and amount of vegetation."*

–National Range and Pasture Handbook

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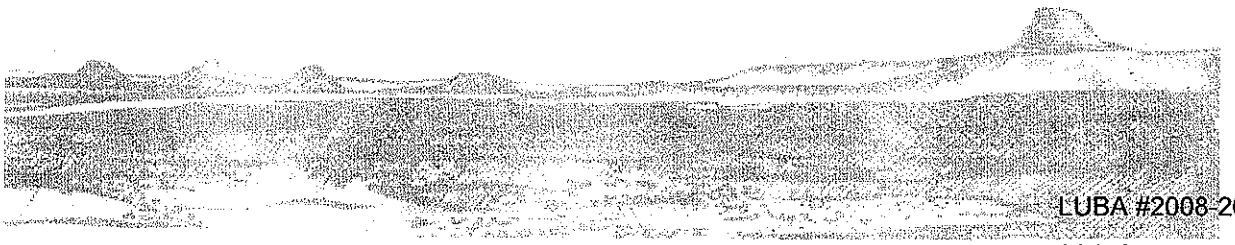

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# Preface

SINCE DECEMBER 1982, ecological site inventory (ESI) has been the Bureau of Land Management's (BLM) standard vegetation inventory technique. The ecological site inventory method involves the use of soils information to map ecological sites and plant communities and the collection of natural resource and vegetation attributes. The sampling data from each of these soil-vegetation units, referred to as site write-up areas (SWAs), become the baseline data for natural resource management and planning.

The purpose of Technical Reference 1734-7, *Ecological Site Inventory*, is to identify the procedures for completing an ecological site inventory and to describe the technique used by the Natural Resource Conservation Service (NRCS) to document and describe ecological sites. These procedures were derived from the NRCS Rangeland Ecological Site Inventory procedure as described in their *National Range and Pasture Handbook*. Information was also adapted from the NRCS National Soils Handbook and BLM Technical Reference 1737-7, *Procedures for Ecological Site Inventory—With Special Reference to Riparian-Wetland Sites*. Technical Reference 1734-7 replaces previous guidance found in BLM Manual Handbook 4410-1.

The need for natural resource inventories are mandated by Congress in Section 201(a) of the Federal Land Policy and Management Act (FLPMA) of 1976. Congress reaffirmed this need in Section 4 of the Public Rangelands Improvement Act (PRIA) of 1978—in particular, to develop and maintain an inventory of range conditions and trends on public rangelands, and to keep that inventory updated on a regular basis.



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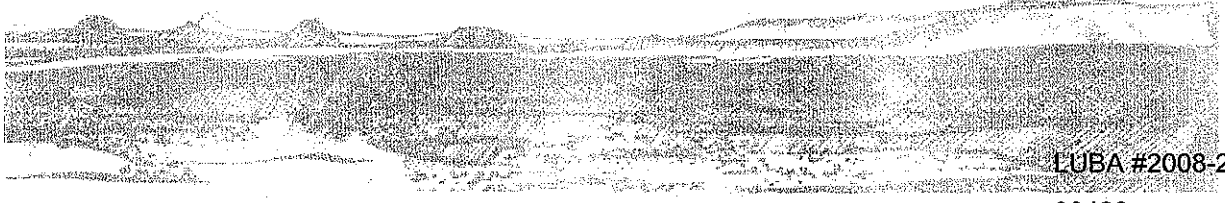

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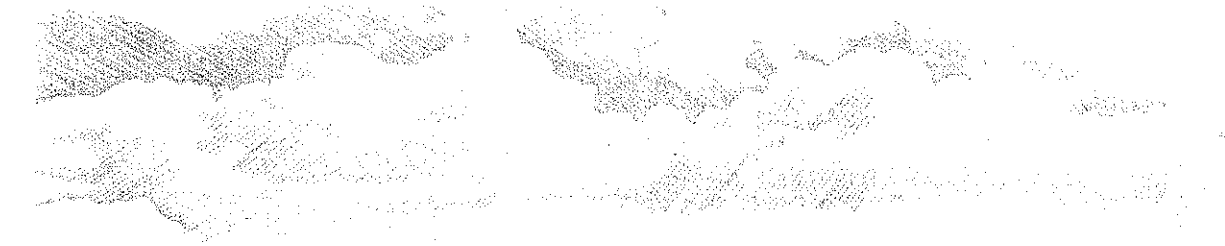

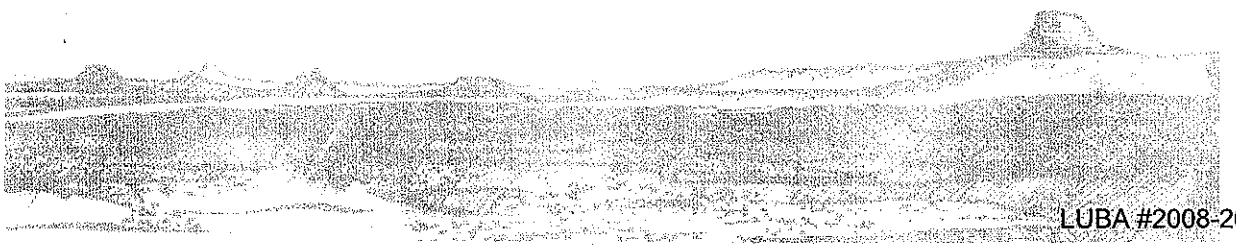

# Chapter 1 - Inventory

## Inventory Preparation

ADEQUATE INVENTORY PREPARATION is essential for all ecological site inventories. Inventory preparation should be initiated at least 1 year prior to the start of field work; however, 2 years is better and is usually required if memorandums of understanding (MOUs) or other agreements are necessary for interagency efforts. Inventory preparation includes developing an inventory plan, conducting inventory plan reviews, and putting together the inventory team.

### *Inventory Plan*

Prior to beginning an inventory, an interdisciplinary team develops the inventory plan. The team sets forth in writing the extent and intensity of the inventory studies needed. The ecological site inventory is designed to serve as the basic inventory of present and potential vegetation on BLM rangelands for use in all programs that require information on vegetation.

The level of intensity for the collection of production data should be documented in the inventory plan, along with a discussion about quality control of data collection. This is necessary to ensure accuracy and promote consistency between crews and inventories.

If a Natural Resources Conservation Service (NRCS) soil survey or soil survey update is conducted along with an inventory, the plan should be consistent with the soil survey MOU and plan of operations according to Section 601.05 of the *National Soils Handbook*. (See the section on soil survey for information on the procedure needed if a soil survey is completed concurrently with the ecological site inventory.)

A suggested format for the inventory plan is shown in Table 1.



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Table 1 - Inventory Plan Format

**Inventory Plan Elements**

| | |
|---|---|
| Purpose | Briefly state the purpose of the inventory in general terms. |
| Objective(s) | Identify the specific objective(s) for the inventory data in relation to uses or issues. |
| Description of the inventory area | Identify the location and boundaries. Describe what it looks like (vegetation diversity, topographic diversity). |
| Identify information to be collected | Although the minimum standards required for an ESI are production and composition by air-dry weight (ADW) by species, all other types of resource data can be collected. Data collection should be tailored to local needs. Inventory protocols can be specifically designed for certain areas within the inventory. Additional data needs could include:<br>- Cover<br>- Vegetation structure<br>- Rangeland health<br>- Soil resource values and condition (soil health)<br>- Tree information (number by size, class, types of tree damage and extent)<br>- Noxious weeds<br>- Biological soil crust |
| Inventory design | - Identify the level of detail needed. A higher level of detail may be required in riparian-wetland or other high value areas.<br>- Specify map scale. Different scales may be required in mapping uplands and riparian-wetland areas.<br>- Specify the minimum size limitation for delineating soil map units and site write-up areas (SWAs). For example, a soil map unit may be no smaller than 160 acres (for a general order 3 survey), while a SWA may be as small as 40 acres.<br>- Determine whether the inventory will be completed in conjunction with a soil survey or after the soil survey is complete.<br>- Determine the time that will be needed to complete the field work and all compilation work. |
| Personnel and funding requirements and/or constraints | - People and skill levels needed (professional level versus seasonal or entry level)<br>- Personnel assigned to complete the work<br>- Special needs (helicopter support, equipment) |



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| | |
|---|---|
| Logistics | - Aerial photo or remote sensing needs<br>- Agreements or MOUs<br>- Transportation (vehicles, helicopter)<br>- Office space<br>- Chemical storage space (HCL, pH reagents)<br>- Lodging (camps, motels)<br>- Food or per diem requirements<br>- Equipment, photos, maps (some procurement may be needed 1 year in advance)<br>- Contracts<br>- Administrative support<br>- Coordination with local officials and notification in the local newspaper, particularly if helicopters are used |
| Field measurements and procedures | - Minimum standards. Production and composition by species, by SWA, and by ecological site are required.<br>- Number and size of plots<br>- Other data collection methods to be used (Daubenmire, step point, line intercept, point frame)<br>- Handbooks and other written guidance<br>- Data collection (forms, field data recorders) |
| Compilation procedures | - Maps<br>- Cartographic requirements<br>- Geographic Information System (GIS) support<br>- Data storage. Method of tabular data input into the Inventory Data System (IDS) (local entry into Bureau database)<br>- Types of reports to be generated and for whom |
| Reporting and quality control (inventory reviews and results) requirements | - Training<br>- Sampling and harvesting protocols<br>- Personnel supervision in the field<br>- Frequency of progress reports (weekly, monthly)<br>- Who is responsible and when progress and final reports are due |
| Approval Process | - Who the responsible individuals are<br>- When<br>- What the administrative levels are |
| File Maintenance | Identify where the field worksheets, maps, and reports will be stored and plans for computerizing the data. Data must be entered in the Bureau's vegetation database. To determine how it will be entered, contact the National Science and Technology Center (NSTC) in Denver. |



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## *Inventory Plan Reviews*

The inventory plan needs to be reviewed annually if the inventory takes longer than 1 year to complete. All changes should be documented. The inventory plan should set forth when and how reviews will be conducted. The inventory team should conduct the reviews. Objectives should be reviewed to ensure adequate quality and quantity of inventory progress and to identify problems that need management attention.

## *Inventory Team*

The inventory team generally consists of a team lead, a soil survey team, a vegetation mapping team, a vegetation transecting team, and a phenological data collection team. A soil survey team may not be necessary if the survey is already done. Also, if specified in the inventory plan, the soil survey and vegetation mapping teams may be combined into a single team to complete the mapping of the inventory area. Figure 1, Composition of Inventory Team, is only a recommendation. Composition of the actual teams will be decided by each individual field office.

Inventory team members must be selected carefully. The combined knowledge, experience, education, and training of each member is extremely important. All specialists on the inventory team will need to work closely together throughout the inventory.

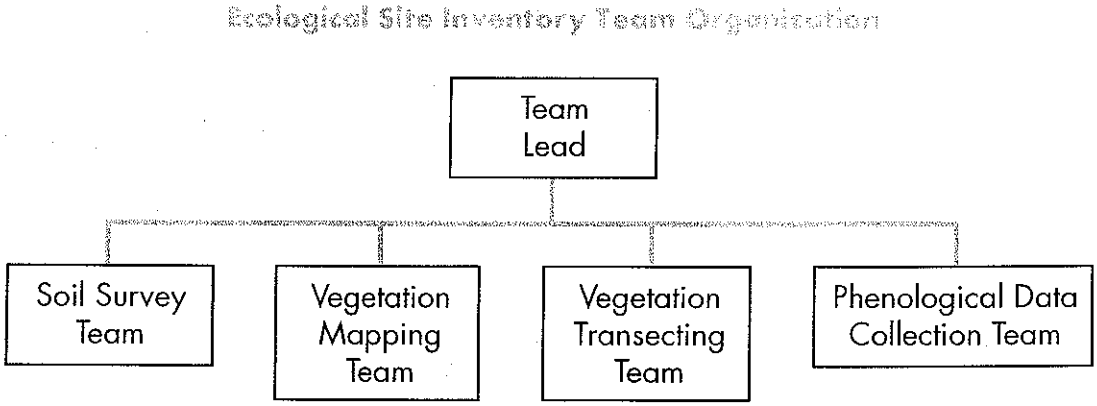


**Figure 1 - Composition of Inventory Team**



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## Team Lead

The team lead should be a BLM permanent employee with supervisory experience. Leads should be selected for their knowledge, experience, competence, and good judgment. They should be knowledgeable and experienced in the objectives and procedures of ecological site inventories and acquainted with the Bureau's interrelated programs. They are responsible for organizing and directing the inventory, coordinating field data collection, assigning work, keeping equipment in good operating order, administrative support (time sheets, leave approval, employee evaluations, travel, training) and reporting the progress of the inventory.

## Soil Survey Team

The soil survey team is needed only if a soil survey has not been completed or if the existing survey needs further refinement. The team may include employees from BLM, NRCS, combined BLM-NRCS, or contract personnel.

## Vegetation Mapping Team

The vegetation mapping team usually works in close contact with the soil survey team and is responsible for the delineation of ecological sites, successional status, and present vegetation communities. Team members should include an experienced vegetation management specialist (e.g., rangeland management specialist, forester, ecologist, botanist), a soil scientist, and a wildlife biologist. If riparian-wetland sites are involved in the inventory, a hydrologist is critical, at least during the planning, soil survey, and vegetation mapping phases. These specialists must be familiar with the soils and plant and animal communities of the inventory area.

## Vegetation Transecting Team

The vegetation transecting team is usually comprised of rangeland management specialists, biologists, botanists, and foresters. A knowledge of the plants in the inventory area is required, along with a good plant taxonomy background. Botany expertise may be required full or part time. For riparian-wetland inventory updates, at least one vegetation specialist with experience in wetland ecology and wetland plant taxonomy is needed.

## Phenological Data Collection Team

It may be desirable to assign the responsibility of collecting data for phenological adjustment factors to one or two individuals. This will ensure accurate data collection in a timely manner for this important phase of the inventory. This team may also collect samples for air-dry weight (ADW) conversion data.

## Natural Resource Specialists on the Inventory Team

The following natural resource specialists can provide the necessary experience and expertise as part of the individual teams that form the main inventory team.

### *Soil Scientist*

The soil scientist is responsible for mapping ecological sites and developing soil map units.

### *Vegetation Management Specialist*

The vegetation management specialist is responsible for mapping vegetation communities and administrative boundaries; collecting vegetation and related resource data (e.g., production, cover, rangeland health, structure); and assisting the soil scientist in mapping ecological sites and developing soil map units.

The vegetation management specialist can be a botanist, biologist, rangeland management specialist, forester, or anyone proficient in identifying vegetation species. This expertise is



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usually involved to some degree on all phases of the inventory (i.e., vegetation mapping, soil survey, transecting, and phenology) including inventory plan preparation.

### *Wildlife Biologist*

The wildlife biologist is responsible for ensuring that wildlife issues and concerns are considered in the mapping of ecological sites and vegetation communities. This includes noting special habitat features on aerial photos. Features to be mapped will have been determined in the pre- planning analysis and inventory plan, which will identify the areas to be investigated in detail after the inventory is complete.

Input from a wildlife biologist is recommended throughout ecological site inventories and soil surveys. Although not involved during all the field mapping, the wildlife biologist needs to have direct input at critical times, which include the initial planning phase and area base map preparation; map unit design to ensure that wildlife habitat vegetation components are recognized and wildlife interpretation needs are met; ecological site description interpretation development and revision; and development of applicable soil-wildlife-habitat interpretations. Because of the extremely high wildlife values associated with riparian-wetland areas, the wildlife biologist's participation in field mapping is critical and participation in riparian-wetland ecological site inventories and updates is required. In addition, the wildlife biologist provides assistance to other members of the inventory team (e.g., hydrologist) in completing the field work for developing ecological site descriptions, and is also involved in inventory plan preparations.

### *Hydrologist*

A hydrologist is an integral part of the inventory team relative to riparian-wetland sites. The hydrologist is responsible for the description of water features associated with riparian-wetland map units and ecological sites. Hydrologic input for progressive soil surveys and ecological site inventories is critical during the planning phase and in map unit design to ensure accurate watershed hydrologic interpretations. The hydrologist's input in mapping, describing, and updating riparian-wetland ecological sites is required.

The hydrologist works with the soil scientist and vegetation management specialist to establish interrelationships and ecological responses to hydrologic events and changes over time and space attributable to stream dynamics or other surface and near-surface water fluctuations.

### *Other Resource Specialists*

Input from other natural resource specialists and managers, other than those mentioned previously, should be actively sought to identify specific needs whenever necessary. Their input is especially valuable during the inventory planning phase and again in the development of site and soil interpretations. In addition, assistance from recreation specialists, geologists, geomorphologists, fire managers, and other natural resource specialists are often helpful throughout the inventory and site description processes depending on the complexity and resource values associated with individual areas.



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# Preparing for Field Operations

The team lead formulates a plan of operation, assembles materials and equipment, makes necessary arrangements, and coordinates with appropriate field office staff. The lead is responsible for ensuring that all forms, maps, photos, and other equipment and supplies necessary for conducting the inventory are available.

## *Training and Orientation*

The training and orientation of the inventory team is the responsibility of the team lead. The lead is responsible for assessing specific training needs. This includes scheduling and preparing training in procedures (e.g., mapping units, data collection, plant identification, aerial photo interpretation). It also includes orientation to the geographical inventory area and rangeland users.

It is particularly important that the inventory team be well trained on measurement techniques. The inventory team should have a basic understanding of the kinds and amount of data needed and the intended uses of the data.

The need for training in specific sampling techniques for each discipline represented in an ecological site inventory will vary greatly depending on individual background and expertise.

*The following are recommended courses:*

- Inventory and Monitoring of Plant Populations (BLM National Training Center (NTC) Course 1730-05). Presents information on inventory, monitoring, analysis, and evaluation techniques for vegetation and plant populations.
- The Ecological Site Concept (BLM NTC Course 4000-ST-2, self-study course and video). Provides basic instruction on soil map units, ecological site concepts, and SWA mapping criteria.
- Coordinated Riparian Area Management (BLM NTC Course 1737-1). Provides an introduction to riparian-wetland ecological site concepts, as well as substantial information on BLM riparian-wetland policies, values, and management concepts.
- Riparian-Wetland Ecological Site Classification (BLM NTC Course 1737-4). Advanced course for mapping and describing riparian-wetland sites.
- GIS - Geodata for Resource Specialists (BLM NTC Course 1730-11). Provides a basic understanding and hands-on experience in the concepts, use, and application of GIS.
- Basic Aerial Phot Interpretation (BLM NTC Course 9160-1). Provides students with the background and ability to interpret and use various kinds of aerial photography.
- Soils - Basic Soil Survey: Field and Laboratory (NRCS National Employee Development Center (NEDC), Fort Worth). Designed to provide new soil scientists and other specialists an opportunity to experience what it takes to complete a soil survey. Output potential of soil interpretations and use of field and laboratory methods and data analysis in soil survey are also discussed.



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*Additional courses recommended for specific disciplines include:*

- ECS - Range Plant Ecology (NRCS NEDC, Fort Worth). Advanced course that provides information on the ecological interaction of range vegetation.

- RES CONS - Saline and Sodic Soils (NRCS NEDC, Fort Worth). Provides a background and hands-on experience in understanding chemical relationships, testing and analyzing data, recognizing problems, and recommending management solutions.

- Soils - Soil Correlation (NRCS NEDC, Fort Worth). Advanced course for soil scientists provides insight and techniques to apply soil classification, soil correlation procedure, geomorphic relationships, soil survey area handbook development, and laboratory data analysis and sampling procedures.

- Soils - Soil Lab Data Use (NRCS NEDC, Fort Worth). Advanced course for soil scientists provides insight and techniques for using laboratory data in soil classification and plant relationships.

- Soils - National Soil Information System (NASIS) (NRCS). Advanced course for soil scientists familiarizes students with NASIS structure, spreadsheet organization, and how to populate NASIS data fields.

## *Aerial Photographs and Maps*

Aerial photographs and maps are important tools in the inventory process. They help identify locations of natural landscape and special features and assist in mapping soils, vegetation communities, and special habitat features.

### Aerial Photographs

It is essential to have a complete set of aerial photographs for inventory purposes. These should be acquired well in advance of the inventory. To facilitate the inventory, more recent (less than 10 years old) photos are the most desirable. Natural color or color-infrared photography is best for mapping vegetation, and a scale of 1:24,000 is best suited for ease of transferring the information to orthophoto quads or topographic maps. The aerial photos or orthophoto quads are used for field mapping and this information is then transferred to the map base. Aerial photos are helpful in seeing greater detail, but orthophotos are better for mapping. Refer to Appendix 1 for details on acquiring aerial photos.

### Orthophoto Quads

Orthophoto quads are distortion-free image maps at 1:24,000 scale. They are excellent tools for mapping data in the field or from aerial photography. They can also be scanned and georeferenced for inclusion in GIS. With an ortho image as a backdrop, the user can digitize the inventory units, display global positioning system (GPS) data, or analyze other data layers. Also available in most areas are Digital Ortho Quarter Quads (DOQQ), which have replaced paper and film orthophotos and are GIS-ready images. Contact your State Office GIS coordinator about availability.

### Topographic and Planimetric Maps

Use topographic and planimetric maps or any high-quality maps that accurately show the relative position and nature of the inventory area features. U.S. Geological Survey (USGS) topographic quadrangles at 1:24,000 scale are the



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most useable and available. They, too, come in digital format for GIS and are called USGS Digital Raster Graphics (DRG).

### Administrative Maps

Administrative maps include information such as management units or grazing allotment boundaries, range improvements, timber harvests, fish and wildlife habitat, and land status. They are useful references for team members during the inventory and can be integrated as data layers for analysis in GIS if they have been digitized. Overlays can be made for use with orthophoto quads as well.

### Other Maps

Topographic maps overlaid with geology, precipitation, and land ownership are helpful in mapping soils and ecological sites.

### Remote Sensing Imagery

Remote sensing images may be helpful in mapping landscape features, vegetation communities, and soils. Remote sensing images can be obtained at comparable scales to orthophoto quads providing multispectral information.

## *General Equipment*

Equipment and tools include items such as photos, maps, references, forms, pens, pencils, Quadrat frames, and balance scales. Table 2 lists general equipment common to each discipline.



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Table 2 - Equipment List

| General Equipment | Soils | Vegetation | Wildlife Biology | Hydrology |
|---|---|---|---|---|
| Inventory plan | x | x | x | x |
| Memorandum of Understanding (MOU) | x | x | x | x |
| Manuals and handbooks (see specific lists under Soil, etc.) | x | x | x | x |
| Forms | x | x | x | x |
| Field notebook | x | x | x | x |
| Existing site descriptions common to the inventory area | x | x | x | x |
| Plant ID references | x | x | x | |
| List of plant names and symbols found in the State | x | x | x | |
| Geomorphology reports for the area and related scientific papers | x | | | |
| Plat or land status maps | x | x | x | x |
| Abney level or clinometer | x | x | | x |
| Stereoscope (mirror and pocket) | x | x | | |
| Camera | x | x | x | x |
| Pens and pencils | x | x | x | x |
| Compass (magnetic) | x | x | | |
| Quadrat frames | | x | | |
| Pin flags | | x | | |
| Paper bags | | x | | |
| Balance scales | | x | | |
| Clippers and grass sheers | | x | | |
| Rubber bands | | x | | |
| Auger or probe (hand and/or power) | x | x | | x |
| Shovel (standard) and tile spade | x | x | | x |
| Tape measure (metric and English) | x | x | x | x |
| Computer | x | x | x | x |
| Vehicle and aircraft | x | x | x | x |
| First aid kit | x | x | x | x |



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## *Specialized Equipment*

The following information lists additional equipment and references specific to each discipline.

### Soils

Specific soils needs include, but are not limited to:

- Manuals and handbooks on procedural guidance and other references
  - NRCS National Soil Survey Handbook (430-VI-NSSH, 1996)
  - Soil Survey Manual (Agriculture Handbook No. 18, Oct 1983)
  - Soil Taxonomy (2nd edition Agriculture Handbook No. 436 and recent amendments)
  - SMSS Keys to Soil Taxonomy (8th Edition, 1998)
  - NRCS National Range and Pasture Handbook (NRPH)
  - NRCS National Forestry Manual (NFM)
  - NRCS National Biology Manual (NBM)
  - NRCS National Cartographic Manual (NCM)
  - NRCS Field Handbook for Describing and Sampling Soils
  - USDA-NRCS Soil Series of the United States (www.statlab.iastate.edu/soils)
  - State Hydric Soil List
  - For other suggested technical references, see Section 602-4 of the National Soils Handbook (NSH).

- Forms
  - NRCS Field Indicators of Hydric Soils in the United States (Version 4.0, March 1998)
  - Map Unit Transect forms commonly used in the State NRCS-SOI-232 Pedon Description or as revised by the State
  - NRCS-SOI-232F Soil Description or other like forms commonly used in field note taking
  - Access to the soil survey database software for data entry into NASIS forms and retrieval

- Field Soil Survey Database (FSSD) for transect management, pedon management, map unit records (NASIS), soils database software

- Pedon description program software

- Equipment
  Altimeter
  Backhoe (mounted on 1-ton truck)
  Color charts (Munsell)
  Digging bar
  Electric conductivity meter
  Geology pick
  Global positions system unit
  Hand lens
  Hydrochloric acid (10% solution)
  Knife
  Light table
  Map board
  pH kit (chemical)
  pH meter
  Sieve set
  Soil analysis (portable field laboratory)
  Soil sample bags and boxes
  Soil hand auger
  Soil test kit (chemical)
  Soil thermometer
  Spot plate
  Water bottles

### Vegetation

Specific vegetation needs include, but are not limited to:

- Manuals and handbooks on procedural guidance and other references
  - NRCS National Range and Pasture Handbook (NRPH)



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- BLM Manual 4400 Rangeland Inventory, Monitoring, and Evaluation
- BLM Manual 1737-7 Procedures for Ecological Site Inventory--With Special Reference to Riparian-Wetland Sites
- National List of Plant Species That Occur in Wetlands (USFWS)
- Soil-site correlation legend
- Soil map unit descriptions

• Forms
- Vegetation Production Worksheet (Appendix 4)
- NRCS Range 417 or equivalent form

• IDSU (Inventory Data System Utilities) computer program and/or access to IDS at NSTC

• Equipment
- Rope (plots 96 ft², 0.01 acre, .01 acre)
- Planimeters (if acreages are to be compiled by field crews)

## Wildlife Biology

Specific wildlife biology needs include, but are not limited to:

• Manuals and handbooks on procedural guidance and other references
- BLM Manual 6602, Integrated Habitat Inventory and Classification System (IHICS)
- Reference guides for the identification of birds, mammals, and reptiles

• Forms
- Animal Species Occurrence 6602-1
- Special Habitat Features 6602-2
- Resource Field Data Sheets 6602-3

• Computer software and documentation
- Integrated Habitat Inventory and Classification System (IHICS)
- Special Status Species Tracking (SSST)
- Species Tracking System (STS)

• Equipment
- Field glass
- Magnifying glass

## Hydrology

Specific hydrology needs include, but are not limited to:

• Manuals and handbooks on procedural guidance and other references
- Stream Classification Reference (Rosgen, unpublished)
- Water Resources Council Bulletin #17B of the Hydrology Committee, "Guidelines for Determining Floodflow Frequency"
- USGS Techniques of Water-Resource Investigations Reports:
  Book 3, Chapter A1: General field and office procedures for indirect discharge measurements
  Book 3, Chapter A2: Measurement of peak discharge by the slope-area method
  Book 3, Chapter A8: Discharge measurement at gaging stations
  Book 4, Chapter A2: Frequency curves
  Book 4, Chapter B1: Low-flow investigations
- Reference guide for estimating Manning's roughness coefficient
- Reference guides for water-quality field techniques

• Computer Software and Documentation
- Statistical software, with documentation, capable of performing frequency analysis using a log-Pearson Type III frequency distribution



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- Open-channel flow software, with documentation, capable of analyzing channel cross-section data, using normal depth and/or standard step calculations to produce relationships between discharge and other hydraulic parameters

• Equipment
- Surveying equipment
  Level, rod, tripod, and survey notebook
- Discharge measuring equipment
  Top-setting wading rod
  Current meter (Marsh-McBirney or vertical-axis current meter)
  Headset and stopwatch (if using vertical-axis current meter)
  Clipboard
  USGS discharge measurement forms
- Well points
- Water quality sampling equipment
  Thermometer
  Conductivity meter and calibration standards
  pH meter and calibration standards
  Bottles, labels, and preservatives for water samples
  Coolers with ice for sample transport to laboratory
  Field forms
  Sampling equipment for special situations
    Depth-integrating sampler (e.g., DH-48), treated for trace elements, for integrated cross-section sampling
    Bedload or bed-material sampling equipment
    Submersible, peristaltic, or other pump for shallow ground-water sampling
    Field filtration equipment for sampling dissolved chemical constituents, as opposed to sampling for total chemistry


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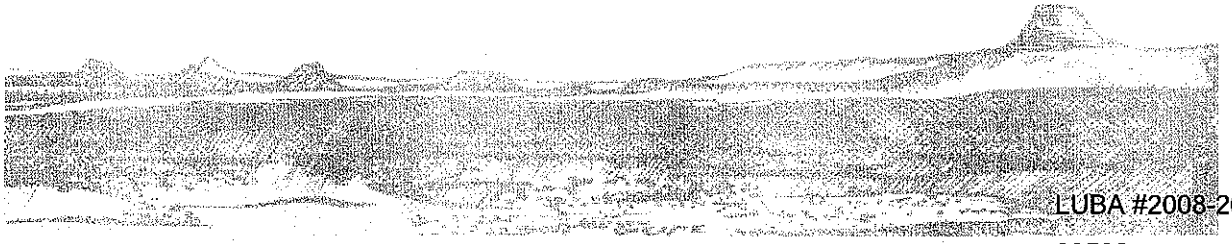

# Chapter 2 - Soils

## Soil Map Unit

SOIL SURVEY INFORMATION IS IMPORTANT in mapping ecological sites and vegetation communities. One major feature of a soil survey is the soil map unit–a group of soil areas or miscellaneous areas delineated in a soil survey. Small areas of similar and dissimilar soils are classified as inclusions. Inclusions are discussed in the soil survey map unit description, but are not mapped because they are either too small to be delineated at the scale of mapping or their interpretations are similar to the dominant soil.

There are four kinds of soil map units: consociation, complex, association, and undifferentiated group. (See the National Soils Handbook (NSH), pages 627-10 and 11). The consociation map unit is the most easily understood level of mapping because only one ecological site is delineated, although mapping at such a fine detail level may not be practical due to minimum size delineations.

### *Consociation*

A consociation is a map unit where the **dominant** single soil taxon or miscellaneous area makes up at least 50 percent of the area.

In a consociation, the **similar** soils or miscellaneous areas (soils or miscellaneous areas so similar to the dominant component that major interpretations do not significantly differ) make up less than 50 percent of the unit.

The total amount of dissimilar inclusions (soils whose interpretations differ from the dominant soil) generally does not exceed about 15 percent if the minor components are limiting (soils whose interpretations limit the use of the soil more than the dominant soil) and 25 percent if they are nonlimiting.

### *Complex*

A complex is a collection of two or more dissimilar kinds of soils or miscellaneous areas in a regular repeating pattern so intricate that they **cannot** be delineated separately due to the scale of mapping selected.

A complex consists of two or more of the following: different soils series, and/or different phases of soils series, and/or miscellaneous areas that occur in regular patterns like rock outcrops.

The total amount of dissimilar inclusions (soils whose interpretations differ from the dominant soil) generally does not exceed about 15 percent if the minor components are limiting (soils whose interpretations limit the use of the soil more than the dominant soil) and 25 percent if they are nonlimiting.

### *Association*

An association is similar to a complex, but differs because the major soil components or miscellaneous areas occur in repeatable patterns and **could** have been broken out into separate soil map units at the scale of mapping but were not.



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Soil association maps for low intensity land use management are more efficient and cost effective than more detailed mapping without detracting from the utility of the soil survey. It is more efficient to group and interpret several soils into one map unit rather than delineate separate map units.

The information about individual soil series are not lost, since their percentages and positions on the landscape are identified in the soil map unit description.

The total amount of dissimilar inclusions (soils whose interpretations differ from the dominant soil) generally does not exceed about 15 percent if the minor components are limiting (soils whose interpretations limit the use of the soil more than the dominant soil) and 25 percent if they are nonlimiting.

## *Undifferentiated Group*

Undifferentiated soil groups consist of two or more taxon components that are not consistently associated geographically and therefore do not always occur together in the same map unit. These taxa are included in the same named map unit because use and management of the soils are the same or are very similar for common uses.

Every delineation in an undifferentiated group has at least one of the major components and may have all the components.

The same principles regarding the proportion of minor components that apply to consociations also apply to undifferentiated groups

# Soil Map Unit Development

Soil map units are developed based on broad landscape features. These landscape features are further broken down into characteristic landforms and geomorphic components, such as hills, side slopes, toe slopes, floodplains, and depressions. The kinds of areas associated with these segments are then identified. Often, distinct vegetation patterns occur along these same landform and geomorphic surfaces. Generally, soil map units represent soil components that are repeated on the landscape.

# Soil Map Unit Descriptions

Soil map unit descriptions characterize the map unit as it is identified and delineated during the soil mapping process. The contents of a map unit description will provide information to the user detailing the setting for each dominant soil component. A brief soil profile description is given that details distinctive surface features, vegetation relationships, and soil properties that affect use and management. All dissimilar soil inclusions are identified and their differences in landscape setting and soil profile characteristics are noted in the description. From these descriptions, the user should be able to determine the patterns and percent of occurrence of each component soil and soil inclusion within the map unit and their position on the landscape.

# Detailed Soil Maps

*Base maps of soil surveys are primarily of two kinds:*

- Rectified photo base maps (high-altitude photography)



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- Orthophoto base maps (high-altitude photography with the displacement of images removed).

Soil map units are delineated on the base map to provide location and spatial relationships of soils for subsequent analysis. A map unit symbol can either be numeric, alphabetic, or a combination of both (NSH, page 627-7). It consists of no more than five elements (characters), including digits, letters, and hyphens that identify the delineation. The best way to assign map unit symbols is to sequentially number them and add alpha characters to describe the slope range of the map unit. The symbol also provides the reference to a map unit description and associated information. It's possible that field map unit symbols could change at final correlation prior to the publication of the soil survey.

## Soil Survey Mapping for Riparian-Wetland Areas

Most published soil survey maps, especially at the 1:24,000 scale are **not** detailed enough to delineate riparian-wetland areas, most streams, seeps, springs, potholes, and other small wet areas. This may necessitate delineating soil map units on a larger scale photo.

One alternative, where GIS capability is available, is to photographically or digitally enlarge an orthophoto quad base map to scales between 1:6,000 and 1:12,000 (Batson et al., 1987), delineate and identify the riparian-wetland map units, and then digitize the areas of the base maps. It is feasible to map riparian-wetland areas at a photo scale of 1:2,400 and perform a map transfer to 1:6,000 scale (a reduction of 2.5 times) if that amount of detail is needed. Riparian- wetland map unit delineations using this method would be quite small, but data entry into GIS would be possible.

A second alternative is to simply designate line segments on a scale of 1:24,000 to represent stream segments as a map unit and spot symbol map units for other kinds of riparian-wetland areas. When either line-break to line-break or dot-to-dot line segments and ad hoc or dot spot symbols are used, the average width of stream segments or the average area of spot symbols will have to be described in the map unit description. This method is used with or without GIS capability and soil survey area base maps are needed for reports. See Appendix 2, Soil Map Unit Delineations, for more details on using these techniques. Figure 2 is a schematic representation of a soil map that includes line segments. Each area with a symbol represents a soil map unit.

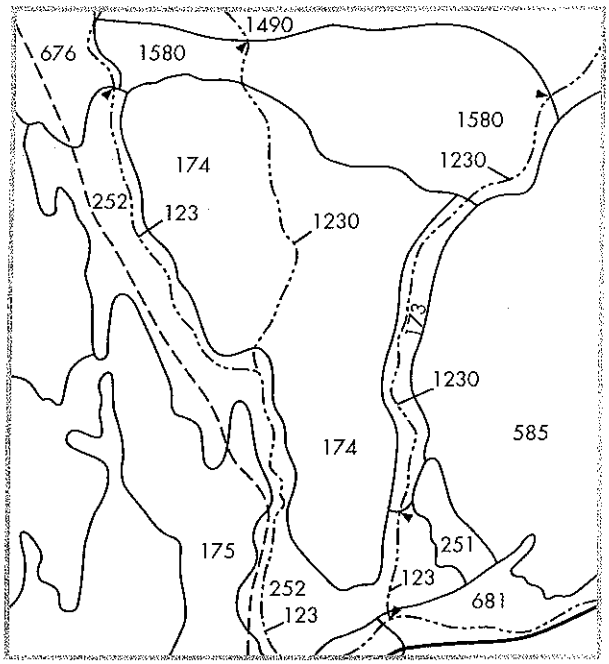


**Figure 2 - Schematic Representation of Soil Map with Line Segments. Each area with a symbol represents a soil map unit.**



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## Importance of Soil Map Units

The soil map unit provides the spatial relationship between soils or groups of soils and landscapes. The map unit also provides the link between the location of named soil taxa and tabular information on specific soil properties and interpretations for use and management.

In addition, soil map unit delineations provide the initial spatial relationship between ecological sites, which are correlated to the soil components of a map unit. Because of the relationship between landscape patterns, soils, and ecological sites, soil maps are an excellent base for other resource delineations or interpretive maps, such as wildlife habitat, recreational areas, watershed conditions, livestock utilization, and many others.



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# Chapter 3 - Ecological Sites

## Definition of Ecological Site

RANGELAND LANDSCAPES ARE DIVIDED into ecological sites for the purposes of inventory, evaluation, and management. An ecological site is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. It is the product of all the environmental factors responsible for its development, and it has a set of key characteristics (soils, hydrology, and vegetation) that are included in the ecological site description. Development of the soils, hydrology, and vegetation are all interrelated. Each is influenced by the other and influences the development of the others.

An ecological site has characteristic ***soils*** that have developed over time throughout the soil development process. The factors of soil development are parent material, climate, living organisms, topography or landscape position, and time. These factors lead to soil development or degradation through the processes of loss, addition, translocation, and transformation. Soils with like properties produce and support a distinctive kind and amount of vegetation and are grouped into the same ecological site.

An ecological site has a characteristic ***hydrology***, particularly infiltration and runoff, that has developed over time. The development of the hydrology is influenced by development of the soil and plant community.

An ecological site has evolved a characteristic kind (cool season, warm season, grassland, shrub-grass, sedge meadowland) and amount of ***vegetation***. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in annual production. These vegetation communities evolved with a characteristic kind of herbivory (kinds and numbers of herbivores, seasons of use, intensity of use) and fire regime. Fire frequency and intensity contributed to the characteristic plant community of the site.

## Succession and Retrogression

Succession is the process of soil and plant community development on an ecological site. Retrogression is the change in species composition away from the historic climax plant community due to management or severe natural climatic events.

Succession occurs over time and is a result of interactions of climate, soil development, plant growth, and natural disturbances existing on the site through time. Primary succession is the formation process that begins on substrates having never previously supported any vegetation (e.g., lava flows, volcanic ash deposits). Secondary succession occurs on previously formed soil from which the vegetation has been partially or completely removed.

Ecological site development associated with climatic conditions and normal range of disturbances (e.g., occurrence of fire, grazing, unusually wet periods, flooding) produce a plant community in dynamic equilibrium with these conditions. This plant community is referred to as the historic climax plant community.



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Vegetation dynamics on an ecological site includes succession and retrogression. The pathway of secondary succession is often not simply a reversal of disturbances responsible for retrogression and may not follow the same pathway as primary succession.

## States and Transition Pathways

A state and transition model is used to describe vegetation dynamics and management interactions associated with each ecological site. A state and transition model provides a method to organize and communicate complex information about vegetation response to disturbances (e.g., fire, lack of fire, drought, unusually wet periods, insects, and disease) and management.

A ***state*** is a recognizable, relatively resistant and resilient complex with attributes that include characteristic climate, soil resource including soil biota, and the associated aboveground plant communities (Figure 3). The soil and vegetation

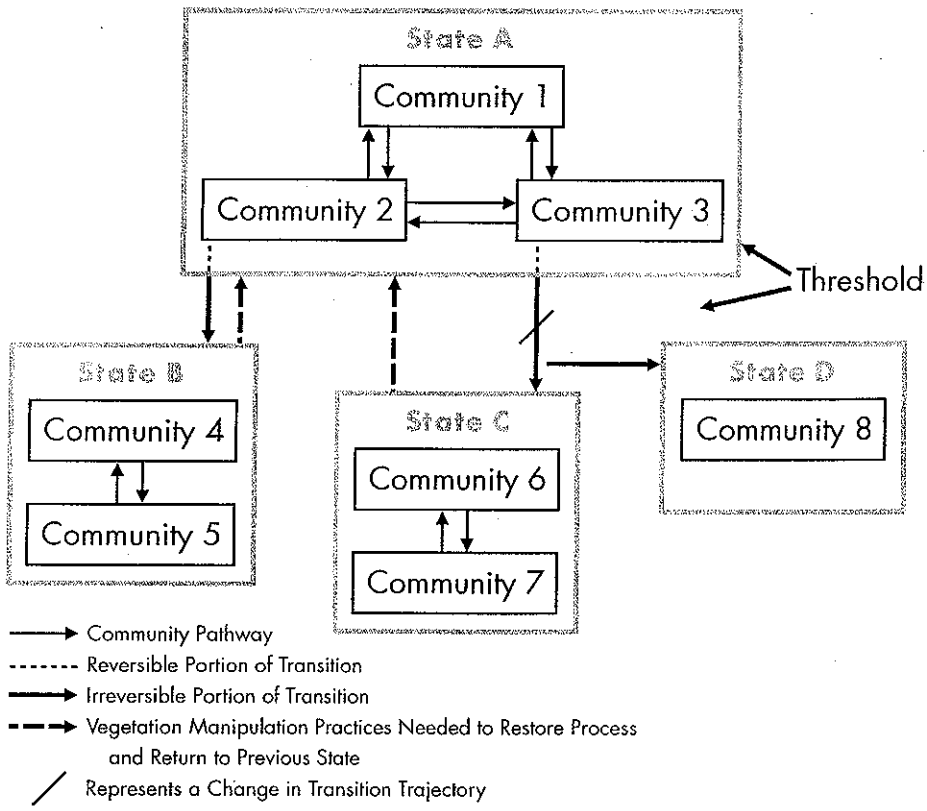


**Figure 3 - State and Transition Model Diagram for an Ecological Site. (Reproduced from the NRCS National Range and Pasture Handbook, 2001.)**



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components are inseparably connected through ecological processes that interact to produce a sustained equilibrium that is expressed by a specific suite of plant communities. The primary ecological processes are water cycle, nutrient cycle, and the process of energy capture. Each state has distinctive characteristics, benefits, and values depending upon the intended use, products, and environmental effects desired from the site.

Two important attributes of a state are resistance and resilience. Resistance refers to the capability of the state to absorb disturbance and stresses and retain its ecological structure. Resilience refers to the amount of disturbance or stress a state can endure and still regain its original function after the disturbances and stresses are removed.

States are relatively stable and resistant to disturbances up to a threshold point. A threshold is the boundary between two states, such that one or more of the ecological processes has been irreversibly changed. Irreversible implies that restoration cannot be accomplished through natural events or a simple change in management. Active restoration (e.g., root plowing, seeding, chaining, prescribed fire, intensive grazing management) must be accomplished before a return to a previous state is possible. Additional thresholds may occur along the irreversible portion of a transition causing a change in the trajectory toward another state as illustrated in Figure 3. Once a threshold is crossed, a disequilibrium among one or more of the primary ecological processes exists and will be expressed through changes in the vegetative community and eventually the soil resource. A new stable state is formed when the system reestablishes equilibrium among its primary ecological processes.

A ***transition*** is the trajectory of system change between states that will not cease before the establishment of a new state. Transitions can be triggered by natural events, management actions, or both. Some transitions may occur very quickly and others over a long period of time. Two portions of a transition are recognized: reversible and irreversible. Prior to crossing a threshold, a transition is reversible and represents an opportunity to reverse or arrest the change. Vegetation manipulation practices, and if needed, facilitating practices, are used to reverse the transition. Once a threshold is crossed, the transition is irreversible without significant inputs of management resources and energy. Significant inputs are associated with accelerating practices, such as brush management and range planting.

States are not static as they encompass a certain amount of variation due to climatic events, management actions, or both. Dynamics within a state do not represent a state change since a threshold is not crossed. In order to organize information for management decisionmaking purposes, it may be desirable at times to describe these different expressions of dynamics within the states. These different vegetative assemblages within states will be referred to as plant communities and the change between these communities as community pathways.

Figure 3 illustrates the different components of a state and transition model diagram for an ecological site. States are represented by the large boxes and are bordered by thresholds. The small boxes represent plant communities with community pathways representing the cause of change between communities. The entire trajectory from one state to another state is considered a transition (i.e., from State A to State B). The



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portion of the transition contained within the boundary of a state is considered reversible with a minimum of input from management. Once the transition has crossed the threshold, it is not reversible without substantial input (vegetation manipulation practices). The arrow returning to a previous state (State B to State A) will be utilized to designate types of practices needed. Additional thresholds occurring along a transition may change the trajectory of a transition (from State C to State D).

The first vegetation state described in an ecological site description is the historic climax plant community or naturalized plant community (Community 1 from Figure 3). From this state, a "road map" to other states has been developed. Each transition will be identified separately and described, incorporating as much information known concerning the causes of change, changes in ecological processes, and any known probabilities associated with the transitions. Plant communities and community pathways within states may be described as needed.

## Historic Climax Plant Community

The historic climax plant community for an ecological site is the plant community that existed before European immigration and settlement. This plant community was best adapted to the unique combination of environmental factors associated with the site. The historic climax plant community was in dynamic equilibrium with its environment. It is the plant community that was able to avoid displacement by the suite of disturbances and disturbance patterns (i.e., magnitude and frequency) that naturally occurred within the area occupied by the site. Natural disturbances, such as drought, fire, unusually wet periods, and grazing (e.g., native fauna and insects) were inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the site that contribute to that dynamic equilibrium. Fluctuations in plant community structure and function caused by the effects of these natural disturbances establish the boundaries of dynamic equilibrium. They are accounted for as part of the range of characteristics for an ecological site. Some sites may have a small range of variation, while others have a large range. Plant communities that are subjected to abnormal disturbances and physical site deterioration or that are protected from natural influences, such as fire and grazing, for long periods seldom typify the historic climax plant community.

The historic climax plant community of an ecological site is not a precise assemblage of species for which the proportions are the same from place to place or from year to year. In all plant communities, variability is apparent in productivity and occurrence of individual species. Spatial boundaries of the communities, however, can be recognized by characteristic patterns of species composition and community structure.

## Naturalized Plant Community

Ecological site descriptions have been developed for all identified ecological sites. In some parts of the country, however, the historic climax plant community has been destroyed, and it is impossible to reconstruct that plant community with any degree of reliability. In these regions, site descriptions have been developed using the naturalized plant communities for the site. The use of this option for ecological site descriptions is limited to those sites where the historic climax plant community has been destroyed and cannot



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be reconstructed with any degree of reliability. The annual grasslands of California are an example of a naturalized plant community.

## Potential Natural Community

A potential natural community (PNC) is defined as the biotic community that would become established on an ecological site if all successional sequences were completed without interference by people under the present environmental conditions. The term "potential natural community" was recommended for use by the Range Inventory Standardization Committee (RISC) in its 1983 report to replace the term "historic climax plant community." The RISC report's rationale was that PNC recognizes past influences by man, including past use and introduced exotic species of animals or plants. Man's influence is excluded from the present onward to eliminate the complexities of management. The concepts of climax and PNC both refer to a relatively stable community resulting from secondary succession after disturbance. Although man may or may not have caused the disturbance, succession to climax or PNC occurs without further perceptible influences of man's activity. PNC is the preferred term because it explicitly recognizes that naturalized exotic species may persist in the final stage of secondary succession and that succession after disturbance does not always reestablish the original vegetation.

## Historic Climax Plant Community Versus Potential Natural Community

In this document, the term "historic climax plant community" is used in reference to the official ecological site description. NRCS still requires the documentation of a historic climax plant community in the revision or preparation of new site descriptions. BLM managers and resource personal have the option of using a PNC for evaluation of similarity indices rather than an historic climax plant community. In order to use PNC there must be compelling evidence that a particular species or group of species, not included in the historic climax plant community, should be included in more advanced successional vegetation communities.

## Changes in Ecological Site Potential

Severe physical deterioration of an ecological site can permanently alter the potential to support the original plant community. Examples include permanently lowering the water table, severe surface drainage caused by gullying, and severe soil erosion. When the ecological site's potential has significantly changed, it is no longer considered the same site. A change to another ecological site is then recognized, and a new site description may need to be developed on the basis of its altered potential.

Some ecological sites have been invaded by or planted to introduced species. The introduced species may become well established or naturalized to the site. They may dominate the site, or they may continue to occupy part of the site even when secondary succession has restored the plant community to near historic climax conditions. In these cases of invasion or introduction of nonnative species, a change in ecological site is not recognized because the edaphic and climatic potential for the site has not been altered.



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## Characteristic Vegetation States of an Ecological Site

Where possible, the historic climax plant community for each ecological site has been determined. Where it is not possible to determine the historic climax plant community, the naturalized plant community will be described. In addition to the historic climax plant community or naturalized plant community, other plant communities that comprise the known steady states of vegetation will be determined and included in future ecological site descriptions.

The description of each plant community should have been considered as an approximation subject to modification as additional knowledge becomes available.

Characteristics of a plant community obtained from several sources or sites should have been used to describe the plant communities. The following factors have been considered in evaluating plant information:

- Effects of fire or lack of fire
- Impacts of grazing or lack of grazing
- Impacts of rodent concentrations
- Impacts from insects
- Soil erosion or deposition by wind or water
- Drought or unusually wet years
- Variations in hydrology and storm events
- Plant disease
- Introduced plant species

The NRCS' Ecological Site Information System (ESIS) can provide useful data in identifying plant communities. This system can be found on the World Wide Web at ***http://plants.usda.gov/esis***.

## Differentiation Between Ecological Sites

*The following guidelines are used to differentiate one ecological site from another:*

- Significant differences in the species or species groups that are in the historic climax plant community, such as the presence (or absence) of one or more species that make up 10 percent or more of the historic climax plant community by air-dry weight (ADW)

- Significant differences in the relative proportion of species or species groups in the historic climax plant community, such as a 20 percent (absolute) change in composition by ADW between any two species in the historic climax plant community

- Significant differences in the total annual production in the historic climax plant community

- Soil factor differences that determine plant production and composition, the hydrology of the site, and the functioning of the ecological processes of the water cycle, nutrient cycles, and energy flow

Any differences in these guidelines (either singly or in combination) great enough to indicate a different use potential or to require different management, are the basis for establishing or differentiating a site.

These guidelines are not definitive for site differentiation or combination. The differences between sites may be finer or broader than the guidelines. Rationale, and the site features listed in the respective ecological site descriptions, should readily and consistently distinguish the differences.



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Differences in kind, proportion, or production of species are the result of differences in soil, topography, climate, and other environmental factors. Slight variations in these factors are not criteria for site differentiation; however, individual environmental factors are frequently associated with significant differences in historic climax plant communities. The presence or absence of a water table within the root zone of highly saline soil in contrast to a nonsaline soil is dramatically reflected in plant communities that such soils support. Marked changes in soil texture, depth, and topographic position usually result in pronounced differences in plant communities, total production, or both. Therefore, such contrasting conditions in the soil characteristics, climate, topography, and other environmental factors known to be associated with a specific ecological site can be used as a means of identifying the site when the historic climax plant community is absent.

Generally, one species or group of species dominate a site. Dominant status does not vary from year to year. Because of their stability in the historic climax plant community, dominant species have often been used to distinguish sites and to differentiate one site from another.

In evaluating the significance of kinds, proportion, and production of species or species groups that are dominant in a historic climax plant community, and given different soil characteristics, the relative proportion of species may indicate whether one or more ecological sites are involved. For example, in one area the historic climax plant community may consist of 60 percent big bluestem and 10 percent little bluestem, and in another area it may consist of 60 percent little bluestem and 10 percent big bluestem. Thus, two ecological sites are recognized. Even though the production and species are similar, the proportion's difference distinguishes them as separate sites.

The effect of any single environmental factor can vary, depending on the influence of other factors. For example, soil depth is more significant on a site that receives extra water from runoff or in a high precipitation zone than on an upland site in a low precipitation area. An additional 2 inches of annual rainfall may be highly important in a section of the country that has an arid climate, but of minor significance in a humid climate. A difference in average annual production of 100 pounds per acre, ADW, is of minor importance on ecological sites capable of producing 2,000 pounds per acre. This difference, however, is highly significant on sites capable of producing only 200 to 300 pounds per acre. Similar variations in degree of significance apply to most factors of the environment. Consequently, in the identification of an ecological site, consideration was given to its environment as a whole, as well as to the individual components.

Where changes in soils, aspect, topography, or moisture conditions are abrupt, ecological site boundaries are distinct. Boundaries are broader and less distinct where plant communities change gradually along broad environmental gradients of relatively uniform soils and topography. Making distinctions between ecological sites along a continuum is difficult. Thus, the need for site differentiation may not be readily apparent until the cumulative impact of soil and climatic differences on vegetation is examined over a broad area.

At times, less frequently occurring plants may increase on a site or the site may be invaded by plants not formerly found in the historic climax plant community. The presence or absence of these plants may fluctuate greatly because of



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differences in microenvironment, weather conditions, or human actions. Consequently, using them for site identification can be misleading, so they should not be used to differentiate sites. Site differentiation, characterization, and determination are based on the plant community that develops along with the soils. A study of several locations over several years is needed to differentiate and characterize a site.

Availability and accessibility to domestic livestock grazing are not factors in ecological site determination and differentiation. Site differentiation is based on those soil characteristics, response to disturbance, and environmental factors that have direct effect on the nature of the historic climax plant community production.

## Revising Ecological Site Descriptions

Analysis and interpretation of new information about the soil, vegetation, and other onsite environmental factors may reveal a need to revise or update ecological site descriptions. Because the collection of such information through resource inventories and monitoring is a continuous process, site descriptions may be reviewed periodically for needed revision. It is especially important that site descriptions be reviewed when new data on production or response to disturbance become available. Documented production data, along with related soil, climate, and physiographic data, will be the basis of the site description revisions or new site descriptions.

## Developing New Ecological Site Descriptions

A new ecological site description should be prepared when data analysis or new information reveals that a different or new ecological site exists. Generally, enough land area must be identified to be of importance in the management or study of the site before a new site will be developed and described. A new ecological site may be differentiated from an existing site when sufficient erosion or other action has occurred to significantly alter the site's potential.

## BLM Procedures

BLM has the capability to develop new site descriptions and propose revisions to existing ecological site descriptions. However, each new site description or proposed change must be prepared using the procedure identified in Chapter 3 of the NRCS National Range and Pasture Handbook. All new and proposed revisions must be reviewed and approved by the local and State NRCS offices.

## Naming Ecological Sites on Rangeland

Ecological sites have been named to help users recognize the kinds of rangeland in their locality. Names of ecological sites are brief and are based on readily recognized permanent physical features such as the kinds of soil, climate, topography, or a combination of these features. Examples of ecological site names based on these criteria are Deep Sand, Sandy, Sandy Plains, Limestone Hills,



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Clay Upland, Saline Lowland, Gravely Outwash, Level Winding Riparian, Pumice Hills, Sub-irrigated, Wet Meadows, Fresh Marsh, and Sandy Savanna. Some States have chosen to add the dominant species commonly found on the site to the ecological site name. Examples are Alkali Bottom (Alkali Sacaton), Desert Clay (Shadscale), and Upland Loam (Basin Big Sagebrush).

Ecological sites having similar soils and topography may exhibit significant differences in their historic climax plant communities because of climatic differences. For example, the average annual precipitation of a clay loam in southern Arizona ranges from 12 to 16 inches. Quantitative evaluation indicates that the amount of vegetation produced in areas where precipitation is 16 to 19 inches is significantly more than that produced in areas where precipitation is 12 to 16 inches. Thus, two ecological sites are recognized and are distinguished by the inclusion of the precipitation zone (PZ) in the name of the sites, as in Clay Loam Ecological Site 12-16 PZ and Clay Loam Ecological Site 16-19 PZ.

The limited number of permanent physiographic features or other features used in naming ecological sites makes repeated use of these terms inevitable. Deep sands, for example, occur in areas of widely divergent climate and support different natural plant communities. The name Deep Sand is appropriate for each of these areas, but obviously it is used throughout the country to designate several ecological sites. Where this occurs within a land resource area, the applicable precipitation zone or other differentiating factors are to be included as part of the name. Sites that have the same name, but are in different major land resource areas, are different sites.

## Numbering Ecological Sites

*The ecological site number for rangelands consists of five parts:*

1. The first character designates whether the site is a rangeland site (R) or a forest site (F). Since this identifier is not actually a part of the number, it is rarely used.

2. A three-digit number and one-digit letter representing the Major Land Resource Area (MLRA)

3. A single letter representing a Major Land Resource Unit (MLRU)

4. A three-digit site number assigned by the State

5. A two-digit letter State postal code

If the MLRA has only two numbers, a zero is inserted in the first space followed by the two numbers. The first letter (e.g., A, B, C) following the MLRA number represents the MLRA subdivisions. Where no MLRA subdivisions are identified, an **X** is used in the fourth space to denote that there is no MLRA subdivision. The fifth space is reserved for the MLRU letter for States that use the MLRU designation. For those States that do not use the MLRU designation, a **Y** is inserted. The next three digits represent the individual ecological site number and are assigned by the State. The final two letters are the State's two-letter postal code. An example of an ecological site number is: RO41XC313AZ

Ecological sites for MLRAs that extend into adjoining States would retain the same identification number including the State designation



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for both States. The State postal code attached would be the State that first described the site.

Site descriptions will be labeled as "draft" until the NRCS's State range conservationist approves the site description.

## Correlating Ecological Sites

Ecological sites should have been correlated between areas, States, and MLRAs on the basis of soils, proportion of species, and annual production of the potential plant communities. In this process, ecological site descriptions are reviewed to ensure consistency in identifying and describing the same site across State, area, and MLRA boundaries. These reviews include comparing similar sites to determine whether they are in fact different ecological sites. Correlation also involves the review of soils information to ensure the description matches the soil properties in the individual soil series.

Only one name should have been given to a single site that occurs in adjacent States within the same MLRA.

## Ecological Site Description

A description has been prepared for each ecological site (see an example in Appendix 3). The description identifies the important resources for the site that are used to identify, evaluate, plan, develop, manage, and monitor rangelands. The description includes the following information, as appropriate:

### *Heading*

All ecological site descriptions will identify the USDA and Natural Resources Conservation Service.

### *Ecological Site Name*

The full name of the site should appear on each page of the description.

### *Ecological Site ID*

The site number is a 10-digit number that also appears on each page of the description.

### *Major Land Resource Area*

Identifies the major land resource area code and common name.

### *Interstate Correlation*

Lists the States that have correlated the site.

### *Physiographic Features*

Describes the occurrence of the site on the landscape. In reference to the historic climax plant community, includes information on whether the site typically generates runoff, receives runoff from other sites, or receives and generates runoff. Physiographic features include:

- Landform
- Aspect
- Site elevation



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- Slope
- Water table
- Flooding
- Ponding
- Runoff class

## *Climatic Features*

*Climatic features include:*

- Frost-free period (length and dates)
- Freeze-free period (length and dates)
- Mean annual precipitation
- Monthly moisture and temperature distribution
- Location of climate stations

## *Influencing Water Features*

Includes information regarding water features where the plant community is influenced by water or the water table from a wetland or stream associated with the site. Water features include the Cowardin wetland classification system and Rosgen stream classification system.

## *Representative Soil Features*

*The main soil properties associated with the site are briefly described. This includes:*

- Properties that significantly affect plant, soil, and water relationships, and the site hydrology
- The extent of flow patterns, and the rills and gullies found in the historic climax plant community
- The amount and patterns of pedestaling and terracettes caused by wind or water inherent to the historic climax plant community
- The size and frequency of wind-scoured areas
- The susceptibility of the site to compaction
- A description of the expected organic layer and physical and chemical crusts that might be present

*Representative soil features include:*

- Parent materials
- Surface texture
- Subsurface texture
- Surface fragments
- Subsurface fragments
- Drainage class
- Permeability class
- Depth
- Electrical conductivity
- Sodium absorption ratio
- Calcium carbonate equivalent
- Soil reaction
- Available water holding capacity

## *Ecological Dynamics of the Site*

The general ecological dynamics of the site are described. Included are the expected changes that are likely to occur because of variations in the weather and the effects this might have on the dynamics of the site. Included are assumptions regarding site development (e.g., fire frequency, native herbivory).

## *Plant Communities*

*This section describes:*

- Vegetation dynamics of the site
- State and transition model diagram
- Common states that occur on the site and the



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transitions between states. Included are the plant communities and community pathways within each state.
- Ground cover and structure
- Annual production
- Growth curves
- Photos of each state or community

The first plant community to be described should be the interpretative community. This plant community will be either the historic climax plant community or, where applicable, the naturalized plant community for the site.

Other states and plant communities that may exist on the site are also described. One or more plant communities for each state will be described. Included is a narrative describing the dynamics of each state and plant community and the causes of community pathway changes. Also described are the thresholds between states, and information that will aid in the identification and evaluation of how the ecological processes of the site are functioning.

Information regarding transitions between states should have been included in the plant community narrative, as well as causes of change and any known probabilities associated with the transitions.

## *Species List*

A detailed species list will be included for the historic climax plant community and each stable state plant community known to exist on the site. Each listing should include the major plant species (i.e., common name and scientific name) and their normal relative production expressed in pounds ADW (pounds per acre per year) in the total plant community. Species should be listed by life form and group, including pounds per acre allowable for each group.

## *Plant Groups*

*Ecological site descriptions usually list plant species by groups. Plant groups include:*

- Cool season tall grasses
- Cool season midgrasses
- Warm season tall grasses
- Warm season midgrasses
- Warm season short grasses
- Annual grasses
- Perennial forbs
- Biennial forbs
- Annual forbs
- Succulent forbs
- Leafy forbs
- Shrubs
- Half-shrubs
- Deciduous trees
- Evergreen trees
- Cacti
- Yucca
- Yucca-like plants

*Other factors used to identify groups include:*

- Kind of plant
- Structure
- Size
- Rooting structure
- Life cycle
- Production
- Niche occupied
- Photosynthetic pathways

If plant groups are shown, plant groupings will identify whether individual species within the group have a production limitation or whether a



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single species can account for the entire group allowable.

Groups may be subdivided into separate groups or combined. For instance, two or three groups of warm season mid-grasses may be described because of different niches occupied and differences in production, structure, elevation, and climatic adaptations in the area of the site.

## *Cover and Structure*

The following table (Table 3) is an adaptation of the table on ground cover and structure found in Appendix 3. Table 3 has been changed to more clearly illustrate ground cover and canopy cover layers (structure) for use by BLM.

Ground cover is the percentage of material, other than bare ground, that protects the soil surface from being hit directly by a raindrop. This would include first contact with plant canopy cover, biological crust, litter, rock fragments, bedrock, and water.

Canopy cover is the percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants.

Structure is the average height and canopy cover of each layer of vegetation.

**Table 3 - Cover and Structure**

| | Ground and Canopy Cover | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Structure - Height Above the Ground* | | | | | | | | | |
| | Not Applicable | | 6–12 inches | | 12–24 inches | | 24–60 inches | | 180–240 inches | |
| | %ground cover | %canopy cover | %ground cover | %canopy cover | %ground cover | %canopy cover | %ground cover | %canopy cover | %ground cover | %canopy cover |
| Trees | | | | | | | | | | |
| Shrubs | | | | | | | | | | |
| Forbs | | | | | | | | | | |
| Grasses | | | | | | | | | | |
| Litter | | | | | | | | | | |
| Cryptogams | | | | | | | | | | |
| Rock Fragments | | | | | | | | | | |
| Bare Ground | | | | | | | | | | |



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## *Biological Soil Crust Communities*

Information on biological soil crust communities (e.g., mosses, lichens, cyanobacteria, algae) usually includes only cover data. However, on tundra sites where current production can be determined on lichens and mosses, production may be expressed as total live biomass.

## *Total Annual Production*

Total annual production is shown as the median air-dry production and the fluctuations to be expected during favorable, normal, and unfavorable years. In areas where examples of the historic climax plant community are not available, the highest production in plant communities for which examples are available have been used.

## *Plant Community Growth Curves*

Plant community growth curves are displayed for each important plant community. Growth curves indicate the percent of growth by month (Table 4). This includes:

- **Number** - This number is used only one time in each State. The first 2 digits are the State postal code, and the last 4 digits are consecutive numbers from 001 to 9999.
- **Name** - This is a brief descriptive name for each curve.

If plant community growth curves are not available, contact the NRCS.

**Table 4 - Plant Community Growth Curves**

Growth curve number:
Growth curve name:
Growth curve description:

| Jan | Feb | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |

## *Ecological Site Interpretations*

This section includes the site interpretations for the use and management of the site. The information includes:

### Animal Community

This narrative describes the major wildlife species that occupy or use the site. It will include any major values or problems associated with their use of this site and the plant communities that may occur on it. Special status animal species, such as threatened and endangered species, and State or local species of concern are discussed. General descriptions of the use of this site by livestock and wild horses and burros should also be included. Suitability of the site for grazing by season and by kind and class of



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livestock will be addressed. Included in the discussion is a list of major barriers to wildlife and livestock use (e.g., water, topography).

### Hydrologic Functions
This discussion includes effects on the hydrologic functions from shifts to different plant communities. There should be a description of the changes in infiltration and runoff characteristics expected due to changes in plant communities and soil surface characteristics. Information about water budgets for each plant community could be included.

### Recreational Uses
Potential recreational uses that the site can support or that may influence the management of the site should be discussed. Included will be a list of special concerns that affect the maintenance of the recreational potentials or site conditions that may limit its potential. Also listed are plant species that have special aesthetic values, uses, and landscape value.

### Wood Products
Indicates use or potential uses of significant species that may influence the management of the site.

### Other Products
Indicates the use or potential uses of other products produced on the site. These may include landscape plants, nuts, berries, mushrooms, and biomass for energy potentials.

### Supporting Information
This narrative involves information about the relationship of this site to other ecological sites. Includes information regarding documentation and references used to develop the ecological site description.

### Associated Sites
This is a listing and description of other ecological sites that are commonly located in conjunction with this site.

### Similar Sites
Identifies and describes ecological sites that resemble or can be confused with the site.

### Inventory Data References
Includes a listing of sample transects or plots supporting the site description.

### State Correlation
Includes the states that this site has been correlated with.

### Type Locality
Includes the location of a typical example of the site. Indicates township, range, and section or longitude and latitude of the specific location.

### Relationship to Other Established Classification Systems
Includes a description of how this ecological site description may relate to other established classification systems.

### Other References
Includes other reference information used in site development or in understanding the ecological dynamics of the site.

## *Ecological Site Documentation and References*

Each ecological site description documents the following information about the preparation of the original or latest version of the description:



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### Authorship
The original author's initials and date. Revision author's initials and revision date.

### Site Approval
Includes signature, title, and date of the State technical specialist who reviewed and approved the ecological site description.

## Forestland Ecological Sites

Forestland ecological site descriptions normally characterize the mature forest plant community that historically occupied the site as well as the other major plant communities that commonly occupy the site. An example of a forestland ecological site description can be found in the NRCS National Forestry Manual, part 537, subpart E, exhibit 537-14.

## Separating Forested Lands from Rangelands in Areas Where They Interface

Rangeland and forested land ecological sites are separated based on the historic kind of vegetation that occupied the site. Forested land ecological sites are assigned and described where this historic vegetation was dominated by trees. Rangeland ecological sites are assigned where overstory tree production was not dominant in the climax vegetation.



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# Chapter 4 - Production Data

## Aboveground Vegetation Production

ALL PRODUCTION AND COMPOSITION data collected are based on weight measurements. Weight is the most meaningful expression of the productivity of a plant community or an individual species.

Production is determined by measuring the annual aboveground growth of vegetation. Some aboveground growth is used by insects and rodents, or it disappears because of weathering before production measurements are made. Therefore, these determinations represent a productivity index. They are valuable for comparing the production of different rangeland ecological sites, plant species composition, and similarity index.

Comprehensive interpretation of plant production and composition requires that data be representative of all species having measurable production. Rangeland and other grazing lands may be used or have potential for use by livestock and wildlife, as recreation areas, as a source of certain wood products, for scenic viewing, and for other soil and water conservation purposes. The value of plant species for domestic livestock often is not the same as that for wildlife, recreation, beautification, and watershed protection. Furthermore, the principles and concepts of rangeland ecological site, similarity index, and other interpretations are based on the total plant community. Therefore, interpretations of a plant community are not limited solely to species that have value for domestic livestock.

The procedures and techniques discussed in this section relate primarily to rangeland. Most of them, however, also apply to grazeable forest and native or naturalized pasture. Changes or modifications in procedures required for land other than rangeland are described.

## Total Annual Production

The total aboveground production of all plant species of a plant community during a single year is total annual production. Total annual production includes the aboveground parts of all plants produced during a single growth year, regardless of accessibility to grazing animals. An increase in the stem diameter of trees and shrubs, production from previous years, and underground growth are excluded.

## Production for Various Kinds of Plants

The Vegetation Production Worksheet (Appendix 4) can be used to record production data on individual plots.



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## *Herbaceous Plants*

These plants include grasses (except bamboos), grasslike plants, and forbs. Annual production includes all aboveground growth of leaves, stems, inflorescence, and fruits produced in a single year.

## *Woody Plants*

Determining production of trees and large shrubs by harvesting portions of stands is time consuming and impractical. Research scientists are devising methods for calculating current production of some species on the basis of measurements of such factors as crown width or height and basal area. These data are helpful in estimating the annual production of trees and large shrubs. (Appendix 5 provides an example of estimating annual production on Utah Juniper.)

### *Deciduous Trees, Shrubs, Half-shrubs, and Woody Vines*

Annual production includes leaves, current twigs, inflorescence, vine elongation, and fruits produced in a single year.

### *Evergreen Trees, Shrubs, Half-shrubs, and Woody Vines*

Annual production includes current year leaves (or needles), current twigs, inflorescence, vine elongation, and fruits produced in a single year.

### *Yucca, Agave, Nolina, Sotol, and Saw Palmetto*

Annual production consists of new leaves, the amount of enlargement of old leaves, and fruiting stem and fruit produced in a single year. Until more specific data are available and if current growth is not readily distinguishable, consider annual production as 15 percent of the total green- leaf weight plus the weight of current fruiting stems and fruit. Adjust this percentage in years of obviously high or low production.

## *Cacti*

### *Prickly Pear and Other Pad-forming Cacti*

Annual production consists of pads, fruit, and spines produced in a single year plus enlargement of old pads in that year. Until more specific data are available and if current growth is not readily distinguishable, consider annual production as 10 percent of the total weight of pads plus current fruit production. Adjust this percentage for years of obviously high or low production.

### *Barrel-type Cactus*

Until specific data are available, consider annual production as 5 percent of the total weight of the plant, other than fruit, plus the weight of fruit produced in a single year.

### *Cholla-type Cactus*

Until specific data are available and if current growth is not readily distinguishable, consider annual production as 15 percent of the total weight of photosynthetically active tissue plus the weight of fruit produced in a single year.



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# Methods of Determining Production

Production of a plant community can be determined by estimating, by harvesting, or by a combination of estimating and harvesting (double sampling) depending on the intended use of the data.

Some plants are on State lists of threatened or endangered species, or are otherwise protected species. Regulations concerning these species may conflict with the harvesting procedures described. For example, barrel-type cactus in some States is a protected species, and harvesting is not allowed.

The weight of such plants is to be estimated unless special permission for harvesting can be obtained. Examiners determining production should be aware of such plant lists and regulations.

When estimating or harvesting plants, include all parts of all plants within the plot, and exclude all portions outside the plot, even though the plants are rooted within the plot. Include portions of plants extending into the plot, but rooted outside the plot (Figure 4).

**Exclude**
all parts of
all plants
outside the plot

**Include**
all parts of
all plants
within the plot

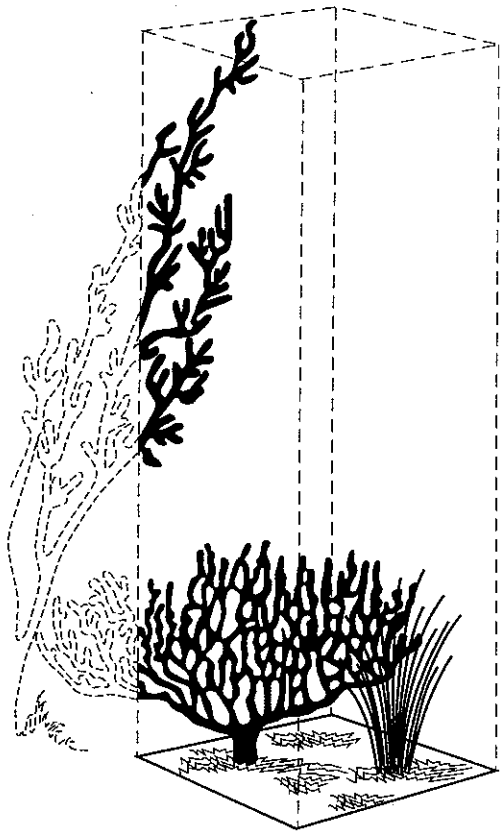

**Figure 4 - Weight Estimate Plots. (Adapted from Sampling Vegetation Attributes, Technical Reference 1734-4, Illustration 23, 1996.)**



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# Estimating by Weight Units

The relationship of weight to volume is not constant; therefore, production and composition determinations are based on weight estimates, not on comparison of relative volumes. The weight unit method is an efficient means of estimating production and lends itself readily to self-training. This method is based on the following:

- A weight unit is established for each plant species occurring on the area being examined.
- A weight unit can consist of part of a plant, an entire plant, or a group of plants (see Appendix 6, Examples of Weight Units).
- The size and weight of a unit vary according to the kind of plant. For example, a unit of 5 to 10 grams is suitable for small grass or forb species. Weight units for large plants may be several pounds or kilograms.
- If a majority of estimates for a particular species are in fractions of a weight unit (e.g., 0.1, 0.5, 0.7), then the size of the weight unit is probably too high.
- Other considerations include:
  - Length, width, thickness, and number of stems and leaves
  - Ratio of leaves to stems
  - Growth form and relative compactness of species

*The following procedure can be used to establish a weight unit for a species:*

1. Decide on a weight unit (in pounds or grams) that is appropriate for the species.
2. Visually select part of a plant, an entire plant, or a group of plants that will most likely equal this weight.
3. Harvest and weigh the plant material to determine actual weight.
4. Repeat this process until the desired weight unit can be estimated with reasonable accuracy.
5. Maintain proficiency in estimating by periodically harvesting and weighing to check estimates of production.

*The procedure for estimating production and composition of a single plot is:*

1. Estimate species composition by visually estimating the percent by weight of each species with the total weight for the entire plot.
2. Estimate production by counting the weight units of each species in the plot.
3. Convert weight units for each species to grams or pounds.
4. Harvest and weigh each species to check estimates of production.
5. Compute composition on the basis of actual weights to check composition estimates.
6. Repeat the process until proficiency in estimating is attained.
7. Periodically repeat the process to maintain proficiency in estimating.



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8. Keep the harvested materials, when necessary, for air-drying and weighing to convert from field (green) weight to air-dry weight (ADW).

## Double Sampling—Estimating and Harvesting

The double-sampling method is to be used in making most production and similarity index determinations. The procedure is:

1. Select a study area consisting of one soil taxonomic unit. This should be a soil taxonomic unit that is an important component of a rangeland ecological site or forestland ecological site.

2. Select plots at specified intervals along a linear transect. The starting point is randomly located within the site write-up area (SWA).

3. After plots are selected, estimate and record the weight of each species in each plot using the weight-unit method. When estimating or harvesting, include all parts of all plants within the plot. Exclude all portions of all plants outside the vertical projection of the plot.

4. After weights have been estimated on all plots, select the plots to be harvested. The plots selected should include all or most of the species in the estimated plots. If an important species occurs on some of the estimated plots, but not on the harvested plots, it can be clipped individually on one or more plots. The number of plots harvested depends on the number estimated. To adequately correct the estimates, research indicates at least one plot should be harvested for each seven estimated. At least 2 plots are to be harvested if 10 are estimated, and 3 are to be harvested if 20 are estimated. Table 5 shows the minimum number of plots to be harvested based on the number of estimated plots.

Table 5 - Number of Harvested Plots

| Number of Plots Estimated | Minimum Number of Harvested Plots |
|---|---|
| 1 - 7 | 1 |
| 8 - 14 | 2 |
| 15 - 21 | 3 |
| 22 - 28 | 4 |
| 29 - 35 | 5 |
| 36 - 42 | 6 |

5. Harvest, weigh, and record the weight of each species in the plots selected for harvesting. Harvest all parts of all plants within the plot. Exclude all portions of all plants outside the vertical projection of the plot.

   Correct estimated weights by calculating an adjustment factor. To do this, divide the harvested weight of each species by the estimated weight for the corresponding species on the harvested plots. This factor is used to correct the estimates for that species in each plot. A factor of more than 1.0 indicates the estimate is too low. A factor lower than 1.0 indicates the estimate is too high.

6. After plots are estimated and harvested and adjustment factors for estimates computed, air-dry percentages are determined by air-drying the harvested materials or by selecting



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the appropriate factor from an air-dry percentage table (Appendix 7). Values for each species are then corrected to air-dry pounds per acre or kilograms per hectare for all plots. Average weight and percentage composition can then be computed for the sample area.

## *Plot Size*

Adapt the size and shape of plots to the kind of plants to be sampled. The area of a plot can be expressed in square feet, inches and meters, or in acres.

If vegetation is relatively short, the following plot sizes work best in determining production:

0.96 $ft^2$ or 41.7 inch circumference
1.92 $ft^2$ or 59 inch circumference
2.40 $ft^2$ or 66 inch circumference
4.80 $ft^2$ or 93.2 inch circumference
9.60 $ft^2$ or 131.8 inch circumference

The listed plots are the most useful when converting grams to pounds per acre. The 9.6 $ft^2$ plot is generally used in areas where vegetation density and production are relatively light. The smaller plots, especially the 0.96 $ft^2$ and 1.92 $ft^2$ plots, are satisfactory in areas of homogeneous, relatively dense vegetation like that occurring in meadows. Plots larger than 9.6 $ft^2$ should be used where vegetation is very sparse and heterogeneous.

If the vegetation consists of trees or large shrubs, larger plots must be used. If the tree or shrub population is uniform, a 0.01 acre plot is more suitable. If vegetation is unevenly spaced, a more accurate sample can be obtained by using a 0.1 acre plot, 4.356 feet wide and 1,000 feet long. For statistical analyses, 10 plots of 0.01 acre are superior to a single 0.1 acre plot. Plots of 0.1 and 0.01 acre are most useful when production data is collected in pounds because it is a direct conversion.

If vegetation is mixed, two sizes of plots generally are needed. A series of 10 square or rectangular plots of 0.01 acre and a smaller plot, such as the 9.6-square-foot plot nested in a designated corner of each larger plot, is suitable. The 0.01-acre plot is used for trees or large shrubs, and the smaller plot for lower-growing plants. Weights of the vegetation from both plots are then converted to pounds per acre. Plots with area expressed in square meters are used if production is to be determined in kilograms per hectare.

If the plots are nested, production from both plots must be recorded in the same units of measure. For example, a plot 20 meters by 20 meters (or other dimensions that equal 400 meters) can be used for measuring the tree and shrub vegetation and a 1-meter plot nested in a designated corner can be used for measuring the low-growing plants. Determine the production from both in grams and convert the grams to kilograms per hectare. Plots of 0.25, 1, 10, 100, and 400 square meters are commonly used.

## *Plot Shape*

Plots can be circular, square, or rectangular. However, long-narrow plots are likely to be more accurate than circular, square, or rectangular plots (Krebs 1989). Edge effect can result in significant measurement bias if the plots are too small (Wiegert 1962). Since aboveground vegetation must be clipped in some plots, circular plots should be avoided because of the difficulty in cutting around the perimeter of the circle with hand shears and the likely measurement bias that would result.



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## Harvesting

This method is similar to the double-sampling method except that all plants in all plots are harvested. The double-sampling procedures for estimating weight by species and the subsequent correction of estimates do not apply. Conversion of harvested weight to air-dry pounds per acre or kilograms per hectare are performed according to the procedures described for double sampling.

## Units of Production and Conversion Factors

All production data are to be expressed as ADW in pounds per acre (lb/acre) or in kilograms per hectare (kg/ha). The field weight must be converted to ADW. This may require drying or the use of locally developed conversion tables.

## Plot Size Conversion Factors

All weights need to be converted to pounds per acre. The following plot size conversion factors (CFs) calculate pound per acre or kilograms per hectare for various weight units (e.g., grams or pounds) and plot sizes (e.g., 9.6 $ft^2$, 0.1 acre, 1 $m^2$, 400 $m^2$).

The weight of vegetation on plots measured in square feet or in acres can be estimated and harvested in grams or in pounds, but weight is generally expressed in grams. If weights are collected on 10 plots, the total weight is converted to pounds per acre by using the factor in column 3. If production is collected on less (or more) then 10 plots, divide the total for the entire transect by the number of plots and use the conversion factor in column 4.

To convert grams to pounds per acre, use the conversions in Table 6.

**Table 6 - Conversion Factors for Grams to Pounds per Acre**

| Plot Size | Weight Unit | Conversion Factor Per 10 Plots | Conversion Factor Per Plot |
|---|---|---|---|
| 0.96 $ft^2$ | grams | 10 | 100 |
| 1.92 $ft^2$ | grams | 5 | 50 |
| 2.4 $ft^2$ | grams | 4 | 40 |
| 4.8 $ft^2$ | grams | 2 | 20 |
| 9.6 $ft^2$ | grams | 1 | 10 |
| 96. $ft^2$ | grams | 0.1 | 1 |
| .01 acre | grams | 10 | 100 |
| .1 acre | grams | 1 | 10 |

In the metric system, a square-meter plot (or multiple thereof) is used. Weight on these plots is estimated or harvested in grams and converted to kilograms per hectare. A hectare equals 10,000 square meters. A kilogram equals 1,000 grams. If weights are collected on 10 plots, the total weight is converted to kilograms per hectare by using the factor in column 3. If production is collected on less (or more) then 10 plots, divide the total for the entire transect by the number of plots and use the conversion factor in column 4.

To convert grams per plot to kilograms per hectare, use the conversions in Table 7.



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Table 7 - Conversion Factors for Grams to Kilograms per Hectare

| Plot Size | Weight Unit | Conversion Factor Per 10 Plots | Conversion Factor Per Plot |
|---|---|---|---|
| 0.25 $m^2$ | grams | 10 | 100 |
| 1 $m^2$ | grams | 10 | 100 |
| 10 $m^2$ | grams | 10 | 100 |
| 100 $m^2$ | grams | 10 | 100 |
| 400 $m^2$ | grams | 10 | 100 |

## *Mixed Measuring Units*

With large volumes of vegetative material associated with trees and large shrubs, it is more practical to estimate weights in pounds rather than grams. The conversion factor on a *per plot* basis, when weights are collected in pounds for a 96 $ft^2$ plot, is 454. Likewise, vegetative material associated with grasses, forbs, and small shrubs is more easily estimated in grams. Therefore, on a per plot basis, weights collected in grams for a .1 acre plot would convert to 2.2 pounds per acre (conversion for a 0.01 acre plot is 0.22).

## Adjustment Factors

The ideal situation for determining production data for each individual species is to sample them when they are at their maximum production. With a diversity of species, it is impossible to make these determinations at one point in time during the growing season. Therefore, the production of each species must be reconstructed to reflect total annual production. This is accomplished using the conversion factors described previously.

## *Green Weight Adjustment Factor*

This is the procedure for converting green weight, which is the weight of vegetation estimated or collected in the field, to air-dry weight.

ADW percentages for various types of plants at different stages of growth are provided in Appendix 7. These percentages are based on currently available data and are intended for interim use. As additional data from field evaluations become available, these figures will be revised. ADW percentages listed in Appendix 7 can be used for other species having growth characteristics similar to those of the species listed.

States that have prepared their own tables of air-dry percentages on the basis of actual field experience can substitute them for the tables in Appendix 7. Be sure to check with the local office of the NRCS for their latest ADW percentage tables. It is recommended that local field offices develop these tables for local conditions and species. Some interpolation must be done in the field to determine air-dry percentages for growth stages other than those listed. If ADW percentage figures have not been previously determined and included in ADW percentage tables, or if ADW conversion factors need to be checked, retain and dry enough harvested material samples to determine ADW percentages.

The relationship of green weight to ADW varies according to such factors as exposure, amount of shading, time since last rain, and unseasonable dry periods. Several samples of plant material should be harvested and air-dried each season to verify the factors shown in Appendix 7 or to establish factors for local use.



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## *Double Sampling Adjustment Factor*

This is the adjustment factor calculated from the double sampling process (see Double Sampling—Estimating and Havesting, number 6). The harvested weights are divided by the estimated weights. A factor of more than 1.0 indicates the estimate is too low. A factor lower than 1.0 indicates the estimate is too high.

## *Air-dry Weight Adjustment Factor*

This is the appropriate ADW percent in decimals from tables and charts that convert green weight to ADW based upon various stages of growth.

## *Utilization Adjustment Factor*

This is the percent of the plant's **current growth** remaining at the time of sampling. Biomass lost as a result of herbivory (e.g., livestock, wildlife, insects) must be recognized and re-created in order to provide a more accurate estimate of the total current year's annual production for individual species and the plant community. The utilization adjustment attempts to restore this missing amount of production. The examiner determines the percent of the current year's growth that remains. This is actually the reverse of percent utilized. For example, if utilization on a plant species averages 30 percent on the production transect, the percentage of the plants remaining would be 70 percent. Thus, the adjustment entered for that particular species would be 0.70. Utilization may vary throughout the weight estimate plots, requiring an estimate of the average use to determine the adjustment.

## *Growth Adjustment Factor*

This is the percent of growth (in decimal form) that has occurred up to the time plot data is collected. The values entered can reflect the growth curves for the site (as listed in some site descriptions), or it could be based upon locally developed growth curve data for each species.

# Reconstructing the Present Plant Community

The existing plant community at the time of inventory must be reconstructed to the normal annual air-dry production before it can be compared with the reference plant community. The reconstruction must consider physical, physiological, and climatological factors that affect the amount of biomass measured (i.e., weighed or estimated) for a species at a specific point in time. The present plant community is reconstructed by multiplying the measured weight of each species by a reconstruction factor. The reconstruction factor formula is:

$$\text{Reconstructed} \quad \frac{(GW)\,(A)\,(B)\,(C)}{(D)\,(E)}$$

where:

GW = Green weight
A = Plot size conversion factor
B = Double sampling adjustment factor, if appropriate
C = Percent of air-dry weight (ADW)
D = Percent of plant biomass of each species that has not been removed
E = Percent of growth of each species that has occurred for the current growing season



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## Ocular Estimation of Production Data

Ocular estimates of production for an entire site, as opposed to estimating production on individual plots, is the quickest and easiest technique. However, with inexperienced people, the reduced accuracy resulting from this technique limits the use of the data. Ocular estimates are useful in quickly determining the similarity index of a site (see Chapter 5) for use in mapping plant communities and in stratifying SWAs for sampling purposes.

The following procedure is used in to become proficient at estimating production for an SWA.

1. Estimate production, in pounds per acre or kilograms per hectare, of individual species on the site.

2. Estimate production of individual species on a series of random plots.

3. Compute production in pounds per acre or kilograms per hectare from the random plots. To further check these estimates, harvest or double sample according to procedures addressed in the double sampling section of this document.

4. Repeat procedure until proficiency is attained.

Although this procedure misses some species of minor importance, it provides a useful check on estimates.

## Inventory Level of Intensity

The minimum standard for an ecological site inventory is production by species. The level or intensity at which the production of a plant community is determined depends on the intended use of the data. Ocular estimates are the quickest and easiest technique for determining production, but may result in reduced accuracy, limiting use of the data. Estimating production of individual species on production plots is more time consuming, but the accuracy of the data is significantly increased, especially if plots are periodically harvested and weight-unit weights are adjusted accordingly. Harvesting is the most accurate technique, but because of the additional time required for collection is seldom used except in research-type efforts. A combination of harvesting and estimating or double sampling is probably the best technique for documenting the production on the site. Double sampling is the technique NRCS uses for documenting new ecological site descriptions and revising existing descriptions. Even with the estimating technique, frequent clipping studies (harvesting) should be conducted to calibrate the observer's eye.

## Production Data for Documenting Rangeland Ecological Sites

Data to be used for preparing rangeland ecological site descriptions and grouping soils into rangeland ecological sites are to be obtained by the double-sampling procedure. All documented production and composition data are to be recorded on the Vegetation Production Worksheet in Appendix 4. Specific procedures for documenting an ecological site description can be found in the NRSC National Range and Pasture Handbook, Chapter 4.



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# Chapter 5 - Similarity Index

## Definition and Purpose of a Similarity Index

THE PRESENT PLANT COMMUNITY on an ecological site can be compared to a reference community by the calculation of a similarity index. In most cases, the reference community is the historic climax plant community or potential natural community.

A similarity index is a comparison of the present state of vegetation on an ecological site in relation to the kinds, proportions, and amounts of vegetation with other vegetation communities the site is capable of producing. It is expressed as the percentage of a plant community that is presently on the site. To make the comparison, the reference vegetation communities must be described in sufficient detail in the ecological site description. As ecological site descriptions are revised and further developed, they should also include descriptions of other common vegetation communities that can exist on the site.

The similarity index can provide managers with a starting point for establishing specific management objectives. It also provides a means of determining the successional status (Table 8).

**Table 8 - Successional Status**

| Similarity Index | Successional Status |
|---|---|
| 0-25% | early |
| 26-50% | mid |
| 51-76% | late |
| 77-100% | (potential natural community) |

## Determining Similarity Index

A similarity index determines how closely the current plant community resembles either the potential natural community or some other reference community. In order to make this determination, the existing plant community must be inventoried by recording weight, in pounds per acre, for each species present. In determining the similarity index, the allowable production of a species in the existing plant community cannot exceed the production of the species in the reference plant community. If plant groups are used, the present reconstructed production of a group cannot exceed the production of the group in the reference plant community.

Table 9 demonstrates how the similarity index is determined on four different reference communities for a loamy upland 12-16 PZ ecological site. (Refer to Chapter 3 for information on Ecological Sites and Appendix 3 for the ecological site description.) Table 9 shows only one plant from each plant group described in the ecological site description. This is for illustrative purposes to show the calculation of the similarity index. In actual practice, it is desirable to list all species found on the sample transect. This example assumes the current plant community has been reconstructed to actual annual production.



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On the similarity index form in Table 9, each species is listed in column B, along with the production for the reference plant community in column C (pounds per acre). Current annual production for each species is shown in column D. The allowable production in column E is determined by using the smaller of the two production amounts (columns B or C). The total allowable production represents the amount of the reference plant community that is currently present on the site. The similarity index is determined by dividing the total allowable production (total of column E) by the total production for the reference community (total of column C).



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**Table 9 - Examples of Similarity Index Determinations on a Loamy Upland 12-16 PZ Ecological Site**

**Determination of similarity index to the potential natural community**

Management Unit or Allotment: *Rockin' Raindrop* Examiner: *Someone's name*
Ecological Site: *Loamy Upland 12-16 PZ* Location: *Center of Horse Pasture*
Reference Plant Community: *Native midgrass (HCPC)* Date: *8/30/96*

| A<br>Plant Group | B<br>Species Name | C<br>Production/acres in reference plant community (from ecological site description) | D<br>Annual production in lb/acre (actual or reconstructed) | E<br>Pounds Allowable |
|---|---|---|---|---|
| 1 | Sideouts grama and others from Group 1 | 400-500 | 25 | 25 |
| 2 | Bluegrama and others from Group 2 | 150-250 | 25 | 25 |
| 3 | Threeawn species others from Group 3 | 50-100 | 40 | 40 |
| 4 | Bush muhley and others from Group 4 | 50-100 | 25 | 25 |
| 5 | Curly mesquite and others from Group 5 | 10-50 | 20 | 20 |
| 6 | Fall witchgrass and others from Group 6 | 10-50 | 30 | 30 |
| 7 | Six week threeawn and others from Group 7 | 10-50 | 15 | 15 |
| 8 | Wild daisy and others from Group 8 | 100-150 | 5 | 5 |
| 9 | Tansy mustard and others from Group 9 | 10-15 | 5 | 5 |
| 10 | Range ratany and others from Group 10 | 50-100 | 50 | 50 |
| 11 | Jumping cholla and others from Group 11 | 10-50 | 160 | 30 |
| 12 | Mesquite and others from Group 12 | 10-20 | 600 | 20 |
| Totals | Average Year | 1000 | 1,000 | 290 |

Similarity Index to Native Midgrass Community = 29% (Total of E divided by total of C)



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Table 9 - (continued)

**Determination of similarity index to the mesquite-short grass vegetation state on loamy upland 12-16 PZ site**

Management Unit or Allotment: *Rockin' Raindrop* Examiner: Someone's name
Ecological Site: *Loamy Upland 12-16 PZ* Location: *Center of Horse Pasture*
Reference Plant Community: *Mesquite-Short Grass* Date: *8/30/96*

| A<br>Plant Group | B<br>Species Name | C<br>Production/acres in reference plant community (from ecological site description) | D<br>Annual production in lb/acre (actual or reconstructed) | E<br>Pounds Allowable |
|---|---|---|---|---|
| 1 | Sideouts grama and others from Group 1 | 15-50 | 25 | 25 |
| 2 | Bluegrama and others from Group 2 | 300-400 | 25 | 25 |
| 3 | Threeawn species and others from Group 3 | 10-50 | 40 | 40 |
| 4 | Bush muhley and others from Group 4 | 0 | 25 | 0 |
| 5 | Curly mesquite and others from Group 5 | 15-100 | 20 | 20 |
| 6 | Fall witchgrass and others from Group 6 | 0 | 30 | 0 |
| 7 | Six week threeawn and others from Group 7 | 0 | 15 | 0 |
| 8 | Wild daisy and others from Group 8 | 10-50 | 5 | 5 |
| 9 | Tansy mustard and others from Group 9 | 0 | 5 | 0 |
| 10 | Range ratany and others from Group 10 | 10-50 | 50 | 50 |
| 11 | Jumping cholla and others from Group 11 | 0 | 160 | 0 |
| 12 | Mesquite and others from Group 12 | 15-100 | 600 | 100 |
| TOTALS | | 665 | 1,000 | 265 |

Similarity Index to Mesquite-Short Grass Community = 40% (Total of E divided by total of C)



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Table 9 - (continued)

**Determination of similarity index to the native-short grass vegetation state on loamy upland 12-16 PZ site**

Management Unit or Allotment: *Rockin' Raindrop* Examiner: *Someone's name*
Ecological Site: *Loamy Upland 12-16 PZ* Location: *Center of Horse Pasture*
Reference Plant Community: *Native-Short Grass* Date: *8/30/96*

| A<br>Plant Group | B<br>Species Name | C<br>Production/acres in reference plant community (from ecological site description) | D<br>Annual production in lb/acre (actual or reconstructed) | E<br>Pounds Allowable |
|---|---|---|---|---|
| 1 | Sideouts grama and others from Group 1 | 15-50 | 25 | 25 |
| 2 | Bluegrama and others from Group 2 | 300-400 | 25 | 25 |
| 3 | Threeawn species and others from Group 3 | 15-50 | 40 | 40 |
| 4 | Bush muhley and others from Group 4 | 0 | 25 | 0 |
| 5 | Curly mesquite and others from Group 5 | 15-150 | 20 | 20 |
| 6 | Fall witchgrass and others from Group 6 | 0 | 30 | 0 |
| 7 | Six week threeawn and others from Group 7 | 0 | 15 | 0 |
| 8 | Wild daisy and others from Group 8 | 15-50 | 5 | 5 |
| 9 | Tansy mustard and others from Group 9 | 0 | 5 | 0 |
| 10 | Range ratany and others from Group 10 | 15-50 | 50 | 50 |
| 11 | Jumping cholla and others from Group 11 | trace | 160 | 0 |
| 12 | Mesquite and others from Group 12 | trace | 600 | 0 |
| TOTALS | | 630 | 1,000 | 165 |

Similarity Index to Native-Short Grass Community = 26% (Total of E divided by total of C)



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Table 9 - (continued)

**Determination of similarity index to dense mesquite vegetation state on loamy upland 12-16 PZ site**

Management Unit or Allotment: *Rockin' Raindrop* Examiner: *Someone's name*
Ecological Site: *Loamy Upland 12-16 PZ* Location: *Center of Horse Pasture*
Reference Plant Community: *Dense Mesquite* Date: *8/30/96*

| A<br>Plant Group | B<br>Species Name | C<br>Production/acres in reference plant community (from ecological site description) | D<br>Annual production in lb/acre (actual or reconstructed) | E<br>Pounds Allowable |
|---|---|---|---|---|
| 1 | Sideouts grama and others from Group 1 | 0 | 25 | 0 |
| 2 | Bluegrama and others from Group 2 | 0 | 25 | 0 |
| 3 | Threeawn species and others from Group 3 | 15-50 | 40 | 40 |
| 4 | Bush muhley and others from Group 4 | 15-50 | 25 | 25 |
| 5 | Curly mesquite and others from Group 5 | 0 | 20 | 0 |
| 6 | Fall witchgrass and others from Group 6 | 0 | 30 | 0 |
| 7 | Six week threeawn and others from Group 7 | 0 | 15 | 0 |
| 8 | Wild daisy and others from Group 8 | 0 | 5 | 0 |
| 9 | Tansy mustard and others from Group 9 | 0 | 5 | 0 |
| 10 | Range ratany and others from Group 10 | 0 | 50 | 0 |
| 11 | Jumping cholla and others from Group 11 | 0 | 160 | 0 |
| 12 | Mesquite and others from Group 12 | 500-600 | 600 | 555 |
| TOTALS | | 620 | 1,000 | 620 |

Similarity Index to Native-Short Grass Community = 100% (Total of E divided by total of C)
(Table adapted from the NRCS National Range and Pasture Handbook, 1997)



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Many older ecological site descriptions document the extent of individual species within the historic climax plant community by percent of composition rather than pounds per acre. Production figures are presented as total weights (pounds per acre) for normal years, favorable years, and unfavorable years.

To calculate a similarity index, species composition must be converted to pounds per acre. Because the percent of composition for each species is based on total air-dry weight (ADW), conversion of the percentages to pounds per acre is easy. Simply multiply the percentage for each species by the total pounds per acre for an average year to arrive at the number of pounds per acre for each species. Table 10 converts the percent composition (column 2) from the reference community (found in an ecological site description) to pounds per acre (column 3). Also shown is the annual production (column 4) and the allowable production (column 5). Column 5 is determined by the smaller of the two amounts (column 3 or 4).

Table 10 - Reference Community

| Reference Community | | | | |
|---|---|---|---|---|
| Symbol | % of PNC (Reference Community) | Average Year 1000 lbs/acre | Annual Production | Allowable Production |
| Grasses | 75-85 | 750/850 | 180 | 180 |
| Group 1 | 40/50 | 400-500 | 25 | 25 |
| Group 2 | 15-25 | 150-250 | 25 | 25 |
| Group 3 | 5-10 | 50-100 | 40 | 40 |
| Group 4 | 1-5 | 10-50 | 25 | 25 |
| Group 5 | 1-5 | 10-50 | 20 | 20 |
| Group 6 | 1-5 | 10-50 | 30 | 30 |
| Group 7 | 1-5 | 10-50 | 15 | 15 |
| Forbs | 5-10 | 50-100 | 10 | 10 |
| Group 8 | 10-15 | 100-150 | 5 | 5 |
| Group 9 | 1-5 | 10-50 | 5 | 5 |
| Shrubs/Trees | 5-10 | 50-100 | 810 | 100 |
| Group 10 | 5-10 | 50-100 | 50 | 50 |
| Group 11 | 1-5 | 10-50 | 160 | 30 |
| Group 12 | 1-2 | 10-20 | 600 | 20 |



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In determining allowable production, it is important not to exceed the production of the reference community relative to each species, plant group, or life form. In Table 10, the annual production of plant groups 1 through 10 does not exceed production in the reference community. In addition, the total annual production of grasses and forbs does not exceed production in the reference community.

In plant groups 11 and 12, annual production is much higher than allowed in the reference community. Therefore, the most production that can be credited is 50 and 20 pounds per acre respectively (high end of column 3). It is also important not to exceed the allowable production for all shrubs and trees (groups 10, 11, and 12). However, the total annual production for all shrubs and trees is 810 pounds and the allowable production is 100 pounds. Since plant group 10 has already been credited with the 50 pounds allowable, the remaining plant groups (11 and 12) can total no more than 50 pounds. Group 12 is given credit for 20 pounds, leaving 30 pounds for group 11.

## Determining Similarity Index to the Potential Natural Community

When compared to the potential natural community, the similarity index represents the percent of the potential natural community present on the site. This provides a basis for describing the extent and direction of change that has occurred. The similarity index, coupled with the state and transition model, can help predict changes that could occur.

## Determining Similarity Index to Other Vegetation States or Desired Plant Community

Determining the similarity index of the existing plant community to one or more of the possible vegetation states in the site description may be desirable. After management objectives have been developed, one specific plant community may be identified as the desired plant community. Once the desired plant community has been identified, it is appropriate to determine the similarity index of the existing community to the desired plant community.

Procedures for determining a similarity index for other vegetation communities are the same as described for the historic climax plant community. Table 9 shows similarity index determinations for some of the other vegetation states described in the loamy upland 12-16 PZ. These determinations use the same transect data used in Table 9. Refer to Chapter 3 for information on ecological sites and Appendix 3 for the ecological site description. These examples show only one species from each plant group.



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# Chapter 6 - Field Procedures

## Minimum Standards

THE MINIMUM STANDARDS REQUIRED for an ecological site inventory are production and composition by air-dry weight (ADW) by species. The number of plots selected depends on the purpose for which the estimates are to be used, uniformity of the vegetation, and other factors. A minimum of 10 plots should be selected for collecting production data used in documenting rangeland ecological sites or for other interpretive purposes. If vegetation distribution is very irregular and 10 plots will not give an adequate sampling, additional plots can be selected. If the inventory design dictates it, fewer than 10 plots can be used.

## Sampling Precision

Most uses of ecological site inventory data would not require the calculation of a sample size necessary to achieve a given level of precision at a given confidence level. Quantitative monitoring studies would be one situation requiring this calculation. However, if an inventory plan calls for a specified level of precision, refer to Sample Size Equation number 1, pages 346–350 of *Measuring and Monitoring Plant Populations*, BLM Technical Reference 1730-1. To use this equation (or the software program discussed in the next paragraph), an estimate of the standard deviation is needed. This can be obtained by taking an initial sample of quadrats and calculating the standard deviation of the set of total production values obtained from this sample. The standard deviation of a set of values is easily calculated using the statistics mode or function on a hand calculator configured with that option or by using the standard deviation formula (also called "worksheet function") on a computer spreadsheet (e.g., the appropriate formula in Microsoft Excel is STDEV).

The easiest way to calculate the sample size for an ecological site inventory is to use the freeware program, PC SIZE: Consultant, which runs on any DOS or Windows machine. Instructions on obtaining and using it are given at the Web site associated with the book, *Monitoring Plant and Animal Populations: A Handbook for Field Biologists* by C. L. Elzinga, D. W. Salzer, J. W. Willoughby, and J. P. Gibbs, Blackwell Science Inc., 2001, at

***http://www.esf.edu/course/jpgibbs/monitor/popmonroot.html***

Once there, click on "Chapter 9, Statistics," then on "Instructions for Using DTSTPLAN and PC-SIZE: Consultant to Estimate Sample Size and Conduct Post Hoc Power Analyses." You'll then get a PDF file that tells how to download PC SIZE: Consultant and how to use it.

## Site Write-up Area

For sampling and planning purposes, the landscape is divided into map units called site write-up



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areas (SWAs). A SWA is defined as the smallest geographical unit delineation to be used as a base for collecting vegetation data and resource information. It is the smallest mapped soil- vegetation unit. SWA delineations are the culmination of mapping ecological sites, vegetation communities, and administrative boundaries. Each individual SWA should consist of only one ecological site and one plant community. The only exception would be if two or more soil- vegetation complexes are so intermingled that individual ecological sites cannot be delineated. SWAs may be mapped down to a minimum of 6 acres. Within a single soil-vegetation unit (ecological site and plant community), for management purposes, SWA boundaries can be set on administrative boundaries such as allotments, pastures, wildlife habitat areas, or watersheds. The exact criteria for subdividing on administrative boundary lines must be documented in the inventory plan.

In order to compile data on a management unit or grazing allotment basis, SWAs must not cross accurately located management unit or allotment boundaries. SWAs may also be delineated on soil mapping unit or pasture boundaries as specified in the inventory plan. The more detailed the mapping, the greater the options are for interpretation of the data. A unique SWA number is assigned to each SWA delineated. The number consists of one alpha character and a consecutive 3 digit number (e.g., A001, F139, S091).

## Field Inventory Mapping

Mapping must be done by trained vegetation specialists, wildlife biologists, foresters, soil scientists, and hydrologists (for riparian areas) working closely together. Field mapping consists of delineating SWAs based on present plant communities (e.g., ecological sites, forestland ecological sites, or forest types). Field mapping should be completed prior to resource data collection. If the inventory plan identifies the need to stratify SWAs for vegetation data collection, the entire inventory area must be mapped first. It is desirable to complete mapping a year in advance of collecting vegetation data.

## Mapping Process With a Completed Soil Survey

In areas where soil survey and ecological site descriptions are complete, an ecological site-soil series correlation should be available in the final soil survey report. The survey report may also identify soil series that support forestland ecological sites or forest types (habitat types) where the potential plant communities have already been defined.

Where Order II soil surveys are completed and ecological site interpretations have been made, boundaries of ecological sites can generally be determined directly from the soil map.

Order III mapping describes individual soil and plant components at association or complex levels. Mapping unit descriptions have been developed that describe each association component and include locations on the landscape and percentages of each soil. Individual ecological sites must be delineated if individual soils in the association have different potential historic climax plant communities.



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## Mapping Process Without a Completed Soil Survey

In areas where soil surveys are not completed, the NRCS must be contacted to obtain any available soil or ecological site data. The NRCS may be able to assist in training and in establishing the mapping legend. The mapping team must work together in the field to achieve consistency in SWA delineation based upon ecological sites, forestland ecological sites, or forest types. The soil scientist must ensure that soils are considered in delineations. If at all possible, a soil survey should be completed prior to or concurrently with delineation of ecological sites.

## Mapping Ecological Sites

The first step in mapping SWAs is the mapping of ecological sites. Based on soils information and field reconnaissance, ecological sites are delineated on aerial photos.

## Present Vegetation

Ecological sites are subdivided based on changes in plant communities. Significant changes in the following factors must be considered in delineating present vegetation communities:

1. Vegetation species composition (kinds, proportions, and amounts of present vegetation)
2. Vegetation ground cover
3. Vegetation height
4. Vegetation age class (especially in forested areas)
5. Topography
6. Other factors identified in the inventory plan

To assist in this effort, current vegetation communities can be mapped as standard vegetation subtypes. Vegetation types are designated according to vegetation aspect. A complete listing is given in Appendix 8. Table 11 lists some of the more common types.

**Table 11 - Common Standard Vegetation Subtypes**

| Type | Subtype | Code |
|---|---|---|
| Grass | Short Grass | 1001 |
| | Mid Grass | 1002 |
| | Tall Grass | 1003 |
| Grasslike | Sedge | 2001 |
| | Rush | 2002 |
| Perennial Forbs | Perennial Forbs | 3001 |
| Shrub | Black Greasewood | 4001 |
| | Creosote Bush | 4011 |
| | Winterfat | 4015 |
| | Mesquite | 4021 |
| | Saltbush | 4030 |
| | Mixed Desert Shrub | 4037 |
| | Sagebrush | 4040 |
| | Mtn. Mahogany | 4056 |
| | Bitterbrush | 4057 |
| | Mountain Shrub | 4060 |
| | Snakeweed | 4071 |
| | Broadleaf Trees | 5000 |
| | Conifers | 6000 |
| | Pinyon | 6097 |
| | Juniper | 6098 |
| Broadleaf Trees | Willow | 5074 |
| Conifer | Douglas Fir | 6001 |
| Cryptogams | | 7000 |
| Barren | | 8000 |
| Annual Grass | | 9000 |
| Other | | 9999 |



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## Successional Status Classification

If appropriate, ecological sites should be further subdivided based on the successional status of the existing plant community. This is usually apparent on the ground as a change in the plant community. Each distinct soil-vegetation unit should be placed in a successional status class by making visual estimates of species production (see ocular estimation of production data in Chapter 4). The mapping team should complete the Similarity Index Form (Appendix 9) to record these initial successional status determinations. To make this initial determination of succession status, compare the present plant community with that of the potential natural community. For the existing plant community, count as allowable production no more than the maximum weight shown on the ecological site description for any species in the climax community. Total the allowable production of all potential natural community species to indicate the relative similarity index. The rating must be between 0 and 100, depending on how closely the existing plant community resembles the potential natural community for the ecological site. These estimated similarity indices can be useful in a stratification effort.

## Forest Types

Forest types are divided into stands—uniform plant communities of trees as to timber type, age class, vigor, height, ground cover, and stocking. The smallest delineated unit within a forest type is the SWA or stand. The mapping team must assign a SWA number to each delineated SWA.

## Feature Mapping

Any permanent cultural, topographic, and biological features, as well as existing improvements, such as fences, roads, or water developments not shown on existing maps should be indicated on aerial photographs. Barriers to livestock, wildlife, or wild horse and burros should be noted.

## Water Resources

Show all water resources, such as marshes, reservoirs, springs, seeps, or streams.

## Photo Scale

The recommended standard photo scale for an ecological site inventory is 1:24,000. The minimum size delineation for SWAs is about 6 acres for distinct wildlife habitat areas, such as riparian areas for food and cover and cliffs or promontories for raptors. Table 12 shows minimum size delineations.

**Table 12 - Photo Scale Minimum Size Delineations**

| Scale | Acres | Inches/Miles |
|---|---|---|
| 1:20,000 | 4.0 | 3.16 |
| 1:24,000 | 6.0 | 2.64 |
| 1:31,680 | 10.0 | 2.0 |

## Stratification

Stratification is grouping together similar SWAs for sampling purposes. To be stratified, a SWA must be composed of similar soil-vegetation



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units. Since production data from one SWA will be used for other SWAs in the stratum, it is extremely important that sites within the stratum be virtually identical. If there is a doubt whether they are the same, keep them separate.

The size of the geographical area to be stratified is determined and documented in the inventory plan. The complexity of the ecological situation, as well as local needs, determines whether stratification is made by allotment, group of allotments, environmental impact statement (EIS) area, planning unit, or field office. The inventory plan sets forth the criteria for stratification including the number of SWAs that need to be sampled. The following protocols are recommended (Table 13).

**Table 13** - Recommended Protocols for Stratification

| SWAs in Stratum | Number of SWAs Transected |
|---|---|
| 1 - 3 | 1 |
| 4 - 6 | 2 |
| 7 - 10 | 3 |

All strata are assigned a number and listed. The SWAs within a stratum should also be listed (Table 14).

**Table 14** - Stratum Listing and SWA Listing by Stratum

**Stratum Listing**

| Stratum Number | SWA Number | Ecological Site Number | Vegetation Subtype | Ecological Condition | Percent Slope | Slope Aspect |
|---|---|---|---|---|---|---|
| 0001 | B001 | 034XY001U | 1002 | M | 10 | N |
| 0002 | B002 | 034XY002U | 4041 | E | 10 | N |

**SWA Listing by Stratum**

| Stratum Number | SWA Number | Ecological Site Number | Vegetation Subtype | Ecological Condition | Percent Slope | Slope Aspect |
|---|---|---|---|---|---|---|
| 0001 | B001 | 034XY001U | 1002 | M | 10 | N |
| 0001 | B013 | 034XY001U | 1002 | M | 10 | N |
| 0001 | B021 | 034XY001U | 1002 | M | 10 | N |
| 0001 | B023 | 034XY001U | 1002 | M | 10 | N |
| 0001 | B033 | 034XY001U | 1002 | M | 10 | N |
| 0001 | B043 | 034XY001U | 1002 | M | 10 | N |
| 0001 | B051 | 034XY001U | 1002 | M | 10 | N |
| 0001 | B063 | 034XY001U | 1002 | M | 10 | N |
| 0002 | B002 | 034XY002U | 4041 | E | 10 | N |
| 0002 | B006 | 034XY002U | 4041 | E | 10 | N |
| 0002 | B012 | 034XY002U | 4041 | E | 10 | N |
| 0002 | B018 | 034XY002U | 4041 | E | 10 | N |
| 0002 | B032 | 034XY002U | 4041 | E | 10 | N |
| 0002 | B041 | 034XY002U | 4041 | E | 10 | N |



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## *Stratums With One Transect*

Data collected in the sampled transect applies to all the SWAs not sampled.

## *Stratums With Multiple Transects*

To determine production data for each individual species, sum production totals for each sampled SWA and divide by the number of SWAs. For example, Black Grama (*Bouteloua Eriopoda*) occurs in sampled SWAs A001 and A005 at 3 and 7 pounds per acre respectively. SWA A009 was not sampled, but is in the same stratum. Total production for Black Grama for SWA A009 and all other unsampled SWAs in the same stratum would be 5 pounds per acre (3 lb/ac + 7 lb/ac = 10 lb/ac / 2 = 5 lb/ac). Species occurring in only one SWA would be treated the same way. Divide the total production by the number of SWAs sampled. For example, if Black Grama had not occurred in SWA A001, then production for Black Grama in unsampled SWAs would be 4 pounds per acre (7 lb/ac/ 2 = 3.5 or 4). Populate unsampled SWAs with the averaged production data.

# Transect Locations

The mapping team must evaluate each SWA and recommend the most representative place to run the transect. Unless otherwise indicated by the mapping team, the following guidelines should be followed for locating the transect.

## *SWAs With One Soil-Vegetation Unit*

*(Figure 5)*

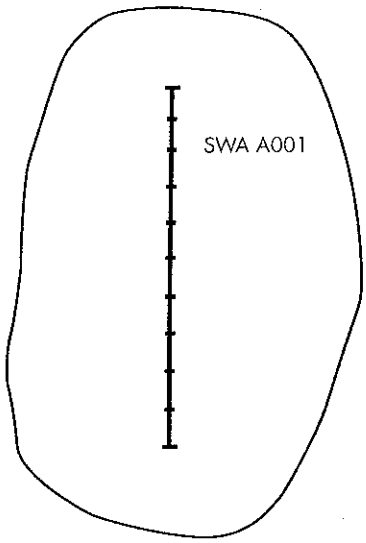


Figure 5 - One Soil-Vegetation Unit

**Step 1.** Determine the distance across the longest axis of the area to be sampled (SWA) in feet with a USGS 1:24,000 scale (orthophoto quads) map. Normally, a transect distance of 1/2 mile is adequate.

**Step 2.** Divide the distance measured by 11 (the number of plots (10) plus one) so as not to sample on SWA boundary.

**Step 3.** Divide the distance between plots by the length of your pace (i.e., two steps) to get the number of paces between plots.

**Step 4.** Measure the compass bearing of the line by protracting off the orthophoto quad or aerial photo.

**Step 5.** Proceed to starting point.

**Step 6.** Take photograph(s) along the transect line.

**Step 7.** Pace the distance determined in Step 3 from the starting point to the first plot.



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## *SWAs With Mixed or Mottled Patterns (Figure 6)*

Where vegetation units are mixed or mottled, it will be necessary to randomly select plots in each soil-vegetation unit in order to collect a reliable sample. Soil-vegetation Unit A is one soil-vegetation unit that will be sampled by Transect 1. Soil- vegetation Unit B occurs as islands surrounded by Unit A. When collecting data for Transect 2, it will be necessary to divide Transect 2 into segments and locate some of the 10 plots on each island of Unit B. Both transects are within SWA F139.

The percentage of each soil-vegetation unit within the SWA is recorded on the Vegetation Production Worksheet in Appendix 4.

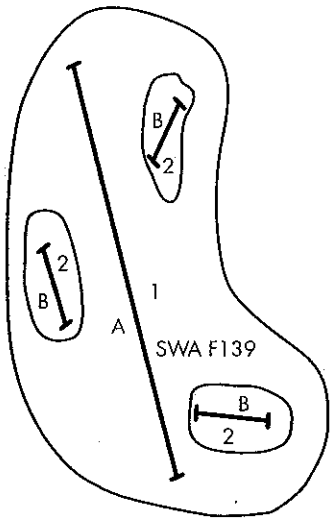


**Figure 6 - Mixed or Mottled Soil-Vegetation Units**

## *Other Options for Transect Layout (Figures 7a and 7b)*

This option uses the same procedures used in the "SWAs With One Soil-Vegetation Unit" section, except the distance and compass bearing of each transect leg will have to be calculated.

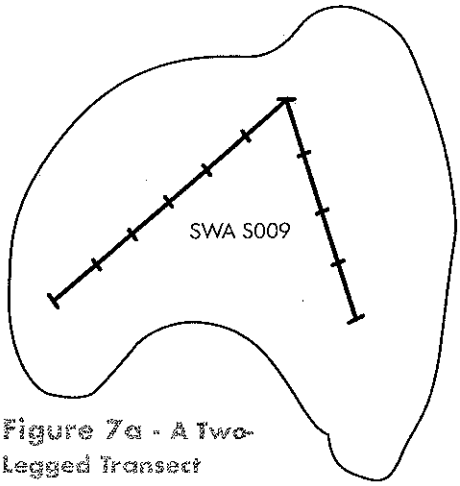


**Figure 7a - A Two-Legged Transect**

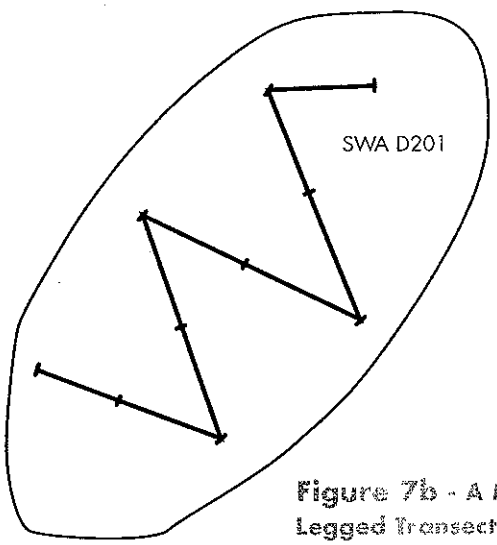


**Figure 7b - A Multi-Legged Transect**



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## Plot Sampling

Randomly select the beginning point of the transect. Determine the transect bearing and select a prominent distant landmark such as a peak or rocky point that can be used as the transect bearing point. Production plots are placed at the specified interval (i.e., paced or measured) along the transect bearing.

## Vegetation Production Worksheet

The Vegetation Production Worksheet, with instructions, is located in Appendix 4. It is a sample form that can be used to record production data on the weight estimate plots. Field offices can use this form or develop forms to suit their needs. Remember, when using this form, to complete the top portion of the worksheet.

Several data elements (e.g., landform, soil texture class, and soil texture modifier) require specific codes. Some of these codes are identified in Appendix 10. Valid data entry values for other data elements on the form can be found in the Corporate Data Dictionary at:

***http://sc2962.sc.blm.gov/datashopper/default.asp***

Select **Applications** on the left side of the site. At the top of the site select **Elements**. At the inventory data systems site, a list of logical data elements will appear followed by a list of physical data elements. On the logical data element list, select **Detail** beside the name of the data element and the definition will appear. At the top, select **Valid Values**.



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# Chapter 7 - Data Storage

THE INVENTORY DATA (ID) SYSTEM, commonly referred to as IDS, is BLM's database for storing, querying, and analyzing soils, vegetation, and resource inventory data. This automated system includes vegetation data collected using the old Soil-Vegetation Inventory Method (SVIM) and the current ecological site inventory (ESI) method. It provides data for land use and allotment management planning. Data includes the physical characteristics of the site write-up area (SWA), such as slope, elevation, slope aspect, and landform; administration information, such as resource area, planning unit, allotment, recorder, and date of inventory; soils information, such as soil taxon name, soil survey number, and soil map unit number; ecological site information, such as site name and number and ecological status; vegetation data, such as species, estimated production, species composition, and life cycle and life form; and location information, such as section, township, range, acres, surface ownership, administrative agency, and jurisdictional agency.

The query process allows the user to determine, for instance, the number of acres in any particular ecological site, the occurrence of a particular species in a given allotment or ecological site, the total air-dry weight (ADW) production of a particular SWA or individual species, and the number of acres in a given successional status class. IDS can also be used to analyze the various plant communities that occur on a specific ecological site to select a desired plant community.

Ecological site inventory data should be input into IDS before field offices report the inventory complete. For information on entering data into IDS, contact the National Science and Technology Center (NSTC) in Denver Colorado.



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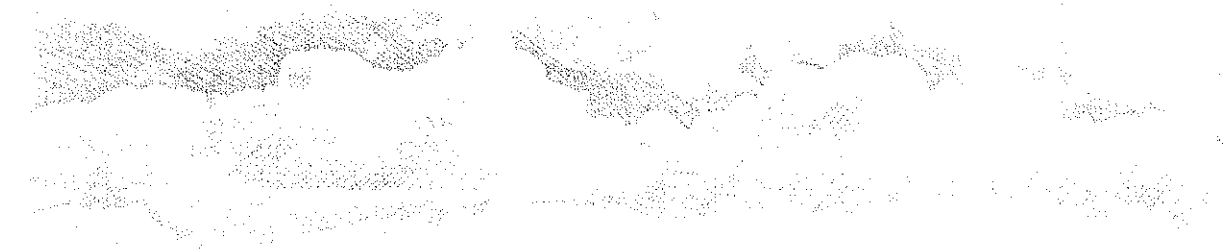

# Abbreviations and Acronyms

| | |
|---|---|
| ADW | air-dry weight |
| BLM | Bureau of Land Management |
| CF | conversion factor |
| DOQQ | Digital Ortho Quarter Quads |
| DRG | Digital Raster Graphics |
| EIS | environmental impact statement |
| ESI | ecological site inventory |
| ESIS | Ecological Site Information System |
| FLPMA | Federal Land Policy and Management Act |
| FSSD | Field Soil Survey Database |
| GIS | geographic information system |
| GPS | global positioning system |
| IDS | Inventory Data System |
| IDSU | Inventory Data System Utilities |
| IHICS | Integrated Habitat Inventory and Classification System |
| MLRA | Major Land Resource Area |
| MLRU | Major Land Resource Unit |
| MOU | memorandum of understanding |
| NAPP | National Aerial Photography Program |
| NASIS | National Soil Information System (NRCS) |
| NBM | National Biology Manual |
| NCM | National Cartographic Manual |
| NEDC | National Employee Development Center (NRCS) |
| NFM | National Forestry Manual |
| NRCS | Natural Resources Conservation Service |
| NRPH | National Range and Pasture Handbook |
| NSH | National Soils Handbook |
| NSSH | National Soil Survey Handbook |
| NSTC | National Science and Technology Center (BLM) |
| NTC | National Training Center (BLM) |
| PNC | potential natural community |
| PRIA | Public Rangelands Improvement Act |
| PZ | precipitation zone |
| RISC | Range Inventory Standardization Committee |
| SSST | Special Status Species Tracking |
| STS | Species Tracking System |
| SVIM | soil-vegetation inventory method |
| SWA | site write-up area |
| USGS | United States Geographical Survey |



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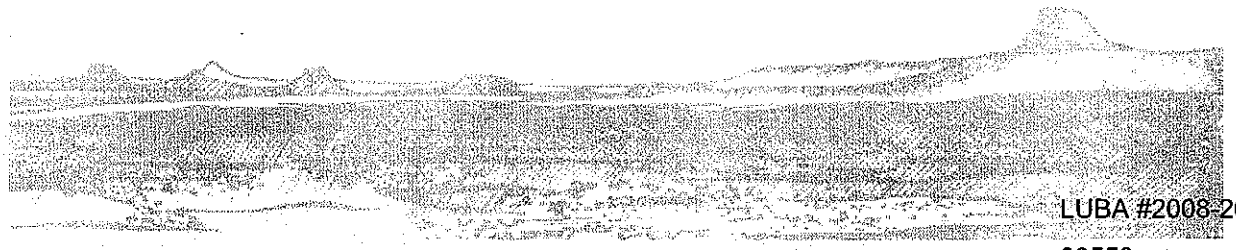

# Glossary

-A-

**Age class:** A descriptive term to indicate the relative age of plants.

**Air-dry weight:** The weight of vegetation after it has been allowed to dry to equilibrium with the atmosphere.

**Allotment:** an area of land designated and managed for grazing by livestock. Such an area may include intermingled private, State, or Federal lands used for grazing in conjunction with the public lands.

**Annual production:** The conversion of solar energy to chemical energy through the process of photosynthesis. It is represented by the total quantity of organic material produced within a given period of time.

**Aspect:** The visual first impression of vegetation or a landscape at a particular time or as seen from a specific point. The predominate direction of slope of the land. The seasonal changes in the appearance of vegetation.

**At risk:** Rangelands that have a reversible loss in productive capability and increased vulnerability to irreversible degradation based upon an evaluation of current conditions of the soils and ecological processes. At risk designation may point out the need for additional information to better quantify the functional status of an attribute.

**Attribute (rangeland health):** One of the three components that collectively define rangeland health; soil/site stability, hydrology function, and integrity of the biotic community.

-B-

**Bare ground:** All land surface not covered by vegetation, rock or litter.

**Basal cover (area):** The cross-sectional area of the stem or stems of a plant or all plants in a stand. Herbaceous and small woody plants are measured at or near ground level; larger woody plants are measured at breast or other designated height.

**Biological soil crusts:** Complex mosaics of any or all of the following: cyanobacteria, microfungi, algae, lichens, and mosses. They do not include club mosses (*Selaginella*) or tundra.

**Biomass:** The total amount of living plants and animals above and below ground in an area at a given time.

**Boot stage:** The growth stage when a grass seedhead is enclosed by the sheath of the uppermost (flag) leaf.

**Brush:** A term encompassing various species of shrubs or small trees usually considered undesirable for livestock or timber management. The same species may have value for browse, wildlife habitat, or watershed protection.

**Bunch grass:** A grass having the characteristic growth habit of forming a bunch; lacking stolens or rhizomes.


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-C-

**Canopy cover:** The percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants. Small openings within the canopy are included. Canopy cover may exceed 100 percent and is synonymous with crown cover.

**Climate:** The average or prevailing weather conditions for a place over a period of years.

**Composition:** See species composition.

**Cool season plants:** Plants whose major growth occurs during the late fall, winter, and spring. Cool season species generally exhibit C3 photosynthetic pathways.

-D-

**Desired plant community:** Of the several plant communities that may occupy a site, it is the one that has been identified through a management plan to best meet the plan's objectives for the site. It must protect the site at a minimum.

**Dominant species:** Plant species or species groups, which by means of their number, coverage, or size, have considerable influence or control upon the conditions or existence of associated species.

-E-

**Ecological process:** Natural processes that function within a normal range of variation to produce and support specific plant and animal communities. Ecological processes include: water cycle (the capture storage and redistribution of precipitation); energy flow (conversion of sunlight to plant and animal matter); and nutrient cycle (the cycle of nutrients such as nitrogen and phosphorus through the physical and biotic components of the environment).

**Ecological site:** A kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in their ability to produce distinctive kinds and amounts of vegetation and to respond to management. Ecological sites are defined and described with information about soil, species composition, and annual production.

**Ecological site description:** A written narrative of the description of soils, climate, vegetation, uses, and potential of a kind of land with specific physical characteristics to produce distinctive kinds and amounts of vegetation.

**Ecological site inventory:** A resource inventory that involves the use of soils information to map ecological sites and plant communities and the collection of natural resource and vegetation attributes. The sampling data from each of these soil-vegetation units, referred to as site write-up areas (SWAs), become the baseline data for natural resource management and planning.

**Ecological status:** See successional status.

**Ecosystems:** Organisms together with their abiotic environment forming an interacting system and inhabiting an identifiable space.

**Energy flow:** Conversion of sunlight to plant and animal matter; one of the ecological processes.

**Erosion:** Detachment and movement of soil or rock fragments by water, wind, ice, or gravity.



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-F-

**Facilitating practices:** Practices that control or influence the management, movement, and handling of grazing animals. These practices include water developments (e.g., reservoirs, pipelines, wells, catchments), stock trails, fencing, salting, and herding.

**Fauna:** The animal species of a region.

**Forb:** Any herbaceous plant other than those in the Gramineae (true grasses), Cyperaceae (sedges), and Juncaceae (rushes) families (i.e., any nongrass-like plant) having little or no woody material on it; a broadleafed flowering plant whose above ground stem does not become woody and persistent.

**Forestland:** Land on which the potential natural community is dominated by trees.

-G-

**Grass:** Any plant of the family Gramineae (Poaceae).

**Grasslike plant:** A plant of the Cyperaceae (sedges) and Juncaceae (rushes) families, which vegetatively resembles a true grass of the Gramineae family.

**Ground cover:** The percentage of material, other than bare ground, covering the land surface. It may include live and standing dead vegetation, litter, cobble, gravel, stones, and bedrock. Ground cover plus bare ground would total 100 percent.

**Growing season:** That portion of the year when temperatures and moisture permit plant growth. In tropical climates, it is determined by the availability of moisture.

**Gully:** A furrow, channel, or miniature valley, usually with steep sides, through which water commonly flows during and immediately after rains or snow melt.

-H-

**Half shrub:** A plant with a woody base whose annually produced stems die each year.

**Harvest:** The removal of annual vegetation production from an area of land.

**Herbaceous:** Nonwoody plant growth.

**Historic climax plant community:** The plant community considered to best typify the potential plant community of an ecological site prior to the advent of European man.

-I-

**Increaser:** Those species that increase in amount for a given plant community, as a result of a specific abiotic/biotic influence or management practice.

**Infiltration:** The flow of a fluid into a substance through pores or small openings.

**Invasion:** The migration of organisms from one area to another area and their establishment in the latter.

**Inventory:** The systematic acquisition and analysis of information needed to describe, characterize, or quantify resources for land-use planning and management of the public lands.



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**-L-**

**Life form:** Characteristic form or appearance of a species at maturity, such as a grass, forb, tree, or shrub.

**Litter:** The uppermost layer of organic debris on the soil surface; essentially the freshly fallen or slightly decomposed vegetal material.

**-M-**

**Major land resource area:** Broad geographic areas that are characterized by a particular pattern of soils, climate, water resources, vegetation, and land use. Each MLRA, in which rangeland and forestland occur, is further divided into ecological sites.

**Management objective:** A planned result to be achieved within a stated time period. Objectives are subordinate to goals, are specific with shorter timeframes, and have increased possibility of attainment. Time periods for completion and outputs or achievements are measurable and quantifiable.

**Monitoring:** The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting objectives.

**-N-**

**Native pasture:** Land on which native vegetation (climax or natural potential plant community) is forest, but which is used and managed primarily for production of native plants for forage. Native pasture includes cutover forestland and forested areas that were cleared and used as cropland.

**Native species:** A species that is a part of the original fauna and flora of an area.

**Nonvascular plants:** Plants without specialized water or fluid conductive tissue (Xylem and phloen) that includes bryophytes, lichens and algae.

**Noxious weed:** An unwanted plant specified by Federal or State laws as being especially undesirable, troublesome, and difficult to control. It grows and spreads in places where it interferes with the growth and production of desired species.

**Nutrient cycle:** The cycle of nutrients, such as nitrogen and phosphorus, through the physical and biotic components of the environment; one of the ecological processes.

**-O-**

**Objective:** See management objective.

**-P-**

**Pasture:** A grazing area enclosed and separated from other areas by a fence or natural barrier.

**Pedon:** The smallest body of one kind of soil large enough to represent the nature and arrangement of horizons and variability in the other properties that are preserved in samples. Pedons extend down through all genetic horizons.

**Perennial plant:** A plant that has a life span of 3 or more years.

**Phenology:** The study of periodic biological phenomena that are recurrent (e.g., flowering, seeding), especially as related to climate.



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**Potential natural community (PNC):** The biotic community that would become established if all successional sequences were completed without interference by man under the present environmental conditions. Natural disturbances are inherent in development. PNCs can include naturalized nonnative species.

**-Q-**

**Qualitative:** Observational type data that is recorded but not measured.

**Quantitative:** Collection of data by measuring vegetation or soil characteristics.

**-R-**

**Rangeland:** A type of land on which the indigenous vegetation (climax or natural potential ) is predominantly grasses, grasslike plants, forbs, or shrubs and managed as a natural ecosystem. If plants are introduced, they are managed similarly. Rangeland includes natural grasslands, savannas, shrublands, many deserts, tundras, alpine communities, marshes, riparian zones, and wet meadows.

**Rangeland health:** The degree to which the integrity of the soil, vegetation, water, and air, as well as the ecological process of the rangeland ecosystem, are balanced and sustained.

**Rangeland similarity index:** The present state of vegetation and soil protection of an ecological site in relation to the potential natural community for the site.

**Relict area:** A remnant or fragment of the historic climax plant community that remains from a former period when it was more widely distributed.

**Rill:** A small intermittent water course with steep sides, usually only several centimeters deep. Rills generally are linear erosion features.

**Riparian zone:** The banks and adjacent areas of water bodies, water courses, seeps, and springs whose waters provide soil moisture sufficiently in excess of that otherwise available locally so as to provide a more moist habitat than that of contiguous flood plains and uplands.

**Rock fragments:** The unattached pieces of rock 2 mm in diameter or larger that are strongly cemented or more resistant to rupture. Rock fragments include all sizes that have a horizontal dimensions less than the size of a pedon. Rock fragments are described by size shape, and, for some, the kind of rock.

**-S-**

**Sample:** A set of sampling units as opposed to a single measurement.

**Seral community:** See seral stage.

**Seral stage:** The developmental stages of an ecological succession; synonymous with successional stage.

**Shrub:** A plant that has persistent woody stems and a relatively low growth habit, and that generally produces several basal shoots instead of a single bole. It differs from a tree by its low stature, less than 5 meters (16 feet), and nonarborescent form.

**Slope aspect:** The predominate direction of slope of the land.



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**Soil:** The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. The unconsolidated mineral matter on the surface of the earth that has been subjected to and influenced by genetic and environmental factors of parent material, climate (including moisture and temperature effects), macro and microorganisms, and topography.

**Soil association:** A kind of map unit used in soil surveys comprised of delineations, each of which shows the size, shape, and location of a landscape unit composed of two or more kinds of component soils or component soils and miscellaneous areas, plus allowable inclusions. The individual bodies of component soils and miscellaneous areas are large enough to be delineated at the scale of 1:24,000. Several bodies of each kind of component soil or miscellaneous areas are apt to occur in each delineation, and they occur in a fairly repetitive and describable pattern.

**Soil classification:** The systematic arrangement of soil units into groups or categories on the basis of their characteristics. Broad groupings are made on the basis of general characteristics and subdivisions on the basis of more detailed differences in specific properties.

**Soil inclusion:** One or more polypedons or parts of polypedons within a delineation of a map unit, not identified by the map unit name (i.e., it is not one of the named component soils or named miscellaneous area components). Such soils or areas are either too small to be delineated separately without creating excessive map or legend detail, occur too erratically to be considered a component, or are not identified by practical mapping methods.

**Soil map unit:** A collection of soil areas or miscellaneous areas delineated in a soil survey. They may encompass one or more kinds of soil or one or more kinds of soil and miscellaneous areas, such as a rock outcrop. They are identified by a unique map symbol in a survey area. There are four kinds of map units: consociations, complexes, associations, and undifferentiated groups.

**Soil survey:** The systematic examination, description, classification, and mapping of soils in an area. Soil surveys are classified according to the kind and intensity of field examination.

**Species composition:** The proportions of various plant species in relation to the total on a given area. May be expressed in terms of relative cover, relative density, or relative weight.

**State:** A recognizable, resistant, and resilient complex of soil and vegetation.

**Steady state:** Vegetation states that are resistant to change. These plant communities change only as a result of a natural event that is beyond the normal range of events or normal human actions.

**Stratification:** the grouping together of similar site write-up areas (SWA) for sampling purposes. SWAs must have the same ecological site, forestland ecological site, or forest type in the same successional status class, or present vegetation community.

**Structure (soil):** The combination or arrangement of primary soil particles into secondary units or pedons. Secondary units are characterized on the basis of size, shape, and grade (degree of distinctness).



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**Structure (vegetation):** The height and area occupied by different plants or life forms in a community.

**Succession:** The progressive replacement of plant communities on a site that leads to the potential natural plant community (i.e., attaining stability). Primary succession entails simultaneous succession of soil from parent material and vegetation. Secondary succession occurs following disturbances on sites that previously supported vegetation and entails plant succession on the more mature soils.

**Successional status:** The present state of vegetation and soil protection of an ecological site in relation to the potential natural community for the site. Successional status is the expression of the relative degree to which kinds, proportions, and amounts of plants in a community resemble that of the potential natural community. The four classes of successional status ratings, expressed in terms of similarity to the potential natural community, are: 0-25 percent early seral class, 26-50 percent mid seral, 51-76 percent late seral and 76-100 percent PNC.

**Succulent:** Juicy, watery or pulpy, as the succulent stems of cacti.

**-T-**

**Threshold:** The boundary between any and all states, or along irreversible transitions, such that one or more primary ecological processes has been irreversibly changed and must be actively restored before returning to a previous state is possible.

**Transition:** A shift in plant composition that results in relatively stable states, as reflected in composition and structure. These shifts can occur by natural forces or as a result of human actions.

**Transition pathway:** The mechanism that causes a change in plant community from one steady state to another (e. g., fire, drought, grazing, rest, chemical and mechanical treatment).

**Tree:** A woody perennial, usually single-stemmed plant, that has a definite crown shape and characteristically reaches a mature height of at least 5 meters (16 feet). Some plants, such as oaks (Quercus spp.), may grow as either trees or shrubs.

**Trend:** The direction of change in a vegetation attribute or successional status observed over time.

**-V-**

**Vascular plant:** Plants with vessels that conduct sap throughout the plant.

**Vegetation:** Plants in general, or the sum total of the plant life above and below ground in an area.

**Vegetation attribute:** The quantitative features or characteristics of vegetation that describe how many, how much, or what kind of plants are present. The most commonly used attributes are frequency, cover, density, production, structure, and composition.

**Vegetation manipulation practices:** Practices that are directed at changing vegetation production, species composition, and erosion control. These practices include root plowing, seeding, pitting, chaining, prescribed fire, herbicide application, prescribed grazing, and livestock exclusion.



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**Vegetation type:** A kind of plant community with distinguishable characteristics described in terms of the present vegetation that dominates the aspect or physiognomy of the area.

-W-

**Warm season plants:** Plants whose major growth occurs during the spring, summer, or fall and that are usually dormant in winter.

**Water cycle:** The capture, storage, and redistribution of precipitation.

**Watershed:** The total area of land above a given point on a waterway that contributes runoff water to the flow at that point. A major subdivision of a drainage basin.

**Weather:** The current state of the atmosphere with regard to wind, temperature, cloudiness. moisture, and atmospheric pressure.

**Woodland sites:** See forestland.



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# Appendix 1 - Aerial Photography

BLM started flying aerial photography projects on a regular basis in the late 1960s. In general, where there are large blocks of BLM land ownership, there is usually resource scale aerial photo coverage.

*Scale:* Usually 1:24,000, some 1:12,000 (Northern California, Western Oregon), 1:15,840 or 1:31,680

*Film Type:* Mostly Natural Color or False Color Infrared (CIR), some Black and White

*Years Flown:* For a particular area, there may be only 1 year of coverage or multiple years/cycles of coverage.

The frequency of flights varies from State to State. Oregon has flown consistently from the 1950s through the present (Western Oregon in particular). Colorado, Idaho, New Mexico, Utah, and Wyoming typically have two cycles of coverage for most areas. Arizona, California, and Nevada typically have two cycles of coverage for only selected areas. Montana mostly has only one cycle of coverage (typically mid 1970s through the early 1980s only).

Special project photographs have also been completed on selected areas, typically for riparian or photogrammetric purposes.

*Scale:* Usually 1:2,400 to 1:6,000 range

*Film Type:* Mostly Natural Color or False Color Infrared(CIR).

*Years Flown:* Generally only 1 year of coverage. In some cases, there may be multiple years/cycles of coverage.

To determine what BLM coverage exists (e.g., geographic area, year flown, scale, film type) and obtain copies of the flight line indexes, contact the BLM State or field office aerial photo/remote sensing contact. Most of the original film is stored at BLM's aerial photo archive in Denver. To order photo reproductions or determine coverage, you can also contact the BLM's National Science and Technology Center (NSTC) in Denver. Contact Larry Cunningham (303-236-6382/ Fax 6564) or Connie Slusser (303-236-7991/Fax 7990) at:

NSTC, ST-122,
BLM, Bldg. 50, Denver Federal Center
PO Box 25047
Denver, Colorado 80225-0047

Other sources of aerial photo coverage include:

U.S. Geological Survey
Earth Science Information Center
Bldg. 810, Denver Federal Center
Denver, Colorado 80225
303-202-4200

*They have an extensive listing of their own coverage, plus what other Federal, State, and county agencies, and private companies have.*

U.S. Department of Agriculture
Aerial Photography Field Office
PO Box 30010
Salt Lake City, Utah 84130
801-975-3503

*They have their own coverage (Forest Service land, Farm Service Agency, and NRCS (previously ASCS and SCS)).*



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There is also the National Aerial Photography Program (NAPP). This program was started in 1987, with 5-year cycles for reflights. Most States have been flown three times. This program covers the entire country and may be more recent than typical BLM coverage.

*Scale:* 1:40,000

*Film Type:* Black and White for most 1990 and newer and CIR for 1987-1989

*Years Flown:* 1987 to present (3 cycles)

For determining coverage and photo numbers for NAPP you can:

- Contact your BLM State Office or the BLM Denver office.
- Contact the USGS or USDA (see above).
- Go to the USGS Web site.

For placing aerial photo orders from the NAPP, contact the USGS or USDA.
For reproduction costs, please contact the BLM, USGS, or USDA for the film they have.
Note: BLM was a contributor from 1987 through 1994, thus we get a price break for these years.



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# Appendix 2 - Soil Map Unit Delineations

*Draft*
*Technical Note*
*RIPARIAN-WETLAND*
*SOIL MAP UNIT DELINEATIONS*

*04/21/92*
*Prepared by George J. Staidl, NSRT*

## Background

Soil survey techniques and procedures guiding soil surveys, soil scientists, and SCS SSQA staff have generally concentrated on the major soil components and map unit delineations with substantial acreage. These procedures, in conjunction with cartographic policy, only allow for a closed line delineation or general spot symbols to identify unique areas. Use of delineations or spot symbols is highly dependent upon the scale of the photobase maps. Many unique areas are comprised of riparian zones and wetlands of minor acreage. These unique areas contain contrasting soils and are usually the most vegetatively productive soils within any survey area. The typical field mapping process identifies these areas with a broadly defined spot symbol or as contrasting soil inclusions within map units. This is a result of not identifying the riparian-wetland mapping objectives in the soil survey area MOU and the emphasis put upon the soil scientist to increase their production of acres mapped. The result is a tradeoff in detail of mapping and reduced ability to provide soil information concerning riparian and wetland areas.

The present farm bill and other congressional legislation have emphasized preservation and management of these unique riparian-wetland areas. They are, for the most part, the more productive and fragile parts of the ecosystem. The soil survey and cartographic procedures presently in use are not conducive to identifying and delineating many of these smaller areas as soil map units. These areas need to be part of a permanent soil database. Without this data, quality information cannot be disseminated to the user to meet the legislative needs. New techniques need to be explored, tested, and implemented within the soil survey process to give the soil scientist the tools to incorporate past, present, and future data into soil survey activities.

## Statement of Needs

As noted previously, congressional legislation has pointed out a need for additional soil survey information applicable to riparian and wetland areas. Availability of this information for total resource planning and conservation practice application is also vitally important in the decision making process. It is recognized that data collection should be initiated in many areas thought to be of less importance, or at least unmappable, using the policy and techniques available to the soil scientist at the time.



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Implementation would require that the resulting soil and plant data obtained be incorporated into a permanent database. This would maximize its utility for present and future data dissemination. This can be accomplished by developing a mechanism to identify these unique areas on field sheets, orthophoto quads, and in a GIS database where available. To maintain a permanent database, some modification of procedures will be needed. This should include modification of requirements using innovative cartographic techniques, map unit design, map unit descriptions, correlation to the series and phase level, and data entry to the soil survey database. Field applications would take into account only that which is normally expected for delineation and documentation common to other map units. Addressing the inequities of the present procedures will minimize the need for continued onsite investigation where soil and vegetation data is presently maintained in a nonpermanent form. Positive changes to the present system will maximize soil data availability for use by managers and others.

## Requirements

A. Any modifications to the existing soil survey procedures will be applicable to a soil survey where:

1. GIS capability may or may not be available.

2. Targeted areas will include:

   a. New SSA(s)
   b. Ongoing SSA(s)
   c. Newly completed SSA(s)
   d. SSA(s) undergoing update

3. The need exists for information on unique lands (riparian-wetland areas and others) and is presently unavailable.

B. Development and expansion of procedures for implementation will:

1. Be incorporated into any existing GIS database where the potential exists.

2. Allow for the correlation of minimal acreage unique soils to the series level. This will initiate data entry into the soil survey database.

3. Allow for the correlation of minimal acreage unique soil mapping units. This will initiate data entry into the soil survey database.

4. Provide techniques for unique delineations and spot symbols that will represent map units, but do not meet the present cartographic requirements.

5. Provide procedures to use the unique delineations and spot symbol map units to represent spatial area and allow for acreage determination.

6. Allow for the description of spatial area concepts for the unique delineation and spot symbol map units as a component in map unit descriptions.

C. Proposed methods for use in soil survey areas:

1. Line segment (e.g., dot to dot or line break to line break) vector format.

   a. Determine and designate the representative delineations line segment width for each map unit (e.g., the map unit line segment represents an average width of 120 feet). This information, along with the line length and scale of map, will determine map unit acreage.



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b. Suggested line width groupings are 1-50, 50-100, 100-150, and 150-200 feet. Areas that are greater than 200 feet wide will typically be located by an enclosed line polygon.

c. Assign a map unit symbol to each line segment using a leader technique. A unique Alpha or Numeric code, representing an average width within a line segment group, will be assigned as the last character in the map unit symbol. An example of a symbol is 103X, where "103" is the map unit name and "X" indicates an average width of 75 feet in the 50-100 feet group.

d. Utilize the existing drainage spot symbols as line segment breaks to minimize map clutter.

2. Spot symbols.

a. Use ad hoc symbols or a dot to represent a map unit.

b. Determine the acreage that each spot symbol or dot represents for the map unit (e.g., averages 2.5 acres). Suggested spot symbol grouping are <1, 1-2, 2-3, 3-4, and 4-5 acres. Those areas that are greater than 5 acres will typically be located by an enclosed line polygon.

c. Assign a map unit symbol to each spot symbol or dot using the leader technique. A unique Alpha or Numeric code representing an average acreage for the spot symbol group will be assigned as the last character in the map unit symbol. An example of a symbol is 103P, where "103" is the map unit name and "P" indicates an average acreage of .5 acres for the <1 acre group.

D. Field procedures for soil survey areas:

1. Field check the area to be mapped in terms of the normal map unit concept.

2. Design a map unit using accepted soil survey procedures.

3. Determine if the map unit is a consociation, association, complex, or undifferentiated group.

4. Identify each major and minor component soil within the proposed map unit, preferably at the soil series level, and assign phases as needed.

5. Obtain all necessary documentation for soils, vegetation, hydrology, etc.

6. Using the documentation collected, correlate each major soil component of the map unit to the series level.

7. Assign each new map unit its own unique map unit symbol and display with representative line segments or spot symbols on the soil map.

8. Designate the representative line segment width and spot symbol acreage in each applicable map unit description.

9. Determine acreage for each line segment or spot symbol on each completed soil map.

10. Continue using accepted National Cooperative Soil Survey procedures throughout the survey.



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E. Delineation and map symbol application will be as follows:

1. Line segments or spot symbols will be on original field sheets and orthophotoquad soil maps.

2. Line segments or spot symbols will be on registered mylar overlays with a stable base map.

3. Line segments or spot symbols will be transferred to scribe coat of orthophotoquad for publication processes.

4. Line segments and spot symbols will be digitized as part of the GIS database.

F. Data permanence procedure within the soil survey area:

1. Identify and implement the soil mapping options noted in (E) above that are applicable to the soil survey area status.

2. Undergo the review and final correlation process common in any soil survey as outlined in the National Soils Handbook.

3. Prepare and process all necessary soil series and map unit information into the National Soil Survey Database for future access of output data.



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# Appendix 3 - Ecological Site Description

## United States Department of Agriculture, Natural Resources Conservation Service

### Ecological Site Description

### Rangeland

Site name: Loamy Upland 12-16 PZ
Site number: R - 041XC313AZ
Major land resource area: 41 - Southeastern Arizona Basin and Range
Interstate correlation: None

### Physiographic features

This site occurs on fan and stream terraces. The elevations range from 3,200 to 5,200 feet above sea level. This site occurs on all aspects of the slope. The slopes on this site range from 1% to 15%.

### Climatic features

Frost-free period: 170-220 days - Feb.20 - Nov.25
Freeze-free period: 180-225 days - Feb.15- Nov.30
Mean annual precipitation: 12-17 inches
Mean annual air temperature: 68.0 °F
Mean annual soil temperature: 70.0 °F

Monthly moisture and temperature distribution:

| | Mean precipitation (in) | Percent precipitation (%) | Mean temperature (°F) |
|---|---|---|---|
| January | 0.93 | 6.65 | 51.1 |
| February | 0.78 | 5.6 | 53.8 |
| March | 0.71 | 5.2 | 57.8 |
| April | 0.45 | 3.2 | 65.0 |
| May | 0.21 | 1.5 | 73.2 |
| June | 0.29 | 2.1 | 82.9 |
| July | 2.82 | 20.3 | 86.2 |
| August | 2.56 | 18.4 | 84.0 |
| September | 2.07 | 14.9 | 80.4 |
| October | 1.15 | 8.3 | 70.4 |
| November | 0.87 | 6.3 | 58.7 |
| December | 1.05 | 7.6 | 52.0 |
| Mean annual | 13.89 | 100 | 68.0 |

### Other climatic features

Precipitation in the subresource area ranges from 12 to 16 inches yearly in the eastern part with elevations from 3,600 to 5,000 feet. Precipitation in the western part ranges from 13 to 17 inches yearly with elevations from 3,300 to 4,500 feet. Winter - summer rainfall ratios are 40:60 in the west side of the resource area to 30:70 in the eastern portion of the area. Summer rains fall July - September, originate in the Gulf of Mexico and are convective, usually brief, intense thunderstorms. Cool season moisture tends to be frontal,



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originates in the pacific and Gulf of California, and falls in widespread storms with long duration and low intensity. Snow rarely lasts more than 1 day. May and June are the driest months of the year. Humidity is generally very low.

Temperatures are mild. Freezing temperatures are common at night from December through April, however, temperatures during the day are frequently above 50 °F. Occasionally in December to February, brief periods of 0 °F temperatures may be experienced some nights. During June and rarely during July and August some days may exceed 100 °F. Frost free days range from 170 to 220.

The cool season plants start growing in the early spring and mature in early summer. The warm season plants take advantage of the summer rains and are growing and nutritious from July through August. Warm season grasses may remain green throughout the year.

## Associated water features

Nonstream characteristics: None
Stream characteristics: None

## Soils

The soils on this site are very deep. They have been formed in loamy alluvium of mixed origin. Surfaces range from very gravelly sandy loam to loam. Sandy loam surfaces can be no thicker than 4 inches (8 inches for gravels). These soils all have argillic horizons near the surface. Plant-soil moisture relationships are good. Soil surfaces are dark colored.

*Major Soil Taxonomic Units correlated to this site include:*

Whitehouse 1, sl
Bernardino 1(15% slope)
Caralampi 1, sl (15% slope)
Sasabe 1, sl
Enzian 1, sl
Forrest 1
McAllister 1

## Plant communities

Historic climax plant community: The interpretive plant community for this site is the Historic climax plant community. This community is dominated by warm-season perennial grasses. All the major perennial grass species on the site are well dispersed throughout the plant community. Perennial forbs and a few species of low shrubs are well represented on the site. The aspect of this site is that of an open grassland.

## Major plant species composition

This list of plants and their relative proportions are based on near normal years. Fluctuations in species composition and relative production may change from year to year dependent upon abnormal precipitation or other climatic factors. The historic climax plant community has been determined by study of rangeland relict areas, or areas protected from excessive grazing. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures and historical accounts have also been used.



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## Grasses and Grasslikes 750-850 pounds per acre

| Scientific plant symbol | Common name | Group | Pounds per acre | Percent by weight | Percent allowable for group |
|---|---|---|---|---|---|
| BOCU | sideoats grama | 1 | 400-500 | | 40-50 |
| ERIN | plains lovegrass | 1 | | | |
| BOBA3 | cane beardgrass | 1 | | | |
| BOER4 | black grama | 2 | 150-250 | | 15-25 |
| BOGR2 | blue grama | 2 | | | |
| BOHI2 | hairy grama | 2 | | | |
| BOCH | sprucetop grama | 2 | | | |
| LYPH | wolftail | 2 | | | |
| ARIST | threeawn species | 3 | 50-100 | 5-10 | 5-10 |
| DICA8 | Arizona cottontop | 4 | | | 5-10 |
| SEMA5 | plains bristlegrass | 4 | | | |
| HECOl0 | tanglehead | 4 | | | |
| TRSE | crinkleawn | 4 | | | |
| MURI | purple muhly | 4 | | | |
| MUPO2 | bush muhly | 4 | | | |
| HIBE | curly mesquite | 5 | 10-50 | | 1-5 |
| BORO2 | rothrock grama | 5 | | | |
| BOFI | slender grama | 5 | | | |
| SPCR | sand dropseed | 5 | | | |
| MUE | aparejograss | 5 | | | |
| PAOB | vine mesquite | 6 | 10-50 | | 1-5 |
| LECO | fall witchgrass | 6 | | | |
| PAHA | Hall panicum | 6 | | | |
| TRPU2 | fluffgrass | 6 | | | |
| PAMU3 | pima pappusgrass | 6 | | | |
| SPCO4 | spike dropseed | 6 | | | |
| LEDU | green sprangletop | 6 | | | |
| ENDE | spike pappusgrass | 6 | | | |
| SIHY | bottlebrush squirreltail | 6 | | | |
| TRMU | slim tridens | 6 | | | |
| BORA | purple grama | 6 | | | |
| BOTR2 | red grama | 6 | | | |
| ARAD | six weeks threeawn | 7 | 10-50 | | 1-5 |
| AROL | annual threeawn | 7 | | | |
| BOBA2 | six weeks grama | 7 | | | |
| BOAR | needle grama | 7 | | | |
| VUOC | six weeks fescue | 7 | | | |
| PAAR | Arizona panicum | 7 | | | |
| BRLAR4 | Arizona brome | 7 | | | |
| LEFI | red sprangletop | 7 | | | |
| EUN2 | Mexican sprangletop | 7 | | | |
| ERAR | desert lovegrass | 7 | | | |
| ERDI | spreading lovegrass | 7 | | | |
| CHVI | featherfinger grass | 7 | | | |



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## Forbs 100 to 150 pounds per acre

| Scientific plant symbol | Common name | Group | Pounds per acre | Percent by weight | Percent allowable for group |
|---|---|---|---|---|---|
| SIDA2 | sida | 8 | 100-150 | | 10-15 |
| TAAU | talinum | 8 | | | |
| ERDI4 | wild daisy | 8 | | | |
| SPNA4 | desert globemallow | 8 | | | |
| BRDE | small matweed | 8 | | | |
| HODE | hog potato | 8 | | | |
| BRPU2 | covena | 8 | | | |
| ANTU | wind flower | 8 | | | |
| HASP2 | spiny haplopappus | 8 | | | |
| CRCO11 | leatherweed | 8 | | | |
| OEPR | evening primrose | 8 | | | |
| VIAM | vetch | 8 | | | |
| FRAR2 | snake cotton | 8 | | | |
| PLIN | trailing four o'clock | 8 | | | |
| STPA4 | wire lettuce | 8 | | | |
| POGR5 | yerba de venado | 8 | | | |
| DYPO | dogbane dyssodia | 8 | | | |
| BAAB | bahia | 8 | | | |
| TILA2 | honeymat | 8 | | | |
| ASTRA | loco species | 8 | | | |
| LOSAB | mares fat | 8 | | | |
| PORTU | pursley species | 8 | | | |
| ASTER | annual aster | 8 | | | |
| TRADE | spiderwort | 8 | | | |
| CINE | thistle | 8 | | | |
| PLIN3 | Indianwheat | 8 | | | |
| ERTE13 | bull filaree | 8 | | | |
| PEPA2 | chinch weed | 8 | | | |
| ERIOG | annual buckwheat | 8 | | | |
| ANODA | anoda | 8 | | | |
| ARABI | rock cress | 8 | | | |
| DYAC | Texas dyssodia | 8 | | | |
| BAMU | desert marigold | 8 | | | |
| JAGR | slender janusia | 8 | | | |
| PSORA | breadroot | 9 | 10-15 | | 1-5 |
| VIAN | annual goldeneye | 9 | | | |
| DEPI | tansy mustard | 9 | | | |
| PHYSA | tomatillo | 9 | | | |
| GALLI | blanket flower | 9 | | | |
| CHENO | lambsquarter | 9 | | | |
| AMTE3 | fiddleneck | 9 | | | |
| LUSP2 | desert lupine | 9 | | | |
| PHLOX | phlox | 9 | | | |
| LILE | blue flax | 9 | | | |
| BELY | green eyes | 9 | | | |
| PENA | desert holly | 9 | | | |
| ERDI2 | diffuse eriastrum | 9 | | | |



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## Shrubs and Trees 100- 150 pounds per acre

| Scientific plant symbol | Common name | Group | Pounds per acre | Percent by weight | Percent allowable for group |
|---|---|---|---|---|---|
| CAEB | false mesquite | 10 | 50-100 | | 5-10 |
| ERWR | shrubby buckwheat | 10 | | | |
| KRPA | range ratany | 10 | | | |
| ZIPU | desert zinnia | 10 | | | |
| ZIGR | Texas zinnia | 10 | | | |
| KRLA | spreading ratany | 10 | | | |
| OPAR2 | pencil cholla | 11 | 10-50 | | 1-5 |
| OPFU | jumping cholla | 11 | | | |
| OPEN | Engelmann pricklypear | 11 | | | |
| ECHIN3 | hedgehog cactus | 11 | | | |
| MOMI | pincushion cactus | 11 | | | |
| CORYP | coryphantha | 11 | | | |
| OPVE | staghorn cholla | 11 | | | |
| OPLE | Christmas cholla | 11 | | | |
| ECWI | fishhook barrel cactus | 11 | | | |
| FOSP2 | ocotillo | 11 | | | |
| AGPA | desert agave | 11 | | | |
| YUEL | soaptree yucca | 12 | 10-20 | | 1-2 |
| YUBA | datil yucca | 12 | | | |
| EPTR | longleaf Morman tea | 12 | | | |
| LYCIU | wolfberry | 12 | | | |
| ATCA2 | fourwing saltbush | 12 | | | |
| BAPT | yerba de pasmo | 12 | | | |
| PRJU | mesquite | 12 | | | |
| PAFL6 | blue paloverde | 12 | | | |
| ACGR | catclaw acacia | 12 | | | |
| ACCO2 | whitethorn | 12 | | | |
| MIBI8 | catclaw mimosa | 12 | | | |
| MESC | twinberry | 12 | | | |
| JUMO | oneseed juniper | 12 | | | |
| NOMI | sacahuista | 12 | | | |
| PAAC3 | retama | 12 | | | |
| HATE | burroweed | 12 | | | |
| GUSA2 | broom snakeweed | 12 | | | |
| GUMI | threadleaf snakeweed | 12 | | | |
| MIDY | velvet-pod mimosa | 12 | | | |
| ELCE | tarbush | 12 | | | |
| PAMI5 | littleleaf paloverde | 12 | | | |
| PSCO2 | whitestem paperflower | 12 | | | |
| ZIOB | greythorn | 12 | | | |



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## Ground cover and structure

| | Height above the ground | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Not applicable | | 6 - 12 inches | | 12 - 24 inches | | 24 - 60 inches | | 180 - 240 inches | |
| | % ground cover | % canopy cover | % ground cover | % canopy cover | % ground cover | % canopy cover | % ground cover | % canopy cover | % ground cover | %canopy cover |
| Trees | | | | | | | | | <1 | 1-3 |
| Shrubs | | | | | | | 2-3 | 5-7 | | |
| Forbs | | | 2-3 | 5-7 | | | | | | |
| Grasses | | | | | 10-12 | 20-25 | | | | |
| Litter | 7-10 | | | | | | | | | |
| Cryptogams | <1 | | | | | | | | | |
| Coarse fragments | 5-10 | | | | | | | | | |
| Bare ground | 60-70 | | | | | | | | | |

## Total annual production

The historic climax plant community will produce approximately the following amounts of air dry vegetation per acre:

Favorable year: 1,500 lb/ac
Normal year: 1,000 lb/ac
Unfavorable year: 650 lb/ac

## Ecological dynamics and major plant community types

With continuous heavy grazing, palatable perennial grasses, such as blue grama, hairy grama, sprucetop grama, sideoats grama, and plains lovegrass, decrease. Increasers under such circumstances include curly mesquite, threeawn species, and in places, false mesquite. With severe deterioration, shrubby species increase to the point of dominance. Mesquite forms the overstory with snakeweed and lesser amounts of burroweed in the understory. Cholla and pricklypear can also increase on the site. When present on the site, mesquite tends to be short, due to the presence of clay horizons at shallow depths in the soils.

Loss of porous surface soil causes a reduction in the sites ability to effectively use intense summer rainfall. Natural fire may have been important in the development of the historic climax plant community. Lehmann lovegrass can invade this site, but usually does not become dominant. The potential for the site to maintain its annual production is reduced by increasing mesquite canopy. Stable areas of the site can produce effective herbaceous covers with up to 10%–15% canopy cover of mesquite. In areas where half-shrubs dominate the understory, the potential production of perennial grasses is about 10% greater than the present production of halfshrubs once they are removed from the plant community by fire or other brush management.

There have been no special emphasis species identified on this site. As that information becomes available it will be included. Following is a description of the present day plant communities that can occupy this site. The diagram illustrates the transition pathways between the common plant communities on the site.



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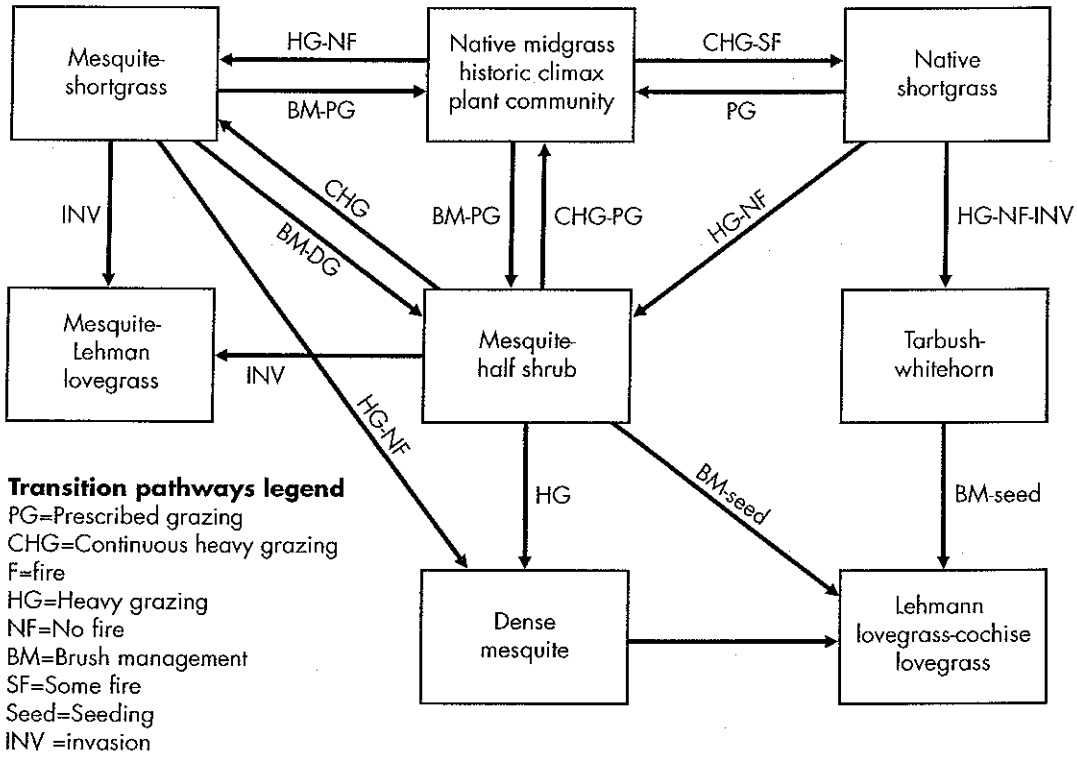


**Native midgrass**-This is the historic climax plant community for this site. This plant community evolved through the holocene in the absences of grazing by large herbivores and with fire frequency of every 10 to 20 years. It exists all across the upper end of this MLRA especially on moderate slopes with very gravelly surfaces. The typical plant community description for this vegetation state is described in detail above.

**Native short grass**-This plant community exists all across the upper end of the MLRA. It is especially common on nearly level slopes with little or no gravel cover. It is characterized by a continuous cover of short grama grasses (blue, black, sprucetop), curly mesquite and low shrubs (calliandra and krameria). It is stable unless basal cover falls below 5%–6% on 2%–3% slopes. Average production is less than historic climax plant community as the more shallow rooted community cannot fully exploit the soil, water, and nutrients available in average or better growing seasons. It is excellent for livestock grazing, but lacks mid-grass cover needed by some wildlife species (antelope fawns). The grass cover is easily thinned by drought, but usually recovers rapidly. The transition pathway included heavy grazing with some occurrence of fire. The water cycle has been severely altered, as has the nutrient cycle. This community occurs in the healthy, at risk and unhealthy recoverable categories.



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The following represents the typical plant community of the vegetation state described as **Native-Short Grass**. Refer to the Historic climax plant community for the plants in each plant group.

| Plant group | Pounds per acre |
|---|---|
| 1 | 15-50 |
| 2 | 300-400 |
| 3 | 15-50 |
| 5 | 15-150 |
| 8 | 15-50 |
| 10 | 15-50 |
| 11 | T |
| 12 | T |

Total annual production 630 lb/ac (normal year)

**Mesquite short grass**-This plant community exists all across the MLRA. Mesquite canopy ranges from 1%–10%. The understory is a continuous cover of short grama grasses and/or curly mesquite. It is stable unless basal cover falls below 5%–6% on 2%–3% slopes. Production is always less than the historic climax plant community. Mesquite exploits the soil, water, and nutrients earlier in the spring and to a greater depth than the shallow rooted warm-season grasses. The grass cover is easily thinned by drought and may be slow to recover due to the presence of mesquite. It is good for livestock grazing, but the tree cover can interfere with livestock handling operations. The presence of mesquite allows species, such as mule deer and javelina, to use this site, but detract from its value as antelope habitat. The transition pathway includes heavy grazing, no fires, and a proximity to mesquite in bottom-lands. The ecological processes of water cycle, nutrient cycle, and energy flow have been severely altered. The hydrologic functioning of this site has been altered. This site occurs most often as at risk and unhealthy recoverable categories.

The following represents the typical plant community of the vegetation state described as **Mesquite-Short Grass**. Refer to the Historic climax plant community for the plants in each plant group.

| Plant group | Pounds per acre |
|---|---|
| 1 | 15-50 |
| 2 | 300-400 |
| 3 | 15-50 |
| 5 | 15-100 |
| 8 | 15-50 |
| 10 | 15-50 |
| 12 | 15-150 |

Total annual production 665 lb/ac (normal year)

**Mesquite halfshrub/cacti**-This plant community exists all across the lower and mid portion of the MLRA. Mesquite canopy ranges from 1%–10%. The understory is a diverse mixture of cacti, burroweed, broom snakeweed, and other shrubs. Perennial grasses exist in trace amounts only. The plant community is poor for livestock grazing, poor for some wildlife species (e.g. pronghorn antelope and scaled quail) and good for other wildlife species (e.g., mule deer, javelina, and gambel quail). Transition pathway is from mesquite short grass with continued heavy grazing and the absence of fire. Almost all the ecological processes on this site have been severely altered, and the site has lost some of the recovery mechanisms. In general, the site is not stable in this plant community and occurs most often as unhealthy recoverable category.

The following represents the typical plant community of the vegetation state described as



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**Mesquite-Shrub-Cacti**. Refer to the Historic climax plant community for the plants in each plant group.

| Plant group | Pounds per acre |
|---|---|
| 2 | 15-50 |
| 3 | 15-100 |
| 4 | 15-50 |
| 7 | 15-50 |
| 11 | 15-150 |
| 12 | 500-600 |

Total annual production 750 lb/ac (normal year)

**Dense mesquite**-This plant community occurs all across the MLRA in small areas, especially historic heavy use areas, such as old homesteads, in horse pastures, along streams with perennial flow and other old watering locations, and also on archaeological sites. Mesquite canopy ranges from 10%–30%. The understory consists of scattered low shrubs, remnant perennial grasses, and annual species. This plant community is very poor for livestock grazing and poor quality habitat for most wildlife species. However, under the present hunting pressure in southern Arizona, the oldest and largest mule deer bucks use these mesquite thickets as hiding and escape cover. The site in this plant community is not stable. Often times so much of the soil surface has been lost under this condition that the site will not respond to treatment and the site potential has been lost. In some cases the erosion has so damaged the site that even the existing mesquite trees have difficulty surviving. Transition pathway is from mesquite short grass with excessive grazing and no fires. This site occurs most as unhealthy recoverable and unhealthy unrecoverable categories.

The following represents the typical plant community of the vegetation state described as **Dense Mesquite**. Refer to the Historic climax plant community for the plants in each plant group.

| Plant group | Pounds per acre |
|---|---|
| 3 | 15-50 |
| 4 | 15-50 |
| 12 | 500-600 |

Total annual production 620 lb/ac (normal year)

**Tarbush/Whitethorn**-This plant community occurs throughout the eastern portion of the MLRA in areas where loamy upland is adjacent to limy sites that naturally support tarbush and whitethorn. Canopy cover of the two shrubby species usually exceeds 10%. The understory consists of scattered low shrubs, remnant perennial grasses and annuals. This plant community is very poor for livestock grazing and poor quality habitat for most wildlife species. The site under this plant community is not stable. Often so much surface soil has been lost that the site will not respond to treatment and the site potential has been lost. Transition pathway is from native mid-grass with heavy grazing, no fires, and a proximity to tarbush/whitethorn on adjacent limy sites. This site occurs most as unhealthy recoverable and unhealthy unrecoverable categories.



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The following represents the typical plant community of the vegetation state described as **Tarbush-Whitethorn**. Refer to the Historic climax plant community for the plants in each plant group.

| Plant group | Pounds per acre |
|---|---|
| 1 | 15-50 |
| 2 | 15-50 |
| 3 | 15-100 |
| 4 | 15-100 |
| 8 | 15-50 |
| 10 | 15-50 |
| 12 | 500-600 |

Total annual production 800 lb/ac (normal year)

**Mesquite-Lehmann lovegrass**-This plant community occurs throughout the MLRA. In nearly all cases it has developed from mesquite native grasslands in the last 30 years. Livestock grazing, fire, and drought have all been demonstrated to enhance this invasion of loamy upland site wherever there is a seed source of Lehmann lovegrass. This plant community offers a great deal of stability to the site. Mesquite canopy is usually less than 10%. Lehmann production equals or exceeds native grass production. Species diversity is usually greatly reduced on this site once Lehmann lovegrass has become dominant. Under mesquite native grass conditions it is common to find 40 to 50 perennial plant species on this site. Under Lehmann dominance that figure will be 20 to 30 species. This plant community is good for livestock grazing. It is fair for some species of wildlife (mule deer and gambel quail). It is good for small herbivores (rabbits and mice) and generally poor for many other species, such as pronghorn antelope and scaled quail. Transition pathway is from mesquite short grass with heavy grazing, some fires, and a Lehmann lovegrass seed source. The ecological processes on this site have been altered somewhat, and this site occurs as healthy, at risk, and unhealthy recoverable categories.

The following represents the typical plant community of the vegetation state described as **Mesquite-Lovegrass**. Refer to the Historic climax plant community for the plants in each plant group.

| Plant group | Pounds per acre |
|---|---|
| 2 | 15-50 |
| 8 | 15-50 |
| 10 | 15-50 |
| 12 | 50-150 |
| 13 | 1,200-1,400 (consists of introduced lovegrasses, such as Lehmann, Cochise, Boer, and Wilman) |

Total annual production 1,425 lb/ac (normal year)

**Lehmann lovegrass and/or Cochise lovegrass**-This plant community occurs throughout the MLRA. It exists where mechanical brush management was used to control mesquite, tarbush, whitethorn, and cacti, and where lovegrass species were seeded. This plant community offers a great deal of stability to the site. Because of the nature of the grass species and the mechanical roughening of the soil surface, these communities generally produce 20–50% more than native grass communities. Although plant species diversity is low in these lovegrass communities, it is usually better than in the woody dominated plant community it replaced. This community is good to very good for livestock grazing, fair for some wildlife species pronghorn antelope and scaled quail), good for other species



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(rabbits and mice), and poor for such species as mule deer and javalina. The transition pathway is from either mesquite halfshrub/cacti or dense mesquite, with the inclusion of mechanical brush management and seeding of one or both of the lovegrass species. The ecological processes are functioning relatively similar to that of the historic climax plant community. This site most often occurs in the healthy category.

The following represents the typical plant community of the vegetation state described as **Lehmaun lovegrass-Cochise lovegrass**. Refer to the Historic climax plant community for the plants in each plant group.

| Plant group | Pounds per acre |
|---|---|
| 1 | 15-50 |
| 2 | 15-100 |
| 8 | 15-50 |
| 10 | 15-100 |
| 13 | 1,250-1,450 (consists of introduced lovegrasses, such as Lehmann, Cochise, Boer, and Wilman) |

Total annual production 1,495 lb/ac (normal year)

## Plant Growth Curves

Growth curve number: AZ0001
Growth curve name: Native 1
Growth curve description: Native plant community with high similarity index and average growing conditions.

| Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 5 | 5 | 3 | 2 | 2 | 20 | 20 | 18 | 10 | 5 | 5 |

Growth curve number: AZ0002
Growth curve name: Native 2
Growth curve description: Native plant community with low similarity index dominated by mesquite and cacti, and average growing conditions.

| Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 5 | 5 | 10 | 15 | 25 | 10 | 5 | 5 | 5 | 5 | 5 |

Growth curve number: AZ0003
Growth curve name: Mesquite-Lehmann lovegrass
Growth curve description: Plant community dominated by mesquite with and understory of Lehmann lovegrass, average growing conditions.

| Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 5 | 5 | 10 | 15 | 15 | 15 | 10 | 5 | 5 | 5 | 5 |



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## Animal community

The plant community on this site is well suited to grazing by both domestic livestock of all kinds and by wildlife at all seasons of the year. Currently the majority of the livestock use on this site is with mother cows in a cow-calf operation. Historic use has always been a cow/calf type operation, but there have been periods of large numbers of stocker cattle on these ranges. Sheep use has been slight historically. The main problem to the use and management of livestock on this site is the lack of natural water sources.

This site is important for many wildlife species. Major species include desert mule deer, pronghorn antelope, gambels quail, scaled quail, and black-tailed jackrabbit. Water developments are very important to these and other wildlife on this site. Being an open grassland, this site is also home to a variety of small herbivores, birds, and their associated predators. With the exception of pronghorn antelope, this site is mainly a forage area for larger wildlife species. The value of this site for food or cover requirements for specific wildlife species changes with the changes in the vegetation that occur from one plant community to another. Each plant community and each animal species must be considered individually. General information has been included here and in the ecological dynamic section of this site description.

**Associated site**-This site is associated with the Limy Upland 12-16 PZ and the Loamy Bottom sites.

**Similar sites**-With the historic climax plant community, this site is not similar enough to any other site to cause a problem or concern. As this site deteriorates it may easily be confused with other deteriorated sites, such as Limy Upland. Many sites will deteriorate into very similar plant communities.

# *Site Documentation*

**Author:** Original WHN 1976
Revised DGR 1987

**Supporting data for site development**-The historic climax plant community has been determined by study of rangeland relict areas or areas protected from excessive grazing. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have also been used. The following transect and clipping data also documents this site. There are 21 permanent transect locations on this site.

| **Sampling technique** | EC | GC | FC | PC |
|---|---|---|---|---|
| SCS-Range 417 | 10 | 15 | 15 | 3 |
| SCS AZ-Range-1 | 1 | 7 | 10 | 13 |

**Type locality:**

| | |
|---|---|
| Pima Co | Buenos Aires NWR, Sec. 19, T21S, R8E |
| Cochise Co. | Oak Ranch, Sec.2, T18S, R28E |
| Cochise Co. | Ft. Huachuca, Sec.17, T21S, R19E unsurveyed |
| Santa Cruz Co. | Santa Fe Ranch, Sec. 13, T23S, R14E |
| Pinal Co. | Tom Mix Hwy ROW, Sec.2, T10S, R13E |

**Field offices:**

| | |
|---|---|
| Casa Grande | Chandler |
| Douglas | Phoenix |
| Safford | San Carlos |
| Sells | Tucson |
| Willcox | |

**Relationship to other established classifications**-This site would most closely fit A.W. Kuckler's Potential Natural Vegetation as unit number 58 Grama - Tobosa - Shrubsteepe. It most closely fits the Society for Range Management's Rangeland Cover Types as unit number 505 Grama - Tobosa Shrub.



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**Plant species index**-(This section provides a cross reference for common names, scientific names, and national symbol. It will be generated by ESIS, no input required here.)

**Other references** (list other references used in the description or correlation of this site.)

**Site approval**-This site has been reviewed and approved for use.

State Rangeland Management Specialist

Date

# *Ecological site interpretations*

## Grazing

The plant community on this site is suitable for grazing by all classes of livestock at any season. With thin, course textured surfaces, and over argillic horizons, these soils become less effective in catching summer rainfall if the grass cover is disturbed or depleted. With a good grass cover, the clayey subsoil releases moisture slowly to the plants over the summer season. Lehmann lovegrass can invade this site slowly, but seldom forms a monotype. At the first sign of invasion, proper use of the native perennials must be practiced to avoid letting lovegrass spread. Herbaceous forage is deficient in protein in the winter. This site has no natural surface water associated with it; therefore, water development for livestock is necessary for utilization of this site.

Initial starting stocking rates will be determined with the landowner or decision maker. They will be based on past use histories and type and condition of the vegetation. Calculations used to determine an initial starting stocking rate will be based on forage preference ratings.

### Forage preferences by season for cattle

(P = preferred, D = desirable, U = undesirable)

| Plant species | Dec/Feb | March/May | June/Aug | Sept/Nov |
|---|---|---|---|---|
| Sideoats grama | U | P | P | P |
| Plains lovegrass | U | P | P | P |
| Cane beardgrass | U | D | P | D |
| Blue grama | D | P | P | P |
| Sprucetop grama | D | P | P | P |
| Curly mesquite | D | P | P | P |
| Harry grama | D | P | P | P |
| Spidergrass | U | U | D | U |
| Red threeawn | U | D | U | U |
| Perennial forbs | P | P | P | P |
| False mesquite | U | P | D | P |
| Ratany species | P | P | D | P |
| Zinnia species | P | P | D | P |
| Mesquite | U (leaves) | P (new leaves) | P (beans) | P (beans) |
| Staghorn cholla (fruits) | P | D | P | P |
| Pricklypear (fruits) | U | U | P | P |



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## Wildlife

This site has no natural surface water associated with it. Water developments are important to wildlife on this site. Being an open grassland, this site is home to a variety of small herbivores, birds, and their associated predators. Except for pronghorn antelope, this site is mainly a foraging area for the larger wildlife. There are no threatened or endangered wildlife species that rely on this site for any of their habitat requirements.

**Guide to site plant use by selected wildlife species**

(P = preferred, D = desirable, U = undesirable, X = used, but degree of utilization unknown)

| Plant species | Desert mule deer | Pronghorn antelope | Gambels quail | Scaled quail | Blacktailed jackrabbit |
|---|---|---|---|---|---|
| Perennial grasses | 2.5% diet | 3% diet | P)seed | P)seed | P)foliage |
| Annual grasses | 2.5% diet | 3% diet | P)seed | P)seed | P)foliage |
| Annual forbs | P)green | P)green | P)sd/gr | P)sd/gr | P)foliage |
| Sida | P)foliage | P)foliage | P)seed | | |
| Evolvulous | P)foliage | P)foliage | | | |
| Dychoriste | P)foliage | P)foliage | | | |
| Cudweed | P)foliage | P)foliage | | | P)foliage |
| Wild daisy | P)foliage | P)foliage | P)seed | X)seed | P)foliage |
| Globe mallow | P)foliage | P)foliage | P)seed | X)seed | P)foliage |
| Ragweed | D)foliage | | | | P)foliage |
| Hog potato | X)foliage | | | P)seed | |
| Covena | P)foliage | X)foliage | | X)seed | |
| False mesquite | P)lvs/twg | P)lvs/flw | P)seed | P)seed | X)foliage |
| Ratany species | P)lvs/twg | | | | X)foliage |
| Zinnia | X)lvs/twg | | | | X)foliage |
| Yerbe-de-pasmo | X)lvs/twg | X)leaves | | | |
| Mesquite | P)lvs/bn | P)bean | P)seed | P)seed | P)lvs/bn |
| Staghorn cholla | P)fruits | P)flw/frt | P)seed | P)seed | |
| Prickly pear | P)fruits | P)flw/frt | P)frt/sd | P)frt/sd | P)pads |
| Ocotillo | D)flowers | X)lvs/flw | | | |
| Barrel cactus | P)fruits | P)fruits | P)seed | P)seed | |
| Agave | | P)flowers | | | |

## Hydrology data

The hydrology of this site is characterized by high intensity thunderstorms during summer months and, in winter, by low intensity frontal storms. From 60 to 70% of the annual moisture occurs during the summer months. The site has a porous soil surface that is resistant to erosion when perennial vegetation cover is sufficient to protect the site from damage. As basal cover is reduced, the surface soil is exposed to accelerated erosion and can be quickly lost. The clayey subsoil is more resistant to erosion, but is not able to sustain the original plant community. Deteriorated sites are characterized by low



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infiltration and excessive runoff. This site naturally delivers water to adjacent sites downstream by overland flow. Concentrated flow patterns are common and can easily become rills and gullies if cover is lost.

## Wood products

Considerable amounts of mesquite occupy several present day plant communities. Wood products potential is low on this site. Mesquites remain small and shrubby because of the soils.



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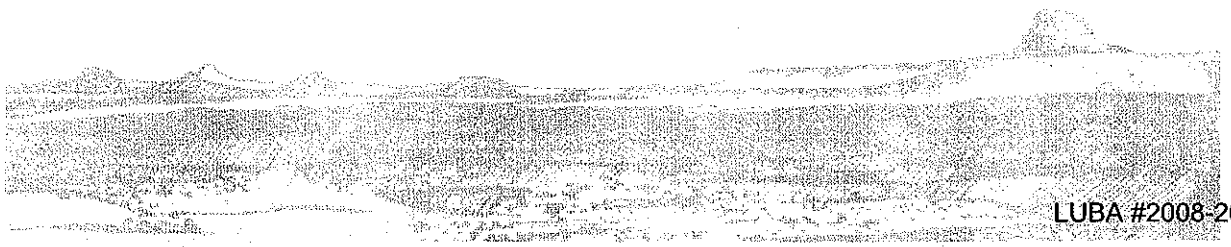

# Appendix 4 - Vegetation Production Worksheet

Inventory Code _____ Management Unit or Allotment _____ Elevation _____ % slope _____ Slope Aspect _____ Landform _____

Site Write-up Area Number _____ Ecological Site Number _____ Ecological Site Name _____ Ecological Condition _____

Transect No. _____ % SWA _____ Soil Map Unit No. _____ Soil Taxon Name _____ Soil Phase Texture Class _____ Soil Phase Texture Modifier

Date _____ Recorder _____ Pasture Number _____ Estimate Total Production _____ (lb/ac) Vegetation Type_____

Stratum No. _____ Sampled? (circle) Yes No

| Plant Species Symbol | Plant Species Common Name | Estimated Weight Units by Species (2) | | | | | | | | | | Total Wt Units | Wt Unit Wt | Wt Meas gm/lb | Plot Size | Adjustments | | | | Double Sampling | | | Total Weight LB/AC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | Plot Size CF | Adw Adj | Util Adj | Gwth Adj | Clip Plots Est Wt | Clip Plots Clip Wt | Clip/ Est CF | |
| (1) | (Optional) | P-1 | P-2 | P-3 | P-4 | P-5 | P-6 | P-7 | P-8 | P-9 | P-10 | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| | | | | | | | | | | | | | | | | | | | | | | | |
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REMARKS:



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# Instructions for Filling out the Vegetation Production Worksheet

Be sure to complete the top portion of the worksheet. The following items deal with the vegetation portion of the transect.

Column 1 Enter the acceptable plant symbol from the USDA PLANTS Database at *http://plants.usda.gov/*. You can even download a list of species specific for your State. Entering the common name of the plant species is optional.

Column 2 For plots 1 through 10 (P-1 through P-10), enter an estimate of the number of weight units by species occurring in the appropriate plot(s), or the estimated weight by species occurring in the plots. The weight unit number can be expressed numerically (e.g. 6, 11.5). If weight by species is recorded, the number entered would be the total estimated weight for that species. For example, a number of 52 in P-3 would mean that 52 grams or pounds is the estimated weight for that species in plot 3.

***Note:*** *When double sampling is used to determine a correction factor, circle the plot numbers that are clipped.*

Column 3 This column represents the summarized total number of weight units or weight by species occurring in plots 1 through 10 as estimated by the data collector.

Column 4 If weight units are entered in the plot data (2) columns, complete this column by entering the weight unit weight by species used by the data collector. If weight by species was entered in the plot data (2) columns, rather than weight units, enter 1 in this column.

Column 5 Enter the weight measure unit (grams or pounds) for the weight unit weight shown in column 4 or the summarized species weight listed in column 3.

Column 6 Enter the plot size used to estimate weight units or weight by species (e.g., plot sizes 9.6 ft2, 96 ft2, or .01 acre).

Column 7 Enter the plot size conversion factor (CF) from Tables 6 or 7 in Chapter 4.

Column 8 Enter the appropriate ADW percent in decimal form, from green weight conversions tables, Appendix 7 (Percent Air-Dry Weight Conversion Table), or local conversion tables.

Column 9 Complete this column only when the ***current season's growth*** of plant species has been removed by grazing. Enter the amount in decimal form (e.g., 0.25, 0.40, 0.60), which best reflects the percentage of the "***plant remaining***" after grazing utilization has occurred. For example, if a plant species averages 30 percent utilization in the production transect, the percentage of plant material remaining would be 70 percent. Thus, the adjustment entered for that particular species would be .70. Utilization may vary through the plots, requiring an estimate of the average use.

Column 10 Enter the cumulative percent of growth, in decimal form, that has occurred up to the time plot data is collected. The values entered can reflect the growth curves for the site (as listed in some site descriptions) or be based upon locally developed growth curve data for each species.

When doubling sampling is used to determine a correction factor, data will be recorded in columns 11 through 13; otherwise, these columns will be left blank.

Column 11 For each plant species occurring in the clipped plots, enter the total ***estimated weight*** (to nearest gram or pound) by multiplying the total weight units by the weight unit weight for all clipped plots.

Column 12 For each plant species occurring in the clipped plots, enter the ***total clipped (harvested) weight*** (to nearest gram or pound) for all clipped plots.

Column 13 To determine the correction factor, divide column (12) by column (11) for each species and enter to the nearest hundredth. A factor of 1 indicates the estimates are the same as the clipped weights. A factor below one 1 indicates estimates are high. A factor above 1 indicates estimates are low.

Total pounds per acre production result:

Column 14 This column represents the air-dry reconstructed weight in pounds per acre after considering all conversion, correction, and adjustment factors. Calculate pounds per acre (nearest pound) for each plant species by multiplying the number of weight units (3), times the weight of the individual weight unit (4), times the plot size conversion factor (7), times the ADW adjustment (8), times the clipped conversion factor (13). Divide by the utilization adjustment (9), times the growth adjustment (10). The formula is:

$$\text{Pounds per Acre} = \frac{\text{Columns (3) x (4) x (7) x (8) x (13)}}{\text{Columns (9) x (10)}}$$



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# Appendix 5 - Foliage Denseness Classes Utah Juniper

Guide for Determining Current Yield of Utah Juniper in Utah Upland Stony Loam (Juniper) Site

| Crown diameter | Weight per tree | Current Yield Air Dry Pounds 10 trees | 50 trees | 100 trees | 200 trees | 300 trees | 400 trees | 500 trees |
|---|---|---|---|---|---|---|---|---|
| **Sparse foliage** | | | | | | | | |
| 1 | 0.1 | 1 | 5 | 10 | 20 | 30 | 40 | 50 |
| 2 | 0.3 | 3 | 15 | 30 | 60 | 90 | 120 | 150 |
| 3 | 0.6 | 6 | 30 | 60 | 120 | 180 | 240 | 300 |
| 4 | 1.0 | 10 | 50 | 100 | 200 | 300 | 400 | 500 |
| 5 | 1.3 | 13 | 65 | 130 | 260 | 390 | 520 | 650 |
| 6 | 1.6 | 16 | 80 | 160 | 320 | 480 | 640 | 800 |
| 7 | 1.9 | 19 | 95 | 190 | 380 | 570 | 760 | 950 |
| 8 | 2.3 | 23 | 115 | 230 | 460 | 690 | 920 | 1150 |
| 9 | 2.6 | 26 | 130 | 260 | 520 | 780 | 1040 | 1300 |
| 10 | 2.9 | 29 | 145 | 290 | 580 | 870 | 1160 | 1450 |
| 11 | 3.3 | 33 | 165 | 330 | 660 | 990 | 1320 | 1650 |
| 12 | 3.6 | 36 | 180 | 360 | 720 | 1080 | 1440 | 1800 |
| 13 | 4.0 | 40 | 200 | 400 | 800 | 1200 | 1600 | 2000 |
| 14 | 4.4 | 44 | 220 | 440 | 880 | 1320 | 1760 | 2200 |
| 15 | 4.7 | 47 | 235 | 470 | 940 | 1410 | 1880 | 2350 |
| 16 | 5.1 | 51 | 255 | 510 | 1020 | 1530 | 2040 | 2550 |
| 17 | 5.5 | 55 | 275 | 550 | 1100 | 1650 | 2200 | |
| 18 | 5.8 | 58 | 290 | 580 | 1160 | 1740 | 2320 | |
| 19 | 6.2 | 62 | 310 | 620 | 1240 | 1860 | 2480 | |
| 20 | 6.6 | 66 | 330 | 660 | 1320 | 1980 | 2640 | |
| **Medium foliage** | | | | | | | | |
| 1 | 0.1 | 1 | 5 | 10 | 20 | 30 | 40 | 50 |
| 2 | 0.3 | 3 | 15 | 30 | 60 | 90 | 120 | 150 |
| 3 | 0.6 | 6 | 30 | 60 | 120 | 180 | 240 | 300 |
| 4 | 1.0 | 10 | 50 | 100 | 200 | 300 | 400 | 500 |
| 5 | 1.4 | 14 | 70 | 140 | 280 | 420 | 560 | 700 |
| 6 | 1.9 | 19 | 95 | 190 | 380 | 570 | 760 | 950 |
| 7 | 2.5 | 25 | 125 | 250 | 500 | 750 | 1000 | 1250 |
| 8 | 3.1 | 31 | 155 | 310 | 620 | 930 | 1240 | 1550 |
| 9 | 3.8 | 38 | 190 | 380 | 760 | 1140 | 1520 | 1900 |
| 10 | 4.6 | 46 | 230 | 460 | 920 | 1380 | 1840 | 2300 |
| 11 | 5.4 | 54 | 270 | 540 | 1080 | 1620 | 2160 | 2700 |
| 12 | 6.2 | 62 | 310 | 620 | 1240 | 1860 | 2480 | |
| 13 | 7.2 | 72 | 360 | 720 | 1440 | 2160 | | |
| 14 | 8.1 | 81 | 405 | 810 | 1620 | 2430 | | |
| 15 | 9.1 | 91 | 455 | 910 | 1820 | 2730 | | |
| 16 | 10.2 | 102 | 510 | 1020 | 2040 | | | |
| 17 | 11.3 | 113 | 565 | 1130 | 2260 | | | |
| 18 | 12.4 | 124 | 620 | 1240 | 2480 | | | |
| 19 | 13.6 | 136 | 680 | 1360 | | | | |
| 20 | 14.8 | 148 | 740 | 1480 | | | | |



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## Guide for Determining Current Yield of Utah Juniper (continued)

| Crown diameter | Weight per tree | Current Yield Air Dry Pounds 10 trees | 50 trees | 100 trees | 200 trees | 300 trees | 400 trees | 500 trees |
|---|---|---|---|---|---|---|---|---|
| **Dense foliage** | | | | | | | | |
| 1 | 0.1 | 1 | 6 | 10 | 20 | 30 | 40 | 50 |
| 2 | 0.3 | 3 | 15 | 30 | 60 | 90 | 120 | 150 |
| 3 | 0.7 | 7 | 35 | 70 | 140 | 210 | 280 | 350 |
| 4 | 1.2 | 12 | 60 | 120 | 240 | 360 | 480 | 600 |
| 5 | 1.9 | 19 | 95 | 190 | 380 | 570 | 760 | 950 |
| 6 | 2.7 | 27 | 135 | 270 | 540 | 810 | 1080 | 1350 |
| 7 | 3.6 | 36 | 180 | 360 | 720 | 1080 | 1440 | 1800 |
| 8 | 4.7 | 47 | 235 | 470 | 940 | 1410 | 1880 | 2350 |
| 9 | 5.9 | 59 | 295 | 590 | 1180 | 1770 | 2360 | |
| 10 | 7.2 | 72 | 360 | 720 | 1440 | 2160 | | |
| 11 | 8.6 | 86 | 430 | 860 | 1720 | 2580 | | |
| 12 | 10.2 | 102 | 510 | 1020 | 2040 | | | |
| 13 | 11.9 | 119 | 595 | 1190 | 2380 | | | |
| 14 | 13.7 | 137 | 685 | 1370 | 2740 | | | |
| 15 | 15.6 | 156 | 780 | 1560 | | | | |
| 16 | 17.7 | 177 | 885 | 1770 | | | | |
| 17 | 19.9 | 199 | 995 | 1990 | | | | |
| 18 | 22.2 | 222 | 1110 | 2220 | | | | |
| 19 | 24.6 | 246 | 1230 | 2460 | | | | |
| 20 | 27.2 | 272 | 1360 | 2720 | | | | |



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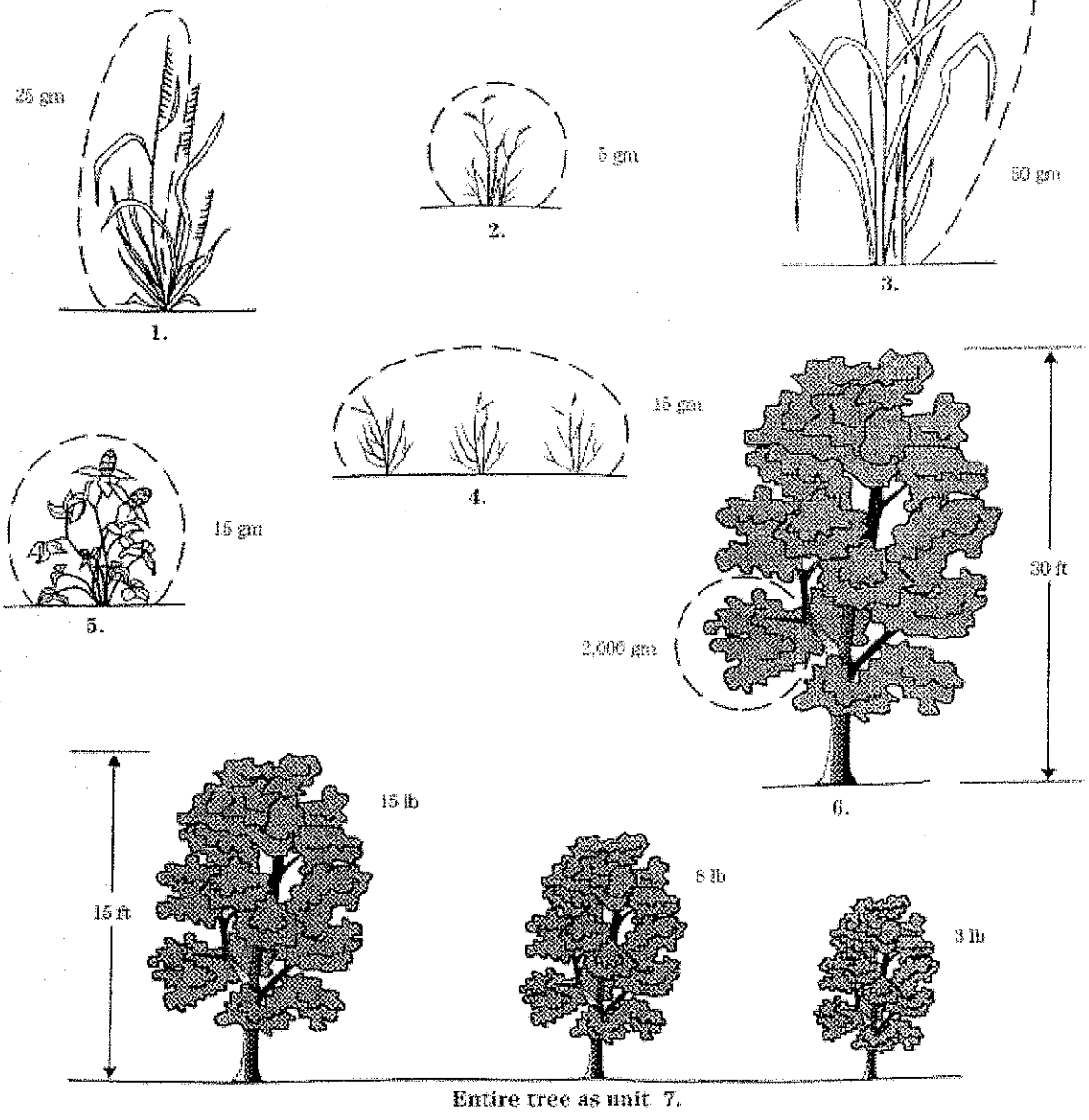
# Appendix 6 - Examples of Weight Units

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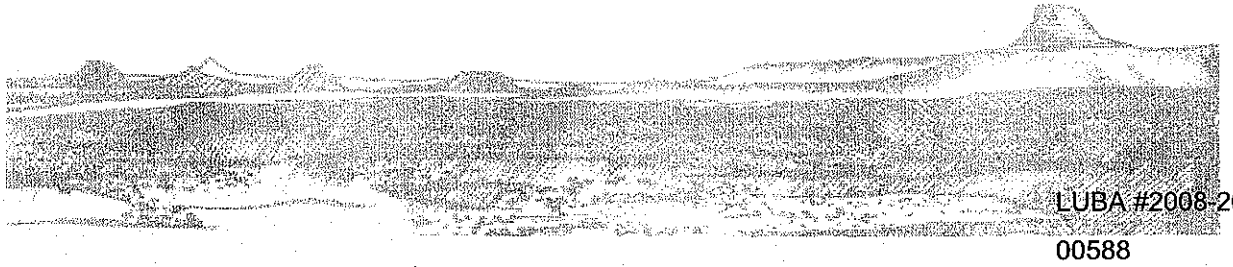

# Appendix 7 - Percentage Air-dry Weight Conversion Table

Percentage of Air-dry Weight in Harvested Plant Material at Various Stages of Growth

| **Grasses** | Before heading initial growth to boot stage (%) | Headed out: boot stage to flowering (%) | Seed ripe: leaf tips drying (%) | Leaves dry stems partly dry (%) | Apparent dormancy (%) |
|---|---|---|---|---|---|
| **Cool season**<br>wheatgrasses<br>perennial bromes<br>bluegrasses<br>prairie junegrass | 35 | 45 | 60 | 85 | 95 |
| **Warm season**<br>Tall grasses<br>bluestems<br>indiangrass<br>switchgrass | 30 | 45 | 60 | 85 | 95 |
| Midgrasses<br>side-oats grama<br>tabosa<br>galleta | 40 | 55 | 65 | 90 | 95 |
| Short grasses<br>blue grama<br>buffalograss<br>short three-awns | 45 | 60 | 80 | 90 | 95 |

| **Trees** | New leaf and twig growth until leaves are full size (%) | Older and full size green leaves (%) | Green fruit (%) | Dry fruit (%) |
|---|---|---|---|---|
| **Evergreen conifers**<br>ponderosa pine, slash<br>pine-longleaf pine<br>Utah juniper<br>rocky mountain juniper<br>spruce | 45 | 55 | 35 | 85 |
| **Live oak** | 40 | 55 | 40 | 85 |
| **Deciduous**<br>blackjack oak<br>post oak<br>hickory | 40 | 50 | 35 | 85 |

USDA, National Resources Conservation Service, National Range and Pasture Handbook



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## Percentage of air dry matter (continued)

| Shrubs | New leaf and twig growth until leaves are full size (%) | Older and full-size green leaves (%) | Green fruit (%) | Green fruit (%) |
|---|---|---|---|---|
| **Evergreen**<br>big sagebrush<br>bitterbrush<br>ephedra<br>algerita<br>gallberry | 55 | 65 | 35 | 85 |
| **Deciduous**<br>snowberry<br>rabbitbrush<br>snakeweed<br>Gambel oak<br>mesquite | 35 | 50 | 30 | 85 |
| **Yucca and yuccca like plants**<br>yucca<br>sotol<br>saw-palmetto | 55 | 65 | 35 | 85 |

| Forbs | Initial growth to flowering (%) | Flowering to seed maturity (%) | Seed ripe leaf tips dry (%) | Leaves dry stems drying (%) | Dry (%) |
|---|---|---|---|---|---|
| **Succulent**<br>violet<br>waterleaf<br>buttercup<br>bluebells<br>onion, lilies | 15 | 35 | 60 | 90 | 100 |
| **Leafy**<br>Lupine<br>lespedeza<br>compassplant<br>balsamroot<br>tickclover | 20 | 40 | 60 | 90 | 100 |
| **Fibrous leaves or mat**<br>phlox, mat eriogonum<br>pussytoes | 30 | 50 | 75 | 90 | 100 |

| Succulents | New growth pads and fruit (%) | Older pads (%) | Old growth in dry years (%) |
|---|---|---|---|
| **Prickly pear and barrel cactus** | 10 | 10 | 15+ |
| **Cholla cactus** | 20 | 25 | 30+ |



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# Appendix 8 - Vegetation Types and Subtypes

## Information Resource Management (IRM) Codes for Vegetation Types and Subtypes

| Type | Subtype | Code |
|---|---|---|
| Annual Forbs | | 0000 |
| | Filaree | 0001 |
| | Halogeton | 0002 |
| | Other Forbs | 0999 |
| Grass | | 1000 |
| | Short Grass | 1001 |
| | Mid Grass | 1002 |
| | Tall Grass | 1003 |
| | Crested Wheat Grass | 1004 |
| | Mixed Grass Seeding | 1005 |
| | Other Grass | 1999 |
| Grasslike | Sedge | 2001 |
| | Rush | 2002 |
| | Other Grasslike | 2999 |
| Perennial Forbs | | 3001 |
| Shrub | | 4000 |
| | Black Greasewood | 4001 |
| | Bailey Greasewood | 4002 |
| | Creosote Bush | 4011 |
| | Tarbush | 4012 |
| | Broom Dalea | 4013 |
| | Winterfat | 4015 |
| | Mesquite | 4021 |
| | Shadscale | 4031 |
| | Nuttal Saltbush | 4032 |
| | Mat Saltbush | 4033 |
| | Fourwing Saltbush | 4034 |
| | Other Saltbush | 4035 |
| | Desert Saltbush AT | 4036 |
| | Mixed Desert Shrub | 4037 |
| | Big Sagebrush | 4041 |
| | Low Sagebrush | 4042 |
| | Black Sagebrush | 4043 |
| | Other Sagebrush | 4044 |
| | Rabbitbrush | 4045 |
| | Sand Sage | 4046 |
| | Chamise | 4051 |
| | Manzanita | 4052 |
| | Ceanothus | 4053 |
| | Shinnery Oak | 4054 |
| | Chaparral | 4055 |
| | Mountain Mahogany | 4056 |
| | Bitterbrush | 4057 |
| | Oakbrush | 4058 |
| | Serviceberry | 4059 |
| | Mountain shrub | 4060 |
| | Blackbrush | 4061 |
| | Cactus | 4062 |
| | Joshua Tree | 4063 |
| | Yucca | 4064 |
| | White Thorn | 4065 |
| | Paloverde Cerci | 4066 |
| | Bursage FRDE-FRD | 4067 |
| | Catclaw | 4068 |
| | Sotol | 4069 |
| | Mariola | 4070 |
| | Snakeweed | 4071 |
| | Fringed Sagebrush | 4072 |
| | Clubmoss | 4073 |
| | Willow | 4074 |
| | Turpentine Brush | 4075 |
| | Burroweed HATE | 4076 |
| | Mormon Tea | 4077 |
| | Skunk Bush | 4078 |
| | Ocotilla | 4079 |
| | Sacahuiste | 4080 |
| | Alder | 4081 |
| | Snowberry | 4082 |
| | Other Shrub | 4999 |



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# Information Resource Management (IRM) Codes for Vegetation Types and Subtypes (continued)

| Type | Subtype | Code |
|---|---|---|
| Broadleaf Trees | | 5000 |
| | Willow | 5074 |
| | Desert Willow | 5075 |
| | Birch AK | 5077 |
| | Balsam Pop - Cottoseed | 5079 |
| | Red Alder | 5081 |
| | Poplar - Birch | 5082 |
| | Aspen | 5083 |
| | Calif Black Oak | 5084 |
| | Cottonwood | 5085 |
| | Maple | 5086 |
| | Oregon White Oak | 5087 |
| | Madrone | 5088 |
| | Tan Oak | 5089 |
| | Noncommercial Hardwood | 5098 |
| | Other Broadleaf Tree | 5999 |
| Conifers | | 6000 |
| | Douglas Fir | 6001 |
| | Doug Fir - Hemlock | 6002 |
| | Port Orford Cedar | 6003 |
| | Doug Fir - White Fir | 6004 |
| | Ponderosa Pine | 6011 |
| | Jeffery Pine | 6012 |
| | Pond-Sugar-Pine-Fir | 6013 |
| | Sugar Pine | 6014 |
| | Incense Cedar | 6015 |
| | Cypress | 6019 |
| | Western White Pine | 6021 |
| | White Fir | 6031 |
| | Red Fir | 6032 |
| | Grand Fir | 6033 |
| | Pacific Silver Fir | 6034 |
| | Engel Spruce | 6035 |
| | Engel Spruce-Subalp Fir | 6036 |
| | White Spruce | 6037 |
| | Blue Spruce | 6038 |
| | Noble Fir | 6039 |
| | Western Red Cedar | 6041 |
| | Sitka Spruce | 6042 |
| | Black Spruce | 6043 |
| | Mountain Hemlock | 6047 |
| | Western Hemlock | 6048 |
| | Alaskan Cedar | 6049 |
| | Western Larch | 6055 |
| | Grand Fir-Larch-Doug Fir | 6056 |
| | Pond Pine-Larch-Doug Fir | 6057 |
| | Larch -Tamarack-Alaska | 6058 |
| | Lodgepole Pine | 6061 |
| | Redwood | 6071 |
| | Noncommerical Softwood | 6090 |
| | Coulter Pine | 6091 |
| | Digger Pine | 6092 |
| | Pinyon-Juniper | 6093 |
| | Knobcone Pine | 6094 |
| | Bristlecone Pine | 6095 |
| | Whitebk & Limber | 6096 |
| | Pinyon | 6097 |
| | Juniper | 6098 |
| | Commercial Nonstocked | 6099 |
| | Other Conifer | 6999 |
| Cryptogams | | 7000 |
| | Lichen-Moss | 7001 |
| | Moss | 7002 |
| | Lichen | 7003 |
| | Fern | 7004 |
| | Other | 7999 |
| Barren | | 8000 |
| Annual grass | | 9000 |
| | Cheatgrass | 9001 |
| | Medusahead Rye | 9002 |
| | Red Brome | 9003 |
| | Three-Awn | 9005 |
| | Six Weeks grama | 9006 |
| | Other | 9999 |



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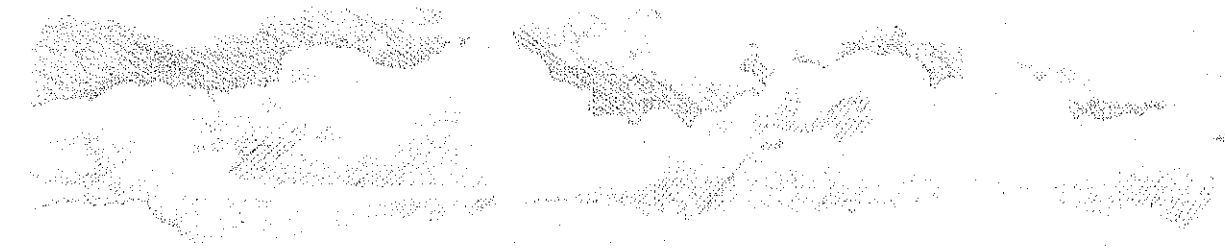
# Appendix 9 - Similarity Index Form

Management Unit or Allotment _____ Examiner _____

Ecological Site _____ Location _____

Reference Plant Community _____ Date _____

| A<br>Plant Group | B<br>Species Name | C<br>Production/acres in reference plant community (from ecological site description) | D<br>Annual production in lb/acre (actual or reconstructed | E<br>Pounds allowable |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |



# Appendix 10 - Data Element Codes

A complete listing of all data elements can be found in the Corporate Data Dictionary at:
***http://sc2962.sc.blm.gov/datashopper/default.asp***

## Data Element Landform 5132

| Code | Landform Name | Description |
|---|---|---|
| ALF | ALLUVIAL FAN | The fan like deposit of a steam where it issues from a gorge upon a plain. |
| ARY | ARROYO | |
| BAL | BADLANDS | An area characterized by the intricate and sharp erosional sculpture of generally weak rocks forming nearly horizontal beds. |
| BNC | BENCH | Level narrow platform breaking up slope |
| BTT | BUTTE | An isolated hill or small mountain with steep sides. With a smaller summit area than a mesa. |
| CAN | CANYON | A deep narrow valley with precipitous sides where downward cutting of the stream greatly exceeds weathering. |
| CHL | CHANNEL | The bed of a single or braided watercourse that is commonly barren of vegetation. |
| CIN | CINDER CONE | |
| CRT | CREST | The very narrow commonly linear top of an erosional ridge, hill, mountain. |
| DMR | DRY MEADOW RIPARIAN | |
| FAN | FAN PIEDMONT | The most extensive major landform of most piedmont slopes, formed by the lateral coalescense of mountain-front alluvial fans downslope into one generally smooth slope without the transverse undulations of the semi-conical alluvial fans by accretion of fans aprons. |
| FPL | FLOOD PLAIN | A flat surface that may be submerged by waterflow built up by stream deposition. |
| GUL | GULLY | Gullies, arroyos, wadis, and gulches. |
| HBK | HOGBACK | A ridge of land formed by the outcropping edges of tilted strata; a ridge with a sharp summit and steeply sloping sides. |
| ISR | INTERMITTENT STREAM | |



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| Code | Landform Name | Description |
|---|---|---|
| ITB | INTERMONTANE BASIN | A relatively small structural depression within a mountain range that is partly filled with alluviam and commonly drains externally through a narrower mountain valley. |
| MAN | LAVA FLOW- NONVEGETATED | |
| MAV | LAVA FLOW- VEGETATED | |
| MSA | MESA | An isolated hill or mountain having abrupt or steeply sloping sides and a level top. |
| MTN | MOUNTAIN | A steep elevation with a restricted summit area projecting 1000 feet or more above the surrounding land surface. |
| OLR | LAKE RIPARIAN | |
| ORR | RESERVOIR RIPARIAN | |
| OSR | STREAM RIPARIAN | |
| PED | PEDIMENT | A broad, gently sloping bedrock surface with low relief that is situated at the foot of a much steeper mountain slope. |
| PYA | PLAYA | An undrained basin that becomes at times a shallow lake on which evaporation may leave a deposit of salt. |
| RAV | RAVINE | Larger than a gully, smaller than a valley. |
| RDG | RIDGE | A range of hills or mountains or the upper part of such a range; an extended elevation between valleys. |
| SDL | SADDLE | A ridge connecting two higher elevations; a low point in the crestline of a ridge. |
| SDN | SAND DUNE | Sand dunes and sand hills. |
| SRP | SCARP | A line of cliffs produced by faulting or erosion. |
| SUM | SUMMIT | The flattish top of a an erosional fan remnant, hill, or mountain. |
| SWL | SWALE | |
| TRC | TERRACE | A level and ordinarily rather narrow plain usually with a steep front bordering a river, a lake, or the sea. |
| UPL | UPLANDS | High land especially far from the sea; ground elevated above the lowlands along rivers. |
| VAL | VALLEY | An elongated depression of the earth's surface commonly situated between ranges or hills or mountains and often comprising a drainage area and an area of generally flat land and drained or watered by a large river and its tributary streams. |
| WMR | WET MEADOW- RIPARIAN | |



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### Soil Phase - Texture Class 4991

| Code | Texture Class |
|---|---|
| C | CLAY |
| CL | CLAY LOAM |
| COS | COARSE SAND |
| COSL | COARSE SANDY LOAM |
| FS | FINE SAND |
| FSL | FINE SANDY LOAM |
| L | LOAM |
| LCOS | LOAMY COARSE SAND |
| LFS | LOAMY FINE SAND |
| LS | LOAMY SAND |
| LVSF | LOAMY VERY FINE SAND |
| S | SAND |
| SC | SANDY CLAY |
| SCL | SANDY CLAY LOAM |
| SI | SILT |
| SIC | SILTY CLAY |
| SICL | SILTY CLAY LOAM |
| SIL | SILT LOAM |
| SL | SANDY LOAM |
| VFS | VERY FINE SAND |
| VFSL | VERY FINE SANDY LOAM |

### Soil Phase - Texture Modifier data element 4992

| Code | Texture Modifier |
|---|---|
| BY | Bouldery |
| BYV | Very Bouldery |
| BYX | Extremely Bouldery |
| CB | Cobbly |
| CBA | Angular Cobbly |
| CBV | Very Cobbly |
| CBX | Extremely Cobbly |
| CN | Chennery |
| CNV | Very Chennery |
| CNX | Extremely Chennery |
| CR | Cherty |
| CRC | Coarse Cherty |
| CRV | Very Cherty |
| CRX | Extremely Cherty |
| FL | Flaggy |
| FLV | Very Flaggy |
| FLX | Extremely Flaggy |
| GR | Gravelly |
| GRC | Coarse Gravelly |
| GRF | Fine Gravelly |
| GRV | Very Gravelly |
| GRX | Extremely Gravelly |
| MK | Mucky |
| PT | peaty |
| RB | Rubbly |
| SH | Shaly |
| SHV | Very Shaly |
| SHX | Extremely Shaly |
| SR | Stratified |
| ST | Stony |
| STV | Very Stony |
| STX | Extremely Stony |
| SY | Slaty |
| SYV | Very Slaty |
| SYX | Extremely Slaty |



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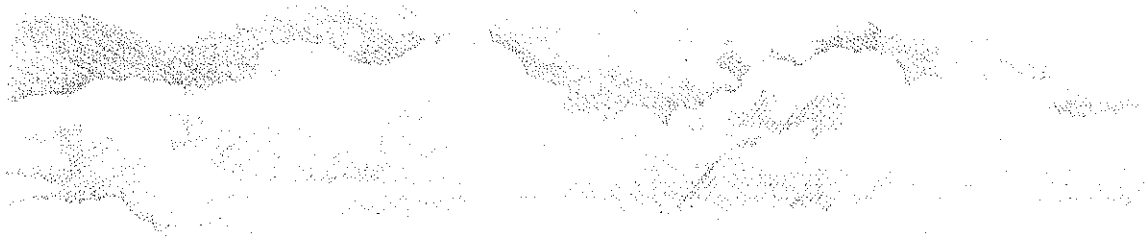

# REPORT DOCUMENTATION PAGE

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Technical Reference 1734-7 describes the procedures for planning and conducting ecological site inventories and for documenting ecological site descriptions. It includes detailed information about mapping ecological sites and plant communities. It includes information about the collection of vegetation production data and the use of the data for determining a similarity index. It discusses plant succession and state and transition pathways.

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# CASCADE HIGHLANDS
# WILDLIFE EVALUATION

## SEPTEMBER 2004


**Prepared For:**
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# CASCADE HIGHLANDS
# WILDLIFE EVALUATION
## August 2004

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# CASCADE HIGHLANDS
# WILDLIFE EVALUATION
# JULY 2004

## I. INTRODUCTION:

Cascade Highlands is a proposed destination resort on the west edge of the City of Bend, in Central Oregon. Cascade Highlands is located immediately north of Century Drive, southerly of Skyliners Road, and westerly of the Broken Top planned community.

Cascade Highlands will offer over-night accommodations, single family homesites, golf, commercial facilities to meet resort needs, and a package of resort amenities for future owners and guests. Approximately 900 equivalent dwelling units have been proposed for the destination resort. Cascade Highlands will provide a high quality vacation resort destination, attracting visitors and owners from throughout the United States. Cascade Highlands will be designed to compliment the natural environment, maintaining the natural beauty of the high desert and providing significant recreational and economic opportunities in Central Oregon.

The destination resort property includes +/- 706 acres at the westerly edge of the City of Bend on undulating terrain. Natural topography varies from flat plateaus to steep slopes, some rocky outcrops, and isolated pine trees. The Cascade Highlands property burned in 1990 in the Awbrey Hall wildfire.

## II. OBJECTIVES AND JURISDICTION:

This wildlife evaluation and report for Cascade Highlands addresses Deschutes County criteria for a destination resort development. The Deschutes County criteria for wildlife protection is identified in Chapter 19.106 Destination Resorts in the Title 19 Bend Urban Growth Boundary Zoning Ordinance.

Deschutes County criteria relating to wildlife includes: **Chapter 19.106.050 Requirements for a conditional use permit and conceptual master plan applications. B. Further information as follows:**

1. **A description of the natural characteristics of the site and surrounding areas, including a description of resources and the effect of the destination resort on the resources; methods employed to mitigate adverse impacts on resources; analysis of how the overall values of the natural features of the site will be preserved, enhanced or utilized in the design concept of the destination resort; and a proposed resource protection plan to insure that important natural features will be protected and maintained. Factors to be addressed include:**

i. Wildlife

**19.106.070. Approval Critieria**

**D. The destination resort incorporates design components, setbacks and buffers to protect designated wildlife areas.**

As required by these standards, this wildlife evaluation and report will describe existing site conditions, proposed development, Deschutes County studies and findings from related wildlife evaluations, a prior wildlife study for the area, proposed mitigation measures, and summary conclusions.

Destination resort development can create both positive impacts and adverse impacts on existing wildlife populations. Cascade Highlands, LLC anticipates that impacts can be balanced as necessary with mitigation measures to ensure the overall development will not have a significant impact on fish and wildlife.

## III. SITE DESCRIPTION:

The proposed Cascade Highlands destination resort is located at the westerly edge of the City of Bend urban area and abuts Unites States Forest Service (USFS) lands on the east. The 727 acre tract is located immediately north of Century Drive and immediately south and west of the Broken Top planned unit community.

Topography:

Existing conditions at the proposed Cascade Highlands resort are typical of the Central Oregon high desert region, except the resort area burned in the Awbrey Hall Fire in 1990. Existing vegetation includes a limited number of isolated pine trees, bunch grass, rabbit brush, manzanita, and bitter brush. A percentage of the ground surface is bare of any vegetation. This condition occurs primarily due to the competition for available soil moisture.

Topography maps for the proposed resort area indicate a typical slope range of flat to 25%. Generally, the existing conditions will be preserved on the steepest land with development occurring on the flatter areas. Generally, the terrain is undulating with a series of ridges or plateaus and draws or valleys.

A few rocky outcrops are visible in isolated sections of the property. Old mining scars from pumice or cinder exploration are also visible across the site. A network of dirt roads, trails, overhead power transmission lines, and primitive bike trails criss-cross the site.

Water Resources:

No natural surface water exists on the Cascade Highlands property. The proposed resort property is described as arid high desert with an annual rainfall of approximately 10 inches. Natural draws and canyons show evidence of minor erosion, and therefore intermittent run-off with thunderstorms or winter precipitation. No evidence of natural streams, lakes, springs, nor seeps exists.

Soils:

Native top soils are considered sandy loam and particularly permeable. Limited precipitation is expected to infiltrate the shallow soil profile almost immediately. Severe summer thunderstorms, heavy winter perception, or snow melt events will cause limited run-off on the floor of natural draws and canyons, based upon observed rill erosion. An underlying volcanic ash or welded tuff subsoil is also anticipated. The volcanic soils, together with limited rainfall and a short growing season create relatively sterile conditions.

Vegetation:

Prior to the 1990 Awbrey Hall Fire, the Cascade Highlands property included a pine tree forest with a brush and grass understory. The Awbrey Hall Fire burned in a narrow band between the Bend Urban Area and the USFS boundary, effectively consuming nearly all trees on the resort site. Isolated groups of pine trees remain in rocky outcrops or small segregated areas. Most dead trees from the Awbrey Hall Fire have fallen, although isolated broken snags exist throughout the site.

The prominent vegetation is rabbit brush, manzanita, and bitter brush, which appears dense and thick across much of the site, with a relatively light grass and ground cover under the brush. The brush stands typically four to six feet high. Some snags and many down logs remain from the 1990 Awbrey Hall Fire.

Wildlife:

Because the site represents a single contiguous habitat type, it is expected the wildlife observed in any one area occurs throughout the site. Wildlife species commonly reported on the Cascade Highlands property include the following:

- Redtail Hawk
- Northern Flicker
- Morning Dove
- Quail
- Mule Deer
- Crow
- Jack Rabbit
- Cotton Tail Rabbit
- Coyote
- Mice
- Fence Lizard
- Bull Snakes
- American Robin
- Sparrows
- Meadow Lark
- Ground Squirrels

- Badger
- Elk

A variety of other wildlife species certainly occur at this site and at the interface with the USFS lands.

In a preliminary work session and subsequent review, the Oregon Department of Fish and Wildlife (ODF&W) provided an interesting perspective and history on the subject property. The proposed development site does not contain any Goal 5 sensitive habitat, as mapped by Deschutes County. However, the site was historic big game winter range habitat and to a point, still provides some of those basic values. Furthermore, this site is immediately adjacent to the Deschutes County adopted Tumalo Mule Deer Winter Range, a significant Goal 5 resource. The proposed development will have an impact on the Winter Range Resource.

ODF&W observed that big game use of the area diminished significantly following the Awbrey Hall Fire as a result of significant loss of cover. However, other species of wildlife increased their use. Winter forage, supplied primarily by bitter brush, is in excellent condition on the subject property. Bitter brush is not considered mature for up to 25 to 30 years of age, when its forage value is limited. The site provides and excellent early-seral stage shrub step habitat condition. The site is lacking in snags and timber cover.

ODF&W did question bat use of the rim rocks, immediately above Century Drive. A site inspection at dusk, with one observer above and one below the existing rim, resulted in no bat sightings.

The greatest wildlife use of the subject property is expected to be along the western edge, abutting USFS lands.

Existing and Post Development Land Inventory:

The following acreages for existing and post development inventories are estimated from aerial photographs and preliminary design concepts for the proposed resort. The following tables demonstrate that existing open space on the subject property will be reduced from approximately 553 acres to approximately 208 acres, as a result of development. The development will however provide approximately 140 acres of turf with the golf course and approximately 5 acres of water features.

**EXISTING LAND INVENTORY**

| *Gross Acreage* | *706 Ac* |
|---|---|
| Narrow Strip Ownership Immediately Adjacent to Broken Top | 138 Ac |
| Old Pumice Mine Sites | +/- 15 Ac |
| Undeveloped Land | 553 Ac |

## POST DEVELOPMENT LAND INVENTORY

| | |
|---|---|
| *Gross Acreage* | *706 Ac* |
| Golf Course | 140 Ac |
| Water Feature | 5 Ac |
| Natural Open Space | 208 Ac |
| Development | 353 Ac |

## IV. PROPOSED DEVELOPMENT

Destination resort development falls under the jurisdiction of Deschutes County and the criteria and requirements established in the Bend Urban Area Destination Resort Ordinance. For example, 50% of the resort land must remain in a form of open space. Therefore, at least 363 acres of the Cascade Highlands project must be retained in its natural state, developed as a golf course, lake, or similar open space use.

The Deschutes County Destination Resort Ordinance also stipulates restrictions on steep slope development, which generally preserves the rocky outcrops and steep slopes in excess of 25%.

The proposed development will include an 18-hole golf course, multiple water features, an irrigation supply, a significant fire protection system, and specific trails and paths. The proposed resort fire protection systems can prevent the devastating effects of wildfire. Water features and irrigation can provide wildlife habitat that does not exist today. Also turf areas can diversify the wildlife habitat and enhance certain species. Established trails and paths tend to restrict pedestrian and vehicle use to intended areas, reducing damage to natural sites and restricting erosion and loss of vegetation. Similarly, restoration of disturbed areas can enhance vegetation and again reduce erosion.

## V. DESCHUTES COUNTY STUDIES AND FINDINGS

Deschutes County Goal 5 Inventory:

Deschutes County, working in corporation with the Oregon Department of Fish and Wildlife (ODF&W) and other state and federal agencies have identified Statewide Planning Goal 5 resources throughout the County. Goal 5 resources include rare and endangered species nest sites, and particularly valuable habitat. No Goal 5 wildlife inventories are mapped on the subject property.

Deschutes County Wildlife Overlays:

ODF&W identified big game habitat throughout Deschutes County. Deschutes County subsequently adopted ODF&W maps for especially sensitive big game habitat, including a deer range, deer winter range, and elk winter range. None of these overlays occur on the Cascade Highlands property. Big game winter range abuts the subject property on the adjacent USFS land.

Deschutes County Destination Resort Mapping:

Land use requirements for destination resort development require a County wide mapping process, stipulated by Statewide Planning Goal 8 and ORS 197.455. In Deschutes County, a significant and detailed mapping process was completed to identify all lands eligible for destination resort siting. The mapping process consisted of a series of exclusions throughout Deschutes County. The following exclusions were imposed and prohibit destination resort development on noted lands:

- All public lands
- Especially sensitive big game habitat as mapped by ODF&W and adopted by Deschutes County.
- Sites with 50 or more contiguous acres of unique or prime farm land, mapped by the Natural Resources Conservation Service (NRCS).
- High value crop lands
- Lands within three miles of high value crop lands.

All of the noted exclusions were compiled throughout Deschutes County and only remaining lands were considered eligible for destination resort siting. In Deschutes County, public lands represent approximately 80% of the gross County land area. The public land exclusion by itself reserves a significant portion of Deschutes County from development. The end result of the destination resort mapping process is that very limited lands are available for destination resort development in Deschutes County.

The overall County wide mapping process is not directly applicable to the conceptual master plan application for the Cascade Highlands Resort, but the mapping process demonstrates how wildlife habitat on essentially 90% of Deschutes County is protected from resort development.

Existing Destination Resorts in Central Oregon:

The Eagle Crest Resort and The Resort at Pronghorn have recently completed wildlife impact studies and developed mitigation programs to offset potential impacts. Both the Eagle Crest and Pronghorn projects have been approved and are under development. Although not applicable to the Cascade Highlands Resort, the prior destination resort projects demonstrate potential wildlife impacts and typical mitigation measures to offset those impacts. The destination resorts and their associated wildlife studies provide findings and examples of successfully implemented wildlife measures.

## VI. PRIOR WILDLIFE PLAN FOR BROKEN TOP DEVELOPMENT

Campbell-Craven Environmental Consultants completed a wildlife plan for Broken Top development in May of 1991. The study was conducted following the Awbrey Hall Fire of 1990.

In 1990, a series of land use applications were submitted to authorize the Broken Top Planned Unit Development (PUD). As part of the application packet, a recovery plan was compiled to "improve the aesthetic appearance of the burned portion of the project

site within and adjacent to the PUD; and to stabilize the soil, and provide long-term fire protection for the entire property, as well as to continue forestry practices on most of the property. Although the property will continue to provide short-term wildlife habitat values, the intention of this plan is to prevent future wildlife displacement problems by not emphasizing revegetation as solely intended to increase wildlife habitat values".

The recovery plan set forth a revegetation proposal for all burned portions of the property to address the impacts of the fire, but not to create a wildlife preserve that could impede future development.

The 1991 Campbell-Craven Environmental Consultants study applied to the Broken Top PUD and not the subject property, currently anticipated for destination resort development. Regardless, the 1991 study provides important site history, predictions for the future, and findings.

The 1991 wildlife study did provide recommendations for restoration, including tree planting, preservation of fire-killed trees, artificial cover for non-game wildlife, and a narrow buffer strip along the west property boundary. Applicable recommendations from the 1991 study for wildlife mitigation have been included in this plan.

Small pine trees are evident throughout the proposed development property. Pine trees are typically four to six feet tall and generally obscured by the heavy brush cover. Many fire-killed snags existed after the Awbrey Hall Fire in 1990, and most of those snags have fallen. Short broken snags do remain throughout the property. In most areas, pine trees reseeded naturally.

The ownership of the property changed after the Awbrey Hall Fire. As noted, the current developer has included applicable recommendations from the 1991 study in this plan. Cascade Highlands LLC, the current developer, also created significant surface water pond, irrigated approximately 100 acres of native meadow and planted 2500 trees within the initial phase of The Highlands at Broken Top. The Highlands at Broken Top were also part o the original 1991 wildlife study area.

## VII. WILDLIFE IMPACT AND MITIGATION RECOMMENDATIONS

Development of raw land, even lands ravaged by wildfire and adjacent to urban areas, will impact wildlife habitat for some species. Impacts are related to loss of vegetation from clearing and grading and the disturbance associated with urban type development.

New development will result in conflicts between wildlife and humans. For example, big game browsing and foraging, increased bat populations, raccoons, waterfowl, coyotes, and skunks can damage resort property and concern urban residents. The developers acknowledge ODF&W's obligation to respond to wildlife damage as a result of development is very limited. ODF&W will only respond to wildlife-human interactions where human safety is an issue. The developer acknowledges an obligation to educate residents and guests on wildlife and habitat, including potential conflicts, anticipated wildlife damage to property, and appropriate action steps.

In the following section, anticipated wildlife habitat impacts are noted, together with appropriate mitigation measures.

| Project Impact | Mitigation |
|---|---|
| Reptile Populations will likely decrease. | Avoid impacts to rocky outcrops where possible. Educate resort owners and guests to avoid rocky outcrops and to especially avoid snakes and lizards. Education may take the form of articles in a homeowner's newsletter, signage along trails, or posters at the central mailbox area. Where appropriate, create brush piles, in select natural areas, from slash and rock removed in the development process. |
| Native bird populations will be reduced somewhat in proportion to the acreage of habitat lost. | Project CC&Rs should impose leash laws for dogs and cats. Adopt measures to control and retain pets, both for the pet's safety and to prevent harm to wildlife. Swallow nest boxes should be placed near water. Where appropriate, preserve snags over 12 inches in diameter, in natural areas, with particular attention within 100 yards of rocky ridges and outcroppings. Encourage planting of natural seed bearing shrubs to increase non-game bird use, through the design guideline plant list. |
| American Robins, American Crows, House Finches, Pigmy Nuthatches, and Flickers may increase in numbers as result of development, from improved food sources. | No mitigation is necessary. |
| Waterfowl will increase as a result of the permanent water features proposed. | No mitigation is necessary, however measures are recommended to deter goose and duck use of golf courses. |
| Native amphibians such as tree frogs will increase in population near new surface waters. | No mitigation is necessary. |
| Any raptors nesting on the site are likely to move to less disturbed areas after development. | Increased prey as a result of removing the existing dense brush cover and increased cotton tail and squirrel populations near the golf course will benefit large raptors. Preserve large down logs, where possible, for small mammals and birds. |
| Bats will benefit from an increased food source over ponds and golf course features. | No mitigation is necessary. |
| Coyote and other predator use is likely to diminish. | Improved prey populations on the perimeter of the resort should offset losses. |
| Periodic use of the subject property by Elk | Golf course improvements will offer some |

| | |
|---|---|
| may diminish due to the increased urban uses. | wintertime forage, particularly on the perimeter of the project. The provision of fire protection systems will greatly diminish the risk of habitat loss on the adjacent USFS lands. |
| General Wildlife Habitat Impacts | Provide a mitigation implementation report annually, along with a resort development summary, to assure mitigation measures are implemented proportionately with the level of development. |
| | Initiate a noxious weed control program. |
| | Initiate an educational program for resort owners and guests to describe wildlife habitat, native species, conservation practices, and opportunities to improve wildlife habitat. Educational programs may include interpretive guides, signage on public trails, periodic articles in Homeowner Newsletters, posters in the central mailbox area or similar actions. |
| | Create on-site wildlife watering areas, which could include open water. |
| | Restore disturbed areas with native vegetation, including Covar or Idaho Fescue bunch grass. |
| | Where appropriate, establish non-development buffer strips, particularly along the USFS property boundary. |
| | Create rough areas along a portion of the edge of ponds and other water features, where not impacted by golf play. |

## VIII. SUMMARY CONCLUSION:

Cascade Highlands LLC is obligated to meet the approval criteria in the Deschutes County Destination Resort Ordinance. The Deschutes County Ordinance generally obligates the developer to mitigate significant adverse impacts on resources, including wildlife.

The resort development will occur on lands burned by the 1990 Awbrey Hall Fire. Resort development will disrupt existing habitat on the raw land, but will also add water features, diversify the habitat, dramatically reduce the threat of wildfire, promote education on wildlife and habitat, and impose significant mitigation measures.

The proposed resort site has no natural surface water or springs, no designated big game habitat areas, and no Goal 5 wildlife nest sites nor rare and endangered species habitat.

The 1991 wildlife plan for Broken Top development provided a recovery plan in response to the Awbrey Hall Fire. The purpose of the recovery and wildlife plan was to address the impacts of the fire and provide interim habitat restoration while the remainder of the CHLP property (outside of the Broken Top PUD) remained undeveloped. The plan contemplated future development and disturbance of the area subject to the current resort application. The findings and recommendations of the plan have been incorporated into this Wildlife Evaluation where possible. Some recommendations no longer apply (i.e. while the property owner retained snags and fire-killed trees, most have since fallen and no longer provide the snag habitat intended in the early years after the fire). The Broken Top plan did recommend a 50 to 100 foot buffer adjacent to USFS lands, and a 100 foot buffer has been proposed by the current developers.

Wildlife impacts and off-setting mitigation measures are summarized in the above table. Implementation of the proposed mitigation measures, in proportion to the level and extent of resort development will minimize wildlife impacts and ensure adequate mitigation, as required by the Deschutes County Zoning Ordinance. The implementation of the above referenced mitigation measures will satisfy the Deschutes County standards.

## DECISION OF THE DESCHUTES COUNTY HEARINGS OFFICER

| | |
|---|---|
| **FILE NUMBER:** | CU-04-94 |
| **HEARING DATE:** | November 16, 2004<br>6:30 P.M.<br>Barnes and Sawyer rooms of the<br>Deschutes Services Building<br>1300 NW Wall Street<br>Bend, Oregon 97701 |
| **APPLICANT/ OWNER:** | Cascade Highlands L.L.C. (CHLLC)<br>c/o Williams & Dame Development Co., Inc.<br>1325 N.W. Flanders<br>Portland, Oregon 97209 |
| **APPLICANT'S REPRESENTATIVE:** | Ball Janik LLP<br>Nancy Craven<br>Kristin Udvari<br>101 SW Main Street, Suite 1100<br>Portland, OR 97204 |
| **APPLICANT'S ENGINEER:** | W&H Pacific<br>Thomas Walker<br>Keith Dagostino<br>920 SW Emkay Drive #C-100<br>Bend, OR 97702-1042 |
| **REQUEST:** | Applicant is requesting approval of a Conditional Use Permit for a Destination Resort Conceptual Master Plan (CMP) that would allow a 706-acre Destination Resort. |
| **STAFF REVIEWER:** | Matthew Martin, Associate Planner |
| **RECORD CLOSED:** | December 9, 2004 |

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DESCHUTES
COUNTY

### I. APPLICABLE STANDARDS AND CRITERIA:

Title 19 of the Deschutes County Code, the Bend Urban Growth Boundary Ordinance:

- Chapter 19.12, Urban Area Reserve Zone
- Chapter 19.100, Conditional Use Permits
- Chapter 19.106, Destination Resorts

Title 22, the Deschutes County Land Use Procedures Ordinance.

Title 23, The Deschutes County Comprehensive Plan.

Oregon Revised Statute (ORS) Chapter 197.435 to 197.467

***or can reasonably obtain adequate financial support for the proposal once approved;***

***3. The destination resort will provide a substantial financial contribution which positively benefits the local economy throughout the life of the entire project, considering changes in employment, demands for new or increased levels of public service, housing for employees and the effects of loss of resource land, and;***

***4. The natural amenities of the site considered together with the identified developed recreation facilities to be provided with the resort will constitute a primary attraction to visitors, based on the economic feasibility analysis.***

**FINDING:** The applicant provided substantial, uncontroverted evidence in the form of an Economic Feasibility Analysis prepared by Economics Research Associates (ERA), letters from Callan Accounting Services, Bank of America, and Intervest Mortgage Investment Company, that demonstrate the owner, CHLLC, and the developer, Atwood Development, have the necessary financial resources to meet the minimum development and investment standards of DCC 19.106. In addition, the ERA report sets out the financial contributions that the resort will make to the local economy, including the contributions to the construction industry, the employee base, payroll and benefits package, the property tax, and transient room tax revenues for Deschutes County. The Hearings Officer concludes that resort will positively benefit the local economy by providing employee housing within the resort boundaries. Finally, the ERA Report demonstrates that visitors will be attracted to the resort based upon the high-quality of the proposed recreational facilities that include an 18-hole golf course and the exceptional scenic vistas will constitute the primary attraction to the visitors. This criterion is met.

***D. The destination resort incorporates design components, setbacks, and buffers to protect designated wildlife areas.***

**FINDING:** The applicant submitted a Wildlife Evaluation as Exhibit D to its application. At the November 16, 2004 hearing, the applicant submitted a revised wildlife plan and indicated that the revised plan, dated November 2004, is satisfactory to ODFW staff. The revised wildlife plan shows the resort has been designed to protect and supplement the wildlife habitat within the resort boundaries, particularly within the designated 50% open space areas.

As detailed in the Wildlife Evaluation, the resort property does not currently provide significant wildlife habitat due to the impacts of the Awbrey Hall fire and the lack of any natural surface water. In addition, the site does not contain any inventoried Goal 5 resources, nor is it within a wildlife overlay. The resort development will actually create wildlife habitat by installing water features and irrigated turf areas, and maintaining 50% open space at all times. As explained above, the Applicant also proposes to provide an irrigated, grass buffer between the dwellings to the immediate west of Skyline Ranch Road and the USFS boundary. The buffer will be 100 feet along the majority of the western boundary, narrowing to 50 feet adjacent to Area 1. The building envelopes and landscaping requirements imposed by the CC&Rs will maintain this buffer along the western half of the lots adjacent to the buffer. This buffer will provide a transition to the undeveloped USFS lands, thereby maintaining existing wildlife habitat on the USFS property. The additional

mitigation measures to be imposed throughout the property are detailed in the chart set forth in the Wildlife Evaluation. These measures will protect and enhance wildlife areas, consistent with this criterion. Conditions of approval are imposed to require that all development be consistent with the revised wildlife plan and that the applicant provide evidence that ODFW supports the mitigation outlined in the applicant's November 2004 wildlife plan .

***E. Important natural features, including but not limited to, significant wetlands, riparian habitat and landscape management corridors will be maintained. Riparian vegetation within 100 feet of streams, rivers and significant wetlands will be maintained. Alterations to important natural features, including placement of structures, is allowed so long as the overall values of the feature are maintained.***

**FINDING:** There are no known or identified "important natural features" within the proposed resort boundaries. However, there are many natural rock outcrop features and rock formations which have been incorporated into the design of the resort, as shown on the submitted site plan, Exhibit A. In addition, the proposed golf course will include several water features, which will create riparian habitat. In addition, the scenic vistas of the Cascade Mountain from existing dwellings and parcels have been taken into consideration in the design and orientation of facilities, open space buffers, and other specific height limitations. To the extent this criterion is an applicable approval standard, the Hearings Officer finds that the proposed CMP will allow for the preservation of natural features on the property.

***F. The development will not force a significant change in accepted farm or forest practices or significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use.***

**FINDING:** The proposed resort does not abut any active farming operations. Although the resort borders USFS land to the west and south, the subject USFS property is not actively employed for intensive forest practices, and the applicant states it is unlikely that active logging will resume due to the proximity of the USFS property to the Bend Urban Area Reserve. Therefore, the applicant asserts the proposed development will not force a significant change in or significantly increase the cost of accepted farm or forest practices on surrounding lands. The applicant has indicated it met with the District representative for the USFS, who expressed support for the proposed resort and did not express any concerns regarding potential impacts on forest practices on the USFS lands. Staff did not receive comments from the USFS in response to the mailed request for comment. The Hearings Officer finds that the proposed development will not force a significant change in accepted forest practices or significantly increase the cost of accepted forest practices, due to the limited nature of those practices in the area.

***G. Destination resort developments that significantly affect a transportation facility shall assure that the development is consistent with the identified function, capacity and level of service of the facility. This shall be accomplished by either:***

# HUNTINGTON RANCH

# CONCEPTUAL

# MASTER

# PLAN

# APPLICATION

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The Applicant has a significant incentive to preserve and create natural appearing amenities so that resort guests can experience and appreciate the volcanic formations and high desert of Central Oregon.

**(i) Landscape Management Corridors**

Landscape management (LM) corridors are designated by Deschutes County along certain Central Oregon highways and parallel to the Deschutes River. None of these designated LM corridors are located on or adjacent to the Huntington Ranch Resort.

**(j) Wildlife**

The Applicant retained Ms. Lynn Sharp, a wildlife biologist, of URS Corporation, to complete a habitat evaluation assessment for the proposed destination resort site. The habitat evaluation assessment (HEP) is attached as Exhibit 21. It describes the wildlife habitat and species at the site. It also describes how impacts to the wildlife habitat can be fully mitigated. Exhibit 21 includes correspondence from Oregon Department of Fish and Wildlife that confirms that the project can fully mitigate its impacts to the wildlife habitat resulting in a no net loss to the resource.

## 2. Traffic Study

Kittelson & Associates have been retained to provide the required traffic study. The report is attached as Exhibit 8. The traffic study satisfies the requirements of this paragraph. A summary of the traffic study is provided under the referenced approval criteria in Chapter 18.113.070 (G).

## 3. Standards and Criteria of Section 18.113.060 and .070

This discussion is provided in detail below.

## 4. Design Guidelines

Design guidelines and development standards for the Huntington Ranch Resort will ensure a high caliber of development, both architecturally and aesthetically. Its design

# VI. APPROVAL CRITERIA (18.113.070)

## A. Destination Resort Definition

The Huntington Ranch Resort meets the definitional requirements of Chapter 18.04.

## B. Chapter 18.113-060 Standards

As noted above, all standards of Chapter 18.113.060 have been satisfied.

## C. Economic Analysis

The Applicant has submitted a letter from Summit Bank that demonstrates that necessary financial resources are available for the Applicant to undertake the development of the Huntington Ranch Resort consistent with the minimum investment requirements. Exhibit 20 provides that The Applicant has the necessary financial resources for the project without the need for assurances from financial institutions, but that, if requested, the Applicant could reasonably obtain adequate financial support for the project.

Exhibit 19 also discusses the financial contributions that the Huntington Ranch Resort will make to the local economy, including the contributions to the construction industry, the employee base, payroll and benefits package, the property tax and transient room tax revenues for Deschutes County. The minimal demand for public services (such as schools) from the Huntington Ranch Resort is also documented.

## D. Fish and Wildlife

The Applicant retained Ms. Lynn Sharp of URS to undertake a Habitat Evaluation Assessment (HEP) on the expansion area in order to describe the physical condition of wildlife habitat on the site as well as to provide an assessment of habitat function for the wildlife species that may use the site. The HEP analysis is attached as Exhibit 21 and will be used to guide mitigation activities.

The recommendations of the HEP analysis include various mitigation measures that, if implemented, serve to mitigate impacts on fish and wildlife. As reflected in the

correspondence from Oregon Department of Fish and Wildlife (ODFW), attached as Exhibit 21, ODFW concurs that these mitigation measure can be made adequate to ensure that there is no net loss of wildlife habitat.

## E. Natural Features

The project site does not have significant important natural features, although there are many natural rock outcrop features and rock formations. There are no water features, riparian habitat or landscape management corridors. As a result, there are no specific setbacks relative to riparian vegetation along streams, rivers or wetlands.

## F. Farm and Forest Practices

The destination resort ordinance stipulates that development of the proposed resort not force a significant change in accepted farm or forest practices on surrounding lands.

As noted in the application maps and exhibits, all of the surrounding lands are owned by the public and managed by the BLM. All of these lands fall within the western juniper vegetation zone. Only juniper trees exist on the site and there is no established market for juniper trees. Normal forestry practices are not applicable.

The lands surrounding the project site are utilized for cattle grazing and are managed through the grazing permits through the Applicant. In any event, the development of a destination resort is compatible with cattle ranching, as evidenced by existing resort developments. Black Butte Ranch, the Running Y Resort, Sunriver, and Eagle Crest all abut or include standard cattle ranching operations as a part of their projects.

There are no agricultural fields, crops, or intensive agricultural use in the vicinity of the proposed resort. To the best of our knowledge, the only known agricultural or forest practice includes cattle ranching, which is not expected to be negatively impacted by the resort development and is controlled, in large measure, by the Applicant.

## G. Traffic Impacts

Section 18.113.070 (G) provides:

**REPORT OF ECOLOGICAL INVESTIGATION**

# ECOLOGICAL EVALUATION OF THE HUNTINGTON RANCH SITE, DESCHUTES COUNTY, OREGON

*Prepared for*
Hix Rubenstein Company
Suite 5, 350 Second Street
Los Altos, CA 94022

September 18, 2000

*Prepared by*
**URS CORPORATION**
111 SW Columbia, Suite 900
Portland, OR 97201
52-00040029.00/00001

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Table 1 Impacts and Mitigation Related to the Proposed Project


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Figure 1 Vicinity Map

## 1.0 Introduction

The Huntington Ranch site is located on one square mile of essentially flat land surrounded by open juniper forest approximately 4 miles south of the Bend/Redmond airport, in Deschutes County, Oregon (T16S R13E Sec. 16, Figure 1). This site is surrounded on all sides by very similar habitat, also dominated by junipers, for at least several miles in all directions. There are hundreds of thousands of acres of juniper habitat surrounding this site. This juniper zone is bounded on the east by the shrub-steppe lands of eastern Oregon, and on the west by ponderosa pine/lodgepole pine forests of the east slopes of the Cascades.. Land adjacent to the site is owned and managed by the Bureau of Land Management (BLM), and is used by the Oregon Military Department as a training area. The BLM has conducted biological surveys (Halvorson 2000) on these adjacent lands in connection with the proposed utility corridors (access roads, water, and sewer) that would be needed for the proposed Huntington Ranch.

The site is in the Columbia Basin Physiographic Province (Franklin and Dyrness 1988). This site receives annual precipitation of approximately 8 inches, and the seasonally high and low temperature extremes create a comparatively harsh living environment for the plants and wildlife that exist there. The lack of water and pumice soils are the greatest influence affecting the vegetation and wildlife of the site.

URS has been retained by High Desert Development Partners LLC (HDDP) to assess wildlife habitat and the impacts of the proposed development, to suggest changes to reduce impacts, and to develop compensatory mitigation for unavoidable impacts.

The Oregon Department of Fish and Wildlife (ODFW) is the state agency responsible for wildlife management in Oregon. In conjunction with the Applicant, URS has consulted with ODFW with regard to the wildlife impacts and mitigation plans. In accordance with Deschutes County Chapter 18.113.070(D), the proposed mitigation plan will ensure that there is no net loss of the wildlife resource.

## 2.0 Methods

In June 2000, wildlife biologists from URS made two visits to the site. The first visit was an initial reconnaissance that included point counts of birds in the early morning hours. The second visit was to conduct field searches for reptiles, which had been requested by ODFW. The initial reconnaissance included stops at five areas within the property; the reptile search covered approximately 200 acres and focused on the rocky outcrops. A topographic map superimposed on an aerial photograph was examined and existing rocky outcrop areas were identified on the map. The outcrop locations were then compared with the most recent available footprint as shown in a project plan draft. Where it appeared that rock outcrops would be impacted by removal according to the proposed development, alternative layouts were indicated and provided to the civil engineers working for HDDP.

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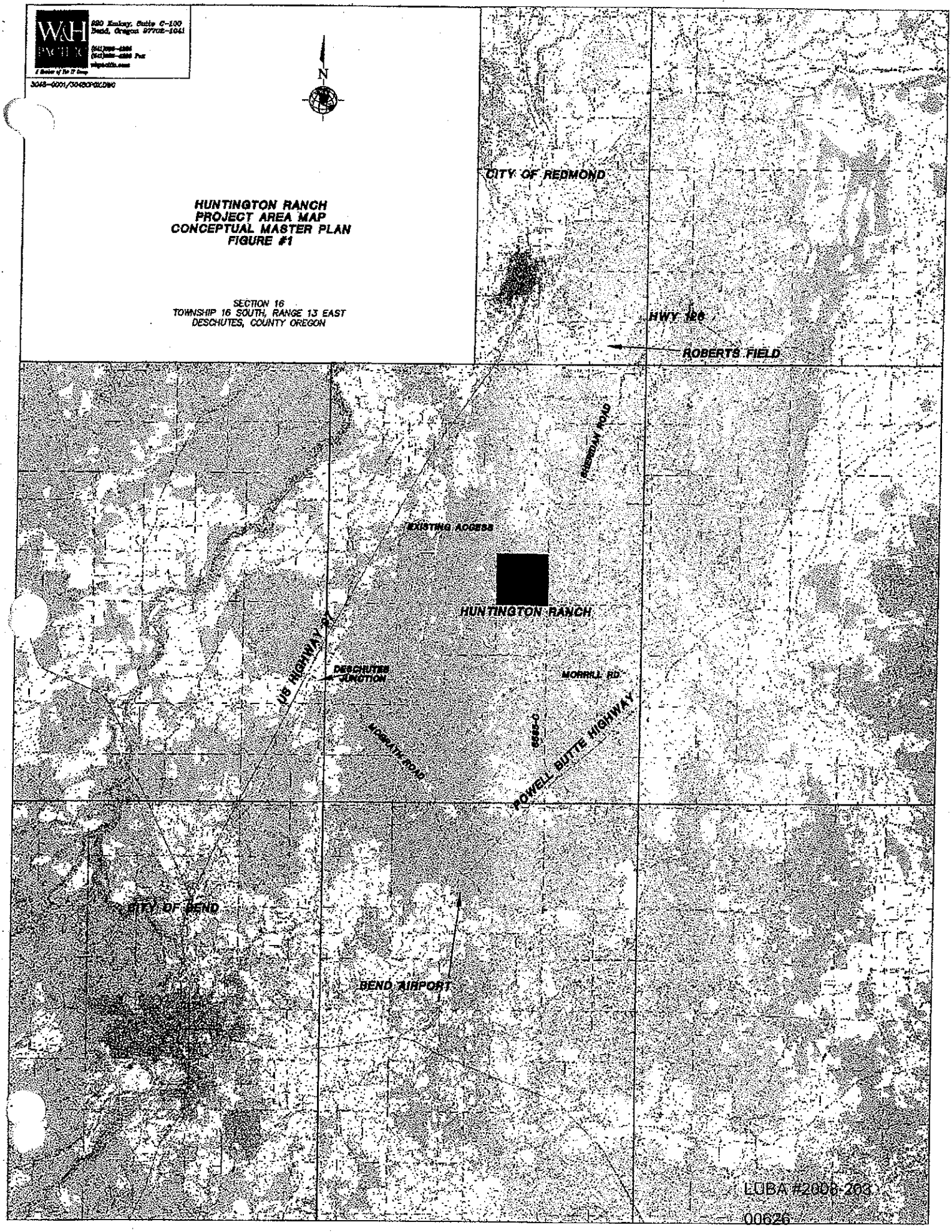
3048-0001/3048CP02.DWG

N

**HUNTINGTON RANCH**
**PROJECT AREA MAP**
**CONCEPTUAL MASTER PLAN**
**FIGURE #1**

SECTION 16
TOWNSHIP 16 SOUTH, RANGE 13 EAST
DESCHUTES, COUNTY OREGON



The area of ground disturbance was calculated and broken down into various habitat types. The important wildlife habitat features of the entire site were evaluated and described. The impacts to habitat that would be caused by the proposed project are expressed in acres of various habitats of a particular quality or value for a specific wildlife group. Mitigation concepts were developed by identifying the habitat changes to other areas within or adjacent to the project square mile would be adequate to offset the unavoidable impacts.

## 3.0 Site Description

The site consists of a square mile of formerly grazed rangeland dominated by open western juniper. There are six dwellings present, linked by a system of unimproved dirt roads. East of the property boundary, a canal conveys water northward to farmland. West of the property boundary, train tracks run north-south. Grazing by both cattle and horses probably occurred at the site over time. No recent evidence of grazing was observed during the site visits.

### *3.1 Topography*

The terrain at the site is essentially flat, interrupted by rock outcrops that are distributed throughout the western and southern portions of the site within the proposed golf corridors. These outcrops are relatively low, achieving an elevation of only 10 to 20 feet above the surrounding terrain. The site slopes gradually upward to the south.

### *3.2 Water Resources*

There are no surface water drainage features or ponds within the site. The North Unit Irrigation District canal runs to the east of the property boundary. The irrigation season runs from April to October.

### *3.3 Vegetation*

The site lies within the Western juniper (*Juniperus occidentalis*) vegetation zone. The plant community at the site most closely resembles the *Juniperus/Artemisia/Purshia* community described by Franklin and Dyrness (1988). Western juniper is the dominant tree on site. Bitterbrush (*Purshia tridentata*) is the dominant shrub where taller shrubs are present. More open areas of juniper do not support dense tall shrubs. Other shrubs observed include big sagebrush (*Artemisia tridentata*) and rabbitbrush (*Chrysothamnus* spp.). The most common herbaceous vegetation included a variety of bunchgrasses, including Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Agropyron spicatum*), Sandberg's bluegrass (*Poa sandbergii*), cheatgrass (*Bromus tectorum*), and *Stipa*. Forbs observed included *Arabis, Mimulus cusickii, Phacelia, Astragalus, Zygadenus, and Eriogonum.* Some areas on the site appeared remarkably undisturbed by grazing or other land-use activities that remove the native vegetation, and supported little or nearly no cheatgrass. In other more disturbed areas, cheatgrass was the most common grass. Overall, in terms of grazing and other disturbances, , this site appears to have been

moderately disturbed in the past. Aside from roads and the areas around residences (such as corrals for livestock), there appears to have been little ground-disturbing activity in the past. Many junipers are relatively large in size, and have dead limbs, and dead woody material on the ground is fairly common. Rock outcrops comprised of boulders are also present scattered throughout the site. The outcrops support the same mixture of vegetation as the flat areas.

The BLM conducted rare plant surveys of the access roads and utility corridors that would pass through BLM lands outside of the proposed project site. The BLM also surveyed 20 percent of the emergency access route on Sheridan Road, and did not survey the proposed sewer alignment. No rare plants were found during these surveys. The BLM report (Halvorson 2000) also stated that numerous inventories had been conducted in the general project area, including the PGT pipeline route, the Oregon Military Department training area, surveys prior to the establishment of the old night vision testing facilities, surveys related to the Deschutes County Fairgrounds and proposed golf course and other minor rights-of-way. No special status plants were found or suspected to occur as a result of these inventories.

*3.4 Wildlife*

A diversity of wildlife species inhabit or pass through this site in the course of a year. The spring field visits indicated that breeding bird life is abundant and very watchable on the site. This will contribute value in terms of the amenity of fun birds to watch and feed as a project benefit to both people and birds. Few reptiles were observed during the single field visit. Species observed in June of 2000 are listed below:

American crow
American robin
barn swallow
bluebird sp.
brown-headed cowbird
California quail
chipping sparrow
common raven
gray flycatcher
house finch
mourning dove
mountain bluebird
mountain chickadee
northern flicker
pygmy nuthatch
red-winged blackbird (flying over toward canal)
red-tailed hawk
western meadowlark
white-throated sparrow

badger (holes)
cottontail
coyote
mule deer
Townsend's ground squirrel

northern sagebrush lizard
western fence lizard

A variety of other wildlife species certainly occur at this site, and elsewhere within the western juniper dominated landscape. One feature of the site is that pronghorn antelope do visit and forage on the more open portions of the site periodically. This site is not considered to provide high quality habitat to pronghorns. The habitat for pronghorns on this site is not nearly as important as the BLM land located near the Fairgrounds. Other pronghorn habitat of higher quality is present in the surrounding area . The site is not located within important deer winter range according to ODFW.

**4.0 Impacts**

The proposed development of Huntington Ranch at this site would incorporate many of the site's natural features (i.e. rock outcrops and native vegetation) into the resort design. Nonetheless, the conceptual design would eliminate approximately 315 acres or 49 percent of the current juniper habitat, and replace it with the following approximate acreages of various habitats:

managed grassland/golf course (including water features) -- 250 ac
residential lots and yards, buildings -- 60 ac
roads and paved areas -- 15 ac

The impacts to wildlife habitat from the development are discussed below.

The conversion of 315 acres of contiguous juniper habitat to 325 acres of fragmented juniper habitat interspersed with residences, golf courses, other facilities, and roads will have the general effects listed in Table 1. Table 1 also includes a conceptual description of mitigation for adverse effects.

**5.0 Mitigation**

Mitigation of impacts for this project include avoidance of sensitive areas in the design, such as avoiding rock outcrop areas. Mitigation may also include minimization of impacts by making slight adjustments in placement of features. Unavoidable impacts such as loss or alteration of rock outcrops and native vegetation may be mitigated through enhancement of on-site and off-site habitat.

As final design progresses for the project, mitigation should include the avoidance of impacts to rocky outcrop areas and the maintenance of connectivity between remaining habitat patches. Table 1 demonstrates that overall, implementation of the proposed project would result in no net loss of wildlife habitat, when the mitigation proposed is considered. Mitigation would consist of enhancement of adjacent lands to benefit a variety of wildlife species.

| Table 1. Impacts and Mitigation Related to the Proposed Project | |
|---|---|
| Project Impact | Mitigation (if impact is adverse) |
| pronghorn use will probably cease | value of surrounding area habitat can be increased to offset the loss of use of the project area, mitigation ratio of 10:1 suggested; mitigation actions would include reduction in livestock grazing and off-road vehicle use, removing invasive weeds if necessary |
| mule deer use will probably remain the same, with some deer becoming potentially troublesome "tame" year-round residents, such as has been observed at Sunriver and other destination resorts in prime deer range | mitigation proposed for pronghorn would also offset deer habitat losses |
| native bird populations will be reduced somewhat in proportion to the acreage of habitat lost, this group would include western meadowlarks, horned larks; the impacts would be highest if cats or dogs were allowed to roam free in the development | enhancement of surrounding area by reducing livestock and vehicle use would enhance that habitat for western meadowlarks, horned larks, and other ground-nesting birds<br><br>swallow nest boxes should be placed near water that could produce mosquitos |
| some species may actually increase as a result of the development from improved food sources (landscaping, feeding activity) such as American robins, American crows, house finches, pygmy nuthatches, and flickers | no mitigation necessary |
| waterfowl use will increase as a result of permanent water features being constructed on the site and in adjacent properties for irrigation reservoirs, and the fresh forage available on the golf course | no mitigation necessary – measures may be necessary to deter goose and duck use of golf courses |
| native amphibians such as Pacific tree frogs will benefit and increase in populations near the new surface water established by the project on and off site | no mitigation necessary unless invasion by bullfrogs occurs -- bullfrogs should be removed if they appear |
| residential yards will also provide habitat for many of the native birds, but probably effectively exclude the mammals and reptiles | reduced grazing and off road vehicle traffic on surrounding areas will increase habitat value to offset losses |

| Table 1. continued Impacts and Mitigation Related to the Proposed Project | |
|---|---|
| roads will represent increased risk of mortality to many ground-dwelling species, particularly small mammals and reptiles trying to move between suitable patches of habitat | underpasses below roads should be provided in areas where roads cross native habitat connections between habitat patches, will also need to include short (6 in) drift fences to lead reptiles to underpasses |
| if there are any raptors nesting on site (red-tailed hawks, kestrels, owls) they are likely to move to less disturbed, offsite areas after development | increased prey as a result of reduced grazing and vehicle use on the surrounding area would offset raptor foraging opportunity, increased cottontail populations near the golf course and in urban habitats may benefit large raptors |
| bats will benefit overall from an increased food source over ponds and possibly golf course features, the extent that bats use the site for roosting is unknown, but roosting habitat in the form of old junipers will still be available on site | bat roosting habitat should be incorporated into the project plan, especially near water that may produce mosquitoes |
| reptile mortality from people and pets | brochure/education program encouraging residents to leave reptiles alone; if rattlesnakes are encountered, they should be left alone;<br>enhanced habitat in adjacent areas expected to offset losses |
| coyote and other predator use is likely to be reduced | improved prey populations in adjacent areas should offset the losses |
| increased attractiveness of the area to Canada geese, especially golf course for foraging | hazing program to deter geese from using the golf course and ponds |

References

Franklin, J.F. and C.T. Dyrness. 1988. Natural Vegetation of Oregon and Washington. Oregon State University Press. 452 p.

Halvorson, R. 2000. Botanical Evaluation, Tom Hix Rights-of-way. Prepared by the Prineville District BLM, Report No. 00022, July 25, 2000.

Oregon
John A. Kitzhaber, M.D., Governor

Department of Fish and Wildlife
High Desert Regional Office
61374 Parrell Road
Bend, OR 97702
(541) 388-6363
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September 21, 2000

Deschutes County Planning Division
117 NW Lafayette Street
Bend, OR 97701

ATTN: Paul Blikstad, Associate Planner

RE: Huntington Ranch "Destination Resort"

We are under the assumption that you will be handling the application for this development. If you are not, please pass this on to the planner that will.

We have been in contact with the developer for this site for the past several months. We are currently working with them to develop a wildlife impact and mitigation plan associated with this application. We are comfortable that the applicants will be able to develop this plan within the next month or two. We will continue to work with them to assure that a good wildlife mitigation package will be developed.

Please feel free to contact me if you need any further information.

Sincerely,

Steven George
Deschutes District Wildlife Biologist
steven.w.george@state.or.us

WHPacific

May 16, 2008

Mr. Chris Carey and Mr. Steve George
Oregon Department of Fish and Wildlife
61374 Parrell Road
Bend, Oregon 97702

Mr. Paul Blikstad
117 NW Lafayette Ave
Bend, Oregon 97701

RE: Pronghorn Wildlife Reporting
WHPacific – 35650.0016

Dear: Chris, Steve, and Paul

Pronghorn recently prepared an updated Wildlife Mitigation Program report in response to annual reporting and tentative plan approval for the next phase of single family homesites at the resort project. Wildlife mitigation is an important part of the commitment of Pronghorn for both short and long term projects related to restoration, monitoring and establishment of wildlife programs included in development of a destination resort. Pronghorn invited you to review the mitigation measures previously addressed, currently in place, or planned for with future activities. The site visit took place on May 14th, 2008.

The original wildlife mitigation plan was initiated by Pronghorn in direct response to Condition of Approval #5 as part of the Conditional Use Permit/Conceptual Master Plan approval for the resort in 2000. Subsequently, Pronghorn submitted, in cooperation with the Oregon Department of Fish and Wildlife (ODFW), an approved Mitigation Plan in the Final Master Plan application in 2002. A number of these mitigation measures were accomplished within the first year of resort development. Pronghorn worked closely with the Bureau of Land Management (BLM) in completing the primary entry, utility corridor, and improving the temporary secondary access to emergency vehicle standards. Pronghorn has since revegetated the disturbed areas along the primary entrance and initiated the noxious weed control program along the utility corridors across BLM managed lands.

As mentioned above, Pronghorn completed a comprehensive Wildlife Mitigation Program report, see attached. The report includes tasks listed from the original ODFW and Deschutes County (County) approved mitigation plan. It lists the status, date complete (if applicable), responsible Pronghorn personnel, and comments related to each task. Photos have been inserted to demonstrate compliance or completeness for project tasks. Together with the May 14th site visit, Pronghorn efforts relative to the mitigation plan have been noted, reviewed, and in many cases accepted by ODFW and County staff. In one case, ODFW requested further information on organizations to which the Pronghorn foundation is contributing and assurance that monies are being earmarked toward native habitat and animals.

WHPacific

There are 28 tasks submitted on the Pronghorn Wildlife Mitigation Program, 16 of which have been noted as complete, 6 have been initiated, and 6 are ongoing. Pronghorn, ODFW, and the County have agreed to continue annual reporting for two more years or until the final project plat has been recorded. A summary of the tasks completed show that many were related to construction projects associated with the development of the resort. The site visit was the best way for ODFW and Deschutes County to verify completeness. Tasks initiated include actual enhancement measures like nesting box installation, restoration of woodlands, education, and programs. In some cases, the commitment to programs such as brochure distribution and noxious weed control, will continue beyond the reporting commitments for this project. The tasks that are ongoing are primarily agency dependent. Timelines and comments will continue to assure these projects will be seen through to completion. For instance, completion of the secondary access will bring two of the tasks to completion status but is also dependent on coordination of several agencies as well as build out requirements associated with the original master plan approval.

The mitigation measures were agreed upon not only to comply with land use issues but also to assist Pronghorn with potential wildlife issues that may take away from the project enhancement. Pronghorn recognizes the effectiveness of the program and is anxious to not only complete the program tasks but also implement them. Pronghorn appreciates the opportunity to work with ODFW and Deschutes County to bring these projects into compliance and also receive comments pertaining to efforts that improve the quality and conditions at Pronghorn for both wildlife, and the residents and visitors of the resort.

In the future, please do not hesitate to contact myself or Dan Hopper at Pronghorn with any questions or comments related to this project.

Sincerely,

**WHPacific, Inc.**

Ron Hand
Sr. Project Manager

Enclosure: Pronghorn Wildlife Mitigation Program

cc: Ms. Janet Hutchison – BLM
Tom Hix
Scott Denney

# Pronghorn Wildlife Mitigation Program

| Task | Status | Date Complete | Responsible Party | Comments |
|---|---|---|---|---|
| **Noxious Weed Control Program**-Along 4 mile stretch of PCD, 5 miles of underground sewer and effluent irrigation across BLM, 7 miles of underground water distribution piping. (HDDP & HOA) | Initiated/ongoing annually | | Landscape | 4/4/08-RD sprays the PCD 4 mile stretch in the spring for noxious weeds for the past 4 years and also hand digs mullin. RD to drive the 7 miles of under ground water to check for noxious weeds within the next two weeks. 05/01/08-RD has checked the 7 mile underground water and there are no noxious weeds at this time. 05/14/08-ODFW asked if there was any knapp weed? If so, dig individuals and spray if they are large; if in September, bag before pulling or digging. |
| **7 miles of underground water distribution piping** | | | | |
| **Thinning & Clearing of Junipers**-300 acres inside including preserving rock outcrops and revegetating 150 acres of golf course fairways. Institute a program to periodically continue | Complete | Nicklaus-'05 Fazio-'06 | Golf | 04/04/08-GCM is continuing the program by completing daily maintenance of the courses and surrounding areas. |
| **Unauthorized Vehicles Off-road**-All unauthorized vehicle use has been prohibited on the 643 acres of private lands through the use of control and security | Complete | 2006 | Development | 04/04/08-Two security gates have been installed as well as security fencing, roadways & cart paths. |
| **Termination Of Livestock**-grazing on the 643 acres within the grazing allotment. | Complete | 2001 | Development | 04/04/08-Acknowledged in letter dated 12/16/03 from W&H Pacific. |



LUBA #2008-203
00637

| Task | Status | Date Complete | Responsible Party | Comments |
|---|---|---|---|---|
| **Control Livestock Grazing**-HDDP is to monitor grazing on the 13,000-acre Crenshaw grazing allotment to minimize overgrazing and enhance pronghorn and mule deer habitat within the boundaries of the allotment. Including; water, salt sets, deferred grazing system, light winter grazing system & early spring grazing system. | Complete | | | 04/04/08-Waiting on Ron Hand to get response from Scott Denney. 05/01/08-TP will get a copy of the grazing rights agreement and verify everyone is in compliance. |
| **Deferred Grazing On Public Land**-Public lands within HDDP's grazing allotment. | Complete | | | 04/04/08-Waiting to get a response from Scott Denney. 05/01/08-Grazing has begun on BLM along the 4 mile Pronghorn Club Dr stretch by Mr. & Mrs. Rickman. 05/14/08-Review Rickman lease agreement. (see agreement in WMP binder section labeled "lease agreement." |
| **Enhance Fire Protection**-Including surrounding lands including provision of water supplies and fire hydrants, agreements with Redmond Fire, enhanced access, construction of golf fairways to create fire breaks & on-site water storage. | Complete | | Development | |
| **Fire Protection**-HDDP shall work with Redmond Fire. Fire personnel and equipment shall be based at the Destination Resort to enhance emergency response time. | Complete | | | 04/04/08-Redmond fire deferred the onsite personnel project until needed. Sheridan Road is being maintained for fire response. |
| **Prohibited Feeding Of Wildlife**-CCR's restrict the feeding of wildlife on-site. CCR's pg. 73 section 15.2 | Complete | 2003 | | |
| **Domestic Cats**-are prohibited from outdoors. CCR's pg. 73 section 15.1 | Complete | 2003 | | |
| **Construction Of Ponds**-HDDP has constructed two ponds on-site including excavation, installation of liners, backfilling, rip-rap erosion control, piping for the water supply and some revegitation. | Complete | Residential Lake-2002 Nicklaus-2002 Fazio-2004 | | 04/04/08-A minimum of 2 ponds were required and we have installed 3 of which one pond includes a shallow area for shore bird habitat. All of the ponds include native upland vegetation and are supported by re-use of highly treated wastewater . |



LUBA #2008-203
00638

| Task | Status | Date Complete | Responsible Party | Comments |
|---|---|---|---|---|
| **Preserved Existing Rocky Outcrops-** on the perimeter of the golf course to the maximum extent practical and created new rocky outcrop features as part of the golf course and residential landscape program | Complete | | | |
| **Set-Backs-**HDDP established exterior boundary setbacks for the entire resort, creating natural open spaces on the entire perimeter | Complete | | | 04/04/08-150' BLM set backs were established as required by the county. Pronghorn has participated in the Redmond Fire's CWPP education classes determining that PH is not considered a fire danger area. |
| **Nesting Boxes-**CCR's have been implemented requiring HOA to install and maintain swallow, bluebird, owl and bat nesting boxes | Initiated | | Golf/Landscape | 4/04/08-The bird and bat houses are constructed. RD & DF to determine locations for install within the next two weeks using a site map. 05/01/08-To date RD & DF have installed 4 houses along the residential lake and will continue installing to complete a master location map. 05/12/08-David Holmes and TP installed an additional 8 birdhouses and 2 bat houses. 05/14/08-ODFW suggests educating members on bird house maintenance & construction for installation on their property (possible add something to TWAP.) ODFW reviewed locations and design of bird & bat houses. They agreed they are adequate for local population. Pronghorn will continue to monitor use and install additional houses. |

Birdhouse @ Fazio Island

Bat house @ Fazio pump house

Birdhouse @ front gatehouse

| Task | Status | Date Complete | Responsible Party | Comments |
|---|---|---|---|---|
| **Restore and Enhance Juniper Woodlands**-approx 3,000 acres on the property and adjacent BLM lands surrounding the project, subject to BLM's authorization. | Initiated | | Landscape | 04/04/08-There has been no request from the BLM to restore. The area had been enhanced by Pronghorn's presence. The sign and kiosk locations have been established for 4 years now. The signs and kiosks have arrived and we are awaiting approval from BLM for installation. |
| **Culverts in natural drainage ways**-HDDP shall install along roads and paths to support the travel of small mammals and reptiles between habitat patches including 6" tall drift fences or alternative devices. | Initiated | | Landscape | 04/04/08-Culverts have been installed at lot's 47/48 . Lot #62-63, #265 & #96 are in progress. DH to verify locations and look for new or existing locations and take pictures. 05/01/08-DH and TP verified locations and have not yet determined if more locations are feasible. 05/14/08-ODFW reviewed the one pictured and agreed to be adequate. The other locations will match this design. |
| **Culvert at lots 47-48 and 6-63** | **(Same)** | | | **(Same)** |
| **Resident Education**-HDDP shall create a program to educate residents about reptile population on and around property including; brochures, articles in newsletter, posters & periodic seminars on-site | Initiated | | Development | 04/04/08-TP to verify how often we have had the High Desert Museum out and dates. RD-will get with Erin to get monthly information regarding wildlife and habitat in the weekly TWAP. TP will call the High Desert Museum to gather info and brochures as an outreach program and set up an information station at Camp Pronghorn. 05/01/08-Flyers and educational materials are in hand and the wildlife education center will go up in the Trailhead within the next 2 weeks. 05/01/08-TP installed the brochures and flyers in the Trailhead and will continue to add items as they become available. 05/14/08-ODFW reviewed and will pass along any brochures they can find on reptiles. |



LUBA #2008-203
00640

| Task | Status | Date Complete | Responsible Party | Comments |
|---|---|---|---|---|
| **Non-native Birds**-HDDP shall utilize decoys, hazing and other non-lethal techniques to discourage expansion of non-native bird populations, such as Canadian Geese | Ongoing | | Golf | 04/04/08-DF has obtained a permit from ODFW to use non lethal methods. 05/14/08-The permit that DF said he has obtained is not accurate...need fire marshal permit for blasting methods. Pronghorn will check into this. ODFW would like to see a report on estimate of goose/duck populations twice a year. If increasing too much than can get birth control food from ODFW or take eggs. Also, RD to advise on status of swan program-ODFW commented that they could help with the process. |
| **Signage**-Provide signage at the primary and secondary access gates instructing the public about gate access through the resort in the case of an emergency | Complete | 2003 | | 04/04/08-Signage was installed and approved by Paul Blikstad from Deschutes County. |
| **Street Signs**-Street signs shall be posted indicating a maximum speed limit of 25 mph | Initiated | | Dev/Ls | 04/04/08-There are some signs up and in place. RD & TP are working on getting more ordered and locations determined. 05/01/08-Ralph Giffin to verify the exact style with Tom Hix and TP to order and install in the next month. 05/12/08-Tom has selected the style and TP is gathering bids this week. |
| **Improve Primary Access Road**-to the County's minimum design and construction standards for rural collector roads | Ongoing | | | 04/04/08-The Sheridan road, Northgate and spur roads are maintained as needed. |
| **Powell Butte Hwy**-HDDP shall construct a northbound left turn lane and a southbound right turn declaration land on PBH at it's intersection with PCD | Complete | 2001 | | The turn lanes were approved in October 2002 construction followed with completion approximately the summer of 2003. |
| **Sheridan Road**-HDDP shall improve the existing roadway for use as a temporary emergency secondary report access road prior to commencing combustible construction. Minimum width of 20' with an all-weather surface capable of supporting a 60,000 lbs fire truck. | Ongoing | | | 04/04/08-DH to get with the National Guard Armory and Janet from the BLM to determine if the use of tactifier is allowed to help the roads condition and determine cost to do so. 05/01/08-TP and Ron Davis met with the National Guard Armory to discuss joint efforts in accomplishing improved roadways. Further updates to be given after discussions with Hap Taylor of Knife River. |
| **Secondary Access**-Until permanent secondary access road is constructed, provide signage at or near it's primary access gate to direct the public to Sheridan Road for access to Hwy 126 | Complete | | | |



LUBA #2008-203
00641

| Task | Status | Date Complete | Responsible Party | Comments |
|---|---|---|---|---|
| **Term Of The Plan**-Plan shall commence upon the filing of the first residential plat for the resort and shall terminate upon the filing of the final residential plat for the resort | Ongoing | | | 04/04/08-A suggestion that the ODFW would respond to includes preparing mitigation plans/measures that are measurable and attainable. Pronghorn discusses going beyond the measurable and attainable goal to propose a packet that will be completed in the next 3-5 years, effectively relieving both Pronghorn and ODFW the responsibilities of--DH 05/01/08-A meeting with ODFW, Pronghorn and Deschutes County is scheduled for 05/14/08. 05/14/08-ODFW & Deschutes County would like to see annual updates for the following two years at which time we will reassess and determine if our final plat has been made. |
| **Annual Report**-HDDP shall submit an annual report to the planning division, with a copy to the ODFW, demonstrating compliance with the wildlife mitigation plan. The report is due no later than the end of each calendar year (Dec. 31st.) HDDP is responsible for monitoring and documenting expenditures for mitigation. | Ongoing | | | 04/04/08-Annual report has not been reviewed by ODFW. See above (Term of Plan) RH-will prepare the ultimate response letter to Deschutes County, with CC to Pronghorn and ODFW. 05/14/08-W&H to prepare summary letter & attach this tracking report on an annual basis for two years or until final plat has been made. |
| **HDDP Investment**-minimum of $210k to be invested by HDDP prior to being funded by the foundation. | Complete | | | 04/04/08-Teresa is waiting on a response from Kelly Clark. 05/01/08-It was determined that Pronghorn has met and exceeded this amount with all the installation and maintenance. |
| **Foundation**-funded by donating a percentage of proceeds from the sale of merchandise from the Pro shop managed by Deschutes Basin Land Trust. The foundation shall dedicate a portion of the funds generated to a non-profit organization dedicated to the preservation of pronghorn antelope and/or habitat. | Ongoing | | | 04/04/08-Teresa is waiting on a response from Kelly Clark .05/01/08-Scott Walley has taken the lead on this as Kelly was unaware of the foundation. 05/9/08-Over $108,000 donated thus far; see attached check log. 05/14/08-ODFW reviewed list and wanted additional info on organizations, i.e.. what purpose. TP to verify and provide a summary of what the money has been used for. ODFW would like to see the money more geared towards native habitat and animals. |

TP- Teresa Pearcy (Pronghorn-Development)
DH- Dan Hopper (Pronghorn-Development)
RD- Randy Damon (Pronghorn-Landscape)
RH- Ron Hand (W&H Pacific)
DF- David Frietag (Pronghorn-Golf)



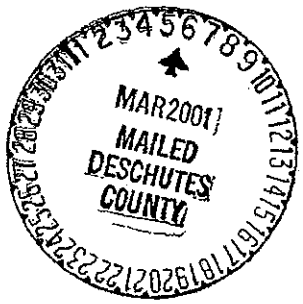
LUBA #2008-203
00642

## DECISION OF DESCHUTES COUNTY HEARINGS OFFICER

**FILE NUMBER:** CU-00-118

**APPLICANT:**
High Desert Development Partners LLC
350 Second Street, Suite 5
Los Altos, California 94022

**AGENT:**
Tom Hix
Hix Rubenstein Company
350 Second Street, Suite 5
Los Altos, California 94022




**ENGINEER:**
Tom Walker
W & H Pacific
920 S.W. Emkay Drive, Suite C-100
Bend, Oregon 97702

**PROPERTY OWNERS:**
Dal Palmore, Jr.
4230 N.E. Azalea Street
Hillsboro, Oregon 97124
Tax Lot 800

Warren Kelly
John Vogel
35070 Ede Road
Lebanon, Oregon 97355
Tax Lot 801

Timothy and Kathy Bryan
P.O. Box 1505
Redmond, Oregon 97756
Tax Lot 802

Ralph and Cathey Davidson
P.O. Box 122
Eagle Creek, Oregon 97022-0122
Tax Lot 803

Peter and Sherry Christoffersen
20325 Fairway Drive
Bend, Oregon 97702
Tax Lot 804

Western United Life Assurance Company
William C. Betzer
P.O. Box 1136
Bend, Oregon 97709
Tax Lot 805

Lewis Hollander
Stanley and Gloria Davis

**FINDINGS:**

1. Economic Viability. Attached as Exhibit 19 to the burden of proof is a comprehensive study of the economic viability of the proposed destination resort prepared by professional consultants on land use economics. The study concludes the proposed destination resort will be economically viable because of the demand for resort housing and amenities. The Hearings Officer has reviewed this study and finds the evidence and analysis in the study support the consultants' conclusions.

2. Economic Impacts. The economic study also concludes the economic impacts on the local economy from the proposed resort will be substantial and positive. Specifically, the study predicts that over a ten-year period the proposed resort will contribute approximately $315 million to the regional payroll, including approximately $196 million during the construction phase and $18 million annually thereafter. The study concludes the proposed resort will have minimal impact on public services compared to the revenue the resort would generate for the county, including property taxes, fees, licenses and service charges. The study predicts a net benefit to Deschutes County service providers of $19 million over the next ten years.

As discussed above, opponent SFPC asserts the applicant's employee housing availability survey fails to demonstrate there will be sufficient affordable housing for resort employees because it does not tie rental housing costs with resort employee income. Therefore, SFPC argues, the applicant has not demonstrated positive economic benefits from the resort considering the potential negative impacts on housing availability. The Hearings Officer finds SFPC raises a legitimate issue. The applicant has not indicated whether the projected 150-200 resort employees will find affordable housing within a reasonable commuting distance of the proposed resort. However, I find this approval criterion does not require such a showing. Rather, the applicant merely must show there will be *net* economic benefits from resort development considering factors including employee housing supply and demand. I find it likely that at least some of the projected 150-200 resort employees will be young adults still living at home as well as employees at higher income levels who can *purchase* housing. These two groups will not require rental housing. And in any case, new rental housing that may be required for resort employees, whether provided by the applicant or by other developers, ultimately will add financial benefits to the community in the form of additional housing units.

3. Natural Amenities. The study's conclusions concerning the resort's economic viability are based in large measure on the proposed developed recreational amenities – in particular, two planned championship golf courses. The study does not specifically address the existing natural amenities of the subject property and their contribution to the resort's viability. However, as discussed above, the Hearings Officer has found the subject property is located in a highly scenic area with the attributes that draw visitors to Central Oregon. For this reason, I find the natural amenities along with the proposed recreational facilities will be the primary attraction to resort visitors. I concur with staff's observation that the proposed resort will enjoy a similar popularity to the Eagle Crest resort, located west of Redmond in a similar natural setting.

For the foregoing reasons, the Hearings Officer finds the applicants' proposal satisfies the economic standards in these subsections.

**D. Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource.**

**FINDINGS:** The record indicates the subject property and surrounding area are habitat for a variety of native plant and animal species. Because the property has no surface water there are no fish resources. The record also indicates the subject property is not included in the county's acknowledged Goal 5 wildlife habitat inventory.[2]

In order to predict the impact on the subject property's wildlife resources from development of the proposed resort, the applicant obtained a habitat evaluation performed by two wildlife biologists dated September 18, 2000. The evaluation is attached to the burden of proof as Exhibit 21. It identifies the current habitat condition and the species present on the property. The evaluation concludes the property "appears to have been moderately disturbed in the past" by livestock grazing, road-building and other uses. Nevertheless, surveys performed for the evaluation revealed the presence of a relatively large number of native wildlife species.

The evaluation concluded development of the proposed resort would remove approximately half of the existing juniper woodland habitat and replace it with managed grasslands (golf courses), water features, residential lots, buildings, and roads and other paved areas. The evaluation predicted replacement of this juniper woodland habitat would result in a number of impacts on native wildlife species, from reduction or cessation of use to an increase in use depending on the species. For example, the evaluation predicted pronghorn and some bird species would no longer use the property, but some species – waterfowl, amphibians and certain songbirds – would increase their use of the property with the proposed grasslands and water features. The evaluation includes a table indicating whether and to what extent on-site and off-site habitat mitigation measures would be necessary "to offset losses." In some cases, the evaluation concluded no mitigation would be necessary. Where mitigation was recommended, it includes improving off-site habitat by reducing grazing and off-road-vehicle use, creating on-site habitat through the introduction of nest boxes and safe road crossings for wildlife, and providing visitor and resident education programs. The applicant's burden of proof states at page 29 that the evaluation "will be used to guide mitigation activities."

This approval criterion establishes a "no net loss" standard, requiring that any habitat loss resulting from development of the destination resort be "completely mitigated." The question presented is whether the mitigation measures recommended in the habitat evaluation, if implemented by the applicant, will satisfy this rigorous standard. The Hearings Officer is not a wildlife biologist. Therefore, as in previous land use matters, I must rely to a considerable extent on the opinions of experts, including the applicant's consultants and ODFW biologists. Exhibit 21 to the burden of proof includes a letter dated September 21, 2000, from Steve George, ODFW Deschutes District Wildlife Biologist, stating in pertinent part:

*"We are comfortable that the applicants will be able to develop ... a* [wildlife

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[2] Katharine Kimball, representing opponent SFPC, argues Goal 5 applies to the proposed resort because the subject property is pronghorn habitat "which is a Goal 5 resource . . . regardless of whether it is identified in the Comprehensive Plan." Ms. Kimball cites as authority for this statement the provisions of "OAR 660-023-0040(e)" [sic]. This rule addresses the Goal 5 "ESEE" process – the evaluation of the economic, social, environmental and energy consequences of protecting or not protecting an inventoried resource. It does not contain a subsection (e). In any event, Ms. Kimball misunderstands the Goal 5 process. The county is required to conduct an ESEE analysis and develop a program to achieve the objectives of Goal 5 *only* for "significant resource sites" – i.e., those that have been included in the county's adopted Goal 5 inventory pursuant to OAR 660-16-030.

habitat and mitigation] *plan within the next month or two. We will continue to work with them to assure that a good wildlife mitigation package will be developed."*

It appears from this language and timing of this letter – only two days after the date of the habitat evaluation -- that Mr. George may not have reviewed the evaluation. However, the record includes a subsequent letter from Mr. George, dated December 14, 2000, stating in pertinent part:

> *"We are presently finalizing an agreement addressing onsite and offsite mitigation that should assure that the Huntington Ranch project satisfies Department of Land Conservation and Development Goal 5 requirements. We believe that final resolution of the remaining issues can be obtained by the end of January and recommend that this letter support a condition of approval on the conceptual master plan requiring final agreement at the time of the final master plan."*

Opponents argue the applicant's wildlife habitat evaluation and Mr. George's letters do not constitute sufficient evidence from which the Hearings Officer can find the applicant's proposal satisfies this destination resort approval criterion. In addition, opponents argue it is not appropriate to condition CMP approval on the development of a mitigation plan that satisfies ODFW because it will not be available for public review through the CMP application process. I understand opponents' concerns. However, as discussed in the findings above, under Section 18.113.050 the purpose of the CMP is to provide "the framework for development of the destination resort and . . . to ensure that the destination resort meets the requirements of this chapter." In other words, the applicant has the burden of demonstrating it *can* develop the proposed resort consistent with the requirements of the DR Zone. Because the development is conceptual at this stage of the process, much detail is left to conditions of approval, compliance with which must be demonstrated at the FMP approval stage.

Nevertheless, the first phase of the proposed resort involves the creation of the golf courses – will cause most of the loss of juniper woodland habitat. For this reason, the Hearings Officer finds it is critical that a habitat mitigation plan satisfying ODFW be finalized *before any work on the golf courses can commence*. I find there is substantial, credible evidence in the record that the applicant *can* finalize and begin to implement such a plan within that time frame. I find the following evidence particularly persuasive. First, both the on-site and off-site habitat mitigation measures identified in the habitat evaluation are feasible, and most are within the control of the applicant. The applicant has complete control of the subject property and can carry out the recommended on-site mitigation measures. The record also indicates the applicant holds grazing leases on the surrounding BLM and therefore can remove livestock and invasive plant species from this land. In addition, the applicant can work with the BLM to restore vegetation on existing roads on BLM land. Second, Mr. George's comments reflect his opinion that the applicant can meet the "no net loss" standard with a mitigation plan that is nearly complete.

For these reasons, the Hearings Officer finds the applicant has demonstrated the proposed resort can be developed so that any negative impact on fish and wildlife resources will be completely mitigated to produce no net loss or net degradation of the resource. However, to assure *timely* compliance with this standard, I find the applicant will be required as a condition of CMP approval, and prior to commencement of any ground disturbance on the subject property, to submit to the Planning Division a wildlife habitat mitigation plan and written documentation that ODFW finds the plan will satisfy the "no net loss" standard. In addition, the applicant will be required as a condition of CMP approval to revise the resort's CC & R's as necessary to assure

resort property owners comply with mitigation plan requirements applicable to them.

**E. Important natural features, including but not limited to, significant wetlands, riparian habitat and landscape management corridors will be maintained. Riparian vegetation within 100 feet of streams, rivers and significant wetlands will be maintained. Alterations to important natural features, including placement of structures, is allowed so long as the overall values of the feature are maintained.**

**FINDINGS:** The record indicates there are no wetlands or riparian habitats on the property. The applicant has proposed to create water features within the resort that may provide similar habitat. However, the Hearings Officer finds this standard is addressed to maintaining *natural* riparian and wetland habitats. The record also indicates the subject property is not located within an LM Zone. I previously have found there are no significant natural features on site. However, the applicant's burden of proof states the applicant intends to preserve existing rock outcrops through measures that incorporate them into the resort's design. For these reasons, I find the applicant's proposal meets this standard.

**F. The development will not force a significant change in accepted farm or forest practices or significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use.**

**FINDINGS:** The record indicates the subject property consists of and is completely surrounded by juniper woodland. This land typically is not devoted to forest or farm use because juniper is not a preferred commercial tree species, and soils typically are too poor to sustain any agricultural activity other than dryland livestock grazing. The record indicates there are no farm or forest practices on the subject property and no forest practices on the surrounding public land managed by the BLM. The burden of proof states the surrounding land has been utilized for livestock grazing. The applicant has grazing leases for the surrounding BLM land and may graze livestock under these leases in a manner similar to livestock operations on land near other destination resorts in the county such as Eagle Crest. The Hearings Officer finds there is nothing inherently incompatible between a destination resort and livestock grazing. I further find the applicant's control of grazing leases on the surrounding public lands will assure that if it elects to graze livestock this activity will be compatible with the resort. For these reasons, I find the applicant's proposal meets this standard.

**G. Destination resort developments that significantly affect a transportation facility shall assure that the development is consistent with the identified function, capacity and level of service of the facility. This shall be accomplished by either:**

**1. limiting the development to be consistent with the planned function, capacity and level of service of the transportation facility;**

**2. providing transportation facilities adequate to support the proposed development consistent with OAR Chapter 660, Division 12; or**

REVIEWED
LEGAL COUNSEL

For Recording Stamp Only

**FINDINGS AND DECISION OF**
**DESCHUTES COUNTY BOARD OF COMMISSIONERS**

| | |
|---|---|
| APPLICANT: | High Desert Development Partners LLC<br>350 Second Street #5<br>Los Altos, CA 94022 |
| PROPERTY OWNER: | High Desert Development Partners LLC |
| REQUEST: | The applicant requests approval of a Final Master Plan for a 640-acre destination resort in the EFU-AL and MUA-10 (DR) zones. |
| FILE NUMBER: | M-02-1 |
| STAFF REVIEWER: | Paul Blikstad, Associate Planner |
| HEARING DATE: | May 14, 2002 |

## I. APPLICABLE STANDARDS AND CRITERIA:

A. Title 18 of the Deschutes County Code, the County Zoning Ordinance

Chapter 18.16, Exclusive Farm Use (EFU-SC) zone
Chapter 18.32, Multiple Use Agricultural (MUA-10) zone
Chapter 18.113, Destination Resorts (DR) zone

B. Title 22 of the County Code, Uniform Land Use Procedures Ordinance

Chapter 22.20, Review of Land Use Action Applications
Chapter 22.24, Land Use Action Hearings

## II. FINDINGS OF FACT:

A. LOCATION: The subject property consists of approximately 640 acres and is identified on Deschutes County Assessor's Map #16-13 as tax lots 800, 801, 802, 803, 804, 805, and 806.

B. LOT OF RECORD: The subject seven tax lots have been determined to all be legal lots of record pursuant to the findings in file no. CU-00-118.



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C. ZONING: The property is zoned Exclusive Farm Use—Alfalfa Subzone (EFU-AL) for tax lots 801-806 and Multiple Use Agricultural (MUA-10) for tax lot 800, with a Destination Resort (DR) combining zone. It is designated Agriculture by the Deschutes County Comprehensive Plan, except for tax lot 800, which is designated rural residential.

D. PROPOSAL: The applicant is requesting final master plan (FMP) approval for the 640-acre destination resort. The applicant previously received approval of the conceptual master plan (CU-00-118) for the resort. The next step is to obtain FMP approval.

E. SITE DESCRIPTION: The subject property is approximately 640 acres and has a varied topography of level areas and rock outcrops. The property has a vegetative cover of juniper trees and scrub brush, along with some grasses. The main access to the resort property is proposed on a road extending on federal land managed by the Bureau of Land Management ("BLM") from Powell Butte Highway north to the subject property. The temporary secondary access for the resort is proposed from the resort east and north along the existing Sheridan Road corridor.

F. REVIEW PERIOD: This application was deemed complete and accepted for review on April 22, 2002. The 150th day on which the county must take final action on this application is September 19, 2002.

G. AGENCY RESPONSE: The Planning Division sent notice of the proposed final master plan application to several public agencies and received one response:

1. **City of Redmond: Require permanent secondary access road to connect to 19th Street. Allow City of Redmond to comment on MOU between Deschutes County and BLM regarding access roads.**

2. **No response was received from the Redmond Fire Department, Central Oregon Irrigation District, County Assessor, County Road Department, County Property Address Coordinator, Watermaster's Office, Cascade Natural Gas, Central Electric Cooperative, Pacific Power and Light, US West Communications, Oregon Department of Fish and Wildlife, Oregon Department of transportation, Redmond Airport, Bureau of Land Management, Oregon Health Division, and the County Transportation Planner.**

Planning Staff contacted the BLM regarding the appeal of the BLM's approval of the Environmental Assessment (EA) for access to the proposed resort. The appeal was submitted on April 3, 2002. At the May 14, 2002 hearing the applicants provided evidence that, on May 7, 2002, the appellants withdrew the appeal.

## III. CONCLUSIONS OF LAW

A. Chapter 18.16, Exclusive Farm Use (EFU-SC) Zone

1. **Section 18.16.035, Destination Resorts: Destination resorts may be allowed where mapped as a conditional use, subject to all applicable standards of the DR zone.**

**FINDING:** The Deschutes County Hearings Officer granted conditional use approval for the conceptual master plan (CMP) for the proposed resort on March 6, 2001. The applicant appealed the conditions of approval to the Board of County Commissioners, and the Board modified the conditions and approved the CMP on June 13, 2001. The CMP approval specifies that the resort site is mapped as eligible for destination resort siting. Compliance with all relevant standards of the DR zone is addressed below.

The resort is subject to the DR Combining Zone standards addressed below and, pursuant to Section 18.113.020(B), is not subject to the standards governing development in the EFU-SC zone. Therefore, none of the remaining sections of Chapter 18.16 are applicable to the FMP application.

B. Chapter 18.32, Multiple Use Agricultural (MUA-10) Zone

1. **Section 18.32.035, Destination Resorts: Destination resorts may be allowed as a conditional use, subject to all applicable standards of the DR zone.**

**FINDING:** The findings of compliance with Section 18.16.035, above, are incorporated herein by reference. The resort is subject to the DR zone combining standards addressed below and, pursuant to Section 18.113.020(B), is not subject to any additional standards governing development within the MUA-10 zone. Therefore, none of the remaining sections of Chapter 18.32 are applicable to the FMP application.

C. Chapter 18.113, Destination Resorts (DR) Zone

1. **Section 18.113.020, Applicability**

**A. The provisions of DCC 18.113 shall apply to proposals for the development of destination resorts, as defined in DCC Title 18, in areas designated DR by the County zoning maps. The provisions of DCC 18.113 shall not apply to any development proposal in an area designated DR other than a destination resort.**

**B. When these provisions are applicable, they shall supersede all other provisions of the underlying zone. Other provisions of the zoning ordinance, made applicable by specific map designations, such as the SMIA, AH, CH, FP or LM, or otherwise applicable under the terms of the zoning ordinance text shall remain in full force and effect, unless otherwise specified herein.**

**C. The provisions of DCC 18.113 apply to destination resorts sited through the Goal 2 exception process.**

**FINDING:** The Board finds that, during CMP review, the Hearings Officer determined that the County applied the destination resort overlay zone to the subject 640-acre tract to allow destination resort siting. As stated above and incorporated herein by reference, the proposed resort is not subject to the development standards of the EFU and MUA-10 zones but is instead governed by the DR combining zone standards, addressed below. There are no other combining zones on the property. The applicant is not siting this resort as part of the Goal 2 exception process.

2. **Section 18.113.040, Application Submission**

**B. Final Master Plan. The applicant shall prepare a final master plan (FMP) which incorporates all requirements of the County approval for the CMP. The Planning Director shall review the FMP to determine if it complies with the approved CMP and all conditions of approval of the conditional use permit. The Planning Director shall have the authority to approve, deny or return the FMP to the applicant for additional information. When interpretations of the Planning Director involve issues which are discretionary, the FMP approval shall be treated as a land use permit in accordance with DCC Title 22.**

**FINDINGS:** The applicant submitted a final master plan application that addressed all requirements set forth in the CMP and Chapter 18.113, as detailed below. The Planning Division determined that the FMP review involved sufficient discretion to treat the application as a land use permit in accordance with Title 22. Therefore, the Planning Division mailed a notice of public hearing to those entitled to notice pursuant to Title 22, and notice of the Board's decision will also be mailed in accordance with Title 22.

In addition, the Board determined in the CMP decision that a Memorandum of Understanding (MOU) and a separate, binding agreement would be required prior to FMP approval. Review and approval of these two documents must occur prior to or concurrent with the FMP approval. Thus, the Board has called up the FMP application for review pursuant to DCC 22.24.020 (B) and has consolidated review of the FMP, MOU, and Improvement Agreement.

To avoid unnecessary duplication, the applicant references in its Burden of Proof several CMP exhibits as support for the FMP application. Therefore, the Board incorporates the entire CMP record by reference.

3. **Section 18.113.090: Requirements for Final Master Plan**

**It shall be the responsibility of the applicant to provide a Final Master Plan (FMP which includes text and graphics explaining and illustrating:**

**A. The use, location, size and design of all important natural features, open space, buffer areas and common areas.**

**FINDING:** The applicant submitted the required text and graphics showing the use, location, size and design of all important natural features, open space, buffer, and common areas of the resort. Specifically, the Preliminary Development Plan (FMP Exhibit C) shows the required buffer areas and the general location of all open space areas, and Exhibit P, Existing Conditions and Setbacks, shows the required setbacks. The Open Space Management Plan (CMP Exhibit 5) describes the resort's policy for designating and managing the required open space areas, including the two golf courses. The specific size, location, and design of the open space areas will be finalized during site plan and tentative plan reviews over the life of the project. The Board finds that there are no important natural features, such as streams, rivers, wetlands, or riparian vegetation, on the property. (See Hearings Officer's Decision, pp. 13, 35.)

**B. The use and general location of all buildings, other than residential dwellings and the proposed density of residential development by location;**

**FINDING:** The applicant submitted the required text and graphics showing the use and general location of all buildings planned within the resort. The proposed development is shown on the Preliminary Development Plan (FMP Exhibit C). CMP Exhibit 5 also shows the general locations of the proposed development areas. Areas 1-9 on Exhibit C will be open for residential and recreational development, and areas 1-4 may include some commercial uses. A large portion of the proposed resort area will be dedicated to the two golf courses and driving ranges and other recreational and lodging amenities.

The FMP application explains that the resort will include three components: 1) The Estates at Pronghorn, a residential development with approximately 420-450 units occupying approximately 220 acres; 2) The Resort and Spa at Pronghorn, which will include a golf course, a resort with a hotel that has between 75-100 rooms, spa/fitness center, tennis courts, swimming pool, restaurants and related amenities, which will occupy approximately 190 acres; and 3) The Club at Pronghorn, a private golf club with a golf course, clubhouse, swimming pool, tennis court, driving range and practice facilities, which will occupy approximately 230 acres. The resort will include approximately 160-180 condominium units. The residential density will be between .65 and .70 units per acre, well within the maximum 1.5 dwellings per acre permitted. Density calculations are also addressed in CMP Exhibit 17.

The Board finds that the applicant sufficiently described the general location of future uses. Final development plans for each area must be submitted by the applicant at the time of subdivision tentative plat and/or site plan review. The Board finds that the actual development phases will be reviewed for consistency with the density requirements on a plat by plat basis. *See also* Condition A.

**C. Preliminary location of all sewer, water, storm drainage and other utility facilities and materials, and specifications and installation methods for water and waste water systems;**

**FINDING:** The applicant submitted the required text and graphics showing the preliminary location of all sewer, water, and electrical facilities and materials on pages 3-4 of the burden of proof statement. The burden of proof explains that the utilities will primarily be underground and generally under roads on site. The application demonstrates that the resort will be utilizing the City of Bend sewer system and Avion water supplies (CMP Exhibits 12 and 13). In addition, the resort will utilize an existing Pacific Power substation for power without the need for construction of such a facility on site. Finally, the applicant has negotiated and obtained a contract for the use of treated effluent or wastewater from the City of Bend to irrigate the golf courses and provide for water features. (CMP Exhibit 23).

The location of the utility corridors within the BLM rights-of-way is described in the BLM Decision Record (Applicant's FMP Exhibit B), illustrated on Applicant's FMP Exhibit F, and described in the Right-of-Way Grants, Serial Nos. OR 57273 and 55746, submitted by the applicant at the May 14, 2002 hearing. The final construction drawings and utility specifications will be reviewed and approved by the Oregon Health Division and Department of Environmental Quality. Storm drainage will be designed to accommodate runoff with soil infiltration adjacent to roads and structures. Thus, this condition has been satisfied

**D. Location and widths of all roads, streets, parking, pedestrian ways, equestrian trails and bike paths;**

**FINDING:** The applicant submitted the required text and graphics showing the approximate location of interior roads, parking, and pedestrian and bicycle trails. The planned facilities are depicted on the Preliminary Development Plan (Exhibit C). The streets and pedestrian/bicycle paths are required to meet the minimum standards established in the CMP approval. Parking shall be accommodated on each dwelling unit site and in the commercial areas. The lower volume roads that will be accessed from the main roads may be allowed some flexibility in design, depending on how the project is developed over time. The Board finds that the applicant's proposal, which incorporates flexibility to meet market demands, can be allowed because each phase requires tentative plat and/or site plan review, which offers planning staff and the public and opportunity to review the applicant's proposed layout and design. *See also* Condition N.

**E. Methods to be employed to buffer and mitigate potential adverse impacts on adjacent resource uses and property.**

**FINDING:** The applicant submitted the required text and graphics showing the methods to be employed to mitigate potential adverse impacts on adjacent resource uses and properties. These mitigation measures are detailed in the CMP application, the CMP findings and decision, and the FMP burden of proof statement. The Board finds that the applicant proposes to use open space buffer areas to mitigate impacts on surrounding uses. The Board finds that this is feasible because the project site is surrounded by publicly-owned, undeveloped BLM lands. No farming or forestry practices occur on adjacent lands, other than dryland livestock grazing, and the applicant has obtained the grazing leases for the surrounding BLM land. As noted by the Hearings Officer, the applicant's control of the grazing leases on the surrounding public lands

will enable the applicant to maintain compatibility between the adjacent uses (Hearings Officer's Decision, p. 35.)

The Board finds that the public lands surrounding the resort are fenced from the project site and will be buffered by perimeter setbacks with broad areas of natural vegetation, natural outcrops, rolling hills, and fences. In accordance with the setback requirements of Section 18.113.060(G)(2), residential structures and commercial developments will be set back significantly from the boundary of the resort development. The surrounding BLM lands and the proposed open space areas, including the golf courses, will provide a significant buffer between the resort and surrounding uses, and the setbacks and buffers will limit impacts on the BLM-managed lands.

With respect to the access roads, the Board finds that the applicant and BLM have designed the roads so as to minimize impacts on surrounding uses. The Environmental Assessment process conducted by BLM in connection with approving the right-of-way grants for access and utilities assures the minimum impact reasonably possible. (FMP Exhibits A and B.) BLM chose the right-of-way alternatives with the least impact on surrounding uses on resources and imposed mitigation measures to mitigate potential adverse impacts.

With respect to local airports, the Board finds that the CMP application demonstrates that the resort will not negatively impact nearby airports. The resort is located approximately four miles south of the City of Redmond Airport and approximately five and one-half miles north of the City of Bend Airport. Deschutes County currently administers two airport-related zoning designations; the Airport Safety Combining (A-S) zone and the Airport Development (A-D) zone. The A-S zone is intended to restrict the height of structures that intrude into areas that are used by aircraft (Deschutes County Code 18.80.010), and the proposed resort falls outside of any airport related restrictions. The A-D zone is applicable only to the Bend Airport and restricts uses and development within the immediate vicinity of airport property (Deschutes County Code 18.76.010). Therefore, there will be no adverse impacts on the Bend or Redmond airports as a result of the development of the resort site. Pursuant to CMP Condition No. 14, the applicant provided a copy of the map transmitted to the Redmond airport manager showing the approximate size and location of all proposed water features (FMP Exhibit E-1).

Finally, with respect to impacts on adjacent Oregon Military Department (OMD) weekend training operations on nearby BLM lands, the applicant has worked closely with the OMD to confirm compatibility with the ongoing military operations. The primary access route selected by BLM is consistent with OMD's preference, expressed during the CMP and EA processes, and will minimize conflicts between the resort and OMD. Conflicts with OMD operations will be analyzed during the future County and BLM processes necessary for the location of a permanent secondary access road. At the May 14, 2002 hearing, the applicant submitted additional confirmation from OMD that the resort and the OMD activities will not interfere with each other and the existing ¼-mile buffers between the resort and the OMD activities will be sufficient to ensure compatibility between the uses.

**F. Building elevations of visitor-oriented accommodations, recreational facilities and commercial services sufficient to**

**demonstrate the architectural character of the proposed development.**

**FINDING:** The applicant submitted the required text and graphics showing possible building elevation designs for the proposed resort (FMP Exhibit G). The Board finds that the building elevations are sufficient to demonstrate the potential architectural character of the resort.

**G. A description of all commercial uses including approximate size and floor area.**

**FINDING:** The applicant submitted the required description of potential commercial uses with approximate sizes (CMP Exhibit 15). As explained above, the Preliminary Development Plan (FMP Exhibit C) also designates general areas for future commercial buildings. Specific commercial uses will be developed once there is sufficient residential development to support such uses and the locations will be detailed during future site plan review. At that time, the specific size, nature, and location of the commercial uses will be developed to meet market demand, and the requirements of Section 18.113.030 of Title 18. *See also* Condition H.

**H. The location of or distance to any emergency medical facilities and public safety facilities;**

**FINDING:** The applicant submitted the required description of the location of and distance from emergency medical and public safety facilities. The burden of proof statement states that the closest medical facilities include hospitals in Redmond (approximately six miles from the resort) and Bend (approximately 11 miles from the resort). "Public safety facilities" are not specifically defined in the zoning ordinance. However, the Board finds that this includes fire and police protection facilities. The FMP references CMP Exhibits 24 and 16, which demonstrate that the Deschutes County Sheriff will provide service and patrols to the resort and the Redmond Rural Fire Protection District will provide emergency, medical, and fire protection services for the resort.

**I. When a phase includes a residential subdivision, a general layout of the subdivision shall include the number of lots, minimum and maximum lot sizes, and approximate location of roadways shall be included.**

**FINDING:** The County has traditionally interpreted this standard to allow resort applicants to provide details on each phase of the resort on a plat by plat basis. The applicant's burden of proof statement indicates that the layout of future subdivisions, including the number of lots, minimum and maximum lot sizes and approximate location of roadways, will be shown with each plat submission. The applicant also submitted a colored rendering of the proposed resort layout at the Board's hearing on May 14, 2002. On a plat by plat basis the Planning Division will ensure that the maximum lot size will remain consistent with the maximum average lot size of 22,000 square feet set forth in Section 18.113.060(G)(1). In addition, the applicant will document compliance with the maximum density of no greater than 1.5 non-overnight dwelling units per acre with the filing of each subdivision plat. The main roadways are shown on the

Preliminary Development Plan (FMP Exhibit C). Secondary roadways will be illustrated on the plat submitted for each phase of the resort. *See also* Conditions K and Q.

**J. A description of measures taken, with copies of deed restrictions, CC&Rs and rental contracts, to implement the measures identified in DCC 18.113 assuring that individually-owned lodging units considered to be overnight lodgings for at least 45 weeks per calendar year through a central reservation and check-in service.**

**FINDING:** The applicant submitted a copy of the revised CC&Rs governing the proposed development (FMP Exhibit H.) Article XIV of the CC&Rs governs overnight lodging units consistent with this standard.

**K. A description of measures taken, with copies of deed restrictions and a final management plan, to implement the open space management plan required by DCC 18.113.**

**FINDING:** The applicant submitted the open space management plan (CMP Exhibit 10) and the revised CC&Rs (FMP Exhibit H), which describe the measures to be employed to protect in perpetuity the identified open space values. The open space management plan describes the restrictions related to open space use and the mechanism for transfer of natural open space ownership to a Homeowner's Association at the time of plat approval. The open space calculation summary is also set forth in CMP Exhibit 17. Articles 2.11, 4.3, and 5.29 of the revised CC&Rs govern the dedication of common areas within the open space acreage and restrict use of the dedicated common area. The Board finds that the applicant will be required to identify the specific location and boundaries of the open space areas and to submit a continuous open space calculation with each subdivision plat. *See also* Condition C.

**L. The status of all required off-site roadway improvements.**

**FINDING:** The applicant submitted sufficient documentation illustrating that it has identified and obtained all necessary approvals for the primary access road and the temporary secondary emergency access, consistent with CMP conditions of approval nos. 29-37. BLM issued an Environmental Assessment and a Decision Record authorizing the right-of-way grants for access and utilities. (FMP Exhibits A and B.) At the May 14, 2002 hearing, the applicant submitted the final Right-of-Way Grants (Serial Nos. OR 57273 and 55746) and evidence showing that the appeal of the BLM decision was withdrawn on May 7, 2002. Therefore, the Board finds that BLM's right-of-way approvals are now final.

The CMP approval required that the applicant continue to work with BLM and the County to "enter into a Memorandum of Understanding (MOU) to confirm their intentions to work cooperatively in the resolution of issues related to the long-term needs of the public on the BLM lands and to collaboratively establish a process for the establishment of connectivity on BLM lands between the primary and secondary access roads." The CMP also required the applicant to enter into a development agreement or similar binding agreement with the County to govern the

applicant's financial allocation for the construction of the connecting road between the permanent primary and secondary access roads.

At the May 14, 2002 hearing, the applicant submitted the signed MOU and the draft Improvement Agreement for the Board's review in conjunction with the FMP. In consultation with the County's legal counsel, the Improvement Agreement has since been revised. The Board finds that the MOU and revised Improvement Agreement meet the requirements set forth in the CMP.

**M. Methods to be employed for managing automobile traffic demand.**

**FINDING:** The applicant submitted a traffic impact study with the CMP application and a supplemental traffic analysis in December, 2000. The traffic studies demonstrate that the internal and external road systems will be adequate to accommodate the existing and proposed resort development, with the mitigation measures described below. (CMP Exhibit 8; Hearings Officer's Decision, pp. 36-38.) In addition, the supplemental traffic analysis dated February 4, 2002 and submitted as FMP Exhibit K also confirms that the future permanent secondary access road will not significantly impact the study area intersections. Furthermore, the Improvement Agreement approved by the Board concurrent with this FMP approval allocates the cost of a connecting road between the primary and permanent secondary access roads.

Pursuant to the CMP conditions of approval, the applicant will widen Powell Butte Highway at the primary access road intersection to accommodate a left turn refuge and deceleration lane. In addition, the applicant proposes a shuttle service between the resort and the Bend and Redmond airports when the development level warrants the service. With respect to interior roads, the applicant will post a speed limit of 25 mph for interior streets. Low volume and cul-de-sac roads connecting to the interior main road shall be controlled with stop signs at the intersections. A separate pathway system for pedestrians and bikes will be provided to accommodate pedestrian and bicycle traffic. *See also* Conditions O, P, and S.

**N. A copy of a WPCF permit issued by DEQ consistent with the requirements of chapter 18.113.070(L).**

**FINDING:** The applicant has entered into a contract with the City of Bend to connect the resort to the City's sewage treatment plant (CMP Exhibit 23). As noted by the Hearings Officer in the CMP decision, "Because the applicant is not proposing an on-site sewage treatment plant," a WPCF permit is not necessary. (Hearings Officer's Decision, p. 44.)

**4. Section 18.113.100, Procedure for Approval of Final Master Plan**

**A. The FMP shall be submitted in a form approved by the County Planning Director consistent with DCC Title 22 for a development permit. The Planning Director shall review the FMP and if the Planning Director finds that all standards of the CMP have been met, the FMP shall be approved in writing without notice. If approval the FMP involves the exercise of**

**discretion, the FMP shall be treated as a land use action and notice shall be provided in accordance with DCC Title 22;**

**B. If the Planning Director finds evidence in the FMP of a substantial change from the CMP, the Planning Director shall advise the applicant to submit an application for modification or amendment of the CMP.**

**FINDING:** The Board exercised its discretion to review the FMP application in part because the CMP conditions of approval require the concurrent review and approval of the MOU and Improvement Agreement discussed above. The Board finds that the applicant submitted the appropriate application form and burden of proof materials to support the FMP application. Conformance with the CMP conditions of approval is addressed below and incorporated herein by reference. The Board finds that there has not been a substantial change from the CMP and therefore a modification or amendment to the CMP is unnecessary.

D. Conformance with the CMP Conditions of Approval, CU-00-118

1. **This approval is based on the submitted destination resort CMP, including the applicant's burden of proof and memorandum and supporting exhibits and public hearing exhibits and testimony. Any substantial change to the proposed CMP will require additional land use applications and approvals.**

**FINDING:** The Board finds that the proposed FMP is not substantially different from the applicant's original CMP. The applicant does not propose to modify the CMP.

2. **The applicant/owner shall manage and operate all portions of the proposed resort in an integrated manner.**

**FINDING:** The Board finds that the FMP demonstrates that the applicant will manage and operate all portions of the resort in an integrated manner according to the CC&Rs, which coordinate cooperation among all components. (FMP Exhibit H).

3. **The applicant/owner shall maintain the 2-to-1 ratio between individually-owned residential and visitor-oriented units throughout the resort and document that ratio with development of each phase of the resort.**

**FINDING:** The Board finds that the applicant will be required to maintain the 2-to-1 ratio between individually-owned residential and visitor-oriented units throughout the resort and will document the ratio with development of each phase of the resort. As a condition of FMP approval, the applicant will demonstrate compliance with this condition on a plat by plat basis. *See also* Condition E.

4. **The applicant/owner shall abandon the existing personal use airstrip pursuant to the regulations of the ODOT Aeronautics Division and/or**

**the Federal Aviation Administration, as applicable, and shall submit to the Planning Division written documentation that the airstrip has been abandoned.**

**FINDING:** At the May 14, 2002 hearing, the applicant submitted an executed copy of FAA form 7480-1 and a letter to the Oregon Department of Aviation, requesting abandonment of the existing personal use airstrip. The January 2, 2002 letter from the Oregon Department of Aviation submitted during CMP review states that the department will close their record for the "Freight Wagon Field Airport," upon receipt this application. Thus, the Board finds that the applicant has satisfied this condition by documenting closure of the airport.

5. **Prior to commencement of any ground disturbance on the subject property, the applicant/owner shall submit to the Planning Division a finalized wildlife habitat mitigation plan and written documentation from ODFW that it finds the plan will satisfy the "no net loss" standard. The applicant/owner shall implement the mitigation plan and shall revise the proposed resort's CC & R's as necessary to assure resort property owners comply with mitigation plan requirements applicable to them.**

**FINDING:** On December 19, 2001, the applicant and the ODFW finalized a Wildlife Mitigation Plan (FMP Exhibit M) that was approved by ODFW as sufficient to satisfy the no net loss standard. Article XIII of the CC&Rs (FMP Exhibit H) include provisions to assure property owner compliance with the wildlife mitigation plan. Consistent with the recommendation in the staff report, the applicant revised Article XIII to clarify that 40 to 50 swallow nest boxes and 10 to 20 bluebird and small owl nesting cavities shall be installed upon completion of the two golf courses. The applicant submitted the replacement CC&R pages at the May 14, 2002 hearing. The Board finds that to further insure that the Mitigation Plan is being implemented, the applicant will be required to submit an annual written report to the Planning Division, with a copy to ODFW, demonstrating ongoing compliance with the mitigation plan, due by the end of the calendar year, each year, once resort construction begins. *See also* Condition W.

6. **Within 180 days of the date this decision becomes final, the applicant/owner shall submit to the Planning Division a revised tentative development plan showing the location of the main internal resort roads.**

**FINDING:** The applicant submitted a revised Preliminary Development Plan showing the location of the main internal resort roads as Exhibit C to the FMP. The Board finds that the BLM right-of-way grants for the external access roads were not issued until March 20, 2002. Because the alignment of the main internal roads is dependent upon the location of the external access roads, the Board finds that the timing of the BLM process precluded the applicant from identifying the alignment of the internal access roads within the 180-day period set forth in Condition No. 6. Furthermore, although the submittal of the requisite plan occurred after the expiration of the 180-day timeline, the Board finds that the plan, in conjunction with the original Tentative Development Plan (CMP Exhibit 5), provides sufficient detail regarding the location of the internal resort roads to enable the Board to approve the FMP. In addition, the Board finds

that the original CMP Exhibit 5, labeled Tentative Development Plan, met the requirement for demonstrating for "identifying the main vehicular circulation system within the resort as required under Section 18.113.050(A)(6)." This exhibit demonstrated a road extending to all nine development areas.

7. **The applicant/owner shall identify the general locations and routes of the pedestrian, bicycle and equestrian trail systems on the revised tentative development plan required under Condition of Approval 6.**

**FINDING:** The applicant's Preliminary Development Plan (FMP Exhibit C) shows the general location and routes of the proposed pedestrian and bicycle and trail systems. In response to the staff report inquiry, the applicant clarified at the May 14, 2002 hearing that no equestrian facilities are proposed at this time.

8. **The applicant/owner shall remove all temporary structures no later than 18 months after they are established.**

**FINDING:** The applicant stated in the burden of proof statement that it will assure that all temporary structures on the resort property shall be removed no later than 18 months after establishment. The FMP shall include a condition of approval mandating compliance with this condition. *See* Condition F.

9. **The applicant/owner shall comply with the county's solar access standards for all single-family dwellings in the resort. All multi-family units, commercial structures, and other resort facilities are exempt from the solar access standards, except where their shadow would impact a single-family residential lot within or adjacent to the resort. A 14-foot solar fence standard shall apply when shadows cast by multi-family, commercial structures or other resort facilities affect residential structures of any type.**

**FINDING:** The Board finds that compliance with the solar access standards shall be determined at the time of site plan review for commercial and multi-family uses and at the time of building permit issuance for single-family dwellings. This requirement will be imposed as a condition of FMP approval. *See* Condition G.

10. **The applicant/owner shall limit commercial uses within the resort to those permitted in the DR Zone and listed in Exhibit 15 to the burden of proof.**

**FINDING:** The Board finds that the applicant is required to limit commercial uses within the resort to those permitted in the DR Zone and those listed in CMP Exhibit 15. This limitation shall be imposed as a condition of approval and future plat and/or site plan applications proposing commercial development shall demonstrate compliance with this condition. *See* Condition H.

11. **The applicant/owner shall supply the open space acreage in the FMP and limit uses in the required permanent open space areas to those permitted by the DR Zone.**

**FINDING:** Pursuant to the applicant's open space calculations set forth in CMP Exhibit 17, the open space acreage for the resort must be at least 321.56 acres. The applicant will limit open space uses to those permitted by the DR Zone, and the uses within open space areas will be regulated pursuant to the common area provisions in Articles 2.11, 4.3, and 5.29 of the revised CC&Rs. The use limitation shall be imposed as a condition of FMP approval. *See* Condition C.

12. **The applicant/owner shall designate the location of all utility lines and easements that burden the property on the FMP.**

**FINDING:** The utility lines and easements that burden the resort property are shown on FMP Exhibit P.

13. **The applicant/owner shall implement the applicant's erosion control plan during all phases of resort development.**

**FINDING:** The applicant has stated in its burden of proof that it will implement the erosion control plan during all phases of resort development and provide evidence of same through submission of development site plans or roadway construction drawings. Provision of this evidence in future plats and/or site plans shall be imposed as a condition of FMP approval. *See* Condition I.

14. **The applicant/owner shall provide to the Redmond Airport Manager a map showing the size and location of all proposed resort water features at the time the FMP is submitted for approval.**

**FINDING:** The applicant submitted FMP Exhibit E-1, which is a copy of the map submitted to the Redmond Airport Manager showing the approximate size and location of all proposed resort water features. Thus, this condition has been satisfied.

15. **The applicant/owner shall submit with its FMP a written description of the mechanism for the central registration and check-in service described in this section. The applicant/owner shall identify in the revised CC & R's, or submit additional revisions to the CC & R's, provisions for limiting use of overnight lodgings as required by this section.**

**FINDING:** The applicant submitted a further description of the registration/check-in service and the provisions for limiting use of overnight lodging with its FMP application. According to the applicant's burden of proof statement, the resort's hotel will have a traditional central registration and check-in mechanism and will be responsible for coordinating registration and check-in for all overnight lodging units. The reservation system for the hotel and all additional overnight lodging units will be created and operated by the applicant or by an entity to which the applicant assigns such system. Article XIV of the CC&Rs requires that all designated overnight

units be available for overnight rentals no fewer than 45 weeks per year through the central reservation system. The Board finds this condition has been satisfied.

16. **Prior to filing the proposed FMP for approval, the applicant/owner shall submit to the Planning Division: (a) a letter from the PUC stating it has approved Avion's contract with the applicant; and (b) an executed revised water supply agreement if revisions to the agreement are required by the PUC.**

**FINDING:** As noted in the staff report, the body of the Hearings Officer's decision specifies that the above-referenced information shall be submitted at the time of submittal the FMP application, rather than prior to filing of the application. (Hearings Officer's Decision, p. 44). Therefore, because the applicant submitted the required documentation concurrently with the FMP application, the Board finds that the applicant properly submitted the PUC's order approving Avion's service to the resort as FMP Exhibit N (Order No. 01-136).

17. **The applicant/owner shall provide financial assurance or bonding acceptable to Deschutes County Legal Counsel for the cost of the required phase-one resort components, including required visitor-oriented lodging and eating establishments and construction of the golf courses, if these components are not in place before sales of residential dwellings and lots commence.**

**FINDING:** The applicant states in its burden of proof statement that it will provide financial assurance or bonding acceptable to Deschutes County Legal Counsel for the cost of the required phase one resort components, including required visitor-oriented lodging and eating establishments and construction of the golf course, to the extent such improvements are not in place before the commencement of the sale of residential dwellings and lots. The FMP approval shall impose this standard as a condition of approval. *See* Condition J.

18. **The applicant/owner shall assure that all commercial, cultural, entertainment or accessory uses provided as part of the destination resort are contained within the development and not oriented to public highways.**

**FINDING:** The applicant states in its burden of proof that it will assure that all commercial, cultural, entertainment and accessory uses provided as part of the resort are contained within the development and not oriented to public highways. The Board finds that compliance will be documented through review of each site plan application. Demonstration of compliance with this standard during site plan review shall be imposed as a condition of FMP approval. See Condition D.

19. **The applicant/owner shall demonstrate compliance with all minimum lot sizes, lot frontages, yard sizes, off-street parking requirements and building height limitations established in Section 18.113.060.**

**FINDING:** The Board finds that, as a condition of FMP approval, the applicant will be required to demonstrate compliance with this condition during site plan and/or building permit review. *See* Condition K.

20. **The applicant/owner shall assure preservation of open space required to meet the 50% open space requirement through the filing of the revised CC & R's for the resort included in the record as Exhibit P to the applicant's memorandum.**

**FINDING:** The Board finds that the applicant will be required, as a condition of FMP approval, to demonstrate continuous compliance with the 50% open space standard at the filing of each future plat. The Board also finds that the CC&Rs will guide the preservation of open space areas by mandating the process for conveying ownership of all common areas to the Homeowner's Association (Section 4.3). Section 4.3 states that "no transfer of any Common Area shall be valid without the written consent of the county if such transfer would put the Project in violation of County open space ordinances or other similar applicable governmental restrictions." The Board finds that the common area provision of the CC&Rs, in conjunction with updated open space calculations submitted during each plat review, is sufficient to maintain compliance with the open space standard.

**[Note: Change in numbering corresponds to Hearings Officer's Decision. The numbers in parentheses are the numbers used erroneously in the CMP decision.]**

21. **(23) The applicant/owner shall identify the type and location of all recreational facilities within the proposed resort on the FMP.**

**FINDING:** The applicant's burden of proof statement indicates that the recreational facilities will likely include swimming pools, tennis courts, trail systems, fine dining, hotel and meeting accommodations, a spa, two golf courses and similar resort amenities. CMP Exhibit 15 lists the possible commercial and recreational uses. The Preliminary Development Plan (FMP Exhibit C) and CMP Exhibit 5 show the general areas in which such facilities may be located. The Board finds that the applicant has provided sufficient information to allow the Board to determine compliance with this condition.

22. **(24) The applicant/owner shall implement all water conservation measures set forth in its Water Conservation Plan attached to the burden of proof as Exhibit 13.**

**FINDING:** The Board finds that the resort will obtain domestic water from Avion through a PUC-approved contract (FMP Exhibit N), and Avion has a water conservation plan approved by the State of Oregon's Water Resources Department. As a customer of Avion, applicant is required to comply with the terms of such water conservation plan. In addition, as a condition of FMP approval the applicant shall be required to comply with the terms of the conservation plan attached as CMP Exhibit 13. *See* Condition L.

23. **(25) The applicant/owner shall comply with all fire protection requirements of the Redmond Fire Department.**

**FINDING:** As a condition of FMP approval, the applicant shall be required to submit all construction drawings to the Redmond Fire Department for a determination of compliance with its fire protection requirements, and submit written documentation from the Fire Department of completion of the infrastructure for fire protection at the time of final plat review or occupancy of any building not part of a subdivision lot. *See* Condition M.

24. **(26) The applicant/owner shall construct all interior resort roads to the county's minimum standards for rural private roads as specified in Table A to the county's subdivision ordinance, Title 17 to the Deschutes County Code.**

**FINDING:** As a condition of FMP approval, the applicant shall be required to construct all interior resort roads to the standards set forth in Title 17. Construction drawings for interior resort roads will be submitted to Deschutes County Road Department for review. *See* Condition N.

25. **(27) The applicant/owner shall construct all bicycle/pedestrian paths in the resort to a paved width of 10 feet, with 2 inches of asphaltic concrete over a 4-inch depth crushed aggregate base.**

**FINDING:** As a condition of FMP approval, the applicant shall be required to construct all separate bicycle/pedestrian paths in the resort to the standards set forth in this condition. Bike path plans shall be shown on street construction drawings submitted to the County Road Department. *See* Condition O.

26. **(28) The applicant/owner shall regulate traffic speeds on interior resort roads through posting a speed limit not to exceed 25 mph.**

**FINDING:** As a condition of FMP approval, the applicant will post signs indicating a maximum speed limit of 25 mph for interior resort roads. *See* Condition P.

27. **(29) Primary Access Road. The applicant/owner shall obtain the necessary right-of-way across BLM land for the primary resort access road and submit to the Planning Division documentation of the right-of-way grant prior to filing the FMP for approval. Subject to BLM approval, the primary resort access road generally shall follow the existing BLM Road 6585-C across BLM land. The applicant/owner shall improve the primary resort access road, including any necessary bridge across the North Unit Irrigation District canal, to the county's minimum design and construction standards for a rural collector road and for bridges as specified in Table A to the county's subdivision ordinance, Title 17 to the Deschutes County Code.**

**FINDING:** The applicant submitted the final BLM documents approving the rights-of-way (and evidence that the appeal of the BLM decision was withdrawn) at the May 14, 2002 hearing. As explained in the Decision Record, the primary resort access road generally follows the existing BLM Road 6585-C. As a condition of FMP approval, the applicant will improve the primary

access road, including the necessary bridge across the North Unit Irrigation District canal, to the County's minimum design and construction standards for a rural collector road and for bridges as specified in Table A to the County's subdivision ordinance, Title 17. Construction drawings will be submitted to the Deschutes County Road Department. *See* Condition Q.

28. **(30) Subject to BLM approval, the applicant/owner shall improve the existing Sheridan Road for future use as a temporary emergency secondary resort access road across BLM land north and east from the resort site until its intersection with Highway 126, approximately 2½ miles east of Redmond. This road shall be improved to a minimum width of 20 feet with an all-weather surface capable of supporting a 60,000 lb. fire truck. This emergency secondary resort access road shall be improved before the commencement of combustible construction on the resort.**

**FINDING:** the applicant has obtained BLM approval to establish a temporary secondary access between the resort and Highway 126, along Sheridan Road (See BLM Right-of-Way Grant No. OR 57273). The right-of-way grant is 20 feet wide, as required by this condition. Consistent with the BLM Environmental Assessment and Decision Record, the applicant will improve the existing Sheridan Road for future use as a temporary emergency secondary resort access road prior to commencing combustible construction on the resort. Improvement of this road consistent with the standards set forth above shall be required as a condition of FMP approval. The applicant will work with the Redmond Fire Department and BLM to assure adequate access with minimal disturbance to BLM lands. *See* Condition R.

29. **(31) The applicant/owner shall submit with its proposed FMP the following evidence: (a) identifying the location of the proposed permanent secondary access road connection point or alternate connection points to a State, City or County road; (b) demonstrating that necessary rights-of-way and access permits can be issued; (c) describing the timetable for construction and the parties' relative responsibilities for construction cost, including the proportional shares of the 19th Street construction if that is chosen as the secondary access; and (d) including a supplemental traffic study analyzing the resort's traffic impacts with a secondary access road's connection point (or alternate connection points) to a County, State or City road. The County's review of this evidence shall be handled as a discretionary land use permit. This road shall be improved to the then applicable County's minimum standards. The permanent secondary access road shall be required at such time as the resort achieves 50% build-out, measured by the number of constructed residential units. The County may elect to construct the permanent secondary access road earlier. In that event, the applicant/owner's responsibility with respect to this road would become an obligation to reimburse the County (subject to the terms of any then-applicable County systems development charges reimbursement policies) for the applicant/owner's proportionate share of construction costs prior to**

**constructing any residential units in excess of 50% build-out. At least 6 months prior to the estimated date of the resort's 50% build-out, the applicant shall notify the County Planning Division.**

**FINDING:** At the May 14, 2002 hearing, the applicant submitted an executed MOU confirming the BLM, County and Applicant's intent to cooperate in good faith regarding the location of a permanent secondary access road. The Board has reviewed this MOU and determined that it is sufficient to demonstrate compliance with sections (a) and (b) of CMP Condition No. 31. The applicant also submitted a draft improvement agreement with Deschutes County outlining the parties' responsibilities for funding and construction of the secondary access. The Board has reviewed and modified this agreement and has determined that, when signed, the Improvement Agreement will be sufficient to demonstrate compliance with section (c) CMP Condition No. 31.

With respect to the supplemental traffic analysis required by section (d) of CMP Condition No. 31, the applicant submitted FMP Exhibit K to confirm that, under any of the three potential secondary access scenarios, the study area intersections will continue to operate at acceptable levels. The supplemental report identifies three alternate connection points to public roads.

30. **(32) Powell Butte Highway Improvements. Concurrent with construction of the resort's primary access road, the applicant/owner shall construct improvements to Powell Butte Highway at its intersection with the primary access road consistent with the county's minimum standards for principal arterial roads as set forth in Table A to the county's subdivision ordinance, Title 17 to the Deschutes County Code, and consisting of a northbound left turn lane and a southbound right turn deceleration lane.**

**FINDING:** As a condition of FMP approval, concurrent with construction of the resort's primary access road, the applicant will construct a northbound left turn lane and a southbound right turn deceleration lane on the Powell Butte Highway at its intersection with the primary access road. Such improvements will be consistent with the County's minimum standards for principal arterial roads as set forth in Table A to the County's subdivision ordinance, Title 17. *See* Condition S.

31. **(33) The applicant/owner shall submit with its proposed FMP written documentation that its primary, temporary secondary and permanent secondary access road locations will not interfere with OMD activities and that the BLM had agreed to the establishment of buffers on its land between the resort and the OMD's operating areas that are acceptable to the BLM, the applicant and the OMD.**

**FINDING:** At the May 14, 2002 hearing, the applicant submitted additional correspondence from OMD confirming that the approved BLM road and utility corridors will not significantly interfere with OMD activities and that the existing buffers between the resort and the OMD areas of operation are acceptable to the applicant and OMD and are consistent with OMD's BLM permit. Thus, this condition has been satisfied.

32. **(34) The applicant shall provide signage at both the primary and secondary access gates to instruct the public about access through the resort in cases of emergency.**

**FINDING:** As a condition of FMP approval, the applicant will provide signage at the primary and secondary access gates instructing the public about access through the resort in cases of emergency. *See* Condition T.

33. **(35) Until a permanent secondary access is determined, the applicant shall provide signage at or near its primary access gate to direct the public to Sheridan Road (or an equivalent road) for access to Highway 126.**

**FINDING:** As a condition of FMP approval, until a permanent secondary access is determined, the applicant will provide signage at or near its primary access gate to direct the public to Sheridan Road for access to Highway 126. *See* Condition U.

34. **(36) The applicant, together with Deschutes County and the BLM, shall continue to work collaboratively with the Upper Deschutes Resources Management Planning Group to determine how to provide connectivity on BLM lands between the resort's primary and secondary access roads. The Board agrees that it shall not require the public connection between the access roads to be located on resort property.**

**FINDING:** The applicant states in its burden of proof statement that it has and will continue to work with the County and the BLM collaboratively with the Upper Deschutes Resource Management Planning Group regarding possible connectivity on BLM lands between the resort's primary and secondary access roads. The MOU approved by the Board governs the applicant's duty to work collaboratively on this issue.

35. **(37) Prior to the FMP, the applicant, BLM, and Deschutes County shall enter into a Memorandum of Understanding (MOU) to confirm their intentions to work cooperatively in the resolution of issues related to the long-term needs of the public on the BLM lands and to collaboratively establish a process for the establishment of connectivity on BLM lands between the primary and secondary access roads. In addition to the MOU, prior to the FMP approval, the applicant and the County shall enter into a development agreement or similar binding agreement with the County which will include a determination of the applicant's financial allocation for the construction of the connecting road between the permanent primary and secondary access roads. The development agreement or similar binding agreement with the County shall also provide that, in the event an agreement between the applicant, County and BLM regarding the location of the connecting road does not occur by the**

**time the permanent secondary access road is approved, the applicant's financial allocation shall be used for off-site mitigation.**

**FINDING:** As discussed above, the applicant submitted a signed MOU and draft improvement agreement for the Board's review, and concurrent with this FMP approval, the Board approved the subject documents. The Board finds the documents are sufficient to demonstrate compliance with this condition of approval.

36. **(38) Prior to the FMP, the applicant may petition for the vacation of that portion of the Huntington Wagon Road that exists on the subject property. The County shall consider these conditions of approval in its determination of the applicable requirements for the vacation petition.**

**FINDING:** The applicant has stated their intention to submit a petition for the vacation of that portion of the Huntington Wagon Road that exists on the subject property when related off-site access and connectivity issues are collaboratively addressed with BLM and Deschutes County. The Board now finds that the petition for the vacation would more appropriately be filed after the FMP approval because the details of the MOU and Improvement Agreement required by the previous condition were not completed prior to this approval. The Board also finds that consideration of the vacation of this portion of County right-of-way is directly related to the condition requiring a connecting road between the primary and secondary access roads. The Board considers the vacation and the connecting road to be related and in the form of an even exchange. Thus, a proportionality determination is unnecessary and the connecting road will be the sole responsibility of the applicant.

## IV. CONCLUSION

The Board finds that the applicant has demonstrated compliance with all FMP approval standards and the conditions of approval of the CMP. Therefore, the Board hereby approves the FMP with the following conditions:

A. The applicant shall demonstrate that each residential subdivision plat submitted pursuant to this FMP approval complies with the maximum average lot size of 22,000 square feet and the maximum density of 1.5 non-overnight dwelling units per acre.

B. The applicant shall illustrate the specific location and alignment of secondary roadways integral to each phase of the resort during preliminary plat review.

C. The applicant shall limit open space uses to those permitted by the DR Combining Zone and shall document continuous compliance with the 50% open space standard during preliminary plat review for each phase of the resort.

D. At the time of site plan and/or preliminary plat review, the applicant shall demonstrate that all commercial, cultural, entertainment, or accessory uses are contained within the resort and not oriented to public highways.

E. The applicant/owner shall maintain the 2-to-1 ratio between individually-owned residential and visitor-oriented units throughout the resort and document that ratio during preliminary plat review for each phase of the resort.

F. The applicant/owner shall remove all temporary structures constructed at the resort no later than 18 months after they are established.

G. The applicant shall document compliance with the applicable solar access standards at the time of site plan review for commercial and multi-family uses and at the time of building permit review for single-family dwellings.

H. The applicant shall limit commercial uses within the resort to those permitted in the DR Combining Zone and those listed in CMP Exhibit 15. The applicant shall document compliance with this condition at the time of preliminary plat and/or site plan review for future commercial development.

I. The applicant shall document compliance with the erosion control plan during preliminary plat and/or site plan review.

J. The applicant shall provide financial assurance or bonding acceptable to Deschutes County Legal Counsel for the cost of the required "Phase One" resort components, including required visitor-oriented lodging and eating establishments and construction of the golf course, to the extent such improvements are not in place before the commencement of the sale of residential dwellings and lots.

K. The applicant shall demonstrate compliance with all minimum lot sizes, lot frontages, yard sizes, off-street parking requirements and building height limitations established in Section 18.113.060 during preliminary plat, site plan, and/or building permit review.

L. The applicant shall demonstrate compliance with the Water Conservation Plan submitted as CMP Exhibit 13 during preliminary plat and/or site plan review.

M. The applicant shall submit all construction drawings to the Redmond Fire Department to document compliance with the Department's fire protect requirements during site plan or final plat review. Written documentation from the Fire Department shall be required for each final plat submittal or the occupancy of any building not part of a subdivision lot.

N. The applicant shall construct all interior resort roads to the standards for rural private roads specified in Table A, Title 17. The applicant shall submit construction drawings for all interior roads to the Deschutes County Road Department.

O. The applicant shall construct all separate bicycle/pedestrian paths to a paved width of 10 feet, with 2 inches of asphaltic concrete over a 4-inch depth of crushed aggregate base. The applicant shall submit bicycle/pedestrian path construction plans to the Deschutes County Public Works Department.

P. The applicant shall post signs indicating a maximum speed limit of 25 mph for interior resort roads.

Q. The applicant shall improve the primary access road to the County's minimum design and construction standards for rural collector roads, as specified in Table A, Title 17. The applicant shall submit construction drawings to the Deschutes County Road Department.

R. The applicant shall improve the existing Sheridan Road for use as a temporary emergency secondary resort access road prior to commencing combustible construction at the resort. The applicant shall improve the road to a minimum width of 20 feet with an all-weather surface capable of supporting a 60,000 lb. fire truck.

S. The applicant shall construct a northbound left turn lane and a southbound right turn deceleration land on the Powell Butte Highway at its intersection with the primary access road, concurrent with the construction of the resort's primary access road. The turn lane shall be constructed consistent with the County's minimum standards for principal arterial roads set forth in Table A, Title 17.

T. The applicant shall provide signage at the primary and temporary secondary access gates instructing the public about access through the resort in the case of an emergency.

U. Until a permanent secondary access road is constructed, the applicant shall provide signage at or near its primary access gate to direct the public to Sheridan Road for access to Highway 126.

V. The applicant shall petition to vacate the Huntington Wagon Road after off-site access and connectivity issues have been collaboratively addressed consistent with the MOU between applicant, BLM, and Deschutes County.

W. The applicant shall submit an annual written report to the Planning Division, with a copy to the Oregon Department of Fish and Wildlife, demonstrating compliance with the wildlife mitigation plan. This written report shall be submitted by the end of the calendar year (December 31st) from the beginning of resort construction throughout the project.

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Parties may appeal this decision to the Land Use Board of Appeals within 21 days of the date on which this decision is final.

Dated this 22nd of May, 2002

BOARD OF COUNTY COMMISSIONERS

TOM DEWOLF, CHAIR

DENNIS R. LUKE, COMMISSIONER

MICHAEL M. DALY, COMMISSIONER

ATTEST:

Bonnie Baker

Recording Secretary

# DECISION OF DESCHUTES COUNTY BOARD OF COMMISSIONERS

REVIEWED
LC
LEGAL COUNSEL

**FILE NUMBER:** CU-99-85

**APPLICANT/ PROPERTY OWNER:** Eagle Crest, Inc.
c/o Alan Van Vliet
P. 0. Box 1215
Redmond, Oregon 97756

**ATTORNEY:** Nancy Craven
Ball Janik L.L.P.
101 S.W. Main, Suite 1100
Portland, Oregon 97204

**ENGINEER:** Thomas A. Walker, P.E.
W & H Pacific
920 S.W. Emkay Drive, Suite C-100
Bend, Oregon 97702

**REQUEST:** The applicant is requesting approval of a conditional use permit for a destination resort conceptual master plan to allow a 480-acre expansion of the existing Eagle Crest resort on land zoned EFU-SC, SMIA.

**STAFF REVIEWER:** Paul Blikstad, Associate Planner

**HEARING DATE:** April 10, 2001

**RECORD CLOSED:** April 24, 2001

## I. APPLICABLE STANDARDS AND CRITERIA:

A. Title 18 of the Deschutes County Code, the Deschutes County Zoning Ordinance

1. Chapter 18.16, Exclusive Farm Use Zone

- **Section 18.16.030, Conditional Uses Permitted - High Value and Nonhigh Value Farmland**
- **Section 18.16.035, Destination Resorts**

2. **Chapter 18.56, Surface Mining Impact Area Combining (SMIA) Zone**

- **Section 18.56.070, Setbacks**
- **Section 18.56.030, Use Limitations**
- **Section 18.56.090, Specific Use Standards**
- **Section 18.56.120, Waiver of Remonstrance**

D. **Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource.**

**FINDINGS:** The Board finds this criterion presents two issues the applicant must address: 1) whether the proposed development will have "negative impacts on fish and wildlife resources;" and 2) if so, whether those impacts can be "completely mitigated" so as to assure "no net loss or net degradation." To address this criterion the applicant submitted a Habitat Evaluation Assessment (HEP) prepared by Shapiro and Associates, Inc., included in the record as Exhibit 20 to the original narrative. The applicant also submitted a Wildlife Habitat Assessment and Mitigation Plan reviewed and approved by ODFW, included in the record as Exhibit K. The purpose of the HEP is stated on page 1 as:

> ". . . to describe the physical condition of wildlife habitat on the site as well as provide an assessment of habitat function for several wildlife species and guilds that may use the site."

The HEP states the subject property presently constitutes undisturbed juniper woodland/big sage habitat which supports a wide diversity of bird and mammal species. (There is no fish habitat on the site due to lack of water features.) The HEP concluded development of the site can have adverse effects on wildlife and their habitat by causing animals to avoid certain areas or to concentrate in other areas. In order to assess the potential effect of resort development on the site on species using it, the HEP selected three representative species "that rely on the structural components of habitat that would be altered as a consequence of site development" - i.e., mule deer, song sparrow and ferruginous hawk. The HEP discussed the habitat requirements for each species and how development of the site could affect those requirements positively or negatively. The HEP concluded that if 20 percent of each dwelling site were developed, there would be net positive benefits to song sparrows and ferruginous hawks and that such development would "create conditions conducive to mule deer use." The HEP recommended a number of mitigation measures, including retaining native species except where removal of mature junipers and sage would improve habitat, surveying and removing non-native species and weeds and providing water features including wildlife "guzzlers."

ODFW initially recommended denial of the applicant's proposal in a July 20, 1999, letter from Steven George, which recommended that this application be denied until the applicant provided an additional analysis of the wildlife habitat impacts with adequate mitigation measures. Subsequent to this letter, the applicant met with ODFW to develop a sufficient Mitigation Plan.

On January 31, 2000, ODFW approved the applicant's Wildlife Mitigation Plan, included in the record as Exhibit K. The stated purpose of the plan is to "completely mitigate any negative impacts on fish and wildlife resources." (Exhibit K, p. 1). ODFW found that the Wildlife Mitigation Plan would achieve that goal and would result in satisfactory wildlife habitat mitigation as required under Statewide Planning Goal 8. In addition, the BLM right-of-way approval also imposes wildlife mitigation measures that are in addition to and independent of the Wildlife Mitigation Plan. These measures are specifically designed to further lessen the impact of the access roads that the applicant proposes to construct on the adjacent federal land.

The Board finds that it is appropriate for the Board to rely on the opinion of ODFW in assessing the adequacy of the applicant's Mitigation Plan. The Board concurs with ODFW that the approved Mitigation Plan is adequate to satisfy the "no net loss or net degradation" standard in this criterion. The Board also finds that the mitigation measures required by BLM as a part of the right-of-way approvals provide further assurances that the proposal will comply with this requirement. Therefore, the Board finds that there is substantial, reliable evidence in this record from which we can conclude the applicant has met its burden of demonstrating compliance with this criterion.

E. **Important natural features, including but not limited to, significant wetlands, riparian habitat and landscape management corridors will be maintained. Riparian vegetation within 100 feet of streams, rivers and significant wetlands will be maintained. Alterations to important natural features, including placement of structures, is allowed so long as the overall values of the feature are maintained.**

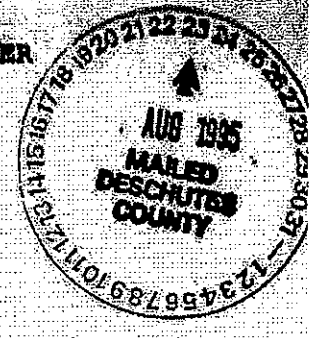
**FINDINGS:** The record indicates there are no rivers, streams, wetlands or riparian habitat on the subject property. As discussed above, aside from the northern portion of the Highway 126 Access Road, the subject property is not located in a landscape management corridor. The road is not a structure subject to building permit requirements. Therefore, the Board finds this criterion does not apply.

F. **The development will not force a significant change in accepted farm or forest practices or significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use.**

**FINDINGS:** Tax Lot 4800 is almost entirely surrounded by large parcels in federal ownership and managed by the BLM. Although this land is zoned EFU-SC, the record indicates the only agricultural activity on these parcels is intermittent cattle grazing. Moreover, the record indicates the juniper woodland on these parcels is not managed for forest use. The record indicates the two parcels to the southeast zoned SM have no farm or forest use occurring on them. Based on this evidence, the Board finds the accepted farm practices in the area surrounding Tax Lot 4800 consist entirely of occasional livestock grazing.

The supplemental narrative, pages 16 and 17, provides additional information regarding farm and forest practices on the private parcels in the vicinity of the proposed access roads. The narrative indicates that none of the parcels adjacent to the proposed access roads are currently devoted to farm or forest practices. The Highway 126 Access Road will cross BLM land abutting Tax Lots 501 and 502, which are zoned EFU-SC. However, tax lot 502 is currently vacant and Tax Lot 501 has a residence and some outbuildings, but no discernible farming activity takes place on either parcel. A small-scale farming operation exists on Tax Lot 503, separated from the access road by Tax Lot 501. Based on this evidence, the Board finds that accepted farming practices in the vicinity of the access roads consists primarily of occasional livestock grazing with a small percentage of small-scale farming.

DECISION OF DESCHUTES COUNTY HEARINGS OFFICER




FILE NUMBER: M-95-1

APPLICANT: Eagle Crest Partners, Ltd.

HEARING DATE: April 4, 1995

RECORD CLOSED: July 3, 1995

REQUEST: Approval of final master plan for the expansion of Eagle Crest Resort, as approved under conceptual master plan CU-93-94.

STAFF REVIEWER: Dale Van Valkenburg

**APPLICABLE STANDARDS AND CRITERIA:**

Title 18 of the Deschutes County Code, the County Zoning Ordinance:

Chapter 18.113, Destination Resort Combining Zone:

Section 18.113.040(B), Application Submission, Final Master Plan;

Section 18.113.080, Procedure for Modification of a Conceptual Master Plan;

Section 18.113.090, Requirements for Final Master Plan;

Section 18.113.100, Procedure for Approval of Final Master Plan;

Section 18.113.110, Provision of Streets, Utilities, Developed Recreational Facilities and Visitor-Oriented Accommodations.

Eagle Crest Conceptual Master Plan Approval, file No. CU-93-94, as amended by the Board of County Commissioners on Appeal.

Title 22, The Deschutes County Land Use Procedures Ordinance.

PL-20, The Deschutes County Year 2000 Comprehensive Plan, Goals and Policies pertaining to the siting of Destination Resorts.

**FINDINGS:**

The Hearings Officer hereby adopts the findings set forth in the Staff Report with the following modifications. In particular, circumstances regarding the sewage disposal facilities and location have changed since the Staff Report was issued.



LUBA #2008-203

00675

The Hearings Officer agrees with Staff's analysis and conclusion on the issue of locating the sewage treatment and disposal site outside of the previously approved resort boundaries. In response to the Staff Report, the Applicant revised its plans for the sewage disposal system by relocating it within previously approved resort boundaries. The Applicant has also amended their WPCF permit with the DEQ, which was still pending at the time the Staff Report was written, to reflect this change in location. The amended WPCF permit has now received final approval from the DEQ.

The amended plan approved by the DEQ and by this approval allows subsurface treatment and eventual mechanical treatment of waste water within Area 11 of Phase II. The parcel north of Highway 126, which was to serve as the site for these facilities, will instead be utilized only to discharge the treated effluent as spray irrigation on farm crops.

The Hearings Officer finds that this method of treatment and disposal is within the scope of possibilities contemplated by the Board of County Commissioners in the conceptual master plan approval, and is therefore not a modification of the conceptual master plan. The Applicant has satisfied Section 18.113.090(N) by providing a copy of the WPCF permit issued by the DEQ, and has now also demonstrated compliance with CMP conditions of approval 41, 42 and 48. By providing a copy of the deed purchasing the property north of Highway 126, the Applicant has also demonstrated a binding legal commitment to discharge the effluent on that site.

The Hearings Officer also concurs with Staff's findings on the issue of density transfer within and between Eagle Crest I and II. Since the application for CMP was submitted and approved as an expansion of an existing resort, it is reasonable to allow some expansion within both phases of the resort within the limitations of the CMP and final master plan approval. Eagle Crest I has adequate space and infrastructure capacity to handle additional timeshare units, but has reached its cap on residential units imposed under the earlier master plan approvals for Phase I. This ruling will allow the Applicant to transfer some of the additional 850 units of density approved under this destination resort expansion final master plan from Phase II to Phase I. Any of the 850 units which are transferred to Phase I will be subtracted from the total number of units which could be built in Phase II.

In response to Staff concern, the Applicant has also revised Exhibit 52, the Open Space Map for Phase I, to accurately depict and exclude areas zoned flood plain from the open space calculations. The Applicant has also revised Exhibit 39 to properly depict roadway widths within the resort.

**DECISION:**

The final master plan is approved, subject to the following conditions of approval:

1. All areas platted in Phase II and CRT for individual lots are not authorized as legal lots by this approval. The Applicant shall obtain tentative plat approval from the County Planning Division prior to platting these and other areas of the expansion areas.

2. The Applicant will be required to bond or assure improvements that are necessary for resort development, as required by DCZO 18.113.110.

3. The Applicant shall develop the sewer system in accordance with the revised sewer master plan and the WPCF permit issued by the DEQ.

4. All portions of Eagle Crest resort must be managed and operated in an integrated manner. Failure to comply with this standard will void resort approval.

5. Commercial, cultural, entertainment or accessory uses provided as part of the destination resort shall comply with the requirements of Section 18.113.070(Q). Specific determination of compliance with this condition shall be made at the time of site plan approval for each individual commercial component of the FMP.

6. Commercial, cultural, entertainment or accessory uses provided as part of the destination resort will be contained within the development and will not be oriented to public highways adjacent to the property. Commercial, cultural and entertainment uses allowed within the destination resort will be incidental to the resort itself. As such, these ancillary uses will be permitted only at a scale suited to serve visitors to the resort.

7. The Applicant and its successors shall guarantee that all open space used to meet the 50% open space requirement of the destination resort ordinance complies with DCZO 18.113.030 (E) which provides that "uses permitted in open space areas generally include only those uses that, except as specified herein, do not alter the existing or natural landscape of the proposed open space areas. No improvements, development or other alteration of the natural or existing landscape shall be allowed in open space areas, except as necessary for development of golf course fairways and greens, hiking and bike trails, lakes and ponds and primitive picnic facilities including park benches and picnic tables. Where farming activities would be consistent with identified preexisting open space uses, irrigation equipment and associated pumping facilities shall be allowed.

17. The Applicant has prepared and filed a comprehensive wildlife mitigation master plan prepared in consultation with Oregon Department of Fish & Wildlife.(applicant's Exhibit 53) that explains how each mitigation measure will be or has been assured. ODF&W agreed (applicant's Exhibit 54) that the proposed plan will mitigate all wildlife impacts. Compliance with this plan shall be a continuing condition of approval, to be enforced at the time of platting of each phase of development.

18. The Applicant shall inventory and protect all important natural features, including but not limited to, significant wetlands, riparian habitat and landscape management corridors. Riparian vegetation within 100 feet of streams, rivers and significant wetlands will be maintained. Alterations to important natural features, including placement of structures, is allowed so long as the overall values of the feature are maintained.

19. To ensure that all traffic impacts from the proposal are adequately mitigated, the following conditions shall apply:

A. The improvements required at Highway 126 and Cline Falls Highway shall be constructed and ready for use prior to any final site plan approval and/or final plat approval of dwelling units in excess of 25% of the projected Eagle Crest Phase II build-out. The exact number of dwelling units that this 25% figure represents is 212 units. Failure of the required improvements to be constructed and ready for use shall preclude any development of the resort beyond the 212 unit/25% threshold level identified herein. The phasing plan for Phase II shall be done in a manner that stopping of development at the 25% threshold would be consistent with DCZO 18.113.060(E) so that at 25% of Phase II buildout the resulting development would be consistent with all requirements of a destination resort.

In conformance with its offer to and agreement with ODOT, Eagle Crest's share of the construction costs of the bridge structure shall be 40%, and Eagle Crest shall be responsible for 100% of all other costs associated with this project, including, but not limited to right-of-way acquisition, abandonment of the existing right-of-way, permits, design and adjoining road work. Where the interchange project requires the realignment of Cline Falls Highway across Phase II property, Eagle Crest shall dedicate to the public those lands necessary to accommodate that realignment. Furthermore, any necessary interim safety improvements as determined by ODOT, such as advance warning signs with flashing lights, shall be installed at ODOT's request. The County shall not be responsible for any of the project costs.

B. Applicant shall contribute $28,000 to an ODOT fund for potential improvements at the intersection of Cline Falls Highway and Highway 20. Applicant shall make the contribution within 30 days of demand for payment by ODOT or prior to any final platting and/or site plan approval beyond 25% of the projected Eagle Crest

this condition shall be determined at the time of site plan review for the new golf course.

37. The Applicant shall design and install fences or other buffers between the proposed golf course and adjacent residential property that is not part of the resort, unless an owner of such property requests in a signed writing that buffering not be provided. Compliance with this condition shall be determined at the time of site plan review for the new golf course.

38. The applicant shall submit, at the time of tentative plat review for each plat, a Title Report for the subject property to show evidence of clear, marketable title and that no encumbrances exist on the areas being dedicated as open space or being developed with resort recreational facilities or sewer or water utilities. If any encumbrances exist, they shall be removed prior to acceptance by the County, unless otherwise approved by the Board of County Commissioners.

39. Any timeshare units not included on the FMP or on individual plats shall be subject to approval under the conditional use criteria set forth in DCZO Chapter 18.128.

40. If reviewing compliance with any condition requires the exercise of factual or legal discretion by the Planning Director or his representative, such as review of the wildlife mitigation plan, such compliance decisions shall be regarded to be land use decisions, subject to notice, and with hearing and/or appeal rights under the County's land use procedures ordinance.

41. This final master plan shall be valid for a period of two (2) years, in which the Applicant must initiate development under the approval. Extensions may be granted pursuant to Title 22 of the County Code.

Mailed this 23rd day of August, 1995.

Christopher C. Eck, Hearings Officer

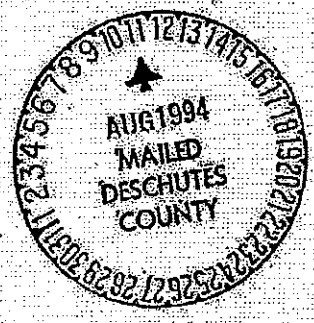
**THIS DECISION BECOMES FINAL TEN (10) DAYS AFTER MAILING, UNLESS APPEALED**

# FINDINGS AND DECISION

File Nos.: A-94-1, A-94-2; Appeals of V-93-28 and CU-93-94

Hearing Dates: April 6, 1994 and April 25, 1994

Record Closed: May 2, 1994




Applicant: Eagle Crest Partners, Ltd.
Post Office Box 1215
Redmond, Oregon 97756

Property Owner: Eagle Crest Partners, Ltd.

Request: Appeal of the Hearings Officer's Decision of Approval of File No. CU-93-94 for a destination resort conceptual master plan and denial of Variance No. V-93-28 for a reduction of the road setbacks for several areas around the perimeter of the resort.

Staff Review: Dale Van Valkenburg, Associate Planner and George Read, Planning Director.

Findings:

1. Background

On January 13, 1994, the Hearings Officer issued a 170-page decision approving the Applicant's request for a conditional use permit for a destination resort conceptual master plan (CU-93-94), but denying the Applicant's request for a variance (V-93-28). The decision contains 74 conditions of approval.

On January 24, 1994, the Applicant submitted timely appeals of the Hearings Officer's decision on V-93-28 and CU-93-94. Appeal File A-94-1 corresponds to the appeal of Variance File V-93-28. File A-94-2 corresponds to the appeal of Conditional Use File CU-93-94. The Applicant submitted separate burden of proof statements addressing each appeal.

The Board of Commissioners held public hearings on April 6, 1994 and April 25, 1994, and received oral and written testimony.

2. Variance

The Applicant has requested approval of a variance to allow certain sections of roadway and bike path around the existing golf course on the Phase II (located in Areas 1, 2, 8, 9, 10, and 11 on the Eagle Crest II Preliminary Master Plan Map) property to encroach into the 100 foot perimeter setback for roads, and 50 foot setback for golf courses and jogging and bike trails



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However, no increase in water usage from the Phase I wells will occur in association with the proposed development. Consistent with Section 3.1 above, the Board finds that these wells are not subject to the requirements of Section 18.113.070(K). Accordingly, Condition #47 of the Hearings Officer's decision has been eliminated in this decision.

3.3 Sewage Disposal

3.3.1 The applicant requested that Condition #6 of the Hearings Officer's decision be deleted. Condition #6 reads:

> "The Applicant shall revise its sewer master plan (to) provide greater detail about the specifications of the proposed sewer system prior to FMP approval. That document shall include plans for stormwater collection and disposal for the entire resort and shall indicate where all sewage system facilities will be located."

The applicant has since revised its proposed sewer system, as demonstrated in Exhibit # 97, and that system has received preliminary approval from DEQ. The Board finds that the revised plan eliminates the need for Condition #6 but that the applicant should be required to develop its sewer system in accordance with the revised master plan. Condition #6, renumbered here as Condition #5, has been revised accordingly.

3.3.2 The applicant requested modifications to conditions of approval #51 through #58 of the Hearings Officer's Findings and Decision. These conditions of approval all relate to the subsurface sewage disposal system. The approval criterion to which these conditions relate is Section 18.113.070(L). This criterion requires that the waste water disposal plan include beneficial use to the maximum extent practicable. It also requires that approval be conditioned upon the applicant applying for and receiving approval of a Water Pollution Control Facility (WPCF) Permit from the DEQ. The Board finds that the Applicant's proposed modifications to Hearing Officer Conditions #51 through 58 are consistent with the method of sewage disposal proposed by the applicant. Those conditions, renumbered in this decision as Conditions #41 through 51, have been modified in this decision as proposed by the applicant.

3.4 Wildlife

3.4.1 The applicant requested that Condition #35 of the Hearings Officer's decision be deleted. Condition #35 requires the applicant to study the wildlife impact of Eagle Crest Phase I, and to mitigate any negative impact on wildlife habitat caused by the resort. This condition was imposed by the Hearings Officer in accordance with Section 18.113.070(D). The Board agrees that

Condition #35 should be deleted for the following reasons: First, consistent with Section 3.1 above, the applicant is only required to mitigate impacts on habitat from future proposed development in Phase I and Phase II. Second, the applicant submitted substantial additional expert testimony indicating that proposed mitigation measures can more than offset the loss of wildlife habitat from Phase I and Phase II development. The Board finds the expert testimony by A.G. Crook Company credible, and concludes that the requirement for complete mitigation can be satisfied by a combination of the mitigation measures set forth in Condition #37 of the Hearings Officer's decision.

3.4.2 The Board further finds that because all of those mitigation measures may not be required in order to achieve complete mitigation of impacts on wildlife habitat, Condition #37 of the Hearings Officer's decision has been reworded to state that the mitigation measures may (rather than shall) be completed or adequately assured prior to final master plan approval. The Board anticipates that the applicant will work with ODF&W to reach agreement on an appropriate mitigation plan. That plan will be subject to public notice and hearing at the time of Final Master Plan review. A requirement to that effect has been included as part of Condition #64 of this decision.

3.4.3 Finally, the Board finds that the proposed expansion will not have an impact on the Deschutes River fishery. The evidence submitted by the applicant, which the Board finds convincing, demonstrates that the Phase II groundwater wells will withdraw water from a regional groundwater system that flows northerly, and intersects the Deschutes River over a long reach, in the vicinity of Lake Billy Chinook. The water bearing zones of the Eagle Crest wells would intersect the surface water system under Lake Billy Chinook. Where this water bearing zone would intersect the surface water system, all minimum instream flows are met. Therefore, the groundwater withdrawals will not affect the Deschutes River Fishery.

3.5 Transportation

3.5.1 Section 18.113.070(G) reads in relevant part:

> "Destination resort developments which significantly affect a transportation facility shall assure that the development is consistent with the identified function, capacity and level of service of the facility."

The ordinance gives an applicant several options for assuring that this criterion is met, including limiting the development and providing adequate facilities.

3.5.1.1 Transportation Facilities Significantly Affected

Oregon

DEPARTMENT OF
FISH AND
WILDLIFE

Central Region Office

5 December 1994

Deschutes County Commission
1130 N.W. Harriman
Bend, OR. 97701

Re: Eagle Crest Phase II Wildlife Mitigation

Dear Commissioners,

Attached is a copy of Eagle Crest's Phase II Wildlife Mitigation Plan on which Eagle Crest and the Oregon Department of Fish and Wildlife (ODFW) have come to consensus. Evaluation of impacts to the wildlife resource was complex and as you will see, resulted in the crafting of creative as well as complex mitigative solutions. This in turn brought about a mitigation plan that is predominantly a framework instead of a finished product. Much work still needs to be done to assure wildlife mitigation is accomplished. In particular, during final master plan approval a ruling will need to be made as to the appropriateness of the proposed mitigation measures. Additionally, if the proposed mitigation measures are approved we will be looking for your support to see that there is an avenue for implementation.

Before we discuss the plan in more detail, we want to express our thanks for the opportunity to work with you and your planning staff on this important land use proposal. All of our interactions with the County have left us with the understanding that the Commission will support a fair and equitable solution that will serve the interests of Deschutes County residents. Following is a brief discussion of our view of the Eagle Crest Phase II Wildlife Mitigation Plan.

## DISCUSSION - EAGLE CREST PHASE II WILDLIFE MITIGATION PLAN

Recently, Eagle Crest and ODFW collectively struggled with a subjective evaluation of wildlife habitat occurring on Eagle Crest Phase II lands. Our goal was to come up with a fair and equitable mitigation package for those charged to ensure Eagle Crest's development and those charged to maintain wildlife values for citizens of Deschutes County and the State of Oregon. What we have settled on is a package we feel both parties can agree on and upon which we can move forward.

In review of Eagle Crest's proposed mitigation package, if we just used the wildlife habitat evaluation figures and direct biological assets, we felt we needed more biological mitigative value. But when we weighed the scope and long-term values associated with the package along with Eagle Crest's perceived sincerity in wanting to implement the mitigative measures as a Community Leader, we felt the package was sound.

61374 Parrell Road
Bend, OR 97702
(503) 388-6363
FAX (503) 388-6281

Given our perception of Eagle Crest's posture, we feel we can work with Eagle Crest and associates to enhance fish and wildlife values provided in the mitigation package by jointly espousing a common goal of working together to achieve respective interests. In particular, through communication and collaboration with Water Resources, Irrigation Districts, Key Community Leaders and Constituents, Eagle Crest will be putting 7.7 cfs of water back into the Deschutes River from the North Canal dam down to Eagle Crest and will allow 4.45 cfs to continue down river below Eagle Crest without withdrawals in perpetuity. Through this action of water conservation, Eagle Crest will be taking a major role in establishing a framework to increase Deschutes River flows for conservation of aquatic resources and enjoyment by Deschutes County residents and other visitors.

We purposely left to Eagle Crest the choice of methods applied to assure that 7.7 cfs of water was placed back into the Deschutes River and 4.45 was allowed to continue down river without withdrawals in order to assure maximum flexibility on their and your behalf. Whether it is appropriate for Eagle Crest to purchase water rights and lease them back to the Deschutes Mitigation and Enhancement Committee for instream uses, or to provide funds to adequately purchase water rights for the 2 cfs diversion rate to the Deschutes Mitigation and Enhancement Committee in lieu of the actual purchase and transfer we felt should be left up to your discretion (See V. Mitigation Plan - Deschutes River Increased Flows: B, 2) & 3). Our decision is based on our understanding that our charge is to determine the scope of mitigation necessary (7.7 cfs back into the river), not the method applied to accomplish it, regulatory language to assure it, or who should pay for it.

Furthermore, Eagle Crest has agreed to work with BLM to close 1500+ acres of BLM land west of Eagle Crest to motorized vehicles as a means to retard active deterioration of the adjacent landscape. They have agreed to develop and implement an educational/interpretive program on BLM's adjacent land, that describe the subtle values of old growth juniper woodlands to Deschutes County residents and other Central Oregon visitors. And they have agreed to install and maintain two water sources on adjacent BLM land to increase jackrabbit and small mammal populations as a forage base for the pair of golden eagles nesting up river from Eagle Crest.

By implementing these mitigation measures we feel a base will be established from which to build future fish and wildlife practices and programs in Deschutes County. If this occurs, the face value of the mitigation package will have been exceeded, thereby providing Deschutes County residents with fair and equitable wildlife mitigation.

Once again, if the above mitigation measures are approved, we will be looking for your support when working with BLM, Water Resources, Irrigation Districts, and Key Community Leaders to assure there is an avenue to implement those approved measures.

Sincerely,

Glen Ardt
Regional Wildlife Habitat Biologist

cc: Eagle Crest c/o W&H Pacific
Dale Van Valkenburg, Deschutes County Planning Division

# EAGLE CREST PARTNERS, LTD.
# WILDLIFE MITIGATION PLAN

Revised October 31, 1994

## I. LOCATION:

This mitigation plan encompasses the proposed expansion of the existing Eagle Crest destination resort, described in the attached exhibit. The proposed expansion includes Canyon River Territories and Eagle Crest II.

## II. PURPOSE:

"Developer" intends to expand the existing Eagle Crest destination resort under the terms and conditions of the conceptual master plan approval, granted by the Deschutes County Commission on May 4, 1994. Under the terms of the approval and the underlying Deschutes County destination resort ordinance (Title 18.113 Deschutes County Code), the "Developer" must completely mitigate any negative impact on fish and wildlife resources.

## III. LAND INVENTORY:

Eagle Crest II encompasses approximately 710 acres and the Canyon River Territories expansion encompasses approximately 35 acres.

## IV. FINDINGS:

Significant assessments and reviews have been completed by "Developer". This mitigation plan is supported by the following findings.

A. "Developer" retained Beak Consultants, in April of 1992, to complete the Eagle Crest II Destination Resort Wildlife Assessment.

B. "Developer" retained A.G. Crook Co., in 1994 to complete additional wildlife assessments.

C. The Oregon Department of Fish & Wildlife, "Department" has conducted field inspections, reviewed assessment reports, and participated in extensive reviews and evaluations.

D. "Developer" and "Department" have a common goal to protect and enhance wildlife use at Eagle Crest and adjacent lands for the benefit of Eagle Crest guests and the residents of Oregon.

E. Prior to development, the Eagle Crest II lands were one of many gateways to thousands of acres of public lands, many of which were heavily impacted by roads, trails, dump sites, and human activity. Abuses included target practice, random dumping of garbage, scarring by all-terrain vehicles, destruction of native vegetation and landscapes, erosion, and stress to wildlife.



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F. No wetlands or riparian areas are located within the project site.

G. No significant rock outcrops occur in the project area.

H. No threatened or endangered species are present.

I. No designated sensitive bird or mammal habitat areas occur within the project boundaries, and none were observed during wildlife assessments. ODF&W personnel believe pygmy nuthatches and loggerhead shrikes may occur.

J. The project area is not within the designated deer winter ranges or deer migration corridors. The nearest designated deer winter range is approximately 4 miles away.

K. Approximately 745 acres are included in the proposed Canyon River Territories and the Eagle Crest II expansions. The following vegetative cover types will be retained or provided.

1. Approximately 127 acres will remain in an undisturbed condition in large tracts.

2. Approximately 109 acres of enhanced native vegetation will be retained within street rights-of-way and within residential lots.

3. Approximately 70 acres will be revegetated or remain natural in various smaller sections.

4. Approximately 219 acres will be converted to irrigated fairways, interspersed throughout the entire development.

5. Approximately 5 acres will be developed with ponds, lakes, and water features.

6. Approximately 112 acres will be landscaped in lawns, shrubs, and similar planting beds dispersed throughout the proposed development.

7. Approximately 103 acres will be converted to roadways, parking areas, and buildings.

L. The development of Eagle Crest will restrict damaging vehicle access on approximately 9,200 lineal feet of Cline Falls Road frontage, assisting in the protection of hundreds of acres of Eagle Crest and adjacent Bureau of Land Management lands.

M. Eagle Crest Resort is located less than 1 mile from the City of Redmond UGB and urban growth and expansion between Eagle Crest and Redmond is anticipated.

N. On May 4, 1994, the Deschutes County Commission concluded 1) wildlife impacts from the expansion of Eagle Crest can be mitigated, 2) mitigation responsibilities of "Developer" are limited to the undeveloped portions of Eagle Crest I and Eagle Crest II, and 3) the withdrawal of groundwater for the resort expansion will have no impact on the surface water flows of the Deschutes River.



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O. On April 20, 1994, the Oregon Water Resources Commission found the proposed groundwater use at Eagle Crest will not have the potential for substantial interference with the Deschutes River.

P. Summertime instream flows in the Deschutes River, below the City of Bend, typically decrease to a flow level of 30 cfs. Increased flows in the Deschutes River are a primary objective of the "Department", the Confederated Tribes of the Warm Springs Reservation, and numerous other organizations. The increased flow is important for the fishery, as well as the riparian zone along the river.

Q. Enhancement of existing juniper forest habitat on private and public lands is an important objective of "Developer" and "Department". Enhancement will occur through road closures, development and implementation of an interpretive/educational juniper woodland program, and installation of two water supplies on adjacent BLM lands.

V. MITIGATION PLAN - Deschutes River Increased Flows:

A. "Developer" offers a combination of water rights and significantly increased flows between Bend and Eagle Crest, but also below Eagle Crest. "Developer" has already purchased Swalley irrigation water rights, which will allow the delivery of 5.7 cfs surface water in the river, between Bend and Eagle Crest. At Eagle Crest, 3.25 cfs will be withdrawn for irrigation. The remaining 2.45 cfs will continue down the river. In addition, Eagle Crest will procure an additional 2 cfs of surface water rights, ~~from the north canal or above to continue downriver without withdrawals~~. During the summer season, the combination of these water rights represent a ±26% increase in instream flows for the ±18 mile reach between Bend and Eagle Crest. Water rights also represent a ±15% increase in low summertime flows in the reach below Eagle Crest. Eagle Crest will be responsible for the procurement of the water rights and completion of the required transfers, if applicable. Eagle Crest may procure rights in phases, proportionate to development.

B. Water right transfers as described may be complex and will be accomplished in one of several ways at "Developer's" discretion, 1) Water rights may be purchased and delivered in the Deschutes River, as is the case with the existing Swalley Water rights, 2) Water rights may be purchased and leased to the Deschutes Mitigation and Enhancement Committee for instream uses, and 3) Funds, adequate to purchase water rights for the 2 cfs diversion rate, may be paid to the Deschutes Mitigation and Enhancement Committee in lieu of the actual purchase and transfer. "Developer may pay the full amount necessary to purchase remaining water rights at any time prior to, but not later than required to maintain mitigation proportional to the level of development. "Developer" payments shall reflect the current price of water rights, as determined by the Deschutes Mitigation and Enhancement Committee.

C. "Developer" shall pay an additional amount to the Deschutes Mitigation and Enhancement Committee, adequate to capitalize current annual water delivery fees for applicable rights.



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## VI. MITIGATION PLAN - Juniper Forest Habitat Enhancement:

A. Improvements may include a fence for access control. The fence will be built with smooth wire with the ground wire a minimum of 18" off the ground and the top wire a maximum of 42" above the ground.

B. "Developer" will develop an educational program for resort visitors primarily on adjacent BLM land. The educational program will include descriptive brochures, interpretive hiking trails, a wildlife water supply, observation/photographic blinds, and displays on the upland desert habitat values and relationships. The educational program will take advantage of the unique juniper woodland habitat.

Trail brochures with corresponding numbered interpretive sites would be established along existing trails (roads). A water supply would be installed to act as a wildlife magnet for visitor enjoyment and understanding of juniper woodland wildlife. Monitoring to assess trail use conflicts would need to be done, or up-front trail use designation would need to be instituted to avoid the establishment of conflicting uses (i.e., mountain bike riders and horseback riders; interpretive trail walkers and mountain bike riders/horseback riders). The design of the educational program could be patterned after Sunriver's highly successful program which has provided many of Sunriver homeowners a focus and a participatory role while providing recreational and educational opportunities for Bend residents and those visiting Sunriver.

C. "Developer" will construct two wildlife water supplies, in a location that will increase the prey density for golden eagle foraging. Water developments are expected to be located on BLM lands and might be used to enhance the education program.

D. "Developer" will work with BLM, with support from ODF&W, to close ±1,500 acres of BLM lands to motorized vehicles, adjacent to Eagle Crest. "Developer" will work closely with BLM to establish access control signs and barricades to prevent further degradation from motor vehicles. Noxious weed control will be completed if necessary and some reseeding of severely damaged areas may occur.

E. As the expansion of Eagle Crest grows and a reasonable number of homeowners (±25% buildout) exist, "Developer" will establish a Homeowner's Association Committee to provide recommendations and advice on the wildlife educational program and continued work on enhancement activities. The intent will be to establish interest and commitment on the part of the Homeowners Association to expand and enhance these programs.

F. Poisonous baits that could cause secondary wildlife poisoning or reduced non-target wildlife production will not be used to control rodents using the golf course.

G. "Developer" will be responsible for any wildlife damage associated with the development.

## VII. AGREEMENTS OF THE "DEPARTMENT":

The "Department" will support "Developer", in the procurement of water rights to increase Deschutes River instream flows, through participation in work sessions, hearings, presentations, or similar events.



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The "Department" will support "Developer" in presentations to the Bureau of Land Management to allow enhancement programs on BLM lands.

The "Department" will provide "Developer" a list of seeds recommended to restore severely damaged areas.

The "Department" will support "Developer" in preparation of educational brochures, interpretive hiking trails, plans for observation/photographic blinds, and displays of upland desert values and relationships.

The "Department" will assist "Developer" in the design and location of two wildlife water supplies, located on adjacent BLM lands.

The "Department" will support "Developer" in presentations to BLM and technical justification to pursue closure of adjacent BLM lands to motorized vehicles.

The "Department" as possible and deemed appropriate, will work with Eagle Crest to encourage the appropriate Eagle Crest Homeowner's Association Committee to continue and expand education programs and continue juniper forest enhancement activities.

VIII. TERM:

The conditions of this agreement will extend from the filing of the first residential plat at Eagle Crest II or Canyon River Territories and terminates upon completion of the final residential plat for Eagle Crest II or Canyon River Territories. This agreement shall be binding upon the successors and assigns of Eagle Crest Partners Ltd., if applicable. Upon completion of the mitigation plan, under the terms of this agreement, "Developer" has conformed with the requirements of Deschutes County, as stipulated in the purpose.

If any of the proposed mitigation measures are unable to go forward as agreed, Eagle Crest will renegotiate those mitigative measures with ODF&W and Deschutes County before further development occurs, or as they correspond to an appropriate phase of development.

IX. TERMINATION:

This agreement may be terminated or amended by mutual agreement of Eagle Crest Partners, Ltd, any successors or assigns, and Deschutes County.

DEVELOPER

Joel E Andre

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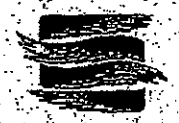
# Eagle Crest Expansion
# HEP Analysis

Prepared for

**Eagle Crest, Inc.**

Prepared by



**Shapiro and Associates, Inc.**

**April 5, 1999**

**EXHIBIT 20**

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## 1.0 INTRODUCTION

The Eagle Crest III site is located on the northern and western slopes of the Cline Butte, south of Highway 126 and approximately 8 miles west of the town of Redmond, in Deschutes County, Oregon (Township 15; Range 12; Section 16). Land adjacent to the site is either privately owned and managed or managed by the Bureau of Land Management (BLM). The site is within the Columbia Basin Province as described by Franklin and Dyrness (1988).

Shapiro & Associates, Inc. (SHAPIRO) was retained by Eagle Crest Incorporated to prepare a wildlife habitat assessment for the Eagle Crest III site. The purpose of the assessment is to describe the physical condition of wildlife habitat on the site as well as provide an assessment of habitat function for several wildlife species and guilds that may use the site. The descriptive account that follows supplements the findings of a Habitat Evaluation Assessment (HEP; U.S. Fish and Wildlife Service [USFWS], 1976) conducted on the Eagle Crest III site during February 1999 (Section 5.0). The results of the analysis will be used to inform and guide mitigation and restoration activities that are proposed as elements of the Eagle Crest III Master Planned Resort.

## 2.0 METHODS

In February 1999, wildlife biologists from SHAPIRO conducted field surveys at the Eagle Crest III, Eagle Crest I, and Eagle Ridge sites as part of a HEP analysis being conducted for the proposed Eagle Crest III project. The approach to field survey and data collection resulted in the majority of the site being visited and accommodated development of both qualitative and quantitative assessments of site condition.

Field data were used to develop an index of habitat suitability that was then used in the HEP for the Eagle Crest III site. Surveys conducted at Eagle Crest I and Eagle Ridge supplemented the data collected at Eagle Crest III and provided a measure of site condition of areas developed for multiple residential and resort recreation uses. Indices of site condition were used to compare and contrast elements of habitat suitability in developed and undeveloped areas. Results of the HEP, field survey methods, and assumptions used in that analysis are described in detail in Section 5.0. Information presented in Sections 3.0 and 4.0 is intended to supplement the HEP analysis and is based on observations made during the February 1999 sample period.

## 3.0 SITE DESCRIPTION

Although the Eagle Crest III site would be characterized as undisturbed, a network of dirt roads, which are a consequence of unregulated off-road vehicle use of the site, criss-cross the area. A power transmission line right-of-way (ROW) extends from east to west through the middle of the site and a second transmission line ROW parallels the southern boundary of the site. The site appears to have been grazed by cattle at some time in the past, but no recent evidence of grazing was observed during 1999 field surveys.

## 3.1 Topography

The project area is located on the northern and western slopes of the northern Cline Butte. The upper slopes of the site are steep, typically greater than 25% slope, but transition to shallower grades on the valley floor. A ridge, which runs north from the center of Cline Butte, bisects the western portion of the site. The majority of the site and the area proposed for the Eagle Crest III development is located on the mid slopes and valley floor, which range in slope from 2 to 8%. Shallow, typically broad draws and hummocks create a rolling terrain that characterizes the mid slopes, while the lower valleys have very little topographic relief. The lower valleys are characterized by relatively constant gentle slopes that trend to the north and west. Volcanic rock outcrops and several steep, short, rock bluffs occur in the northern portion of the property.

## 3.2 Hydrology

No natural surface water features were observed on the site during the February site visit. Deep ruts in the roads ponded water in several places, but only in places where the soils did not drain or the ground was frozen. No erosion or other signs of surface runoff were observed in these draws. One short, eroded rill coming off the northern slope of Cline Butte and running along the southern property boundary was observed during the February field visit. It appeared that ruts caused by off-road vehicle use serve as conduits for surface runoff and erosion in the area.

## 3.3 Vegetation

The site occurs within the Western juniper (*Juniperus occidentalis*) vegetation zone. The juniper/sagebrush/bunchgrass (*Juniperus/Artemisia/Agropyron*; Franklin and Dyrness, 1988) plant community appears to dominate the site, with plant species that are both structurally and floristically typical of vegetation of that community. Plant species observed on the site are listed in Appendix A.

Junipers on the site are widely spaced, with a canopy cover of approximately 30%. Trees are generally mature, with an average diameter at breast height (dbh) of approximately 12 inches. Several trees greater than 40 inches dbh were observed. Several trees with dead tops were observed, but snags were rare. Coarse woody material was also rare and generally consisted of trees that had been cut and left on the ground or large broken limbs.

The shrub layer is dominated by big sage (*Artemisia tridentata*). Other common shrub species that occur across the site include rabbitbrush (*Chrysothamnus* spp.) and three-tipped sage (*A. tripartita*). Shrub distribution across the site is patchy and shrub stands are punctuated by areas of open or bare ground. Dense stands of sagebrush occur in larger openings between juniper trees. Individuals of these species are typically greater than 3 feet in height which contributes to a relatively dense mid-story vegetation layer.

Herbs and grass are also sparsely distributed across the site. Bluebunch wheatgrass (*Agropyron spicatum*) and cheatgrass (*Bromus tectorum*) are the most common grass species that occur on the site. Other grass and herb species are present; however, the vegetative state of this material made identification impossible.

Throughout most of the site, individual juniper trees have been cut down, and the wood removed. Much of the wood gathering activity appears to have been concentrated in areas where roads offer easy access to the site. Several small burned-over areas also were found on the site. Some of these appear to be the result of slash burns, while others appear to be a result of small, isolated fires.

### 3.4 Wildlife

Because the site represents a single contiguous habitat type, it is expected that wildlife observed in one area of the site most likely occurs in other areas of the site. In fact, most wildlife species observations for the site were noted in several different areas. Wildlife species observed during the February 1999 field surveys are listed below.

| Common Name | Scientific Name |
|---|---|
| **Avian** | |
| American crow (v) | *Corvus brachyrhynchos* |
| Golden eagle (v) | *Aquila chrysaetos* |
| Red-tailed hawk (v) | *Buteo jamaicensis* |
| **Mammals** | |
| Black-tailed jackrabbit (v) | *Lepus californicus* |
| Mountain cottontail (t) | *Sylvilagus nuttallii* |
| Coyote (t) | *Canis latrans* |
| Mule deer (v) | *Odocoileus hemionus hemionus* |
| Mice/voles (t) | |
| Red fox (t) | *Vulpes vulpes* |
| Woodrat (t)(n) | *Neotoma* sp. |

**v=visual, t=tracks, n=nest, as primary identification**

The list most likely under-represents the diversity of species that use the site for some or all of their life needs. The large size of the site, the larger contiguous plant community, and the vegetative stage of succession provides habitat for a wide variety of wildlife. Other species that are commonly associated with juniper/big sage communities are listed in Appendix B. It is likely that all the species listed in Appendix B occur on the site during some period of the year, and may be found in association with large boled junipers, mature sagebrush, rock outcrops, or cliffs.

## 4.0 DISCUSSION

The Eagle Crest III site is part of a larger, mature *Juniperus/Artemisia/Agropyron* plant community. Most of the site appears to be relatively undisturbed by human activity; however, the magnitude of effect of off-road vehicle use, cattle grazing, and other human use cannot be fully assessed. As a consequence, the effects of human activity on wildlife in the area is poorly understood. Human activity may cause animals to avoid certain areas, concentrate activities in other areas, and/or expend energy moving away from the disturbance.

## 5.0 HABITAT EVALUATION PROCEDURE

### 5.1 Background

Prior assessment of wildlife habitat suitability in the vicinity of the Eagle Crest III site (Figure 1) revealed that the potential for wildlife production in the area is somewhat limited. These findings, which were concluded from data collected for the Eagle Crest I resort prior to development of that site relate to the lack of wetland or riparian habitat in the area; lack of unique habitat features, such as snags and downed logs; and lack of contiguous or uninterrupted habitat for migratory species.[1] The Eagle Crest III site is similar in character to the Eagle Crest I site, however, the Eagle Crest III site is unique in the distribution of mature junipers across the area.

Conclusions regarding habitat suitability of the Eagle Crest I site were based on reconnaissance level surveys that supported a qualitative description of habitat availability, species composition of vegetation, and vegetative structure and diversity. Although this approach referenced the USFWS HEP, a systematic survey of habitat was not completed. In order to develop a more quantitative assessment of habitat potential in the area of the proposed Eagle Crest III development, SHAPIRO conducted a systematic survey of habitat according to USFWS guides for use in a HEP assessment.

SHAPIRO anticipated that the primary effects of development at the Eagle Crest III site would be related to habitat loss or conversion, human disturbance, and potential loss of prey base. Specifically, habitat loss or conversion would be related to alteration of habitat structure or species composition of vegetation or the addition or subtraction of water to the site. Human disturbance would be related to increased traffic, interruption of migration corridors, or alteration of the soil component of habitat. Finally, the potential loss of prey base would relate to the physical alteration of vegetation structure and/or disturbance of the soil component of habitat.

SHAPIRO proposed an analysis using species whose life needs reflect a relationship to the special features of habitat including vegetation species diversity, vegetation structure and cover, the availability of water, and the interspersion of various habitat types. Specifically, SHAPIRO included models for big game (mule deer), song birds (song sparrow [*Melospiza melodia*]), and raptors (ferruginous hawks [*Buteo regalis*]) that either occur within the project area or rely on the structural components of habitat that would be altered as a consequence of site development.

The purpose of the HEP approach is to develop an index of an area's habitat suitability for wildlife based on the structural and floristic components and special features of habitat. Special features might include the presence or absence of water, roads, or structures. The structural components of habitat might include shrub height, grass height, or stand size. The floristic components of habitat might include vegetation species diversity, percent cover of vegetation, or the presence or absence of palatable and unpalatable vegetation species.

[1] Analysis of wildlife impacts has been completed previously for the Eagle Crest project area. These analyses include reviews by Deschutes County, the Oregon Department of Fish and Wildlife, the Bureau of Land Management, Beak Consultants, W&H Pacific, the A.G. Crook Company, and Shapiro & Associates, Inc.

The present HEP analysis relied on a systematic survey of various habitats (e.g., shrubland, grassland) within the proposed Eagle Crest III project area. In addition, the Eagle Ridge (Figure 2) and Eagle Crest I (Figure 3) sites were systematically sampled to develop an index of habitat suitability representing the potential given a "developed" site condition.

## 5.2 Model Selection

SHAPIRO included models for big game (mule deer), song birds (song sparrow), and raptors (ferruginous hawks) that commonly occur or historically occurred throughout the Western juniper vegetation zone. The following section discusses life requisites of mule deer, song sparrow, and ferruginous hawks, model variables that are used to develop indices of habitat suitability, and the analytic approach.

### 5.2.1 Mule deer

Mule deer were selected for HEP analysis because they commonly occur throughout the proposed project area and are frequently observed on the Eagle Crest I and Eagle Ridge developments. Mule deer are tolerant of and adapt to human disturbance, adjusting habitat use based on the type, degree, and frequency of disturbance in a given area. Mule deer forage on shrubs, consuming "browse" with greater regularity than grasses or forbs. Mule deer diet varies based on the abundance and distribution of common forage species. Deer forage habitat is generally "open" (e.g., less than 60% canopy closure of trees and shrubs), with foraging potential influenced by the availability of hiding cover (e.g., vegetation capable of hiding 90% of a deer) in proximity to foraging habitat. Although the *Juniperus/Artemesia/Agropyron* vegetation association lacks significant hiding cover, the Eagle Crest III site is an exception and affords hiding cover among the large shrubs and junipers that are interspersed across the site. Thermal cover is also limited in the vegetation association, although again large junipers provide some protection from extremes in temperature and precipitation.

The interspersion of foraging and hiding habitats affects the time and energy deer expend foraging and hiding and affects deer use of these habitats. As the size of forage and cover areas increases, use of the "core area" of these habitats decreases. Deer use of forage and hiding cover also declines in relation to other factors that limit or prohibit deer movement through these areas (e.g., roads, slash depth). Slash depth on the proposed Eagle Crest III, Eagle Ridge, and Eagle Crest I sites was generally not measurable, and so is not presumed to present an impediment to deer use of foraging or hiding cover. Road density on the Eagle Ridge and Eagle Crest I sites was high and likely contributes to avoidance or interruption of deer use of these areas. It is expected that development of the Eagle Crest III site would result in road densities similar to those measured on the Eagle Crest I and Eagle Ridge sites.

deer will avoid

**Model Overview**

The mule deer model considers forage and cover, and other limiting factors (e.g., roads, slash depth, winter stress) that influence deer use of an area. The Eagle Crest III, Eagle Ridge, and Eagle Crest I sites were evaluated for habitat suitability based on forage and hiding cover and other limiting factors. Formulas for calculating the habitat suitability of thermal and optimal cover, which are also important components of deer habitat, are more applicable given a

west-side, forested condition and were dropped from the analysis. The analysis targets habitat suitability based on foraging and hiding cover during the 182-day non-critical winter period. The model was used to evaluate habitat suitability for deer within shrubland and grassland that dominate portions of the Eagle Crest III, Eagle Ridge, and Eagle Crest I sites.

**Habitat Suitability Index**

The Habitat Suitability Index (HSI) developed to quantify habitat suitability of an area for deer is based on the interaction of forage and hiding cover, the interspersion of foraging and hiding habitats, mean slash depth, and road density. The deer model is compensatory and compensates for low variable values of habitat suitability by weighting higher variable values for certain components of habitat (USFWS, 1981).

**Model Variables Included in the Analysis**

$V_1$ percent herbaceous cover
$V_2$ percent grass cover
$V_3$ percent shrub cover
$V_4$ mean distance of forage to cover
$V_5$ mean distance of cover to forage
$V_6$ mean slash depth
$V_7$ road density,

**where the HSI is based on:**

Foraging habitat $H_f \times A_f \times T_1 = W_f$
Hiding habitat $H_h \times A_h \times T_1 = W_h$

**where**

$H_f = [((V_1 \times V_2^2)^{1/3} \times V_3 \times V_5 \times V_6 \times V_7)]^{1/2}$
$A_f$ = area of shrubland, grassland, agricultural land
$T_f$ = time foraging cover is available during the 182-day non-critical winter period
$W_f$ = foraging cover habitat equivalent

**and**

$H_h = [((V_1 \times V_2^2)^{1/3} \times V_4 \times V_5 \times V_6 \times V_7)]^{1/2}$
$A_h$ = area of shrubland
$T_f$ = time hiding cover is available during the 182-day non-critical winter period
$W_h$ = hiding cover habitat equivalent

**where**

$W_f + W_h = HE_w$

**and the HSI becomes the ratio of:**

$HE_w$:$HE_s$

**where**

$HE_w$ = total foraging and hiding cover habitat equivalents available during the 182-day non-critical winter period.
$HE_s$ = maximum habitat equivalent during the 182-day non-critical winter period that assumes all variables $I_1$ through $I_6$ equal maximum suitability (e.g., 1.0).

### Special Considerations

Percent canopy cover of vegetation is used to "generalize" the abundance of plants available for deer foraging. Shrubs below 2 meters in height are included in the shrub measurement. On the Eagle Crest III, Eagle Ridge, and Eagle Crest I sites, average shrub height was generally below 2 meters. Slash depth across each of the sites was not measurable, so mean slash depth was assumed to be zero with a habitat suitability of 1.0 or the maximum suitability. Although disturbance from roads varies with the intensity of road use, all roads open to vehicular travel were included in the model analysis. The variable measure for road density is based on the miles of road per square mile. The estimate for the developed condition was based on an average of the miles of road per square mile measured on the Eagle Ridge and Eagle Crest I sites. The estimate for the undeveloped condition was based on the miles of road per square mile measured across the Eagle Crest III site.

## 5.2.2 Song sparrow

Song sparrows were selected for HEP analysis because they commonly occur throughout the proposed project area and are frequently observed on the Eagle Crest I and Eagle Ridge developments. Song sparrows occupy a variety of habitats, remaining within their territorial boundaries if sufficient food and cover is available. Song sparrows forage on the ground, in "edge" habitat, and in grasslands adjacent to shrub cover.

Low, dense thickets of shrubs and tall grass and weeds provide suitable habitat for song sparrows. Song sparrows roost in weeds, hedges, and small-statured trees and shrubs. Song sparrows build their nests at the ground level, under tufts of grass, weeds, or thistles and also construct nests in small statured trees.

### Model Overview

Vegetation height and the presence of water appear to be important for song sparrows. Suitable song sparrow habitat must provide cover for nesting, roosting, hiding, and singing. The species will remain in their territories throughout the year if sufficient cover is available for these activities and if water is available in proximity to these areas. In fact, most species life requisites can be met by a single cover type as long as there is water in the area. The song sparrow model is used to evaluate habitat suitability within shrubland and grassland habitats that dominate portions of the Eagle Crest III, Eagle Ridge, and Eagle Crest I sites.

### Model Variables Included in the Analysis

$V_1$ distance to water
$V_2$ shrub/herbaceous cover
$V_3$ shrub/herbaceous height

**where the HSI is based on the lowest $SI_n$ value for:**

Water $SI_1 = V_1$
Reproduction $SI_2 = (V_2 \times V_3)^{1/2}$

### Special Considerations

Song sparrows remain within their territories if sufficient food, water, and cover is available. Territories range in size from a minimum of 0.04 acre to a maximum of 1.5 acres.

### 5.2.3 Ferruginous hawk

Ferruginous hawks were selected for HEP analysis because historically the species was common in eastern Oregon, they are obligate grassland nesters, and they have been reported to occupy juniper groves and cliff habitat in northeastern Oregon. These hawks may build their nests on rock outcrops, cliffs, isolated trees, or on the ground. Ferruginous hawks forage in shrub openings, cropland, or cultivated lands within shrub-steppe and prairie vegetation communities. Vegetation density influences ferruginous hawk foraging success in these areas. The structural attributes of habitat that influence suitability of an area for nesting and foraging are shrub and herbaceous vegetation cover, height of shrub and herbaceous vegetation, area of contiguous crop or grassland, and terrain class.

### Model Overview

The HSI for ferruginous hawks is based on the product of the HSIs for forage and reproduction life requisites. The reproduction life requisite is based on terrain class and mean distance of foraging areas to trees or shrubs that provide suitable nest sites. The forage life requisite for ferruginous hawks is based on shrub height and density that influences the abundance and availability of prey species. The ferruginous hawk model is used to evaluate habitat suitability within shrubland and grassland habitats that dominate portions of the Eagle Crest III, Eagle Ridge, and Eagle Crest I sites.

### Model Variables Included in the Analysis

$V_1$ average height of shrub and herbaceous cover
$V_2$ percent cover shrub and herbaceous vegetation
$V_3$ area of contiguous cropland/agricultural land/grassland
$V_4$ mean distance to tree or shrub >1m
$V_5$ terrain class

**where the HSI is based on the product of the suitability indices from food and reproduction life requisites:**

Food SI = $(V_1)^2 \times V_2 \times V_3$
Reproduction SI = $V_4 + V_5$ (if SI > 1 then SI equals 1)

### Special Considerations

The distribution of trees and shrubs across the Eagle Crest III project area is such that habitat suitability for the reproduction life requisite is 1.0 or the maximum habitat suitability. The distribution of trees and shrubs across the Eagle Ridge and Eagle Crest I sites that will be used to determine reproduction site quality under a developed condition is based on the distance measure of forage to cover areas that was recorded for the mule deer model. This

measure was chosen because distance of forage to cover surveyed on the developed sites was based on the relationship of open foraging areas to native trees and shrubs that were retained on the developed sites and which provide adequate cover for ferruginous hawk reproduction

## 5.3 HEP Variable Measurement

A non-mapping technique[2] was used to locate 37 sample plots within the Eagle Crest III expansion area and 9 and 12 sample locations within the Eagle Ridge and Eagle Crest I areas, respectively (Appendix C). Samples collected within the Eagle Crest III project area were used to develop habitat suitability indices reflective of an undisturbed site condition, which were compared to indices derived for a developed site condition represented by the Eagle Crest I and Eagle Ridge areas. The number of samples collected for each of the developed and undisturbed sites was based on site condition which is homogeneous with no unique features or diversity of cover types that would warrant more exhaustive surveys.

At each sample location, three 100-meter transects were established to measure percent cover and height of shrub, herb, and grass vegetation. Three 1-square-meter plots were located at equal intervals along the 100-meter transects to measure shrub canopy cover and height. Similarly, five 0.25–square-meter plots were located at equal intervals along the 100- meter transects to measure herb and grass canopy cover and height. A maximum of nine, 1-square meter shrub plots and 15, 0.25-square-meter herb and grass plots were sampled at each location.

At plot center, observers took a photograph of the site and recorded plot slope, distance to water, topographic class, azimuth, vegetation cover type, slash depth, and any unique features on the site. Variables used to develop habitat suitability indices and methods of data collection for each model species are included in Table 5.1.

[2]The non-mapping technique is a random sampling technique that ensures an adequate and stratified random sample of each of a number of habitats present on a site. The technique requires developing a grid, the size which is determined by the minimum plot size (e.g. 1 acre), and overlaying the grid on a design drawing in order to select sample locations. The non-mapping technique is applied in circumstances where the variability of habitats across a site is unknown or the size of an area precludes pre-sampling to assess the homo- or heterogeneity of habitats across the site.

Table 5.1 **Habitat Variables Derived from Field Data Collection for Use in HEP Analysis for Mule Deer, Song Sparrow, and Ferruginous Hawk**

| Species | Variable (V) | Measure | Method |
|---|---|---|---|
| Mule Deer | V1 | % canopy cover herbaceous vegetation | Line intercept |
| | V2 | % canopy cover grass | Line intercept |
| | V3 | % canopy cover shrubs | Line intercept |
| | V4 | Size and spacing of foraging areas | Aerial photographs |
| | V5 | Size and spacing of cover areas | Aerial photographs |
| | V6 | Slash depth | Visual observation |
| | V7 | Road density | Visual observation |
| | | | |
| Song Sparrow | V1 | Distance to water | Visual estimate |
| | V2 | % cover shrubs/herbs | Line intercept |
| | V3 | Mean shrub/herb height | Line intercept |
| | | | |
| Ferruginous Hawk | V1 | % canopy cover shrubs | Line intercept |
| | V2 | % canopy cover herbaceous vegetation | Line intercept |
| | V3 | Area of contiguous crop/grassland | Aerial photographs |
| | V4 | Mean distance to trees, shrubs, outcrops | Visual estimate |
| | V5 | Topographic class | Visual estimate |

In addition to field data several variables including the size and spacing for foraging areas, the size and spacing of cover areas, and the area of contiguous crop- or grassland were measured from aerial photographs and maps of the project area.

## 5.4 Results

The HEP analysis provides a means to quantify the suitability of a given area based on an index of habitat quality and the area of habitat available for occupation or use by a species. The habitat suitability index is mathematically derived based on an index for each variable included in a species model. The habitat suitability index is multiplied by the total area of habitat to derive the number of habitat units that an area provides for a given species.

For example, a songbird that requires grassland habitat for nesting may require vegetation that is 10 centimeters tall which provides the *maximum habitat suitability* for nesting. If habitat quality is at maximum, the suitability index is 1.0. If a 20-acre grassland area is vegetated by grasses that are 10 centimeters tall, the area would provide 20 habitat units for use by songbirds. This number is derived from the index of habitat suitability for grass that is 10 centimeters in height, (e.g., 1.0) multiplied by the acres of grassland available in the area (e.g., 20 ac). If grass height is 8 centimeters or is "less suitable," the grass height variable may be assigned a suitability index of 0.80 or some value less than 1.0 which reduces the number of habitat units available to songbirds to 16, or 20 times 0.80.

The derivation of habitat suitability indices and habitat units is much more complicated than the example above might suggest; however, the example illustrates how habitat units are derived. The example also points to the use of field data for deriving habitat suitability indices, the importance of understanding the number of acres of each habitat available on a site, and the importance of understanding how the acres of habitat will be created, removed, or converted. Based on existing site condition of the Eagle Crest III site and the proposed development alternatives for the site (e.g., 20% or 33% lot conversion), the following acreages will be used in the HEP analysis:

| Existing Condition | | 20% Lot Conversion | | 33% Lot Conversion | |
|---|---|---|---|---|---|
| Acres | Type | Acres | Type | Acres | Type |
| 480 | Shrub | 240 | Shrub[a] | 240 | Shrub[a] |
| 0 | Grass | 48 | Developed | 79 | Developed |
| | | 151 | Shrub[b] | 120 | Shrub[b] |
| | | 41 | Grass[c] | 41 | Grass[c] |
| Total | | | | | |
| 480 | | 480 | | 480 | |

[a]Undeveloped open space, including the area of 100-foot road setback, area >25% slope, and natural areas located throughout the resort development.
[b]Shrub habitat retained in natural vegetation on individual home sites, areas of home sites that remain undeveloped, or areas that will be restored to native vegetation following site construction.
[c]Area that will be planted to turf grass following site development will not exceed 17% of site.

Habitat suitability indices that are used to represent habitat quality given an "undeveloped" condition were derived from data collected at the Eagle Crest III site. Habitat suitability indices that are used to represent habitat quality and site condition given a "developed" site condition were derived from data collected at Eagle Ridge and Eagle Crest I. The data collected at Eagle Ridge and Eagle Crest I were averaged to generate one habitat suitability index for the developed condition. The rational for collecting field data at both Eagle Ridge and Eagle Crest I and for generating a habitat suitability index based on data collected at both of these sites, relates to the range in site condition and habitat suitability, that varies between the developed areas.

The variable measure, associated HSI, and total habitat units for each species is included below.

**Song Sparrow**

| | Existing Condition | | | | 20% Lot Conversion | | | | 33% Lot Conversion | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variable Measure | Shrub | | Grass | | Shrub | | Grass | | Shrub | | Grass | |
| Distance to water (V1) | 800 | 0.01 | NA | NA | 762 | 0.02 | 762 | 0.02 | 762 | 0.02 | 762 | 0.02 |
| Shrub and herb cover (V2) | 39.6 | 1.0 | NA | NA | 32.2 | 0.70 | 72.8 | 1.0 | 32.2 | 0.70 | 72.8 | 1.0 |
| Shrub and herb height (V3) | 1.53 | 1.0 | NA | NA | 1.94 | 1.0 | 0.07 | 0.01 | 1.94 | 1.0 | 0.07 | 0.01 |

The HSI is based on the lowest $SI_n$ value where:

| | Existing | | 20%Conversion | | 33% Conversion | |
|---|---|---|---|---|---|---|
| | Shrub | Grass | Shrub | Grass | Shrub | Grass |
| $SI_1 = V_1$ | 0.01 | NA | 0.02 | 0.02 | 0.02 | 0.02 |
| $SI_2 = (V_2 \times V_3)^{1/2}$ | 1.00 | NA | 0.83 | 0.10 | 0.83 | 0.10 |
| HSI = | 0.01 | NA | 0.02 | 0.02 | 0.02 | 0.02 |

Total habitat units for song sparrow

| | Existing | | 20% Conversion | | 33% Conversion | |
|---|---|---|---|---|---|---|
| | Shrub HUs | Grass HUs | Shrub HUs | Grass HUs | Shrub HUs | Grass HUs |
| | 4.80 | NA | 7.82 | 0.82 | 7.20 | 0.82 |
| **Total HUs** | | | | | | |
| Song sparrow | 4.80 | | 8.64 | | 8.02 | |

**Ferruginous hawk**

| | Existing Condition | | | | 20% Lot Conversion | | | | 33% Lot Conversion | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variable Measure | Shrub | | Grass | | Shrub | | Grass | | Shrub | | Grass | |
| Ave shrub and herb height (cm) (V1) | 1.53 | 0.25 | NA | NA | 0.18 | 1.0 | 0.07 | 0.5 | 0.18 | 1.0 | 0.07 | 0.5 |
| Shrub and herb cover (%) (V2) | 39.6 | 1.0 | NA | NA | 42.4 | 1.0 | 72.8 | 1.0 | 42.4 | 1.0 | 72.8 | 1.0 |
| Area of grassland habitat (ha) (V3) | 10 | 0.50 | NA | NA | 4.8 | 0.50 | 3.7 | 0.50 | 4.8 | 0.50 | 3.7 | 0.50 |
| Mean distance to tree or shrub (m) (V4) | 183 | 1.0 | NA | NA | 331 | 1.0 | 331 | 1.0 | 331 | 1.0 | 331 | 1.0 |
| Terrain class (1-4) (V5) | 2 | 0.25 | NA | NA | 1.8 | 0.15 | 1.5 | 0.1 | 1.8 | 0.15 | 1.5 | 0.1 |



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The HSI is based on the product of the suitability indices for the food and reproduction life requisites:

| | Existing | | 20% Conversion | | 33% Conversion | |
|---|---|---|---|---|---|---|
| | Shrub | Grass | Shrub | Grass | Shrub | Grass |
| **Food SI = $(V_1)^2$ x $V_2$ x $V_3$** | 0.03 | NA | 0.50 | 0.13 | 0.50 | 0.13 |
| **Repro SI = $V_4$ + $V_5$ or 1** | 1.00 | NA | 1.00 | 1.00 | 1.00 | 1.00 |
| **HSI =** | 0.03 | NA | 0.50 | 0.13 | 0.50 | 0.13 |

Total habitat units for ferruginous hawk

| | Existing | | 20% Conversion | | 33% Conversion | |
|---|---|---|---|---|---|---|
| | Shrub HUs | Grass HUs | Shrub HUs | Grass HUs | Shrub HUs | Grass HUs |
| | 14.4 | NA | 195.5 | 5.33 | 180 | 5.33 |
| **Total HUs Ferruginous hawk** | 14.4 | | 200.83 | | 185.33. | |

**Mule deer**

| | Existing Condition | | | | 20% Lot Conversion | | | | 33% Lot Conversion | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variable Measure | Shrub | | Grass | | Shrub | | Grass | | Shrub | | Grass | |
| Herb cover (%) (V1) | 17.5 | 0.17 | NA | NA | 42.4 | 0.4 | 72.8 | 0.8 | 42.4 | 0.4 | 72.8 | 0.8 |
| Grass cover (%) (V2) | 17.5 | 0.17 | NA | NA | 42.4 | 0.4 | 72.8 | 0.8 | 42.4 | 0.4 | 72.8 | 0.8 |
| Shrub cover (%) (V3) | 39.6 | 0.40 | NA | NA | 32.2 | 0.30 | 15.1 | 0.20 | 32.2 | 0.30 | 15.1 | 0.20 |
| Distance forage to cover (m) (V4) | 600 | 0.30 | NA | NA | 1075 | 0.10 | 1075 | 0.10 | 1075 | 0.10 | 1075 | 0.10 |
| Distance cover to forage (m) (V5) | 200 | 0.80 | NA | NA | 380 | 0.85 | 425 | 0.90 | 380 | 0.85 | 425 | 0.90 |
| Road density (mi/sq mi) (V6) | 4.6 | 0.15 | NA | NA | 9 | 0.05 | 9 | 0.05 | 9 | 0.05 | 9 | 0.05 |
| Slash depth (V7) | 0.25 | 0.75 | NA | NA | 0.25 | 0.75 | 0.25 | 0.75 | 0.25 | 0.75 | 0.25 | 0.75 |

The HSI is based on the ratio of the sum of the HSI's for hiding and foraging habitat to the maximum HSI when the index for all variables equals 1.0. Detailed calculations for the mule deer model are included in Appendix D.

| | Existing | | 20% Conversion | | 33% Conversion | |
|---|---|---|---|---|---|---|
| | Shrub | Grass | Shrub | Grass | Shrub | Grass |
| **HSI =** | 0.35 | NA | 0.27 | 0.25 | 0.27 | 0.25 |

Total habitat units for mule deer

| | Existing | | 20% Conversion | | 33% Conversion | |
|---|---|---|---|---|---|---|
| | Shrub HUs | Grass HUs | Shrub HUs | Grass HUs | Shrub HUs | Grass HUs |
| | 168 | NA | 105.6 | 10.3 | 97.2 | 10.3 |
| **Total HUs Mule deer** | 168 | | 115.9 | | 107.5 | |



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## 6.0 DISCUSSION

Several important points must be kept in mind when reviewing the results of the HEP analysis. First, HEP is a tool used to quantify losses and gains in habitat units based on changes in certain features of habitat. Characteristics of habitat vary for all species, but include such things as the presence or absence of water, the density of trees or shrubs, the height of vegetation, or the juxtaposition of one habitat to another. Like a ruler, HEP is a tool that provides the means to measure and quantify losses and gains of habitat that result from alteration of the landscape. Species models are selected for analysis based on the features of habitat that are present or absent on a site or that will be created or altered as a consequence of treatment of the landscape.

Second, HEP models vary in their degree of sophistication and level of verification. Some models are mathematically crude, while others rely on complex formulations to derive a measure of habitat suitability. For example, the song sparrow model includes a variable for distance to water, which becomes the basis upon which a high or low habitat suitability rating is reconciled. Similarly, the mathematics of the ferruginous hawk model illustrate how the variable for vegetation height drives that model. In areas where shrub height exceeds or falls short of a very narrow range of suitability, the suitability index quickly drops away from the maximum suitability of 1.0. In contrast, the mule deer model is much more complex in its mathematical application. Based on the level of complexity of that model, one could speculate that it *may* provide a more accurate estimate of habitat quality than either of the models. This stated, it must be pointed out that no matter their degree of sophistication, because *the models are applied consistently across each alternative and every site*, the results allow discussion of the "relative" effect across alternatives and between sites.

Third, care was taken to select models that represent the species and/or guilds that are present or that have been reported previously for the Eagle Crest III site. The models selected facilitate an assessment of habitat condition based on the features of habitat that are present on the Eagle Crest III site or that will be created as a consequence of development on that site. For example, the song sparrow model was chosen because it includes a variable for water that is present on the developed site and will be added as a feature of the Eagle Crest III site. Similarly, the ferruginous hawk model that includes a variable for vegetation height was chosen because of changes to the tree and shrub components of habitat that are anticipated as a result of project development.

Finally, it must be kept in mind that the bottom line HEP results reflect changes relating to the unique features of habitat. Therefore, the results of HEP analysis should not focus simply on the bottom line number of habitat units that area lost or gained as a consequence of some alternative, but should be discussed in terms of the differences in the features of habitat (habitat variables), which will vary depending on site condition. Simply stated, all elements of model input, throughput, and output should be reviewed for their relationship to the results.

Based on the results, it appears the 20% conversion scenario (where 20% of each 0.5-acre home site is developed) would result in net positive benefits to song sparrows and ferruginous hawks (and species that rely on similar features of habitat). Based on the results of the model run for ferruginous hawks, it appears the existing undisturbed condition offers

far less habitat potential for the species than either of the developed scenarios. The logic of this conclusion "that a developed site offers greater habitat potential than an undeveloped site" is not intuitive and in fact raises a question regarding the analysis for predicting change. That stated, recall the second caveat, which discusses the level of sophistication of the ferruginous hawk and song sparrow models, and consider the following discussion.

As the results for ferruginous hawk reflect, vegetation clearing and the removal of large-statured trees and shrubs, which has created a more "open" condition on the developed site, appears to afford more suitable conditions for ferruginous hawk foraging. Conversely, on the undeveloped site, where large-statured trees and shrubs dominate the vegetation canopy, the site condition for ferruginous hawk foraging is reduced. From the standpoint of numerical analyses, the results of the ferruginous hawk model are correct; however, what the results do not illustrate is the function of the vegetation height variable that drives the mathematics of that model. The variable for vegetation height has a very narrow range within which vegetation height is considered "suitable" for ferruginous hawk foraging. Because the HSI for ferruginous habitat quality is based on the product of the suitability indices for the food and reproduction life requisites, and because food habitat suitability is based on this measure of vegetation height, a low suitability rating for vegetation height drives the entire HSI result down. The point herein relates back to the interpretation of model results and how results must be regarded in terms of the individual variable values, as well as the cumulative HIS.

Like the ferruginous hawk model, the song sparrow model outputs reflect the influence of a presence or absence of water on a site and produce a lower habitat suitability rating in areas where water is absent. Thus, for the undeveloped Eagle Crest III site, which proposes only one water feature, the habitat suitability is reduced. Conversely, on the developed site that includes several developed water features, the suitability rating is higher. Again, these results require consideration of the fact that the model develops an overall rating of habitat suitability based on the lower of two values, those being the suitability ratings for water and reproduction habitat. Thus, if water is absent from a site and the suitability rating is 0.01, then overall suitability of the area is rated at 0.01. Again, results such as this require that attention be focused on individual variables, as well as on the cumulative HSI derived from the analysis.

The discussion of the ferruginous hawk and song sparrow model outputs prompts attention to the value of viewing individual variables as guides for developing mitigation, restoration, and enhancement, which will be discussed later.

Last, output from the mule deer model, which is the most sophisticated of the three models chosen for analysis, reflects how the degree of habitat interspersion or habitat diversity affects model results. Overall, the mule deer analysis illustrates how certain features of habitat compensate for other features that are or are not conducive to deer use of an area. For example, the suitability rating for percent shrub cover is "squared," then included among the suitability ratings for herb and grass cover in order to derive an overall suitability rating for foraging habitat on a site (Appendix E). Although the value for foraging habitat suitability is derived separately from that of hiding habitat suitability, ultimately the two are combined using "interspersion variables" (e.g., the distance of forage to cover and cover to forage) in order to derive an overall suitability rating for a site.

Based on the model results, which depict a relatively minor change in habitat units between the existing and the developed conditions, it appears that a reasonably high degree of habitat interspersion creates conditions conducive to mule deer use of an area. This is verifiable to some degree, as mule deer were observed on both the developed and undeveloped sites at similar frequencies. These results point to mitigation, restoration, or development activities that result in a high degree of habitat interspersion, including native vegetation, as well as man-made and cultivated (e.g., turf grass) habitat features.

## 7.0 SUMMARY AND MITIGATION RECOMMENDATIONS

The results of the analysis illustrate that several models key into specific features of habitat, which influences model results. The song sparrow analysis revealed the significance of water as a key component of habitat. It appears that a lack of water on a site limits site potential for this species. The model results prompt consideration of the addition of water as a feature of site design to improve conditions not only for song sparrows, but for other species. The ferruginous hawk analysis revealed that vegetation height, which influences forage availability for ferruginous hawks, dictates habitat potential for the species. As vegetation height exceeds or falls short of a very narrow range, the suitability of an area for ferruginous hawk foraging drops away from 1.0 dramatically. Finally, the mule deer analysis, which is more sophisticated than the other analyses, revealed that the mule deer model responds to the availability and juxtaposition of various habitats.

Based on the HEP results and conclusions from field observations, SHAPIRO recommends the following be considered in developing design criteria for mitigation.

**Native species retention.** Species composition of vegetation observed on the developed sites (Eagle Crest I, Eagle Ridge) revealed an abundance of non-native, weed species (e.g., cheatgrass) that pioneered areas following disturbance. Retention of native vegetation during site development or revegetation of sites using native shrubs and bunchgrasses following site disturbance will contribute to an improved condition for wildlife in ways that are not measurable using a HEP model.

Vegetation on the Eagle Crest III expansion area includes predominantly shrubs. The structural component of the shrub layer generally limited site suitability for ferruginous hawks. Further, a general lack of grass or herb species lowers the habitat interspersion value for mule deer on the site. Based on this SHAPIRO recommends enhancing vegetative diversity by restoring native bunch grasses to areas of disturbance.

SHAPIRO recommends broadcast seeding disturbed areas with native bunch grasses following site development. Seeding should be done in fall (October) to provide the greatest opportunity for re-establishing species. An arid climate and generally thin, rocky soils limit site potential for vegetation production. Therefore, SHAPIRO anticipates the most effective means of restoring native bunchgrasses will include propagation by manual broadcast seeding, using native seed collected from within the same geographic area.

SHAPIRO recommends that areas that will be disturbed and then re-vegetated which contain weeds, including cheatgrass, be pretreated to reduce competition with desired species. Pretreatment can consist of herbicide application and/or disking of planting areas. The sites should then be allowed to lay fallow until residual seeds in the soil germinate. The sites should then be retreated prior to seed set. Following completion of pretreatment, the site can be planted with native bunchgrasses. If terrain permits, seed should be drilled in (mechanically planted below soil surface). If terrain prohibits mechanical seeding, broadcast seeding is acceptable.

Typical application rates for this type of restoration are 2 pounds/acre/species not to exceed a total of 12 pounds/acre. SHAPIRO recommends consulting a local restoration specialist who

will be familiar with seed availability, site-specific seeding rates (pounds/acre), pretreatment methods, planting methods, and availability of materials. SHAPIRO recommends revegetation across 151 and 120 acres, that correspond to the 20 and 33% conversion scenarios, respectively, that are proposed for the site.

**Annual weed survey.** Consistent with efforts to restore native vegetation, Eagle Crest, Incorporated, should conduct an annual weed survey to assess the extent of and the rate of colonization of disturbed sites by non-native and noxious vegetation species. This activity is consistent with the Bureau of Land Management strategy to control the spread of noxious plant species and supports Deschutes County weed control efforts. Additionally, the survey will contribute to meeting overall monitoring objectives for the site.

If a weed abatement program becomes necessary to control the spread of noxious species, the weed management strategy should be phased to include presuppression, initial attack, and rehabilitation. The HEP analysis provides an indication of weed species abundance and distribution across the Eagle Crest site. These data should be used to establish permanent sample locations. Weed surveys should be conducted annually in conjunction with surveys to monitor propagation rates of bunch grasses. Surveys should be conducted in late May. Results of surveys should be used to guide local eradication efforts and should be reported to Deschutes County to inform the County's weed control efforts.

**Water features, including wildlife guzzlers.** Wildlife guzzlers (e.g., water tanks) can concentrate wildlife use in areas where they would be less susceptible to impacts of human disturbance. The results of the HEP analysis revealed that the absence of water on a site can have somewhat negative consequences for certain species. In the absence of developed water features as elements of site design, wildlife guzzlers might provide an element of habitat that is key to species use of an area. The placement of wildlife guzzlers in areas of open space or areas not currently proposed for development (e.g., the areas of >25% slope) would benefit certain species by drawing them away from developed areas and adding a habitat feature that is currently unavailable.

SHAPIRO recommends coordinating with BLM staff to evaluate the effectiveness of two guzzlers that were developed as mitigation for the Eagle Crest I project. Results of that analysis will lend to developing design criteria for guzzlers proposed as an element of this mitigation proposal. SHAPIRO recommends construction of two water supplies on the east slope of Cline Butte, at least one of which would be large enough to support use by big game.

**Removal of large-statured shrubs and trees to enhance vegetative structure.** As the HEP model results revealed, the distribution of large junipers and mature shrubs creates a relatively dense vegetation canopy that limits site suitability for a variety of species. Development of the Eagle Crest III Master Planned Resort will likely involve the removal or disturbance of vegetation across a large portion of the site. In areas proposed for development, a vegetation clearing plan that retains the large junipers (e.g., >40 inches dbh) as unique features of habitat but also removes trees and shrubs from areas where canopy cover exceeds 75% may benefit a number of wildlife species. Mature shrubs should continue to provide foraging, nesting, and hiding habitat for small mammals and birds. Clearing that opens up the shrub canopy should make conditions more conducive to raptor foraging. Mature shrubs and trees will provide habitat for songbird and raptor nesting, and hiding cover for big game.

There is disagreement among biologists regarding the importance of mature junipers as unique features of habitat. A vegetation clearing plan that retains larger junipers (e.g., >40 inches dbh) but accommodates the removal of other smaller-statured trees should accomplish multiple objectives of maintaining a unique feature of the Eagle Crest III site; reducing the potential for fire, which is elevated because of the amount of standing biomass on the site; and enhancing growing conditions for other shrub and herb species across the site.

# Eagle Crest, Inc.
# Wildlife Mitigation Plan
For
# Eagle Crest Expansion #3

January 7, 2000

## I. LOCATION:

This mitigation plan encompasses the proposed expansion of the existing Eagle Crest destination resort, described in the attached Exhibit 'A'.

## II. PURPOSE:

"Developer" intends to expand the existing Eagle Crest destination resort under the terms and conditions of the Deschutes County Destination Resort Ordinance (Title 18.113 Deschutes County Code). The subject ordinance requires the "Developer" to completely mitigate any negative impacts on fish and wildlife resources. This Wildlife Mitigation Plan achieves that goal.

## III. LAND INVENTORY:

Eagle Crest 3 encompasses approximately 480 acres.

## IV. FINDINGS:

The "Developer" has completed significant assessments and reviews of the subject property. This mitigation plan is supported by the following findings:

A. The "Developer" retained Shapiro and Associates, Inc. in January 1999, to complete an analysis of the subject property.

B. In September 1999, the "Developer", The Oregon Department of Fish & Wildlife ("Department") and Shapiro and Associates, Inc. staff conducted additional field inspections, reviewed analysts report, and participated in extensive reviews and evaluations of the expansion property.

C. The "Developer" and "Department" have a common goal to protect and enhance wildlife at Eagle Crest for the benefit of Eagle Crest guests and the residents of Oregon.

D. Prior to development, the Eagle Crest 3 site could be characterized as undisturbed mature juniper woodlands with a network of dirt roads throughout the area. Livestock have grazed on the land seasonally and some woodcutting has occurred.

E. No wetlands or riparian areas are located within the project site.

F. No significant rock outcrops occur in the project area.

G. No threatened or endangered species occur in the project area.

H. No designated sensitive bird or mammal habitat occurs within the project boundaries.

I. The project area is not within designated mule deer winter ranges or migration corridors.

J. Approximately 480 acres are included in the proposed expansion. The following vegetative cover types will be retained or provided:

1. Approximately 70 acres will not be developed except for nature and interpretive trails and shall remain in large tracts of open space. Habitat enhancement will improve breeding and foraging habitat in those areas over existing conditions.
2. Approximately 170 acres will be disturbed areas of open space that will be restored and enhanced. These areas may include trails (4 +/- acres), parks and water features (20 +/- acres).
3. Approximately 100 acres will be disturbed acres around dwelling units where the native vegetation will be restored to natural conditions.
4. Approximately 140 acres will be converted to roadways, parking areas, buildings and formal landscaping.

## V. REQUIRED ON SITE MITIGATION

A. Enhance breeding and foraging habitat throughout the property by working closely with "Department" staff to:

1. Thin younger juniper canopy to release native shrubs, grasses, and forbs.
2. Construct an average of two brush piles and one rock pile per acre throughout the 240 acres of designated open space.
3. Install 100 mountain bluebird boxes along the open edges of the 170 acres of juniper woodland open space. Clean and maintain boxes annually.
4. Restore any of the 170 acres of open space that is disturbed during construction and not developed into parks back to natural features and vegetation.
5. Formal landscaping around homes and units will conform to the Architectural Review Committee Guidelines (ARCG). The ARCG limits the amount of manicured turf area to 17% of any given lot along with a providing an approved plant list developed by a Landscape Architect specializing in native landscape planting and design.
6. These mitigation measures will be maintained for the life of the development.

## I. ADDITIONAL MITIGATION

The "Developer" and "Department" have worked closely together to develop a variety of mitigation options. The "Developer" is responsible for completing one of the following options or portions of any combination of the following options at the approval of the "Department" that will satisfy the off-site mitigation requirements. The amount that the "Developer" must invest on the ground, excluding administrative costs, to satisfy the offsite mitigation requirements is $63,750[1] initially plus funds necessary to maintain additional mitigation measures for the life of the development. The unused balance of the $63,750 shall be adjusted annually based upon the Consumer Price Index for Portland, Oregon as prepared by the U.S. Department of Labor, Bureau of Labor Statistics. The "Developer" shall mitigate wildlife impacts within a 5-year period after construction begins and proportionate to the pace of development.

A. Work closely with the Bureau of Land Management (BLM) and "Department" staff to help rehabilitate the 3,382-acre "Maston Allotment" property. The work will include but not be limited to 850 acres of juniper thinning, creating on average two brush piles per acre. The actual scope of work will be determined jointly between BLM, "Department", and "Developer" staff. Implemented mitigation measures will be maintained for the life of the development. If wildlife values are lessened by land use change, then suitable land will need to be located and improvements made to mitigate for lost values.

B. "Developer" shall restore and enhance BLM juniper woodlands. The scope of the rehabilitation will be dependent on current conditions of the property and amount of restoration necessary. Implemented mitigation measures will be maintained for the life of the development. If wildlife values are lessened by land use change, then suitable land will need to be located and improvements made to mitigate for lost values.

C. "Developer" shall obtain a perpetual "Wildlife Easement" worth $63,750 on private lands. Said easement will prohibit the development and grazing of the lands for the benefit of the "Department". The actual acreage will be based on the location of the land and the existing condition of the habitat on which the easement is obtained. The "Developer" and "Department" will work closely together to determine the actual size of the easement based on the suitability of the habitat versus the habitat lost on the Eagle Crest 3 parcel. Wildlife values that the easement was based on will be maintained throughout the life of the development.

[1] The off site mitigation figure of $63,750 is based on an average of telephone bids ($75/acre) solicited from recommended contractors supplied by the Bureau of Land Management and obtained by the "Developer" for thinning 850 acres of habitat similar to the Eagle Crest 3 property.

D. "Developer" shall obtain a combination of water rights that will increase Deschutes River flows between Bend and Lake Billy Chinook by purchasing $63,750 worth of additional water rights. The "Developer" will be responsible for the procurement of the water rights and completion of the required transfers, if applicable, in addition to the value of the water right.

## I. TERM

The conditions of this Wildlife Mitigation Plan will extend from the filing of the first residential plat and terminates upon the completion of the final residential plat for Eagle Crest 3. The plan is binding upon the successors and assigns of Eagle Crest, Inc. Upon completion of this mitigation plan, "Developer" has conformed to the requirements of Deschutes County.

If any of the proposed mitigation measures are unable to go forward as agreed, Eagle Crest, Inc. will renegotiate those mitigative measures with the "Department" and Deschutes County before further development occurs, or as they correspond to an appropriate phase of development.

## VIII. TERMINATION

This Wildlife Mitigation Plan may be terminated or amended by mutual agreement for Eagle Crest, Inc., any successors or assigns, and Deschutes County.

**DEVELOPER**

Allen VanVliet DATED: 1/27/00

**The Oregon Department of Fish and Wildlife has reviewed this Wildlife Mitigation Plan for Eagle Crest Expansion #3. We believe that effective implementation of this plan will result in satisfactory wildlife habitat mitigation as required under LCDC Goal 8, while being consistent with the Department's Fish and Wildlife Habitat Mitigation Policy.**

[signature] DATED: 1-31-00

REVIEWED
LEGAL COUNSEL

For Recording Stamp Only

**DECISION OF DESCHUTES COUNTY BOARD OF COMMISSIONERS**

**FILE NUMBER:** M-01-1

**HEARING DATE:** Thursday, July 12, 2001 & Monday, October 15, 2001
3:00 P.M.
County Commission Hearings Room
1130 NW Harriman
Bend, OR 97701

**APPLICANT:** Eagle Crest Inc.
Post Office Box 1215
Redmond, OR 97756

**PROPERTY OWNER:** Eagle Crest Inc.

**ATTORNEY:** Nancy Craven
Ball Janik LLP
101 S.W. Main, Suite 1100
Portland, Oregon 97204

**ENGINEER:** Thomas A. Walker, P.E.
W & H Pacific
920 S.W. Emkay Drive, Suite C-100
Bend, Oregon 97702

**REQUEST:** The applicant is requesting approval of a Final Master Plan (FMP) for the Eagle Crest III expansion to an existing destination resort on property zoned EFU-SC/SMIA/DR.

**STAFF CONTACT:** Paul Blikstad, Associate Planner

## I. APPLICABLE STANDARDS & CRITERIA:

A. Title 18 of the Deschutes County Code, the County Zoning Ordinance.



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- Chapter 18.16, Exclusive Farm Use (EFU-SC) zone
- Chapter 18.56, Surface Mining Impact Area (SMIA) combining zone
- Chapter 18.113, Destination Resorts (DR) zone

B. Title 22 of the Deschutes County Code, the Development Procedures Ordinance

II. **BASIC FINDINGS:**

A. **LOCATION:** The subject property has no assigned address and is located near Cline Buttes, and approximately one-half mile from the current Eagle Crest Resort boundary, west of Redmond and south of U.S. Highway 126. It is identified on Deschutes County Assessor's Map #15-12 as tax lot 4800. The access roads serving the resort will be located on adjacent federal lands managed by the Bureau of Land Management (BLM) and identified as tax lots 1500, 600 and 1300 on Deschutes County Assessor's Map #15-12.

B. **SITE DESCRIPTION:** The subject property is 480 acres in size. The property is mostly level but rises steeply to the south and southeast on Cline Butte. The property is undeveloped and has a vegetative cover consisting of mature juniper trees, big sagebrush and native grasses. The property has no existing public road access. The resort expansion on the property will be accessed from a road extending west from Eagle Crest II (the Ridge at Eagle Crest) and a road extending directly south from Highway 126.

C. **ZONING:** The property is zoned Exclusive Farm Use – Sisters/Cloverdale subzone (EFU-SC), and Surface Mining Impact Area (SMIA) combining zone with a Destination Resort (DR) overlay. It is designated Agriculture by the Deschutes County Comprehensive Plan. The adjacent federal lands on which the access roads will be located have a County zoning designation of EFU-SC.

D. **SURROUNDING ZONING AND LAND USES:** The subject property is almost entirely surrounded by land zoned EFU-SC, in federal ownership and managed by BLM. To the southeast are two privately-owned parcels zoned Surface Mining (SM) for the protection of which the SMIA zone has been established.

E. **LOT OF RECORD:** The subject property is a legal lot of record pursuant to the findings in File No. CU-99-85.

F. **PROPOSAL:** The applicant is requesting final master plan (FMP) approval for the Eagle Crest III expansion area. The applicant has previously received approval of the conceptual master plan (CU-99-85) for the resort expansion, and the next step is to apply for FMP approval.

G. **REVIEW PERIOD:** This application was deemed complete and accepted for review on June 25, 2001. The 150th day on which the county must take final action on this application is November 22, 2001.

H. **AGENCY RESPONSE:** The Planning Division sent notice of the proposed final master plan application to several public agencies and received the following response:

1. Redmond Fire Department submitted a no comment response.

2. No response was received from the County Assessor, County Road Department, County Sheriff's Office, County Property Address Coordinator, Watermaster's Office, Central Electric Cooperative, Pacific Power and Light, US West Communications, Redmond School District, Oregon Department of Environmental Quality, Oregon Department of Fish and Wildlife, Oregon Department of Transportation, Water Resources Department, Bureau of Land Management, Oregon Health Division, County Transportation Planner, and the Central Oregon Park and Recreation District.

## III. CONCLUSIONARY FINDINGS:

### A. Chapter 18.16, Exclusive Farm Use (EFU-SC) zone.

1. Section 18.16.035, Destination resorts.

***Destination resorts may be allowed where mapped as a conditional use, subject to all applicable standards of the DR zone.***

**FINDING:** The Board of County Commissioners rendered a decision approving a conditional use permit (CU-99-85) for the conceptual master plan (CMP) for the Eagle Crest III project on May 24, 2001. The procedural history on the CMP is listed on pages 1 and 2 of the applicant's burden of proof statement and is incorporated herein by reference.

In File No. CU-99-85, the Board found that the subject property is mapped as eligible for destination resort siting and therefore the proposed expansion of the existing Eagle Crest destination resort is permitted as a conditional use subject to the standards of the DR zone.

The DR overlay zone standards govern development of destination resorts within the DR overlay. The DR zone standards supercede all other provisions of the underlying EFU-SC zone. Consequently, the remainder of Chapter 18.16 of Title 18 is inapplicable to the proposed FMP application.

### B. Chapter 18.113, Destination Resorts (DR) zone.

1. Section 18.113.020, Applicability.

A. **The provisions of this chapter shall apply to proposals for the development of destination resorts, as defined in this title, in areas designated DR by the county zoning maps. The provisions of this chapter shall not apply to any development proposal in an area designated DR other than a destination resort.**

B. **When these provisions are applicable, they shall supercede all other provisions of the underlying zone. Other provisions of the zoning ordinance, made applicable by specific map designations, such as the SMIA, AH, CH, FP or LM, or otherwise applicable under the terms of the zoning ordinance text shall remain in full force and effect, unless otherwise specified herein.**

C. **The provisions of this chapter apply to destination resorts sited through the Goal 2 exception process.**

**FINDING:** This chapter applies to the proposed destination resort expansion area. In File No. CU-99-85, the Board found that the subject property is mapped as eligible for destination resort siting and therefore the proposed expansion of the existing Eagle Crest destination resort is permitted as a conditional use subject to the standards of the DR zone. The subject property is also encumbered by a SMIA combining zone, which pertains to surface mining site no. 252 on the County's surface mining inventory, located directly south and east of the subject property. The applicant is not siting this destination resort expansion as part of a Goal 2 exception process.

2. Section 18.113.040, Application submission.

B. **Final Master Plan. The applicant shall prepare a final master plan (FMP) which incorporates all requirements of the county approval for the CMP. The Planning Director shall review the FMP to determine if it complies with the approved CMP and all conditions of approval of the conditional use permit. The Planning Director shall have the authority to approve, deny or return the FMP to the applicant for additional information. When interpretations of the Planning Director involve issues which are discretionary, the FMP approval shall be treated as a land use permit in accordance with chapter 22 of the County Code.**

**FINDING:** The applicant submitted the FMP application required by Section 18.113.040, and the application was deemed complete on June 25, 2001. The Planning Division determined that there was enough discretion involved in the FMP review to treat it as a land use permit in accordance with Title 22 of the County Code. The Planning Division issued a notice of public hearing, and the Board held a public hearing on July 12, 2001, and the hearing was continued to October 15, 2001. Notice of the Board's decision on this application will also be sent out pursuant to Title 22. As explained below, the Board finds

that the FMP application complies with the approved CMP, including all conditions of approval of the CMP.

3. Section 18.113.090, Requirements for final master plan.

***It shall be the responsibility of the applicant to provide a Final Master Plan (FMP) which includes text and graphics explaining and illustrating:***

*A. The use, location, size and design of all important natural features, open space, buffer areas and common areas;*

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate the use, location, size, and design of all important natural features, open space, buffer areas, and common areas. Further detail will be provided as each phase of the expansion project is developed and site specific surveys are completed. The applicant submitted several drawings with the FMP application. The graphics titled "Existing Terrain, Easements and Buffers" show the buffer areas required under section 18.113.060(G)(2), except for the 250-foot setback for multi-family development and visitor-oriented accommodations. The important natural features and open space include these buffer areas, as well as the steep slopes on the most northerly of the Cline Buttes. The tentative development plan for Phase III (Original CMP Exhibit 5)[1] identifies the important natural features and open space areas. The Open Space Management Plan (Original CMP Exhibit 9) also describes the resort's policy for designating and managing the required open space areas. The specific size, location, and design of the open space areas will be finalized during preliminary plat review. Additional common/open space areas within the various phases of the project will also be identified during preliminary plat review.

*B. The use and general location of all buildings, other than residential dwellings and the proposed density of residential development by location;*

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate the general location of all buildings, other than residential dwellings, and the proposed density of residential development by location.

The applicant submitted a map entitled "Final Master Plan – Proposed Utilities System" that identifies the areas designated 10 and 11 and 16-18 as the general location of future commercial uses. The applicant's FMP narrative confirms that commercial uses will be limited to those listed under Section 18.113.030 of Title 18 for destination resorts. The application materials demonstrate that a majority of the proposed expansion area will be used for residential/vacation purposes, similar to what has occurred in Eagle Crest II. As noted by the Planning Staff in the staff report, the existing development of Eagle Crest has been in place for as many as 17 years, and in that time there has been little commercial development within the resort. This historical pattern suggests that commercial development within the phase III expansion area is also likely to be limited.

The applicant also submitted a map entitled "Final Subdivision Master Plan" which depicts examples of lot sizes for certain areas within the proposed resort expansion. The residential development will include either freestanding dwellings or multi-unit development, similar to what has already occurred at both Eagle Crest I and II. Note #13 on this map states: "The intent of the exhibit is to document the flexibility allowed in developing Eagle Crest 3 in a free enterprise market. The final development plans for each area will be submitted for approval at the time of final platting. Density and total units will be tracked on a plat by plat basis." The Board finds that since each development phase will require separate tentative plat and/or site plan review, the actual development phases can be reviewed for consistency with the overall plan and the zoning/subdivision ordinance requirements during future land use reviews. As required by CMP Condition 6, the applicant will maintain a residential density of no greater than 1.5 non-overnight

[1] The applicant refers to the exhibits attached to the applicant's original rather than the supplemental CMP narrative as "Original CMP Exhibits." The exhibits from the supplemental CMP narrative are referenced as the "Supplemental CMP Exhibits." The Board will utilize the same references where appropriate.

dwelling units per acre in Phase III, documented with the filing of each subdivision plat within Phase III.

C. **Preliminary location of all sewer, water, storm drainage and other utility facilities and materials, and specifications and installation methods for water and waste water systems;**

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate the preliminary location of all sewer, water, storm drainage, and other utility facilities and materials, and specifications and installation methods for water and waste water systems.

The Board finds that the master plans for the domestic water supply system (Original CMP Exhibit 12) and the sanitary sewerage collection system (Original CMP Exhibit 11) adequately describe the proposed water and sewer systems. In addition, the map entitled "Final Master Plan – Proposed Utilities System" shows the locations of the main sewer and water lines for the project. The applicant also submitted evidence documenting approval from the Oregon Water Resources Department for the new well for Eagle Crest III, and the application materials demonstrate that storm drainage will be similar to what is already occurring in both Eagle Crest I and II, where runoff is accommodated into soil and gravel areas adjacent to roads and structures.

In addition, at the October 15, 2001 hearing, the applicant provided supplemental information to update the description of the proposed sewer system consistent with CMP Condition 17. The Applicant submitted evidence demonstrating that, on October 9, 2001 following public hearings, the City of Redmond voted to accept and treat Eagle Crest III sewage at its sewage treatment plant in the City of Redmond and that Eagle Crest intends to construct the sewer extension to the City of Redmond consistent with the agreement with the City of Redmond. This is reflected in Condition 9.

D. **Location and widths of all roads, streets, parking, pedestrian ways, equestrian trails and bike paths;**

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate the location and width of all roads, streets, parking, pedestrian ways, equestrian trails and bike paths. The applicant's maps show the main internal and external roads serving the project, and the map described as the Final Subdivision Master Plan shows three areas where more internal roads may be located. The specific location of lower volume, internal roads may be determined during future preliminary plat and/or site plan review. As detailed in the FMP application, the streets will meet the minimum standards established in CMP Conditions 14, 15, and 16, with varying right of way widths. Parking will be accommodated on each dwelling unit site and in the commercial areas when/if they are developed. Pedestrian ways/bike paths will be required on the main roads throughout the project and will typically be separated from the main vehicular travel surface. The applicant has requested flexibility in the locations of any equestrian trails. The Board finds that the application may satisfy this criterion by specifying the location of equestrian trails during future preliminary plat and/or site plan reviews.

Staff and the public will have an opportunity to review the applicant's proposed layout and design for future internal roads and equestrian trails during preliminary plat and/or site plan review.

E. **Methods to be employed to buffer and mitigate potential adverse impacts on adjacent resource uses and property;**

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate the methods to be employed to buffer and mitigate potential adverse impacts on adjacent resource uses and property. The methods to be employed to mitigate potential adverse impacts on adjacent resource uses and properties are detailed in the original and supplemental CMP applications and in the CMP findings and decision.

As detailed therein, the applicant will provide a number of on-site recreational amenities to mitigate demands on the adjacent Cline Falls State Park and the surrounding BLM lands. The subject property is surrounded on four of the six property boundaries by public land, including the Bureau of Land Management (15-12, tax lots 1504, 4900, 1300 and 1500; 15-12-9, tax lot 600) and the State of Oregon (15-12, tax lot 5300). The remaining two property boundaries are adjacent to the property identified as 15-12, tax lot 4700, a surface mining site. The Board finds that the surrounding BLM lands and the proposed open space areas within Phase III will provide a significant buffer between the resort and surrounding uses. With respect to the surface mining site to the southeast of Tax Lot 4800, the applicant will require every future buyer of a Phase III lot located within one mile of the surface mining site to execute an affirmation waiving remonstrance against the surface mining operation, consistent with CMP Condition 20.

With respect to the off-site access roads, the applicant and BLM have designed the roads so as to minimize impacts on surrounding uses. As required by CMP Condition 15, the applicant will construct both access roads to ensure that traffic is evenly distributed and does not disproportionately impact a particular area. In addition, the applicant will construct the roads to maintain a vegetated buffer between the roads and the adjacent private lots to minimize noise and visual impacts on the properties, as detailed in the CMP findings and decision. Finally, as required by CMP Conditions 12 and 15, the applicant will comply with the ODFW and BLM mitigation requirements discussed in the findings and decision. These mitigation measures will reduce traffic speeds, maintain the character of the surrounding area, and enhance the existing juniper woodland habitat.

**F. Building elevations of visitor-oriented accommodations, recreational facilities and commercial services sufficient to demonstrate the architectural character of the proposed development.**

**FINDING:** The applicant has not submitted building elevations for the above referenced uses. However, the applicant submitted photographs of existing visitor-oriented accommodations, recreational facilities, and commercial services within the resort with the FMP application and stated in the FMP narrative that all structures in Phase III will be consistent in architectural character with the buildings depicted in the photographs. The Board finds that these photographs are sufficient to demonstrate the architectural character of the proposed development for purposes of compliance with this criterion. The Board further finds that the applicant will be required to submit building elevations at the time of site plan review for each listed facility. The purpose of site plan review is to examine the overall appearance of the structures (architectural character).

**G. A description of all commercial uses including approximate size and floor area.**

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to describe all potential commercial uses, including the approximate size and floor area. Exhibit 14 to the FMP application provides a list of potential commercial uses with approximate sizes. The "Final Master Plan—Proposed Utilities System" map designates areas 10 and 11 and 16-18 for future commercial buildings.

The Board finds that more specific information regarding Phase III commercial uses and locations will be detailed during future site plan review. Because the Phase III commercial area is unlikely to be developed within the next 2 years, it is unreasonable to request more detailed information at this stage. Commercial uses will be developed within Phase III once there is sufficient residential development to support such uses. At that time, the specific size, nature, and location of the commercial uses will be developed to meet market demand. The type, design, and size of the commercial uses will be analyzed during future site plan review.

H. **The location of or distance to any emergency medical facilities and public safety facilities.**

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate the location of the closest medical and public safety facilities. The FMP application indicates that the closest medical facilities include hospitals in Redmond (approximately 5 miles away) and in Bend (approximately 20 miles away). Public safety facilities are not specifically defined in the zoning ordinance. The Board finds that, for purposes of this review, this listing includes fire and police protection facilities. The closest fire station appears to be located within the Redmond city limits, which is also approximately 5 miles away. Eagle Crest appears to have an adequate water supply for emergency personnel to fight any structural or other fires that may occur at the resort. The Sheriff's Office has previously indicated that they currently serve the resort and are looking at a possible satellite station/office in Eagle Crest in the future. The closest sheriff's office to Eagle Crest is the office on Cascade Street in the City of Redmond.

I. **When a phase includes a residential subdivision, a general layout of the subdivision shall include the number of lots, minimum and maximum lot sizes, and approximate location of roadways shall be included;**

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate a general layout of future residential subdivisions. The FMP application includes a map which demonstrates three types of subdivision layouts similar to what has been developed within Eagle Crest II. The lower volume roads have been shown on these draft layouts. Lot sizes vary depending on the type of development proposed. The development is subject to the maximum average lot size of 22,000 square feet (section 18.113.060(G)(1)), and a maximum overall density of 900 dwelling units. All of the 18 proposed phases within Eagle Crest III could have residential lots. More detailed information regarding the layout, density, and roadway location within the residential subdivisions will be provided during future preliminary plat and/or site plan review. The applicant will maintain a residential density of no greater than 1.5 non-overnight dwelling units per acre in Phase III and will document compliance with the density requirements with the filing of each subdivision plat.

J. **A description of measures taken, with copies of deed restrictions, CC & R's and rental contracts, to implement the measures identified in this chapter assuring that individually-owned lodging units considered to be overnight lodgings for at least 45 weeks per calendar year though a central reservation and check-in service.**

**FINDING:** The Board finds that the applicant has submitted copies of the required deed restrictions and CC&R's necessary to ensure that individually-owned lodging units will function as overnight lodging for at least 45 weeks per calendar year. The applicant submitted the CC&R's governing the proposed development as Exhibit 10 to original CMP narrative. The applicant has confirmed during the FMP process that the resort's existing central reservation and check-in service will serve

Phase III.

K. **A description of measures taken, with copies of deed restrictions and a final management plan, to implement the open space management plan required by this chapter.**

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate the measure that the applicant proposes to take to implement the open space management plan. The applicant submitted an open space management plan as part of the CMP review process. CMP Condition 5 requires the applicant to assure through continuous monitoring that the Eagle Crest Resort, including Phase III, continues to meet the 50 percent open space requirement. Consistent with CMP Condition 5, the applicant stated in the FMP application that it will submit a continuous open space calculation with each subdivision plat to implement the Open Space Management Plan. Each phase may contain common areas or common easement areas, both of which are to be managed as open space. The open space areas are to remain in a natural state. Open space will be dedicated to the appropriate homeowner's association at the time of final plat approval.

L. **The status of all required off-site roadway improvements.**

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate the status of all required off-site roadway improvements. The applicant has documented that all required approvals for off-site road improvements for the resort have been obtained. This includes the revised Cline Falls Road/Highway 126 intersection, a northern connection to the Eagle Crest II project, and the turn lane at the main entrance to Eagle Crest II.

The applicant has received approval from BLM to construct two access roads across BLM land to serve the development on Tax Lot 4800: one road from Eagle Crest Phase III directly to Highway 126 (the "Highway 126 Access Road"), and one road from Eagle Crest Phase III to Eagle Crest Phase II and Cline Falls Road (the "Cline Falls Access Road"). As detailed in the CMP findings and decision, BLM reviewed the access proposal, conducted an Environmental Assessment, issued a Finding of No Significant Impact, and issued a Decision Record amending Right-of-Way OR 49350 to allow construction of the subject access roads. (Supplemental CMP Exhibit D).

The applicant also entered into a Memorandum of Understanding (MOU) with the Oregon Department of Transportation (ODOT) on October 12, 1999 for highway access onto Highway 126 (Misc. Contracts & Agreements, No. 17.762) and a Cooperative Improvement Agreement with ODOT on May 3, 2001 (Misc. Contracts & Agreements No. 17,671) that outlines the applicants' obligations with respect to the planned interchange at the intersection of Cline Falls Highway and U.S. 20.

The MOU provides that ODOT agrees to assist the applicant in obtaining all requisite access permits to allow the intersection of Highway 126 and the Highway 126 Access Road. The MOU also requires the applicant to make the necessary improvements on Highway 126 to facilitate the access. Such improvements may include a left turn refuge to accommodate westbound traffic making a left turn onto the proposed access road, as well as a right-turn deceleration lane to accommodate eastbound traffic making a right turn onto the proposed access road. The MOU and the Cooperative Improvement Agreement also require the applicant to contribute $240,000 to fund a portion of the planned interchange at the intersection of Cline Falls Highway and US 20. Pursuant to the terms of the Agreement and the MOU, the applicant will pay the interchange contribution at the time construction of the new interchange commences. The applicant submitted

a copy of the MOU as Exhibit R to the Supplemental CMP application. The applicant submitted a copy of the executed Cooperative Improvement Agreement as Exhibit "O" to the FMP application.

M. **Methods to be employed for managing automobile traffic demand.**

**FINDING:** The Board finds that the applicant has submitted sufficient text and graphics to explain and illustrate the methods to be employed for managing automobile traffic demand. The Board finds that the traffic impact study submitted with the original and supplemental CMP materials demonstrates that the internal and external road systems will be adequate to accommodate the existing and proposed resort development, with the mitigation measures required by CMP Condition 14. (Original CMP Exhibit 7; Supplemental CMP Exhibits L & M).

In addition, the Board finds that the MOU and the Cooperative Improvement Agreement submitted with the Supplemental CMP application and the FMP application illustrate that the applicant will make the necessary off-site transportation improvements to facilitate access to the resort. With respect to off-site roads, the above-referenced Memorandum of Understanding (ODOT Misc. Contracts & Agreements, No. 17.762) requires the applicant to make the necessary improvements on Highway 126 to facilitate the access. Such improvements may include a left-turn refuge to accommodate westbound traffic making a left turn onto the proposed access road, as well as a right-turn deceleration lane to accommodate eastbound traffic making a right turn onto the proposed access road. The MOU and the Cooperative Improvement Agreement also require the applicant to contribute $240,000 to fund a portion of the planned interchange at the intersection of Cline Falls Highway and US 20. The applicant will pay the interchange contribution at the time of commencement of construction of the new interchange.

N. **A copy of a WPCF permit issued by DEQ consistent with the requirements of chapter 18.113.070(L).**

**FINDING:** While the applicant has a WPCF permit issued by DEQ, it is inapplicaple to Eagle Crest III because it will be serviced by a sewer extension to the City of Redmond. As stated above, the applicant submitted evidence at the October 15, 2001 hearing that, on October 9, 2001, the City of Redmond voted to accept the applicant to accept and treat sewage from Eagle Crest III. The connection will be made consistent with FMP Condition 9.

4. Section 18.113.100, Procedure for approval of final master plan.

***A. The FMP shall be submitted in a form approved by the county Planning Director consistent with Title 22 of the Deschutes County Code for a development permit. The Planning Director shall review the FMP and if the Planning Director finds that all standards of the CMP have been met, the FMP shall be approved in writing without notice. If approval of the FMP involves the exercise of discretion, the FMP shall be treated as a land use action and notice shall be provided in accordance with Title 22 of the Deschutes County Code;***

***B. If the Planning Director finds evidence in the FMP of a substantial change from the CMP, the Planning Director shall advise the applicant to submit an application for modification or amendment of the CMP.***

**FINDING:** The Planning Director determined that approval of the FMP involves the exercise of discretion and therefore the FMP application has been treated as a land use action. Accordingly,

notice of the application and the hearings before the Board has been provided in accordance with Title 22. The Board concurs with Staff's finding that applicant submitted the FMP application on the County's required application form and submitted enough detail for Staff to make a determination on whether the application met the applicable criteria under Chapter 18.113 and the conditions of approval of the CMP. The Board further finds that there is not evidence in the FMP of a substantial change in the development proposal from the CMP to the FMP. Therefore, the Board finds that it is unnecessary for the applicant to modify for amend the CMP.

**C. Conformance with the conditions of CU-99-85.**

**1. This approval is based upon the submitted Eagle Crest Phase III CMP. Any substantial modification to this CMP beyond what is required by this decision shall require a new land use application and approval.**

**FINDING:** The Board finds that, with the conditions of approval, the FMP application conforms to the CMP. The applicant has proposed no substantial modifications to the CMP as part of the FMP.

**2. Development within Eagle Crest Phase III shall be subject to the lot and yard dimension standards in the former Planned Community Zone for Sunriver, former Chapter 18.108 of Title 18 of the Deschutes County Code, a copy of which is attached hereto as Exhibit A, except the 25-foot rear setback. The rear setback shall be no less than 5 feet.**

**FINDING:** The Board finds that development within Eagle Crest III will be subject to these standards, which are identical to those approved for Eagle Crest II.

**3. Development within Eagle Crest Phase III shall be subject to the building height standards in Section 18.120.040 and the off-street parking and loading standards in Section 18.116.030.**

**FINDING:** The Board finds that development within Eagle Crest III will be subject to the standards set forth in the cited sections of the Deschutes County Code.

**4. Development within Eagle Crest Phase III shall be subject to the solar access standards in Chapter 18.116 of Title 18 for single-family residential lots. Exceptions to allow a 14-foot solar fence south roof protection standard shall be reviewed and approved by the Planning Division on a case by case basis, as individual property owners develop their lots, and as allowed by the terms of the solar setback ordinance. All multi-family units, commercial structures, and other resort facilities will be exempt from the solar setback standards except in circumstances where the shadow of such structures would impact a single-family residential lot within or adjacent to the resort. In such cases, a 14-foot solar fence standard shall apply.**

**FINDING:** The Board finds that development within Eagle Crest III will be subject to the solar setback requirements outline in CMP Condition 4.

**5. The applicant/owner shall assure through continuous monitoring that development within the Eagle Crest resort, including Phase III, meets the**

requirement of 50 percent open space.

6. The applicant/owner shall assure through continuous monitoring that development within the Eagle Crest resort, including Phase III, does not exceed a maximum density of 1.5 dwelling units per acre.

7. The applicant/owner shall assure through continuous monitoring that development within the Eagle Crest resort, including Phase III, meets the requirement that individually-owned residential units not exceed two such units for each unit of visitor-oriented overnight lodging.

8. The applicant/owner shall assure through continuous monitoring that the erosion control plan submitted as Exhibit 16 to the original narrative is followed throughout development of Eagle Crest Phase III.

9. The applicant/owner shall assure through continuous monitoring that the Water Conservation Plan submitted as Exhibit 19 to the original narrative is followed throughout development of Eagle Crest Phase III.

10. The applicant/owner shall assure through continuous monitoring that the Water Mitigation Plan approved by OWRD is followed throughout development and operation of Eagle Crest Phase III.

11. The applicant/owner shall assure through continuous monitoring that all temporary structures located within Eagle Crest Phase III are limited to use for construction and lot sales and that such structures do not remain on the Phase III site longer than 18 months.

12. The applicant/owner shall assure through continuous monitoring that the Wildlife Mitigation Plan approved by ODFW is followed throughout development and operation of Eagle Crest Phase III.

**FINDING:** Conditions 5-12 require continuous monitoring for the ongoing development of Eagle Crest III. The Board finds that development in Eagle Crest III will be subject to these conditions, and the applicant and Staff will be responsible for ensuring that the required monitoring continues throughout the development of Phase III and that compliance with the subject conditions is documented during future preliminary plat and/or site plan approvals.

13. The applicant/owner will be required to obtain conditional use approval pursuant to Chapter 18.128 of Title 18 for any timeshare units developed in Eagle Crest Phase III that are not included on the FMP or on individual subdivision plats.

**FINDING:** The Board finds that timeshare unit development within Phase III will be subject to this condition.

14. The applicant/owner shall improve all interior roads within Eagle Crest Phase III to the County's rural local road standards, including:

    a. a dedication of sufficient right-of-way to accommodate the minimum pavement widths required below and any required utility easements;

b. except as provided in paragraph (c), a minimum pavement width of 25 feet, with 2 inches of asphaltic concrete on a 6-inch crushed aggregate base, with 2-foot aggregate shoulders;

c. for low-volume side loop roads and cul-de-sacs a minimum pavement width of 20 feet with a 6-inch crushed aggregate base and a 2-inch asphaltic concrete surface, and 2-foot aggregate shoulders;

d. a 5-foot clear zone between the edge of the pavement and adjacent trees or other vegetation

e. bicycle/pedestrian paths with a minimum pavement width of 10 feet, with 2 inches of asphaltic concrete over a 4-inch depth crushed aggregate base, and

f. all low-volume and cul-de-sac roads connecting to the interior main road shall be controlled with stop signs at the intersections.

In addition, the applicant/owner shall limit speeds on internal roads within Eagle Crest Phase III by posting a speed limit of 20 mph.

FINDING: The Board finds that all of the interior roads within Phase III will be subject to the above condition. The applicant will be required to demonstrate compliance with this condition at the time of individual tentative plat and/or site plan reviews.

15. Consistent with the BLM right-of-way approvals, the applicant/owner shall provide two points of access to Eagle Crest III including an access to Cline Falls Road through Eagle Crest Phase II and an access to Highway 126.

16. The applicant/owner shall improve the two required access roads across BLM land to the County's rural local road standards set forth in Condition 14 above. Because the grants of right-of-way from the BLM do not transfer title to the right-of-way to Eagle Crest, Inc., the applicant/owner is not be required to dedicate right-of-way to the County for the access roads.

FINDING: The Board finds that the applicant will be required to provide two roads into the Phase III development, consistent with Conditions 15 and 16. The subject access roads must be constructed consistent with the right-of-way approval issued by BLM (Supplemental CMP Exhibit D). One of the access roads shall be constructed to the applicable standards (or appropriately assured in conformance with Deschutes County policies and requirements) prior to final plat approval of any land division or any site plan approval.

17. The applicant/owner shall comply with the following conditions with respect to sewage treatment:

a) Prior to the sale of any lots within Eagle Crest III, the applicant shall execute a binding contract for the conveyance of resort sewage to the City of Redmond wastewater treatment system consistent with the May 1, 2001 Memorandum of Understanding between the applicant and the City of Redmond. The contract shall provide that construction of the sewer extension to the City of Redmond be completed and

**operational within 18 months of the CMP approval for Eagle Crest III. In the event of appeals of local land use approvals for Eagle Crest III or of any permits necessary to the sewer extension to the City of Redmond, the applicant may elect to toll the timeline for completion of the sewer extension until such appeals are resolved.**

**b) In the event that the applicant is not able to establish the connection to Redmond, the applicant may propose an alternate sewage disposal method (such as on site sewage treatment plant). A proposed alternate sewage disposal method shall meet the timeline provided for in Condition 17(a) such that it is completed and operational within 18 months of the CMP approval for Eagle Crest III. The county will consider any sewage disposal method other than the connection to Redmond as a modification to the CMP, requiring review under Chapter 18.113.080.**

**c) As required by Goal 8, the applicant shall pay for the sewer extension and connection to the City of Redmond sewer system.**

**d) As required by the Eagle Crest WPCF permit, the threshold flow rate of 68,000 gallons per day for Eagle Crest Resort (or a lesser amount if imposed by DEQ) shall not be exceeded until the Redmond sewer connection has been constructed.**

**FINDING:** The sewer system for Eagle Crest III will be connected to the City of Redmond, in accordance with a Redmond City Council decision of October 9, 2001. The Board finds that the applicant presented evidence of a binding agreement with the City of Redmond at the October 15, 2001 hearing. (Exhibit __).

**18. The applicant/owner shall assure through continuous monitoring and the construction of water storage and delivery facilities and fire hydrants that the minimum required fire flow of 1000 gpm is available at all times during development of Eagle Crest Phase III.**

**FINDING:** The Board finds that Phase III will be subject to this condition, and the Board will rely on both the applicant and the Redmond Fire Department for verification that the above standard is met.

**19. The applicant/owner shall comply with the terms of the Memorandum of Understanding dated October 12, 1999, between Eagle Crest, Inc. and ODOT (Misc. Contracts & Agreements, No. 17,762), including the agreement to pay into a fund for the improvement of the Cline Falls (Cook Avenue)/Highway 20 intersection the sum of $240,000.**

**FINDING:** The Board finds that the Memorandum of Understanding has now been replaced by the Cooperative Improvement Agreement signed by authorized representatives of Eagle Crest and ODOT, which the applicant has submitted a copy of (Exhibit "O"). Prior to the recording of the plat for the first phase in Eagle Crest III, Staff shall confer with ODOT to determine whether the terms of the Agreement have been met.

**20. The applicant/owner shall assure the execution and recording of a waiver of remonstrance in accordance with Section 18.56.120 for each residence in Eagle Crest Phase III that is located within one-half mile of the boundary of Surface**

Mining Site 252.

**FINDING:** The Board finds that the applicant will be required to have any owners of property within one-half mile of Surface Mining Site No. 252 sign waivers or remonstrance for the surface mining activities at the mining site. The waivers must be executed prior to building permit approval for those lots within the SMIA zone.

## IV. CONCLUSIONS AND RECOMMENDATION:

The Board finds that the applicant has met the applicable criteria under Chapter 18.113 of Title 18 of the Deschutes County Code for the destination resort expansion, as well as the conditions of approval established for the conceptual master plan, and recommends approval of the FMP, subject to the following conditions of approval:

1. All conditions of the Conceptual Master Plan approval shall be met and continue to be met throughout the life of the project, unless approval is granted for any changes.

2. Site plan and/or subdivision application and approval shall be required for the applicable phases of development.

3. Direct access to the main access road (the "Highway 126 Access Road") within Phase III shall not be taken from individual lots.

4. The applicant shall construct the secondary access road extending from Highway 126 to the Eagle Crest III project (the "Cline Falls Access Road") no later than the construction and completion of 25 dwelling units within the project.

5. The main roads within Phase III of the project shall include a paved pedestrian/bike path a minimum of 10 feet wide, including the road connection between Eagle Crest, Phases II and III.

6. All roads within the development shall be clearly marked with street signs meeting fire department regulations for visibility. No roads shall exceed a grade of 12 percent.

7. Maintenance of all roads within the project shall be assured through Covenants, Conditions and Restrictions or other homeowner's association documents. These shall be recorded with the first phase of development within the project and shall be binding upon all phases within Eagle Crest III.

8. The final plats for each phase shall include any necessary utility easements.

9. The applicant shall construct a sewer line extension to the City of Redmond to serve Eagle Crest III consistent with its agreement with the City of Redmond and all development in Phase III will be connected to that sewer line extension.

10. The applicant shall meet all requirements of the Oregon Health Division for the community water system for the Phase III expansion area. Each individual phase within the expansion area shall require verification from OHD that their requirements have been met.

11. The applicant shall follow the wildlife mitigation as outlined in the plan dated January 7, 2000. Verification of compliance with the plan from the Oregon Department of Fish and Wildlife shall be required two times a year, due on January 1st and July 1st of each calendar year.

12. All setback standards under section 18.113.060(G)(2) shall be met by the development within Phase III.

13. The open space plan shall be followed as outlined in Original CMP Exhibit 9. Conformance with the open space plan shall require a written report to the Planning Division due by the end of each calendar year.

14. A Waiver of Remonstrance shall be signed for all lots that are within one-half mile of the Surface Mining Site No. 252 prior to issuance of any building permits for those lots.

15. At the time of development of the phases identified as Areas 6 and 8 on the master plan, the applicant shall assure compliance with the Surface Mining Impact Area requirements prior to approval of any tentative plat or site plan for development in these areas.

Dated this 16th of October, 2001

BOARD OF COUNTY COMMISSIONERS

TOM DEWOLF, CHAIR

DENNIS R. LUKE, COMMISSIONER

ATTEST:

Recording Secretary

MICHAEL M. DALY, COMMISSIONER

August 12, 2008

Anne Corcoran-Briggs, Hearings Officer
Deschutes County, Oregon

In this letter we are providing responses to the verbal testimony and written materials from the July 15, 2008 hearing on the proposed Thornburgh Resort Final Master Plan. The opponents' arguments are in bold type and the responses are in regular type.

**Although mitigation is predicated on no net loss, there are no data provided to serve as a baseline against which no net loss can be measured.**

Baseline conditions have been clearly described in terms of wildlife habitat value in the modified HEP analysis, which was originally based on real-world data collected for Eagle Crest III, as recommended by ODFW. The impacts and mitigation area needed were estimated using the same model. ODFW has agreed that implementation of this mitigation plan would meet the no net loss or degradation standard. Specific habitat mitigation measures are proposed in the revised mitigation plan, as are before-mitigation and after-mitigation monitoring methods to determine whether the specific habitat mitigation goals will be achieved.

**Wildlife species list is a "bizarre compilation."**

TT submitted the correct species list, which was inadvertently excluded from the June 17, 2008 hearing submittal. A corrected submittal was provided at the July 15, 2008 hearing. This list is not a bizarre compilation. The species list was derived from Csuti et al.'s (2001) "Atlas of Oregon Wildlife," which includes distribution maps and species accounts describing all wildlife species known to inhabit Oregon and which the authors hope will "serve as a useful reference for serious naturalists and wildlife professionals." (p. xii).

**Species are pulled from large areas and in lots of different habitats. The relevance to this specific site is unclear. The handful of species chosen is not representative of the "complete biota."**

See response above.

**The data doesn't generalize to the bird community or small invertebrates.**

The bird community of the Thornburgh vicinity is well represented in the list of evaluation species in the HEP model: four of the seven are the red-tailed hawk,

American kestrel, mountain bluebird, and northern flicker. Small invertebrates are inferred from the condition of the habitat at the site. The grouping of small mammals as a species guild was used due to the general response species have based on the proposed habitat treatments. Small mammals serve as a prey base to raptors and it was concluded, in consultation with ODFW, that the general treatment of small mammals as a grouping was sufficient for use in the HEP analysis.

**No data are provided to document the actual species or numbers present on the site. There is no "rudimentary metric."**

These data are not necessary for the habitat approach taken for this mitigation plan.

**Basic surveys, for which this approach is standard, should be conducted two years prior to the start of significant changes to the habitats.**

This is not a requirement of the current regulations and statutes governing destination resort permitting. The modified HEP analysis was based on actual data gathered from the local area for Eagle Crest III. Not even large wind projects or pipelines are required by regulatory agencies to conduct two years of pre-construction surveys, except in the case of endangered or threatened species such as northern spotted owls or marbled murrelets.

**The HEP and HSI approaches can work as reasonable approximations only for species for which we possess the requisite species-specific ecological data based on extensive field studies.**

*See* ODFW's email to Paul Dewey dated July 28, 2008, explaining that they used the published models for the Running Y Ranch project and found that the models needed to be modified using best professional judgment about the specific habitat conditions at the resort site, to avoid results that did not make sense, based on the local biologists' knowledge from working in the area for many years.

**The HEP data are "guesstimates."**

We disagree. The core data that were used in the model were derived from GIS-based analysis, peer-reviewed literature and local biologists' knowledge of the area.

A GIS analysis calculated the amount of breeding and foraging habitat present for each species or grouping using USGS land cover habitat data. The disturbance reduction multipliers were derived from published distances species react to disturbances. In turn, suitability indices were derived from published models used at adjacent resorts in the Cline Buttes area. From this, Habitat Units were derived and formed the total amount of off-site mitigation needed to mitigate project impacts. During this entire process, local

federal and state biologists who specialize in local wildlife habitat requirements were engaged to refine values that reflect local, site-specific conditions.

The limitations of using modified HEP models have been detailed in the USFWS methods, which describe the inherent difficulties of applying data to determine individual species-specific impacts from project activities. These limitations were addressed in the calculations by basing values in the most conservative way possible.

**It is inappropriate to limit consideration to seven entities "as surrogates for the large and diverse array of species potentially present on the Thornburgh property."**

We disagree. The HEP process was designed by the USFWS to do exactly that. It is not feasible (and for that reason, is not required anywhere in the regulations) that every species on a site be identified and studied. Guidance from the USFWS to conduct that analysis this manner is documented in their HEP manual (USFWS 1981) and an excerpt from this manual is provided with this submittal.

**The challenge of actual revegetation and restoration is not addressed. This is far more difficult than Thornburgh study acknowledges.**

Tetra Tech is following the BLM's guidance on revegetation and restoration, which was established in the UDRMP and is further developed in the draft EA on the Cline Buttes Recreation Area plan. (See draft BLM EA section). The success criteria established in the mitigation plan are based on the realistic goals established by the BLM, which recognizes that invasive species such as cheatgrass cannot be eradicated from treated areas. Instead, the BLM goal for areas with these invasive weeds is to encourage the development of native (and, if necessary, in BLM's opinion, desirable non-native) plant communities capable of competing with cheatgrass. The standards established by the BLM include minimum percent cover of natives rather than a minimum percent cover of cheatgrass and other invasives. Note that cheatgrass will be controlled where it is dense, however, for fire management purposes. BLM acknowledges this difficulty, but there are also documented successes on the part of BLM in this activity. Filed herewith, as Exhibits B4 and B5, are two poster presentations related to successful vegetation management of the same type as proposed for this mitigation program.

**There is a complete absence of quantitative vegetation data for the Thornburgh site, and no indication that such data will be obtained for the BLM site.**

The mitigation plan includes a description of how existing vegetation data will be obtained on both the resort and offsite mitigation areas, prior to mitigation actions. The same monitoring will take place on and off site annually for at least five years after the

mitigation actions are implemented. The goals for the revegetation are established by BLM in Table VM in their draft Cline Buttes Recreation Area plan.

**It is not established that the BLM would agree to permanently remove grazing from offsite mitigation areas under their jurisdiction.**

Permanent cessation of grazing on BLM lands off-site of the proposed project is not included in the mitigation plan. BLM will continue to manage grazing consistent with their policies and the designation of the area as to land use priority.

**A fundamental problem is how to measure the success or failure of mitigation. There is no pre-treatment data for wildlife or vegetation and no valid methods described for post-treatment data collection.**

These methods are described in the revised Wildlife Habitat Mitigation Plan. The methods described in this plan are consistent with the federal standards and management objectives outlines outlined in the Upper Deschutes Resource Management Plan and Final Environmental Impact Statement (BLM 2005) and the Cline Buttes Recreation Area Plan that is currently under development.

**A subjective assessment of habitat value, impacts, and improvement resulting from mitigation measures cannot be "conclusively shown to meet the standard" of DCC 18.113.070(D).**

The Oregon Energy Facility Siting Council (EFSC) has issued Site Certificates for wind and other energy facilities, which means that the facilities have met the ODFW standard which is more restrictive than DCC 18.113.070(D).

**The species used for analysis "seems largely representative of major wildlife species impacted by the development activities," but the decision was made to drop the golden eagle. Red-tailed hawk is different enough that cannot be used as sample species for "large raptors."**

ODFW directed Tetra Tech to delete the golden eagle, primarily due to the absence of nesting habitat on the Thornburgh property, which differed from the Eagle Crest III property which did have eagle nesting habitat on it. The only value was foraging habitat which was considered by ODFW to be similar enough for the golden eagle and red-tailed hawk. In any case, the removal of young juniper trees, especially removal in areas of former shrub-steppe, would improve hunting conditions for both raptor species in a similar way. A map submitted by Mr. Munson showed golden eagle nest locations approximately 4 miles to the west and 4 miles to the east-southeast of the Thornburgh project site. This indicates that the Thornburgh site could be used by foraging golden

eagles from either or both nest sites, although it is also possible that these are alternate nest sites used by one pair of birds, given their large territory size.

**Mule-deer make "seasonal" use of property, indicating it is important as deer winter range.**

The property is not included by Deschutes County in designated winter range areas. The area is acknowledged by BLM, ODFW, and Tetra Tech to experience generally *low* winter use by mule deer. It is not designated as "important" winter range according to BLM, ODFW, or Deschutes County. An e-mail from Steven George (District Wildlife Biologist – ODFW) dated April 9, 2008 concerning mule deer winter range stated "there are no County Goal 5 resources identified on the property," which was submitted as evidence at the July 15, 2008 hearing. Goal 5 resources are defined as resources considered to be of statewide importance and requires local governments to inventory those resources and create programs to protect them. This includes lists of sensitive, threatened or endangered wildlife species.

**There is some mention of the removal of shrubs, but no specific mention of how bitterbrush will be dealt with. Saving all bitterbrush is key to reducing impact on the deer population.**

BLM recognizes the importance of bitterbrush. The existing shrub cover in the area is on average lower than the standards established by BLM for representative habitats, so it is likely that bitterbrush will be mostly saved in areas where it does not exceed the desired density or conflicts with fuel management objectives. Thinning may take place where shrub cover exceeds 25% but Tetra Tech will preserve as much bitterbrush as possible when conducting shrub treatment, in compliance with fire management provisions. This type of consideration has been proposed in the draft Cline Buttes Recreation plan and has been proposed in the Off-Site Mitigation and Monitoring Plan for the Thornburgh Resort.

**Increased traffic from roads will have impacts on mule deer; these are "poorly documented and addressed."**

In our analysis we recognize and include the effects of roads on the quality of mule deer habitat, and provide compensation for this loss in the mitigation plan by $20,000 for increased traffic effects on Cline Falls Hwy.

**Starling populations will increase, but their impact is not considered.**

The impacts of increased starling populations at the proposed resort are among the factors considered when baseline and post-development Habitat Suitability Indices (HSIs) were established in the modified HEP analysis; post-development habitat value was reduced.

**It will be very difficult to eliminate cheatgrass, as promised.**

The mitigation plan submitted in July 2008 does not include a specific criterion for successful control of cheatgrass. Tetra Tech and the BLM acknowledge this in the mitigation plan and the Cline Buttes Subarea Plan Draft by establishing standards for cover of native or desirable non-native plants. In addition, all habitat treatments proposed in the mitigation plan will include weed management programs consistent with BLM protocol and follow guidelines set forth in UDRMP (BLM 2005), *Prineville District Integrated Weed Management Environmental Assessment* ( BLM 1994), and *Vegetation Treatment on Bureau of Land Management Lands in the Seventeen Western States Programmatic Environmental Report* (BLM 2007).

**Dogs and cats are almost impossible to control.**

This is patently not the case at destination resorts in central Oregon. Provisions banning uncontrolled dogs and cats are enforced, and the presence of wildlife, including deer, at sites like Sunriver support this. The free-roaming dogs and cats are usually from isolated ranch residences where animals have room to roam. Submittal of a brochure from Eagle Crest indicating that pet owners should walk their pets on BLM managed land has no relevance to what the CC&Rs require of residents of this project, which will is to leash all pets outdoors.

**The proposed mitigation is difficult to assess without knowing the specific site. The possible mitigation sites are not south facing.**

The Cline Buttes Recreation Area Plan (CBRAP) is currently under development by the BLM and is scheduled by public comment in late 2008. The BLM does not feel comfortable in recommending specific areas for mitigation prior to incorporating public comments and finalizing the CBRAP. Instead, in consultation with TtEC, the BLM has provided three general areas that may be considered for future mitigation that are consistent with the BLM's current land use designations under the UDRMP. The Maston Allotment, Canyon Region and Deep Canyon Region have been identified as potential mitigation sites. Figure 1 in the Off-site Habitat Mitigation Plan shows these areas.

**Opponents recommend that "an area of non-habitat, already in some other land use, be permanently protected via purchase or conservation easement, and restored to a condition of habitat similar to the Thornburgh property."**

The body of research that addresses habitat restoration vs. re-creation from non-resource landscratch is clearly in favor of attempting to restore poorly functioning habitats with some of the original pre-settlement characteristics, especially soils with at least some

native seedbank present, vs. creating/growing such a new community from scratch. This is particularly important in arid areas such as the Thornburgh site.

Surely the opponents are not proposing that feasible mitigation for this project is to grow old growth junipers from scratch!

For example, to account for differences in success of wetland restoration vs. creation, the Oregon Department of State Lands' compensatory mitigation ratios for wetlands are 1:1 for restoration; 1.5:1 for wetland creation; and for enhancement range from 2:1 to 3:1 depending on its use (OAR 141-085-0136 (1) and (2)). The mitigation ratio proposed for this project, 2.3:1, is in this same range as the OARs.

**Fragmentation of an existing block of old-growth juniper woodland will occur, regardless of mitigation measures.**

This is acknowledged. That is why a habitat mitigation plan was developed and why mitigation will be performed offsite. However, we also point out that the Thornburgh property is not currently an unfragmented block of pristine old-growth juniper habitat. We refer the reader to Figures E-1 through E-3, which demonstrate the current fragmentation effects to wildlife from existing land use, dwellings, roads and trails.

**There is no consideration for the *cumulative* impact of adding another resort to the fringes of Cline Butte, further isolating the upper elevations of the Butte from other Juniper woodlands.**

Cumulative impacts are addressed as one of the discussion items in the attached Cumulative Impacts Memorandum dated August 12, 2008. The Butte habitats will still be connected to other juniper woodlands through BLM land from the east and west. The upper elevations of the Butte are heavily impacted by the presence of a public road to near the summit, and OHV use which has degraded habitat conditions on the Butte.

**Because there is no effectiveness monitoring provided for the future, it will be impossible to determine if the mitigation standard is met. (No feedback loop is created to assess whether the mitigation has worked.)**

The revised habitat mitigation plan includes specific descriptions of how mitigation effectiveness will be monitored quantitatively. This monitoring and management plan will use an adaptive management approach, as is also included in BLMs approach to its Cline Buttes Recreation Area Plan draft. Adaptive management focuses on establishing a feedback loop designed to assess whether the desired mitigation performance standard has been met, and if not, allows for changes to the mitigation plan to achieve the desired success.

**Conditions of approval must be specified.**

The revised mitigation plan includes specific standards or ranges that must be met to assure success.

**The ODFW letter to governor indicates that where wildlife mitigation plans for destination resorts are concerned, there has been a lack of implementation by developers, a lack of oversight by the county, and a lack of cumulative impact assessment.**

A cumulative impact assessment is provided in the Memorandum dated August 12, 2008.

**A mitigation plan must assume growth in background use (base), as well as for other approved projects in process; the approach taken should be similar to traffic impacts analysis.**

The current background traffic conditions and their effects on wildlife were included in the spatial analysis discussed and included in the mitigation plan submitted in July 2008, and included projections of future conditions. As part of the mitigation plan, Tetra Tech has assumed that the BLM will implement the UDRMP and generally enhance local habitats through juniper thinning, invasive weed treatments, and better control of OHV use; the mitigation plan was prepared with consideration of these reasonably foreseeable actions.

**There is a need for a cumulative impacts analysis.**

This is provided in the attached Memorandum dated August 12, 2008.

**The hearings officer should not rely just on ODFW and OWRD; the land use process is a separate fact-finding process.**

Then what is the purpose of the state having entire departments of experts to manage these resources and provide comments to land use proceedings?

**The report shows no understanding of impacts of invasive species.**

We disagree with this statement. We are well aware of the problems related to invasive species and the reality of this issue is well-considered and addressed in the revised wildlife habitat mitigation plan.

**There is no recognition of human impacts on adjacent properties (ORVs, etc.).**

The effects of current human use including habitation and distances from ORV-type trails were incorporated into habitat ratings within certain distances of the source of disturbance; this analysis was jointly developed by Tetra Tech, BLM, and ODFW biologists. Impacts on areas within 1 mile of the boundary of the proposed resort were

considered in the modified HEP model for all species before and after proposed development.

**A growing body of literature challenges the notion that "If you build habitat, they will come." Generalist species may do well, but other species may not.**

There is also literature that supports the notion. The results at individual sites vary and Tetra Tech, the BLM, and ODFW feel that the restoration and enhancement actions proposed will benefit many wildlife species and that in balance, there will be no net loss, although species composition may change. Populations of non-generalist species are likely to benefit from the mitigation actions proposed.

**Miscellaneous Objections**

**Gould Ex. 3 6-17-08, submitted at FMP hearing (Submits Cline Buttes Effects Analysis Methods from BLM Standards without additional comment)**

The team worked with BLM in modifying the HEP model to account for human disturbance, and BLM based its recommendations on this document, but did not go into as much detail. This level of detail is not needed for the Thornburgh analysis.

**Legislative Concept dated April 4, 2008 from DLCD**

**Several opponents testified that the Hearings Officer should wait until the next legislative session is complete and expected changes to Destination Resort Statutory Requirements.**

The Thornburgh Resort project mitigation and additional information provided has been designed specifically to address, and does adequately address, all of the wildlife-related points discussed in this legislative concept.

**Impacts on natural resources, especially water and sensitive habitat areas**

These impacts have been investigated, and there is no surface water or sensitive habitat area on the Thornburgh property, as designated by ODFW, the BLM, or Deschutes County. Impacts are described in the resort application materials.

**Lack of ability to implement mitigation**

Financial and procedural details that will adequately fund and implement mitigation are provided in the plan.

**Wildlife impacts only assessed on site**

The Thornburgh analysis includes offsite impacts.

**Lack of cumulative impact assessment**

A cumulative impact assessment that addresses reasonably foreseeable actions in the vicinity of the proposed resort has been provided.

**Proposed legislation should ensure that resorts do not further compromise the protection of:**

*Big game winter range* - Thornburgh is not located on or within 1 ½ miles of big game winter range

*County-adopted Goal 5 resource areas* – No such areas are located at the Thornburgh site

*Areas within 6 miles of sage grouse leks* – There are no leks within 6 miles of the Thornburgh site

*Migration corridors* – The proposed resort does not block any known migration corridors

*Oregon Conservation Strategy Conservation Opportunity Areas* – The western juniper savannah is identified as a specialized and local habitat. Habitat values lost to the proposed resort will be compensated for over approximately 4,500 acres (7 $mi^2$) of land managed by the BLM in the 32,640-acre (51 $mi^2$) Cline Buttes Subarea.

*Identified critical habitat for federally listed T&E species* – There is no such habitat at or near the Thornburgh site.

*Sensitive forest habitat not addressed under Statewide Planning Goal 5* – There is no such habitat at or near the Thornburgh site. Concurrence of this testimony was provided in an email by ODFW submitted as part of the evidence in the July 2008 hearing.

**The plan lacks sufficient detail in characterizing mitigation sites as well as determining mitigation methods and monitoring success.**

We didn't identify a specific mitigation site because BLM has not completed their Cline Buttes Recreation Area Plan and identified potential mitigation sites specifically. The BLM's draft plan provides details of how their program of rehabilitating and restoring old growth juniper, young juniper-dominated shrub-steppe, and shrub-steppe areas. The Thornburgh mitigation plan is based on this BLM approach and includes additional details on study protocols, performance standards, monitoring, and adaptive management which is an integral part of both the BLM and Thornburgh's plans.

**Continued emphasis on the need to conduct field studies and identify all wildlife species present in the resort area.**

The standard expressed in DCC 18.113.070(D) does not mention or call for a complete list of wildlife species at a particular site for which development is proposed. The standard simply states that there should be no net loss or degradation of the wildlife resource. In this case,

ODFW requested, and Tetra Tech prepared, a habitat-based method of assessing habitat value, impacts, and mitigation, rather than an individual species based approach. This habitat approach has been used by ODFW in relation to destination resorts in Deschutes County for years.

**Lonsdale Letter dated July 28, 2008**

**BLM hasn't completed its Cline Buttes subarea plan and thus the mitigation is not assured.**

At least 12,500 acres of potential mitigation areas are identified by BLM as potentially suitable for Thornburgh mitigation. The financing mechanism and schedule for the mitigation have been addressed in detail in the mitigation plan and their stated goals are consistent with the BLMs UDRMP.

**There is no mention of golden eagles nesting or foraging on or near the Thornburgh property, submits map showing golden eagle nest site approximately four miles west of the Thornburgh site, and one approximately four miles ESE of the Thornburgh site.**

We do not consider a distance of four miles to be "on or near" for nesting, and neither does ODFW. The use of the area by foraging golden eagles is acknowledged in the mitigation plan on pages 9 and 10 of the Wildlife Report submitted with the FMP. The reason for the deletion of the golden eagle is given in the supporting text for the modified HEP analysis in Exhibit E of the FMP. The location of the Thornburgh property, equidistant between these two nest sites (both of which may be used the same pair in alternate years, or by two different pairs), indicates that it is used only for foraging, not nesting. Both red-tailed hawks and golden eagles forage most effectively in open habitats such as shrub-steppe and will benefit from the juniper removal planned for offsite mitigation areas, which will be within the home ranges of either one of these two golden eagle pairs, or any others that may occur in the vicinity.

**Sierra Club Letter Dated July 15, 2008**

Lists additional concerns ODFW has on destination resorts: big game winter range, Goal 5 resource overlays, areas within 1 ½ mi of big game winter range, within 6 miles of sage grouse leks, in migration corridors, Oregon Conservation Strategy, and critical habitat for listed species.

These concerns were all addressed above in the response to the Legislative Concept.

Complete mitigation within 5 years of a signed mitigation plan, or funds to a trust fund.

Mitigation implementation will be phased along with development; not all phases of development are expected to be completed in 5 years.

**Katy Yoder email to Ruth Herzer dated July 15, 2008**

Loss of wildlife during development, due to being shot, frightened, increased traffic disturbance, starving

The wildlife mitigation plan is designed to offset the impacts of the resort development.

**Package listing DCC 18.113.070 Approval Criteria in the July 29, 2008 package**

**The application does not address how the development of the resort will affect the uses in the Upper Deschutes Resource Management Area by BLM, or what mechanisms will be used to prevent wildlife damage to golf courses or other resort features and how the resort development might affect traditional use areas or connectivity to habitats along the river.**

The mitigation plan directly addresses and is built on the principles and goals established by the BLM for the UDRMP. Wildlife damage to the golf course will be minimized by fencing the perimeter of the property to exclude big game. Development of the resort does not break the existing east-west corridor of shrub-steppe and juniper woodland habitat between the Deschutes River and the eastern Cascades.

**Letter from Native Restoration Fund and Steve Munson dated July 29, 2008**

**Dogs and cats from the resort will kill smaller birds and small mammals.**

As stated above, free-roaming dogs and cats will be prohibited at Thornburgh.

**Literature Cited**

Csuti, B., T. O'Neil, M. Shaughnessy, E. Gaines, and J. Hak. 2001. Atlas of Oregon Wildlife – Distribution, Habitat, and Natural History, Second Edition. Oregon State University Press, Corvallis, OR. 525 p.

Bureau of Land Management (BLM). 2007. Vegetation Treatment on Bureau of Land Management Lands in the Seventeen Western States Programmatic Environmental Report, United States Department of the Interior. Nevada State Office. Reno, Nevada.

Bureau of Land Management (BLM). 2005. Upper Deschutes Resource Management Plan and Final Environmental Impact Statement. Deschutes County, Prineville District Office, Bend, Oregon.

Bureau of Land Management (BLM). 1994. Prineville District Integrated Weed Management Environmental Assessment. Deschutes County, Prineville District Office, Bend, Oregon.

United States Fish and Wildlife Service (USFWS). 1991. Habitat Evaluation Procedures Handbook. Division of Ecological Services. Department of the Interior. Washington, D.C.

Thank you for this opportunity.

Sincerely,

Lynn Sharp

Lynn Sharp

Tetra Tech EC, Inc.

**Thornburgh Cumulative Impacts Assessment**
August 12, 2008

Cumulative impacts considered are limited to those, defined under NEPA, as reasonably foreseeable. The BA prepared by the BLM on the Thornburgh project right-of-way grant application lists the following as cumulative impacts to be considered:

- Continued loss of wildlife habitat in the vicinity (1970 acres); this project represents 1,970 acres of Deschutes County and will restore and enhance approximately 4,500 acres within the County as mitigation.
- There is still a large corridor several miles wide connecting wildlife habitat on the west, south and east sides of the proposed resort as well as a narrower native landscape corridor to the north along Cline Butte.
- The matrix of western juniper woodland would be retained through much of the resort; 897 acres would retain mature western junipers, although the habitat will be fragmented and less useful to many wildlife species. The proposed habitat mitigation plan will provide compensation for this loss.
- Impacts of increased traffic to wildlife have been addressed in the wildlife habitat mitigation plan.

Some additional reasonably foreseeable developments in the vicinity include the following:

- BLM completion and implementation of their Cline Buttes Subarea Plan and EA. The goals for habitat and vegetation management of that subarea are the same goals as expressed in the wildlife habitat mitigation plan for the Thornburgh project. Assuming that the BLM acts to achieve these goals, the following improvements can be expected to take place in the undeveloped BLM land in the vicinity of the proposed resort:
    - Great reduction in density of young junipers and return of the area to more widely scattered old junipers with inclusions of shrub-steppe from which nearly all young junipers will have been removed
    - Increases in cover of native herbaceous and shrub vegetation in many areas from which it is lacking at present
    - Rehabilitation/replanting of OHV created trails in areas no longer designated by BLM as available for OHV use
    - BLM expected increasing compliance with restrictions on OHV use over time, as they have experienced at other areas where control programs have been implemented
    - Enhanced fire protection for urban-wildland interfaces by reductions of fuel in these areas
    - Habitat enhancement at the Maston grazing allotment which lies between the proposed resort and the Deschutes River canyon as wildlife habitat improvement is the primary designation for this parcel

GROUP MACKENZIE

River East Center | 1515 SE Water Avenue, Suite 100 | Portland, OR 97214
P.O. Box 14310 | Portland, OR 97293
Tel: 503.224.9560 Web: www.grpmack.com Fax: 503.228.1285

Group Mackenzie, Incorporated

August 12, 2008

Ms. Anne Corcoran Briggs, Hearings Officer
c/o Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, Oregon 97701

Re: **Thornburgh Resort Development**
*Technical Response #10*
*Response to Public Comments*
Project Number 2040342.01

Dear Ms. Briggs:

This technical letter addresses transportation issues identified in materials submitted into the public record. Specifically, this includes issues identified by Annunziata Gould in a Memorandum dated June 27, 2008 (p. 6), a Supplemental Memorandum dated June 17, 2008 (pp. 5-6) and a Second Supplemental Memorandum dated July 29, 2008 (p. 11). All three memoranda highlight similar transportation issues which are more specifically addressed in the following sections:

1. Identified Transportation Issues
2. Conceptual Master Plan Volumes
3. Final Master Plan Volumes
4. Destination Resort Phasing
5. Summary

## 1. IDENTIFIED TRANSPORTATION ISSUES

Pages 5 and 6 of the Annunziata Gould Supplemental Memorandum dated June 17, 2008, presents *"Section C. Transportation Issues"*. Materials contained on page 5 of the memorandum assert the Conceptual Master Plan (CMP) average daily traffic (ADT) volumes presented in the Applicant's transportation impact analysis (TIA) are different than the Final Master Plan (FMP) ADT volumes presented in the wildlife analysis. These different ADT volumes are presented in the following table:

| TABLE 1 – AVERAGE DAILY TRAFFIC (ADT) VOLUMES | | |
|---|---|---|
| Location | CMP (TIA – 2005) | FMP (Wildlife Analysis – 2015) |
| Cline Falls Hwy, just south of Hwy 126 | 5,291 | 6,250 |
| Cline Falls Hwy, just south of SW 83rd Street | 3,081 | 4,120 |
| Cline Falls Hwy, just north of White Rock Loop | 3,234 | 3,980 |

As shown in the table, these ADT volumes are different; however, it is important to note they represent different analysis years – and both are accurate. Descriptions of the CMP and FMP assumptions are provided in the following sections.

## 2. CONCEPTUAL MASTER PLAN VOLUMES

CMP ADT volumes for Cline Falls Highway are presented in Figure 4a of the Applicant's TIA. These volumes are based on 24-hour count data obtained in July 2005 which is contained in TIA Appendix B – Traffic Count Summaries.

In conclusion, CMP ADT volumes are based on field-collected data for the peak traffic month of July and accurately represent 2005 operating conditions.

## 3. FINAL MASTER PLAN VOLUMES

A wildlife analysis was included as part of the Applicant's FMP. This analysis identifies resort impacts to the roadway system – in terms of the average day versus the PM peak hour which was the TIA focus. Further, these volumes were estimated in 2015 (the plan year) and not in 2005 (current TIA year).

To determine impacts in a manner consistent with standard engineering practice, ADT volumes were estimated as 10 times the PM peak hour volumes. Therefore, to estimate resort generated ADT volumes, PM peak hour data presented in Figure 8a of the TIA was multiplied by 10. And, to estimate pre-development roadway ADT volumes, PM peak hour pre-development traffic volume data contained in Figure 7a was multiplied by 10.

In conclusion, FMP ADT volumes are *estimated* and accurately represent 2015 operating conditions.

## 4. DESTINATION RESORT PHASING

Materials contained on pages 5 and 6 of the Annunziata Gould Supplemental Memorandum dated June 17, 2008 asserts there are *"... potential differences in phasing which would make a difference in the traffic impact analysis. As reflected in Ex. H, the TIA assessment done by the Applicant at the CMP stage showed traffic impacts for the northern and southern areas of the resort separately. To the extent that development is altered between these northern and southern areas, then the traffic numbers and impacts along the respective roads would obviously change."*

Resort development assumptions, including impacts for the northern and southern areas, have not changed from those contemplated in the CMP TIA. Further, area background growth has been consistent with TIA estimates.

In conclusion, the CMP TIA accurately reflects anticipated impacts and revision is not necessary.

## 5. SUMMARY

This letter addresses transportation related issues raised in materials submitted into the record by Annunziata Gould. The following conclusions and recommendations are based on findings contained in this letter:

1. CMP ADT volumes are based on field-collected data for the peak traffic month of July and accurately represent 2005 operating conditions.
2. FMP ADT volumes are *estimated* and accurately represent 2015 operating conditions.
3. The CMP TIA accurately reflects anticipated impacts, and revision is not necessary.

Sincerely,

Christopher M. Clemow, P.E., P.T.O.E.
Transportation Engineer

c: Ruth Herzer — Deschutes County, Community Development Department
Kameron DeLashmutt — Thornburgh Resort
Peter Livingston — Schwabe Williamson & Wyatt
Myles Conway — Schwabe Williamson & Wyatt

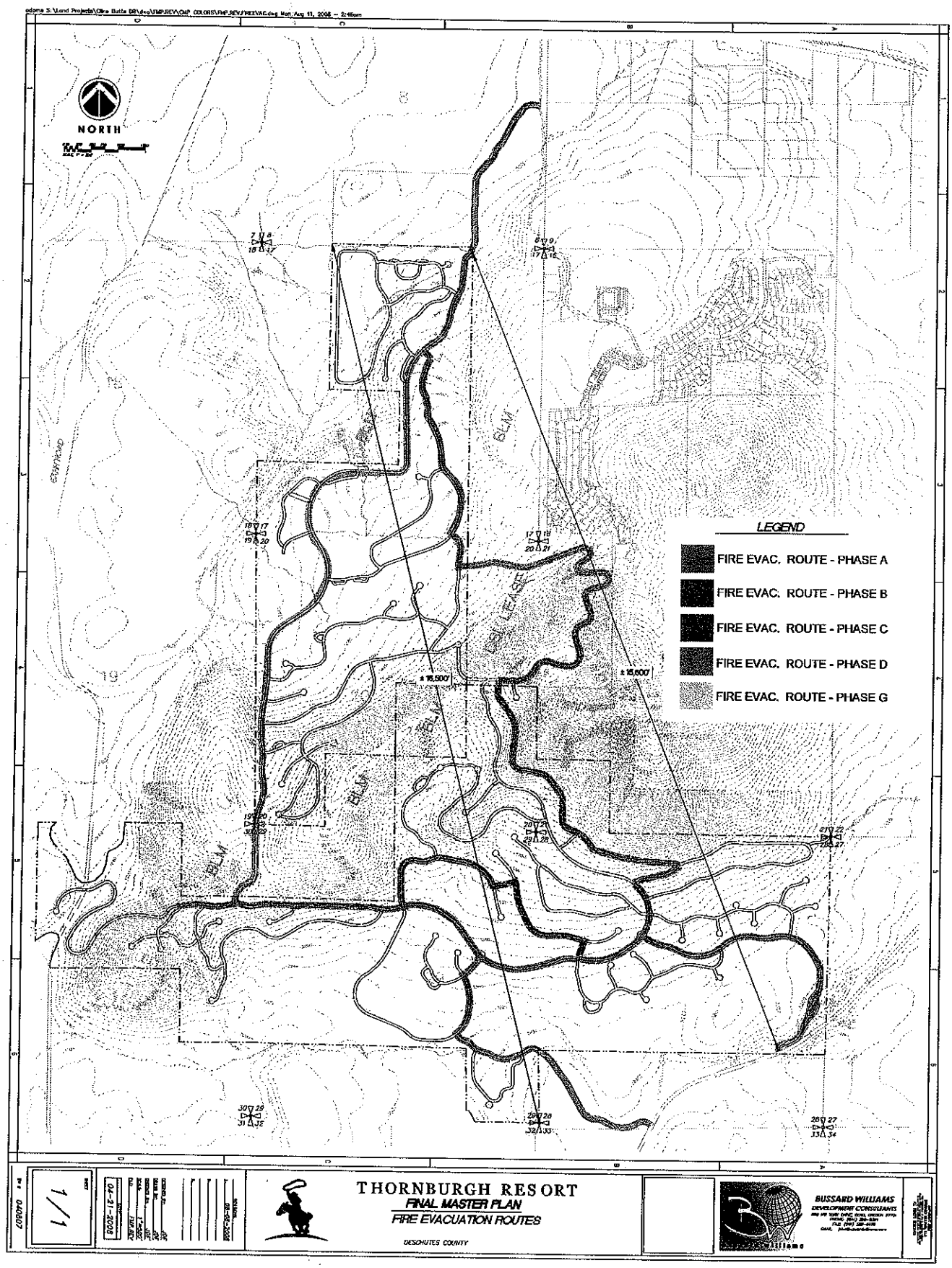



Exhibit F.7.1
LUBA #2008-203
REVISED AS REBUTTAL EXHIBIT C.2
00749

C-2

Kam,

The location of fire apparatus roads is defined in Section D104.3 of the 2006 International Fire Code.

"**D104.3 - Remoteness.** Where two access roads are required, they shall be placed a distance apart equal to not less than one half the length of the maximum overall diagonal dimension of the property or area to be served, measured in a straight line between accesses."

Here are the distances.

**Thornburgh:**

The longest diagonal distance is 16,440-ft. Half that distance is 8,220-ft.

The distance between the southeast entrance (Tribute) is 15,740-ft from the north entrance (Pinnacle).

The distance between the southwest entrance (Tribute) is 14,700-ft from the north entrance (Pinnacle).

Jeff Fuchs, PE
Bussard Williams, LLC
Consulting Engineers
389 SW Scalehouse Court, Suite 100
Bend, Oregon 97702

541-389-9351 Extension 110
jeffreyf@bussardwilliams.com

Kameron,
I am the project manager for the Tumalo environmental process and we are currently collecting survey information of the area and plan on kicking off the project later this fall (as your email indicates). I will add you to me stakeholder distribution list and keep you informed of the timelines of the schedule.

If you have any other questions, please feel free to contact me.

Sincerely,

Stephanie Serpico, PE
Region 4 Interim Program Manager
Oregon Department of Transportation
63030 OB Riley Road
Bend, OR 97701
541-388-6309 (work)
541-388-6483 (fax)

---

**From:** DEVONEY Mark
**Sent:** Friday, August 08, 2008 11:01 AM
**To:** SERPICO Stephanie L
**Cc:** Kameron DeLashmutt; BRYANT Robert W
**Subject:** RE: question about timing

Stephanie,
Would you please update Kameron on when we plan to get started on the Tumalo environmental analysis process?
Thanks,
Mark

---

**From:** Kameron DeLashmutt [mailto:kameron@bendcable.com]
**Sent:** Friday, August 08, 2008 9:53 AM
**To:** BRYANT Robert W
**Cc:** DEVONEY Mark
**Subject:** question about timing

Bob,
A question has come up about the timing of the study that you are undertaking and the next steps. Testimony was made that ODOT has no plans to do anything or even study the issue until after 2013. From my conversations I understood that ODOT was going to begin the study process later this year or early next. Can you drop me an email that would outline what you think will happen and when? It is appreciated.
Thank you,

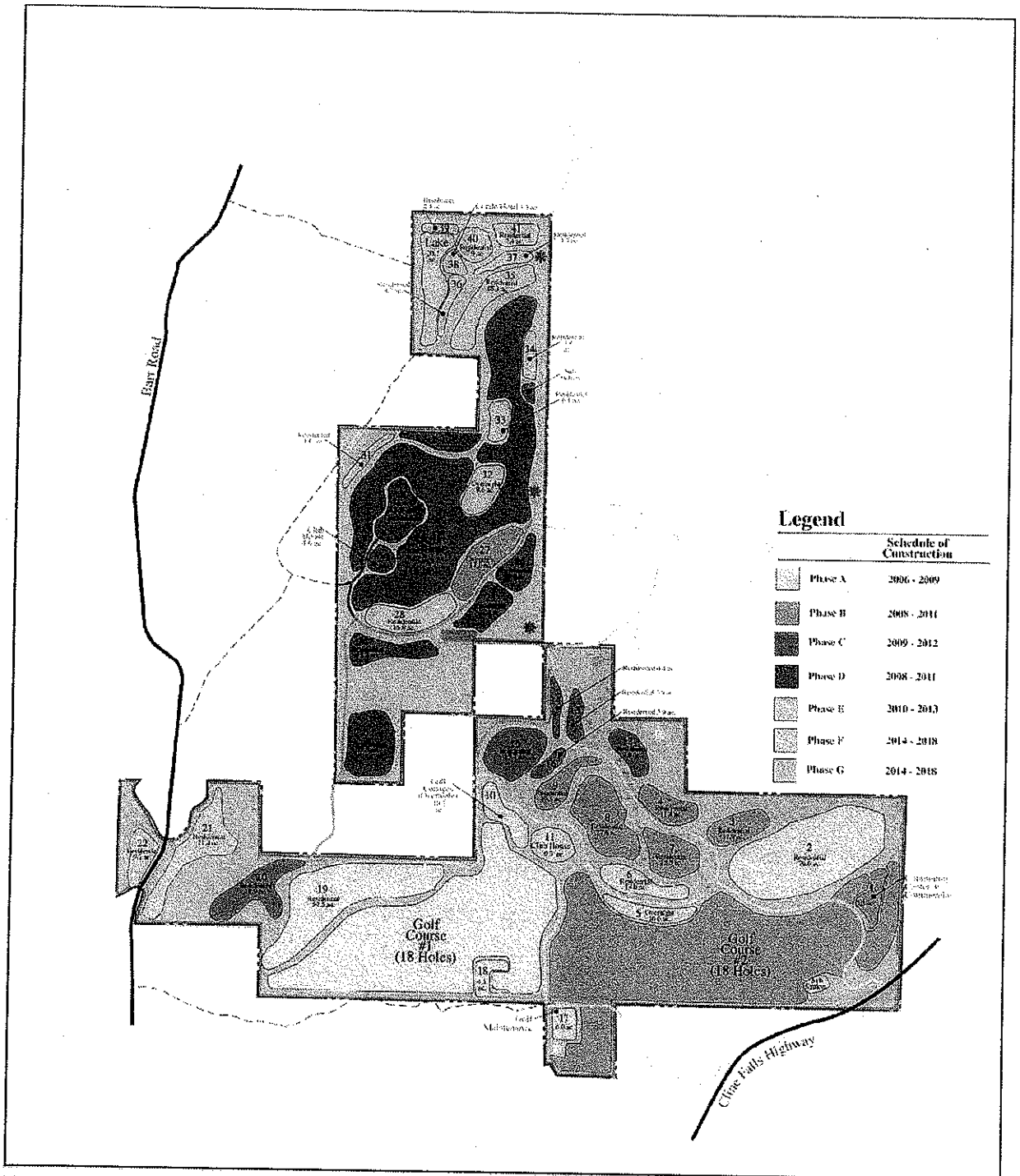
Kameron DeLashmutt
O) 541-318-9950 ext 104
C) 541-350-8479

## Kameron DeLashmutt

**From:** Kameron DeLashmutt [kameron@bendcable.com]
**Sent:** Tuesday, August 05, 2008 9:53 AM
**To:** Kam DeLashmutt
**Subject:** FW: Cooperative Improvement Agreement with Thornburgh Destination Resort
**Attachments:** 2655717_5.pdf

**From:** DEVONEY Mark [mailto:Mark.DEVONEY@odot.state.or.us]
**Sent:** Tuesday, August 05, 2008 9:21 AM
**To:** BEERNINK Albert H
**Cc:** BRYANT James R; BRYANT Robert W; Kameron DeLashmutt
**Subject:** FW: Cooperative Improvement Agreement with Thornburgh Destination Resort

Hans,
Please begin the agreement approval process for this agreement with Thornburgh Resort, including DOJ review and any other required internal review. Once this is complete, let's schedule for the earliest OTC agenda that we'll be ready for (probably Sept or Oct depending on how long our DOJ review takes).
Thanks,
Mark




THORNBURGH RESORT

PHASING PLAN - EXHIBIT #B-1.08

***REVISED B-1.08 AUGUST 11, 2008***

LUBA #2008-203

***REVISED AS REBUTTAL EXHIBIT D.1***

00753

D-1

July 18, 2008

To Whom It May Concern:

This is in regards with Sharon Gambrel and my family, dealing with Steve Munson on Cline Butte. When Steve Munson moved to Harry Kems house as a renter Mr. Munson approached me about the mining claims. Mr. Munson said he would like to buy them for Geo thermo for the mining claims are on a hot spot and he could sell power to Bend, Redmond and Sisters. I told him the claim wasn't for sale. Then from that time on he started to harass us. Until he moved out of Harry Kems house 3 plus years.

We had permission from Everett and Eva Thornburgh to get rock and cut wood on their property, we also had permission to get rock off of Harry Kems property. I had access to go on the property to get to mining claims.

To my knowledge at the time Mr. Munson was renting from Harry Kim. He was renting only the house and property around the house not the 360 acres. Mr. Munson acted like it was all of his property.

My son Craig Gambrel was the coca pit and Mr. Munson road up on a horse with some lady and pulled a shotgun on him and told him to freeze. Craig went to the Deschutes County sheriff's office and made a report.

We had let Chad Michael get some rock out, and when he was going up to the mining claims Mr. Munson had a gun on him. Mr. Munson had a bad temper and a very loud voice, Chad was very scared. He had Chad arrested for trespassing. When Chad and I went to court Mr. Munson didn't show up so there was no court.

Mr. Munson harassed all of us for 3 plus years. When he was living in Harry Kems house at times, he would sneak up on us while we were working and shoot his gun off up into the air. We were always looking over our shoulders when we were working.

Craig was working on the claims and he called a friend, Lisa to bring him a hamburger for lunch, she had a friend with her, Mr. Munson stopped them with a gun pointed at them with his bad temper and loud voice.

We had put in a report about this and he was arrested. When Mr. Munson went to court he pleaded guilty and got 5 years probation and had his guns taken away.

This is only part of what Mr. Munson did to my family and I on Cline Butte, I know Mr. Munson called BLM about my family and I several times.

I feel Mr. Munson's concern about the resort on Cine Butte is all about the Geo thermo potential and not the resort itself.

Sharon G. Gambrel

State of Oregon

County of Deschutes

Signed or attested before me on July 18 2008 by Sharon Gambrel.

Vivian M. Garcia-Coumas
Notary Public – State of Oregon

OFFICIAL SEAL
VIVIAN M GARCIA-COUMAS
NOTARY PUBLIC-OREGON
COMMISSION NO. 423140
MY COMMISSION EXPIRES NOV. 7, 2011

My commission expires 11/7/2011

August 11, 2008

To Whom it May Concern:

My name is Craig Gambrel. For many years my family operated mining claims on BLM land in the Cline Buttes area next to the Thornburgh resort. For part of that time Steve Munson rented a home from Harry Kem on property that is now part of the resort. Munson made numerous attempts to get our family off our mining claims because he wanted the geothermal rights under the land. When we refused to leave, he resorted to threats and violence. On numerous occasions, I saw Munson threaten people who crossed the Thornburgh and Kem properties. Several times he threatened me and other people from my family with guns. I think Munson is opposing the resort because he couldn't get the geothermal.

Craig Gambrel

32011

DESCHUTES COUNTY, WORK CENTER
2000 JUL -3 AM 10:30

IN THE CIRCUIT COURT OF THE STATE OF OREGON
FOR DESCHUTES COUNTY

| | |
|---|---|
| THE STATE OF OREGON<br>Plaintiff,<br>vs<br>MUNSON, STEPHEN MILES<br>Defendant. | Case Number 00FE0627MS<br>**BENCH WARRANT** |

IN THE NAME OF THE STATE OF OREGON: To any Peace Officer in the State of Oregon.

By order of the above entitled Court, you are hereby commanded to take into your custody and to arrest the above named defendant and bring him/her before the Court forthwith for the offense of CWPNF-UNLAWFUL USE OF DANGEROUS WEAPON WITH A FIREARM;CWPNF-UNLAWFUL USE OF DANGEROUS WEAPON WITH A FIREARM;GUNP-POINTING FIREARM AT ANOTHER;GUNP-POINTING FIREARM AT ANOTHER;MEN-MENACING;MEN-MENACING

DATED at Bend, Oregon, this 29 day of June, 2000

Security Amount:

$ 25,000

Circuit Judge

FILED
DESCHUTES COUNTY
OREGON
JUL 24 AM 11:09
BY COURT

STATE OF OREGON )
County of Deschutes )

RETURN

I hereby certify that the foregoing Bench Warrant was executed on

_____, 20_____.

_____
Name

_____
Title

==========

Entry: LEDS Yes NCIC Yes RESTRICTIONS IFT only
Identifiers: DOB 01/21/44 WM HGT 509 WGT 175 HR GRY
Eyes BRO Other Identifiers TAT L ARM ;TAT R ARM ;
Last known address 67555 SW CLINE FALLS RD BEND, OR 97701
Orig Agency SO 0011940 Officer GARIBAY, LARRY
06/27/00 DA: S.G.

Arrested 7-20-00 by DCSO



LUBA #2008-203
00757 E-3

FILED
CIRCUIT COURT

IN THE CIRCUIT COURT OF THE STATE OF OREGON
FOR DESCHUTES COUNTY

| | |
|---|---|
| THE STATE OF OREGON<br>Plaintiff,<br>vs<br><br>MUNSON, STEPHEN MILES (125116)<br>(DOB 01/21/44)<br>(* No control#)<br>(SID#: 05232603)<br><br>Defendant, | Case Number 00FE0627MS<br><br>**INDICTMENT**<br>For Violation of ORS:<br>166.220(c) F/C<br>166.220(c) F/C<br>166.190 M/<br>166.190 M/<br>163.190 M/A<br>163.190 M/A<br>SO 0011940 |

The above named defendant is accused by the Grand Jury in this indictment of the offense of UNLAWFUL USE OF DANGEROUS WEAPON WITH A FIREARM (Count 1) ; UNLAWFUL USE OF DANGEROUS WEAPON WITH A FIREARM (Count 2) ; POINTING FIREARM AT ANOTHER (Count 3) ; POINTING FIREARM AT ANOTHER (Count 4) ; MENACING (Count 5) ; MENACING (Count 6) committed as follows:

(Count 1 - ORS 166.220) That the said defendant, on or about the 12th day of April 2000, in Deschutes County, Oregon, did unlawfully attempt to use against Lisa Nash a dangerous weapon, to-wit: A rifle,

The State further alleges that the defendant used or threatened to use a firearm during the commission of the above-described offense,

(Count 2 - ORS 166.220) That the said defendant, on or about the 12th day of April 2000, in Deschutes County, Oregon, did unlawfully attempt to use against Linda Rodriguez a dangerous weapon, to-wit: A rifle,

The State further alleges that the defendant used or threatened to use a firearm during the commission of the above-described offense,

(Count 3 - ORS 166.190) That the said defendant, on or about the 12th day of April 2000, in Deschutes County, Oregon, being a person over the age of 12 years, did unlawfully, knowingly, and purposely point a gun at or toward Lisa Nash, who was within range of said firearm,

(Count 4 - ORS 166.190) That the said defendant, on or about the 12th day of April 2000, in Deschutes County, Oregon, being a person over the age of 12 years, did unlawfully, knowingly, and purposely point a gun at or toward Linda Rodriguez, who was within range of said firearm,

(Count 5 - ORS 163.190) That the said defendant, on or about the 12th day of April 2000, in Deschutes County, Oregon, did unlawfully and intentionally attempt to place Lisa Nash in fear of imminent serious physical injury,



LUBA #2008-203
00758

(Count 6 - ORS 163.190) That the said defendant, on or about the 12th day of April 2000, in Deschutes County, Oregon, did unlawfully and intentionally attempt to place Linda Rodriguez in fear of imminent serious physical injury,

contrary to the statutes, regulations and such cases made and provided and against the peace and dignity of the State of Oregon. The State declares its intent to continue to treat any misdemeanor charged herein as a crime.

Dated at Bend, Oregon this 27th day of June, 2000

Witnesses subpenaed and examined before the Grand Jury and for the State of Oregon:
GARIBAY, LARRY
NASH, LISA ELIZABETH

a true bill

Foreman of Grand Jury

MICHAEL T. DUGAN, District Attorney

By _____
OSB 94083 S.G.

Security amount is $ 25,000
Let a Bench Warrant issue.

Dated: 6-29-2000

Circuit Judge

STATE OF OREGON, COUNTY OF DESCHUTES - RELEASE ORDER AND AGREEMENT
1100 NW BOND, BEND OR 97701

MUNSON, STEVEN NILES )Case Number(s): 00FE0627MS
)00FE0627MS 00FE0627MS
)00FE0627MS 00FE0627MS
)00FE0627MS
01/21/44 )Charges: UNLAWFUL USE OF
DOB CONTROL NUMBER )DANGEROUS WEAPON WITH A
)FIREARM ; UNLAWFUL USE OF
)DANGEROUS WEAPON WITH A
)FIREARM ; POINTING FIREARM AT
)ANOTHER ; POINTING FIREARM AT
)ANOTHER ; MENACING ; MENACING

FILED
CIRCUIT COURT
2000 JUL 21 AM 9:56
DESCHUTES COUNTY
OREGON

CONDITIONS:

As conditions of my release from custody, I promise and agree that:

* I will make my first/next court appearance pursuant to this agreement in the Deschutes County court on 08/23/00 at 08:30AM
* I will submit to the orders and process of the court and will appear on any future dates set by the court until discharge or final order of the court of jurisdiction.
  I will reside at: 67555 SW CLINE FALLS RD, BEND OR
  BEND OR 97701
  (Phone# 504-1973) unless otherwise authorized by the court;
* I will be a law abiding citizen at all times, and I understand that a new arrest may cause this release order to be revoked;
* SUBJECT TO COURT ORDERED MONITORING ( )
* I will not depart this state UNLESS AUTHORIZED BY THE COURT ( )
* I will keep in contact with my attorney _____
* I will comply with the following additional conditions imposed by the court:

_____

_____

I also acknowledge that IF I VIOLATE ANY OF THE CONDITIONS in this agreement, a warrant for my arrest may be issued, I will forfeit to the court the full security amount. Any bail posted as deposit on security will be forfeited as part of that security amount. I know I may also be prosecuted for CONTEMPT OF COURT or the separate crime of FAILURE TO APPEAR.

I have read this agreement, or had it read to me, and I understand the terms contained herein. I swear the above information is true, and I will comply in every respect with the above terms.

Steve Munson
Defendant's Signature

Subscribed and sworn to before me on this 20th day of July, 2000

C.R. Jones Jones
Representative of: Judge/Release Officer/Clerk/Sheriff

==========

Type of Release Authorized:

Security $2,500.00 Deposited by: FRANK CARIGLA

IN THE CIRCUIT COURT OF THE STATE OF OREGON

FOR THE COUNTY OF DESCHUTES

STATE OF OREGON

Plaintiff,

vs.

Munson, Stephen Miles

Defendant.

Case No. 00FE0627MS

MOTION TO DISMISS
AND
JUDGMENT OF DISMISSAL

FILED
CIRCUIT COURT
DESCHUTES COUNTY, OREGON
01 JAN 11 AM 10:49

The State moves the Court for an Order dismissing

___ District Attorney's Information ✓ Indictment

✓ without prejudice ___ with prejudice, the charges herein of:

Unlawful Use of a Dangerous Weapon with a Firearm x2
Pointing Firearm at Another x2, Menacing x2

for the reason that:

✓ pursuant to plea negotiation and agreement defendant will plead guilty to Reckless Endangering in 01FE0036MS.

___ evidence insufficient to sustain prosecution

___ victim declines to prosecute

___ in the interests of justice

___ facts have been presented to the Grand Jury

___ request outstanding warrant be recalled

DATED: 1/09/01

Deputy District Attorney OSB _____

IT IS SO ADJUDGED this 11th day of January 2001.

and any outstanding warrant in this matter is recalled

Judge of the Circuit Court

FILED
CIRCUIT COURT
DESCHUTES COUNTY, OREGON
01 JAN 11 AM 10:49



Original: Court Copy: DA, Sheriff, Defendant/Def Counsel

1/9/01

THORNBURGH

RESORT COMPANY

August 12, 2008

Anne Corcoran Briggs
Hearing Officer
c/o Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, OR 97701

Dear Ms. Briggs:

The purpose of this letter is to respond to some of the negative comments made toward the Thornburgh Resort project and to describe some of the many positive plans Thornburgh is implementing.

Many comments have been made that Thornburgh does not care about how it impacts the land and the area, that we should do something sustainable, that we should have less impacts, lower density, or smaller development. I understand that in many cases these comments are made by people who are promoting their own agendas and motives, and as such they are suspect. But I would still like to point out how far those claims and comments are from the truth. We think the record should reflect:

**Thornburgh's Commitment to finding Beneficial Solutions:**

1. We consistently strive to collaborate, and cooperate with the public agencies tasked with overseeing or commenting on elements of our development. Letters from the Agencies consistently attest to that. Examples include:

   - Letters from ODOT thank us for the spirit of cooperation with which we approach issues and for the support of their planning efforts pertaining to the Hwy 20 and Cook Avenue solution. We voluntarily increased our contribution (from our earlier agreement) by roughly $750,000 to help facilitate that solution when ODOT explained to us the challenges they were having in moving forward. Our actions here will have substantial benefits to the region, the citizens of Tumalo, and visitors to Thornburgh.

   - Over a 5-year history of working together with the BLM, communications from them consistently praises our spirit of cooperation. This cooperation resulted in the MOU between us and will pave the way for on-the-ground cooperation as the Cline Buttes Subarea Plan takes place. These efforts will improve the entire area for thousands of visitors as well as improve the area for wildlife habitat.

   - Information from ODFW not only states that we are fully mitigating for our impacts but also that we are putting together the best mitigation plan of any resort in Central Oregon.

**Thornburgh's Commitment to Livability**

2. The many times we have chosen livability over profitability in our planning is reflected in the layout of the community. Our development plan consistently has lower impact than that which is allowed under the codes. Some examples are:

   - Open space allowed by code is 50% whereas Thornburgh is in excess of 60%.

   - Total units allowed by code are 2,955 single family units plus 1,477 overnight units for a total of 4,432 dwelling units. Thornburgh's planned total of 1,425 DU's is only 32% of the allowable maximum.

**Thornburgh's Commitment to Sustainability**

3. Our development planning is taking into account many "Green" and sustainable elements that will serve to lower usage and impacts in numerous ways. Many of the elements that we are incorporating are at the leading edge of sustainability. All of them are voluntary and in many cases quite costly.

   - We have registered with Audubon International under their Gold Signature program which is a level of environmental care pertaining to the entire community that only a handful of communities in America have been able to achieve. This voluntary program deals with water quality, use of chemicals, wildlife and habitat issues.

   - We have applied for certification for our developer-owned commercial buildings under the US Green Building Council's LEED (Leadership in Energy and Environmental Design) program under at the level of Gold.

   - We are pursuing the use of a substantial solar array that would dramatically reduce our use of power from sources using fossil fuels.

   - We are incorporating elements into our building guidelines incentives that will improve the resource efficiency of homes in the project far in excess of local building codes.

We are spending time, effort and millions of dollars in financial resources to do things that are not required, to make voluntary overtures, and to work with agencies in areas that are not necessary for us to do. We do this because we are committed to the creation of a project that imparts a positive impact on the community, is a good neighbor, and leaves a lasting legacy for its residents and guests for decades to come.

Sincerely,

Kameron DeLashmutt
Thornburgh Resort

THORNBURGH

RESORT COMPANY

Anne Corcoran Briggs

Hearing Officer

c/o Deschutes County Planning Division

117 NW Lafayette Avenue

Bend, OR 97701

Re: DSL Lease Option Agreement for Land Acquired From BLM

Dear Ms. Briggs:

This letter responds to questions raised by Ms. Nunzie Gould during the Final Master Plan hearings regarding ownership and control of certain lands adjacent to the Thornburgh property that were previously owned by the United States, Bureau of Land Management, and that recently were transferred to ownership by the State of Oregon, Department of State Lands (DSL). The property in question consists of 240 acres commonly called the "Z-3" lands, referring to a planning classification by the BLM for lands no longer needed for public purposes that may therefore be conveyed out of federal ownership.

Ms. Gould was correct in noting that the BLM has, in fact, recently conveyed ownership to the State. However, Ms. Gould was apparently unaware that Thornburgh has an option to lease the Z-3 lands from DSL. The lease option was created by letter agreement dated October 17, 2006, amending Special Use Lease 33991-SU between Thornburgh and DSL. A copy of Special Use Lease 33991-SU was submitted into the hearing record during the CMP stage. A copy of October 17, 2006 letter amendment is attached. Thornburgh has given notice to DSL of its intention to exercise the option and is currently working with DSL on a final written agreement.

Sincerely,

Kameron DeLashmutt

Thornburgh Resort LLC

SCHWABE, WILLIAMSON & WYATT
ATTORNEYS AT LAW

Equitable Center, 530 Center St., NE, Suite 400, Salem, OR 97301 | Phone 503-540-4262 | Fax 503-399-1645 | www.schwabe.com

MARTHA O. PAGEL
**Admitted in Oregon and Washington**
**Direct Line: Salem (503) 540-4260; Portland (503) 796-2872**
**E-Mail: mpagel@schwabe.com**

October 17, 2006

**BY HAND DELIVERY**

Stephen J. Purchase
Assistant Director, Field Operations
Oregon Division of State Lands
775 Summer Street NE Suite 100
Salem, OR 97301-1279

Re: Amendment of Special Use Lease
Our File No.: 112188/138798

Dear Steve:

I am writing on behalf of our client, Thornburgh Resort LLC (Thornburgh), to request amendment of the existing Special Use Lease 33991-SU ("Lease") between Thornburgh and the Department of State Lands (DSL). As described more fully below, Thornburgh requests that the lease be amended to add an option for Thornburgh to lease an additional 240 acres of land that DSL is in the process of acquiring from the United States Bureau of Land Management (BLM). The lands are commonly called "Z-3" lands, referring to a planning classification by the BLM which indicates that the lands are no longer needed for public purposes by the BLM and may therefore be conveyed out of federal ownership.

The 240 acres of Z-3 lands consist of five parcels that are situated as in-holdings within the private lands owned by Thornburgh and planned for development as a destination resort. Thornburgh proposes to add these lands to the existing lease, with an option to include the lands within a master plan for future resort development, as currently provided under the Lease for 160 acres of land currently owned by the State.

**Background/Recitals**

The Lease currently includes an option under which Thornburgh may provide a Conceptual Master Development Plan to DSL describing how the 160 acres of state-owned land could be incorporated into the Destination Resort. Upon approval of the Conceptual Master Development Plan, Thornburgh is authorized to seek necessary county land use approvals to re-

map the leased premises for destination resort development. Upon successful completion of that process, Thornburgh has an option to develop the leased premises, subject to modification or expansion of the Lease terms, as appropriate, for implementation of the Master Development Plan.

This Lease Amendment is intended to create an option for Thornburgh to lease an additional 240 acres of land (the Z-3 Lands), upon acquisition by DSL from the BLM, and to include the additional land within the Conceptual Master Development Plan and approved Master Development Plan, as provided under the Lease, subject to all other terms and conditions of the Lease.

The Z-3 Lands are adjacent to and largely surrounded by lands owned by Thornburgh and proposed for development as part of the Destination Resort.

The Z-3 Lands are comprised of five parcels totaling 240 acres. Four the five parcels are subject to surface mining claims for which Thornburgh holds an option to purchase. The fifth parcel is surrounded on three sides by Thornburgh property.

The private land owned by Thornburgh is zoned for Exclusive Farm Use (EFU), but is also included in a county comprehensive plan overlay map that allows destination resort development on land otherwise zoned as EFU. The Z-3 Lands and the 160 acres of land currently included within the Lease Premises are not within the overlay map. Therefore, a map change approved through part of the County's comprehensive plan would be required before the lands could be developed for destination resort purposes.

**Lease Amendment**

Based on the foregoing background, and for due consideration as provided herein, the Parties hereby amend the Lease as follows:

Option to Expand the Leased Premises: Upon acquisition of title to the Z-3 Lands by Landlord, Tenant shall have the option to expand the Leased Premises to include the lands referred to as the "Z-3" Lands," more particularly described in Exhibit 1. Landlord shall provide written notice to Tenant within 30 days of acquisition of title to the Z-3 Lands, and Tenant shall have 30 days after receipt of notice to exercise the Option.

Additional Rent: Rent for the Z-3 Lands shall be $17,232 per year payable upon the Commencement Date for this Lease Amendment. The Commencement Date shall be the day following transfer of title for the lands from the BLM to DSL.

Uses of the Premises: The Z-3 Lands may be improved, used and maintained by Tenant for "open space," as provided under Article 5 of the Lease and subject to the provisions of Article 5 for inclusion in and possible development under an approved Master Development Plan for the Destination Resort.

Other Terms and Conditions: Use of the Z-3 Lands shall be subject to all other terms and conditions of the Lease.

We are providing two signed originals of this Letter Agreement Amending Lease 33991-SU. Please sign and return one fully executed original to us. We understand you will also prepare a Memorandum of Lease Amendment to be executed and recorded in Deschutes County after the Commencement Date.

Thank you for your assistance.

Very truly yours,

Martha O. Pagel

MOP:kdo
cc: Kameron DeLashmutt

ACKNOWLEDGED AND AGREED TO:

Oregon Division of State Lands

By: Stephen J. Purchase
Stephen J. Purchase
Assistant Director
Dated: November 9, 2006

**Exhibit 1**

**Description of "Z-3" Lands**

T15S, R12 S, Sec 17, NE1/4SW1/4, 40 acres (Parcel 1)
T15S, R12 S, Sec 20, NW1/4SE1/4, 40 acres (Parcel 2)
T15S, R12 S, Sec 20, SE1/4SW1/4, 40 acres (Parcel 3
T15S, R12 S, Sec 29, N1/2NW1/4, 80 acres (Parcel 4)
T15S, R12 S, Sec 30, NE1/4NE1/4, 40 acres (Parcel 5)



p.5

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bussard williams

Martha Pagel
SCHWABE, WILLIAMSON & WYATT
530 Center St. NE, Ste. 400, Salem, OR 97301

Re: Wastewater flow characterization discrepancy between the Concept Master Plan submittal and the Water Pollution Control Facilities Permit.

Dear Ms. Pagel,

You have brought to my attention that the wastewater flow rate allowed by the state Water Pollution Control Facilities (WPCF) permit is less than the flow rate basis in the Concept Master Plan (CMP) submitted to and approved by the County. The flow rates developed for the CMP were taken from the Oregon Administrative Rules governing onsite disposal of wastewater; Table 2 of OAR 340-071. Those rules were developed for flows typically below 2000 gallons per day (gpd) and apply to conventional septic systems and onsite pre-treatment technologies. The onsite rules are for use by local jurisdictions having authority over flows less than 2000 gpd. However, for facilities over 2000 gpd the treatment and disposal systems fall under DEQ jurisdiction and are considered engineered systems. For engineered systems, there are no defined flow rates. It is up to the engineer to characterize the wastewater generation rates.

The WPCF permit application required the development and submittal of a preliminary engineering report. The report, entitled *Thornburgh Resort, Draft Wastewater Facilities Plan,* included wastewater characterization and flow projections. This report was developed, as required, following the concept master plan approval and prior to the final master plan submittal. The rates used for the report are based on flow rates found in the literature and backed up data from similar resorts operating in Central Oregon. The table below provides the flow basis by establishment used in the report for WPCF permitting purposes.

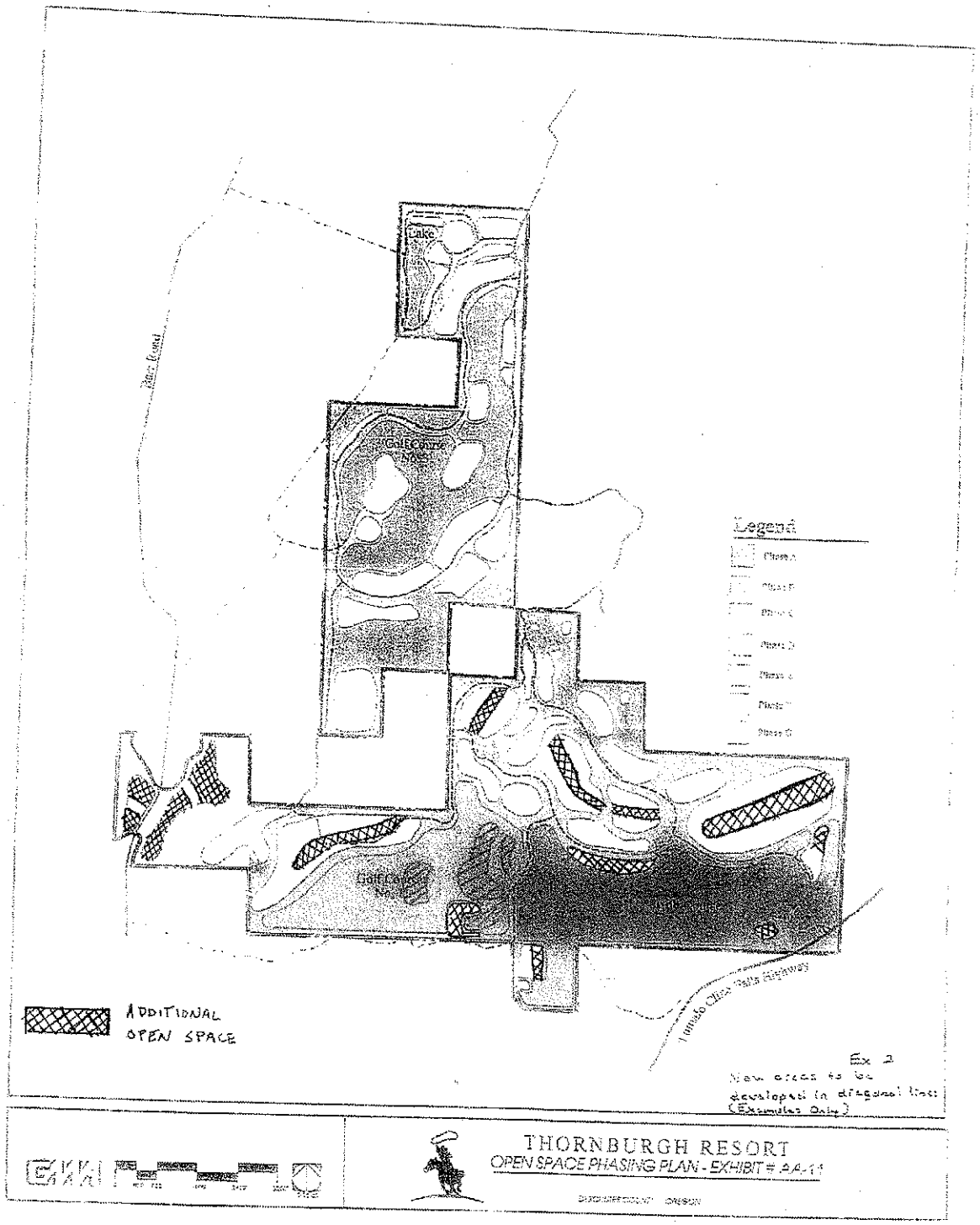
| Establishment type | Gallons per unit per day |
|---|---|
| Single family homes | 200 |
| Cottages | 200 |
| Time shares/condos | 200 |
| Hotel rooms | 120 |
| Golf clubhouse (people) | 25 |
| Sport/community facilities | 10 |
| Meeting rooms (seats) | 5 |
| Restaurants (seats) | 40 |

The flow rates used for the CMP were conservative and overestimated the projected sewage flows. The flow rates used for the WPCF permit are consistent with similar resorts found in Central Oregon and are based on standard practice for engineering wastewater treatment facilities.

Sincerely,

J. Rob von Rohr, P.E.

389 Scalehouse Court, Suite 100 ♦ Bend, Oregon 97702 ♦ (541) 389-9351 ♦ Fax (541) 388-5416




THORNBURGH RESORT
OPEN SPACE PHASING PLAN - EXHIBIT # AA-11

REVISED B-1.9

## Ruth Herzer

**From:** Livingston, Peter [plivingston@SCHWABE.com]
**Sent:** Monday, August 11, 2008 2:31 PM
**To:** Ruth Herzer
**Cc:** Laurie Craghead; kameron@bendcable.com; Pagel, Martha; Conway, Myles A.
**Subject:** Inclusion of CMP Record into Record
**Follow Up Flag:** Follow up
**Flag Status:** Red
**Attachments:** 2846238_1.pdf

Ruth:

Please note enclosed.

<<2846238_1.pdf>>

**PETER LIVINGSTON | Attorney**
**SCHWABE, WILLIAMSON & WYATT**
**1211 SW 5th Ave., Ste. 1900 Portland, OR 97204**
**Direct: 503-796-2892 | Fax: 503-796-2900 | Cell: 503-314-1050 | Email: plivingston@schwabe.com**
**Assistant: Melissa Albrecht | Direct: 503-796-3770 | malbrecht@schwabe.com**
**www.schwabe.com**

To comply with IRS regulations, we are required to inform you that this message, if relating to federal taxes, cannot be used for the purpose of avoiding penalties that under federal tax law. Any tax advice that is expressed in this message is limited addressed in this message. If advice is required that satisfies applicable IRS regu opinion appropriate for avoidance of federal tax law penalties, please contact a Sch arrange a suitable engagement for that purpose.

NOTICE: This communication (including any attachments) may contain privileged or co information intended for a specific individual and purpose, and is protected by law. intended recipient, you should delete this communication and/or shred the materials attachments and are hereby notified that any disclosure, copying or distribution of or the taking of any action based on it, is strictly prohibited. Thank you.

SCHWABE, WILLIAMSON & WYATT
ATTORNEYS AT LAW

Pacwest Center, 1211 SW 5th Ave., Suite 1900, Portland, OR 97204 | Phone 503.222.9981 | Fax 503.796.2900 | www.schwabe.com

**PETER LIVINGSTON**
**Admitted in Oregon and Washington**
**Direct Line: 503-796-2892**
**Cellular Phone: 503-314-1050**
**E-Mail: plivingston@schwabe.com**

August 11, 2008

**VIA E-MAIL**

Ruth Herzer
Associate Planner
Deschutes County Community Development
117 NW Lafayette Ave
Bend, OR 97701-1925

Re: Thornburgh Resort Company, LLC
Modified Final Master Plan Application, M-07-2
Our File No.: 112388/138798

Dear Ms. Herzer:

This letter confirms our telephone conference today as follows: Applicant Thornburgh Resort Company, LLC requests that the record of the conceptual master plan proceedings (CU-05-20) in this phased approval process be included, in its entirety, in the record of the final master plan proceedings.

Very truly yours,

Peter Livingston

PLI:maw
cc: Ms. Laurie E. Craghead
Martha O. Pagel
Myles A. Conway
Kameron DeLashmutt

SCHWABE, WILLIAMSON & WYATT
ATTORNEYS AT LAW

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August 11, 2008

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Associate Planner
Deschutes County Community Development
117 NW Lafayette Ave
Bend, OR 97701-1925

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Very truly yours,

Peter Livingston

PLI:maw
cc: Ms. Laurie E. Craghead
Martha O. Pagel
Myles A. Conway
Kameron DeLashmutt

## IF YOU WISH TO TESTIFY

Please complete this card & turn it in to a County staff person.

Name: Mimi Gould

Mailing Address: _____

Phone #: 541-420-3325

E-mail Address: _____

Date: 6/2/08

Subject: Fire District

## IF YOU WISH TO TESTIFY

Please complete this card & turn it in to a County staff person.

Name: PAUL DEWEY

Mailing Address: 1535 NW Vicksburg

Phone #: 317-1993

E-mail Address: pdewey@bendcable.com

Date: 6/2/08

Subject: Thornburgh

## IF YOU WISH TO TESTIFY

Please complete this card & turn it in to a County staff person.

Name: Randy Miller

Mailing Address: SWW

549 SW Mill View Way, Suite 100, Bend OR 97702

Phone #: (541) 749-4042

E-mail Address: Rmiller@Schwabe.com

Date: June 2, 2008

Subject: Thornburgh

Thornburgh

SCANNED

AUG 5 2008

RECEIVED

AUG 4 2008

Deschutes County CDD

LUBA #2008-203

00774

July 28, 2008
Ruth Herzer, Associate Planner
Deschutes County CDD
117 NW Lafayette Ave.
Bend, OR 97701-1925

RE: File # M-07-2; MA-08-6

**Additional Comments on the Thornburgh Resort Final Master Plan**

By Sandy Lonsdale, concerned local resident and chair of the Native Restoration Fund. 345 SW Cyber Drive, Suite 103, Bend, OR 97702. Residence address: 64925 McGrath Road, Bend, OR 97701 slonsdale@copper.net

Dear hearings officer,

In my earlier comments I referred to comments made by Water Watch of Oregon regarding the adequacy of Thornburgh's water mitigation plan to mitigate the effects of pumping groundwater at the resort site to supply all the water needed by the resort, or roughly 1 million gallons of groundwater per day.

Water Watch has since had an op/ed published in the Bend Bulletin dated 6/2/08 where they describe how the Deschutes Basin Groundwater Mitigation Plan is not a plan that results in water returning to surface flows in amounts that satisfy current deficiencies in lower Deschutes River flows at critical times of the year for fish spawning and rearing. The lower Deschutes is already deficient in flows during late fall and early spring when protected fish (salmon and steelhead) need critical flows to reproduce.

Why this is important to clarify for the record is that Thornburgh states in their mitigation plan that reduced flows in the lower river are insignificant because the lower river, outside normal irrigation season, has plenty of water to satisfy fish needs. This is simply not true, the flows in the lower river are already deficient and Thornburgh will reduce these flows further below their mandated minimum flows. Thornburgh must have no impacts to any flows in the Deschutes at any time of the year in order to meet the Deschutes County requirement of no net loss to area resources.

This op/ed is available to me only in paper form so I request that when the copy of this letter arrives at your office it be added to the record.

Also in my earlier comments I referred to a letter that I attached to my comments from the Prineville BLM regarding Thornburgh's mitigation requirements. The BLM's reference number for this document is 2803 (OR056), it appears in the Tetra Tech Wildlife Impacts Mitigation Plan.

What I failed to note in my comments, and what does not appear in the Tetra Tech report is the date stamped on the BLM's letter, the date that BLM sent the letter. The date stamped on the BLM letter is April 21, 2008. Why I bring this up for clarification to my

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Deschutes County CDD

comments is that in the BLM letter they state that the Cline Buttes Rec Area Plan (CBRA) is "expected to be finalized in approximately 2 months", which would be approximately June 21, 2008. In speaking with the BLM's Rec Planner Greg Currie on July 18, 2008 he stated to me that the CBRA may finally be complete "in a month and a half to two months". This makes the new date for completion of the CBRA plan approximately mid-September. How can we be assured now that Thornburgh can and will mitigate their impacts to area fish and wildlife with the BLM's blessing if the plans are not yet final and the BLM has not seen a final mitigation plan from Thornburgh?

Why this is important to note in the context of Thornburgh's wildlife impacts mitigation plan is that it is not at all sure that Thornburgh will be able to meet these requirements given the delays and difficulties that BLM experiences in preparing these sorts of plans. The BLM states that Thornburgh's actions must be consistent with the Upper Deschutes Resource Management Plan (UDRMP) but in fact Thornburgh proposes significant changes to the environment around Cline Buttes if their FMP is approved, therefore significantly straying from the resolutions contained in the UDRMP. Also, the BLM states that they have "reviewed several drafts of the mitigation plan" not the plan submitted by Thornburgh in the FMP.

These seem to be significant hurdles that Thornburgh has not addressed and that the BLM has not addressed adequately. More clarification is needed before the FMP is approved.

A third point I made in my comments regarding Golden Eagles and their protection status was challenged by the witness for Tetra Tech in their rebuttal to the July 15, 2008 hearing. While I admit that the golden eagle is not a federally listed T&E species, it is a federal species of concern, it is a Keystone Species and as such it is due certain protections under the federal ESA. The definition of keystone species as provided by the conservation organization Forest Guardians is attached to these comments.

Additionally, the Tetra Tech wildlife report makes no mention of golden eagles nesting or foraging on or near the proposed Thornburgh Resort when in fact goldens do nest and forage on and near the proposed resort. We have identified these sites on a map labeled Exhibit E, and I hereby reference that map to show these sites. Thornburgh should mitigate their impacts to Golden Eagle just as Eagle Crest had to mitigate its impacts when their resort was approved.

At the hearing on July 15, Rex Barber criticized Mark Yinger for allegedly misrepresenting or challenging the validity of his Big Falls Ranch water rights. His criticisms are unfounded and are, in fact, misrepresentations themselves.

Mr. Yinger at page 2 of his letter of June 13 merely stated that "[n]o evidence is given that the 464.9 acres of Big Falls Ranch irrigation water rights on Deep Canyon Creek are valid water rights." He pointed out that no proof is given that all of the 464.9 acres have been irrigated within the past five years and he identified an aerial photo showing that some of the acreage was not irrigated on the date of the photo. He further pointed out that no data or evidence is given to substantiate flow volume of Deep Canyon Creek.

At page 3 of his letter, Mr. Yinger further stated that no evidence had been presented to justify the claim that there would be 5.5 cfs of flow in Deep Canyon Creek during the irrigation season. Mr. Yinger also asked for evidence of the water temperature of the Creek.

Rather than respond to these points with the evidence that Mr. Yinger was requesting, Mr. Barber accused Mr. Yinger of misrepresenting his water rights. Mr. Barber's expression of indignation cannot substitute for the responsibility of the applicant here to provide evidence of what it asserts.

Mr. Barber's further criticism of Mr. Yinger for referring to "Nolan Weigand" as if that was a first and last name is similarly misplaced. Mr. Yinger did not say those were first and last names but was merely referring to the two names shown on the County GIS map. Those are apparently last names of two of the owners of the property.

We have done some investigation into the Barber water, the Big Falls Ranch water, proposed as mitigation for Thornburgh's water impacts to the middle and lower Deschutes River and Whychus Creek. In Thornburgh's FMP application they state that the 5.5 cfs groundwater right that Barber proposes to transfer to Thornburgh to mitigate the cold water flows reduced by the groundwater pumping of the resort's new wells is fully proven and is available as mitigation water. Those statements are not supported with evidence to the record.

Attached to these comments are the supporting documents proving that the Deep Canyon Creek water (5.5cfs) is phantom water, not fully proven, and not available for use as mitigation for Thornburgh. Other comments will reference these documents as well; I only reference them and attach them here to be sure that they are entered into the record. We are submitting large maps in paper form so that it is easy for a reviewer to locate details on the maps, and we are also submitting smaller versions (8 1/2x11 inches) so that when the record advances these maps will still be in the record.

Sandy Lansdale

# In My View

MONDAY 6/2/08

# Groundwater mitigation: Not all state's streams are faring equally

**By Kimberley Priestley**
*Bulletin guest columnist*

"Water trade-off bolsters rivers" The Bulletin declares in its April 22 headline leading into a discussion of the five-year review of the Deschutes Groundwater Mitigation Plan. The lead-in follows: "System devised in '01 works, its first formal review finds." Even the photo caption optimistically declares: "The five-year review shows the Deschutes Groundwater Mitigation Plan is working."

In actuality, things are not so rosy. It is true, as the article points out, that flows in the Middle Deschutes River (below Bend) have increased during the summer months, and thus the mitigation program could be said to be working for that section of river seasonally. What is not true, however, is that the Mitigation Program is working for the basin as a whole. It's not offsetting the full impact of new groundwater development on Central Oregon's beloved rivers. The Crooked, Metolius, Whychus and Lower Deschutes are, or will be, taking the hit from new groundwater development.

A little background. Streamflows throughout the Deschutes Basin are protected by the Scenic Waterway Act and Instream Water Right Act. Protected flows are set by month, representing the minimum biological needs of fish. The United States Geological Society determined that pumping groundwater will ultimately diminish streamflows in the basin. Where groundwater pumping will diminish protected streamflows, the law prohibits the state from issuing new groundwater permits unless mitigation water is put into the river to fully offset the impacts on the river. In 2002, the Water Resources Commission adopted rules to govern groundwater mitigation in the Deschutes Basin. Among other things, the rules allow mitigation water to be calculated on an "annual" basis without any requirement that the mitigation water be put in the river during all months that pumping actually affects river flows. They also fail to require that mitigation water be returned to the river where the river is being impacted.

As noted by The Bulletin, WaterWatch and 13 conservation groups, individuals and businesses filed suit in the Oregon Court of Appeals asserting that the mitigation rules failed to protect streamflows as required by law. The court agreed with us and invalidated the rules. Then, in a classic political maneuver, the Legislature did an end-run around the court opinion and "validated" the mitigation program without correcting a single one of the program's flaws.

*With these deadlines looming ... the state needs to be honest about the program's successes and failures alike.*

So here we are five years later. While the Water Resources Department is declaring the program a "success," one look at the state's modeling results shows that the mitigation program is having a negative impact on Lower Deschutes River flows from the late fall through the early spring. In other words, flows are going down. Importantly, the drop in streamflows coincides with spawning and rearing seasons for steelhead as well as spawning, incubation and rearing seasons of chinook salmon. And while some may ascribe to the myth that there is an abundance of water in the Lower River and thus a negative hit is not a problem, this is not in fact the case. In 1998, the WRD determined that protected flows in the Lower Deschutes were not being met nine months of the year. Data from the Oregon Department of Fish and Wildlife indicate that even a small decrease in flows in the Lower Deschutes River would have a significant impact on steelhead spawning habitat. And even in 2008, a banner "wet" year by all accounts, the state's instream water rights for the Lower Deschutes were not met nearly all of January and February.

And the beloved Metolius? While there have been no mitigation projects on the Metolius yet, with some proposed new destination resorts in the making, what "can be" is troubling. The problem here is that while the impacts from new development will likely affect the headwater springs, if mitigation water is returned to the bottom of the river system, the rules would "call it good." Moreover, in a recent letter to Gov. Kulongoski, the director of the WRD acknowledged that groundwater withdrawal outside of the Metolius sub-basin could have an impact on stream flow in the Metolius and that the mitigation program would not require mitigation of this impact.

So where are we? A report on the mitigation program is due to the Legislature in 2009. The Legislation "validating" the otherwise invalid rules sunsets in 2014. With these deadlines looming, rather than ignore the mitigation program's failings, the state needs to be honest about the program's successes and failures alike. Only when the state acknowledges this can all interests work together to modify the mitigation program and keep the entire Deschutes River system flowing.

**Kimberley Priestley** *works for WaterWatch.*

## In My View Policy

In My View submissions should be between 600 and 800 words, signed and include the writer's phone number and address for verification. We edit submissions for brevity, grammar, taste and legal reasons. We reject those published elsewhere.

**WRITE:** In My View
P.O. Box 6020
Bend, OR 97708

**FAX:** 385-5804

**E-MAIL:** bulletin@bendbulletin.com

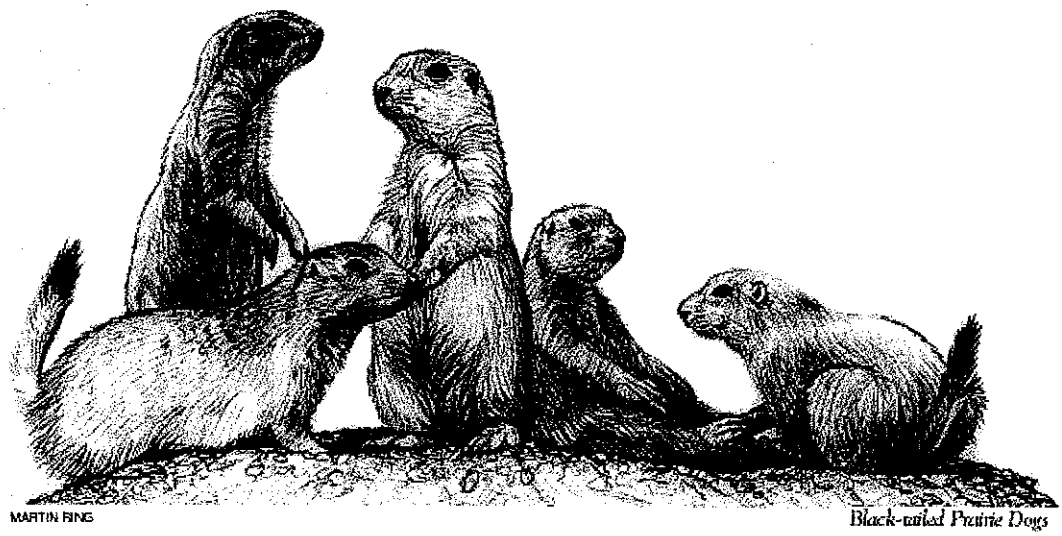
FOREST GUARDIANS

*Like the keystone that supports an archway*
*in architectural design, keystone species sustain ecosystems.*
*The loss of keystone species may usher in ecosystem collapse.*

# Keystone Species Campaign

The present biodiversity crisis, caused by human activities such as oil and gas development, livestock grazing, logging, mining, and urban sprawl, features extinction rates at 1,000 to 10,000 times the natural extinction rate. Under the federal Endangered Species Act, passed by Congress in 1973, species facing imperilment or extinction must be provided with protection by the U.S. Fish and Wildlife Service (FWS). The Bush Administration's refusal to provide species on the brink with urgently needed ESA listing and protections makes the work of groups such as Forest Guardians absolutely vital if we are to preserve the rich variety and abundance of native animals, plants, and ecosystems in the U.S.

With the overwhelming loss of native species and habitats, Forest Guardians focuses on species whose defense will provide collateral protections to other wildlife, plants, and habitats. Enter keystone species...



MARTIN RINS

*Black-tailed Prairie Dogs*

LUBA #2008-203

00779

*The Keystone Approach to Saving Species*

Keystone species perform important ecological roles through creating habitat and acting as prey or predator. Like the keystone that supports an archway in architectural design, keystone species sustain ecosystems. The loss of keystone species may usher in ecosystem collapse, in the form of waves of secondary extinctions. One of Forest Guardians' primary legal and policy strategies will be to require FWS to adopt an approach to prioritizing species that reflects the ESA's purpose of providing protection to imperiled species and the ecosystems of which they are a part.

*Rodent Keystones*

Many rodents play crucial keystone roles in the habitats where they live. Keystone rodents include beavers, prairie dogs, pocket gophers, and kangaroo rats. Each of these rodents engineer ecosystems by modifying soil structure and fertility, shaping plant communities, providing a prey base for predators, and creating habitat for associated plants and animals. Unfortunately, the ecological labor these rodents perform is, at best, underappreciated by humans. On private and public lands alike, rodents are poisoned, shot, trapped, plowed, or bulldozed.

*Our Current Efforts*

Forest Guardians' actions on behalf of rodent keystones will include broadcasting to the public the importance of rodent keystones, and pressuring politicians and government agencies to reform backwards policies toward keystone species. Here's an overview of our efforts:

- **Black-tailed prairie dog.** Forest Guardians has an ongoing campaign to secure ESA listing for this species. We continue to monitor the black-tailed prairie dog's status and will relentlessly advocate for listing at every turn. In addition, we participate in efforts to protect prairie dog associates, such as the mountain plover and the black-footed ferret.

- **Gunnison's prairie dog.** Forest Guardians is conducting a status review on this species, which will likely culminate in a petition for listing under the ESA. We also participated in successful grassroots efforts to require the relocation of Gunnison's prairie dogs via a Santa Fe, NM city ordinance.

- **Utah prairie dog.** Forest Guardians has undertaken an exhaustive review of the recovery program for this species. The Utah prairie dog has continued to decline, despite being listed since 1973. We expect to initiate litigation on behalf of the Utah prairie dog in 2003.

- **Northern pocket gopher.** We are identifying imperiled pocket gopher subspecies in need of protection and will likely pursue a multiple-species listing petition that will highlight the critical role these species play in desert and grasslands across the Southwest.

- **Beaver.** Our first major initiative seeks to prohibit the federal Animal Damage Control agency from indiscriminately killing and trapping beaver, because of adverse effects to endangered species. Beavers sustain riparian areas in the region that are essential for endangered species, including primarily the Southwestern willow flycatcher.

Visit www.fguardians.org or call 505-988-9126 for more information and to volunteer in the Forest Guardians effort to preserve and restore native wildlands and wildlife in the American Southwest.

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**BEFORE THE HEARINGS OFFICER**
**OF DESCHUTES COUNTY**

| | |
|---|---|
| In the Matter of the Application for a Final Master Plan for a Destination Resort | M-07-2; MA-08-6<br><br>Thornburgh Destination Resort |

# SECOND SUPPLEMENTAL MEMORANDUM OF NUNZIE GOULD IN OPPOSITION TO THE PROPOSED DEVELOPMENT (7/29/08)

## I. INTRODUCTION

This filing is in response to the Applicant's submittals and testimony at the July 15, 2008, hearing and their responses to the Hearings Officer's questions of July 7, 2008.[1] Attached are the reports of David Dobkin, Bret Michalski and Chuck Huntington and several exhibits referenced below.

## II. HEARINGS OFFICER'S REQUEST FOR ADDITIONAL EVIDENCE/BRIEFING

The Hearings Officer categorized her questions and issues under three general headings, "General," "Wildlife Mitigation Plan," and "Transportation Issues." These questions and issues are shown in bold below.

### A. General:

The first question asked by the Hearings Officer was:

> **"1. The applicant asserts that the proposal was consistent with the Conceptual Master Plan (CMP) approval. Mr. Dewey argues that the applicant has not specified the modifications that have been made to the proposal in the interim between initial CMP approval and the present. In his written testimony, Mr. Dewey identified some specific examples where he contends further review is required to ensure the proposal is consistent with the CMP. I would like the applicant to respond to Mr. Dewey's assertions by:**
>
> > **a. Graphically separating out areas that are planned for 'natural' open space from areas that will be used as golf courses, developed open space, buffer.**

The Applicant argued at the hearing that this is not a requirement based in the Code. However, as we pointed out in our initial memorandum, DCC 18.113.090(A) requires identification of the

[1] To clarify earlier submittals, there was no Ex. 3 to the June 17, 2008, Memorandum of Nunzie Gould in Opposition to the Proposed Development.



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use, location, size and design of the open space. One of the values to be protected in the Open Space Plan is "natural" open space areas. (See the attached Ex. 1) Further, Condition of Approval 34 requires restoration of native vegetation in the open space areas that are to be retained in a substantially natural condition. For this Condition of Approval to have meaning there must be identification of the open space areas to be retained in a natural condition.

Rather than identify the natural areas as requested by the Hearings Officer, the Applicant merely states that its "common" open space is the "natural" open space. (Thornburgh 7/15 Response, p. 2)[2] The designation of "common" open space has been a reference to the ownership and entitlement to use of an area.[3] There is no basis for claiming these areas are to be managed for a natural condition. In fact, the Revised CC&Rs (Ex. H4.1 in Ex. 8 of the FMP), at pages 12-16, address the ownership and right to use these areas. Development, including golf cart paths (Section 3.5.4), vehicular ingress and egress (Section 3.5.1(g)(iii)), utilities (Section 3.5.1(g)(ii), etc. is allowed.

The suggestion that the 530 acres of "common area" are the areas planned for "natural" open space is also not consistent with the Tetra Tech Wildlife Mitigation Plan (Ex. L1 in Ex. 12 of the FMP) which at page 8 identifies 897 acres of native vegetation to be retained.

**b. Graphically delineating among residential densities (from most dense to least dense).**

The Applicant has submitted a new map with this information.

**c. Addressing claims that the MOU with ODOT is insufficient to identify the methods that the applicant will use to manage automobile traffic demand.**

The Applicant asserts that progress is being made in compliance with the MOU. The fact remains that it has still not been implemented.

Beyond the MOU, however, we assume the Hearings Officer's question is getting at our contention that the existence of the MOU is not dispositive of all traffic related issues. These issues include the failure to comply with CMP requirements for internal roads (now on appeal to LUBA), the substantial change in Cline Falls Highway numbers, unexplained changes in traffic impacts due to changes in design of the resort and the failure to apply Transportation Planning Rule traffic demand methods (TDM).

The Applicant contends that this is an impermissible collateral attack on the CMP approval, but where the FMP must be consistent with the CMP and where we have shown substantial changes

[2] This "THORNBURGH RESORT COMPANY'S RESPONSE TO THE HEARINGS OFFICER'S QUESTIONS" of July 15 appears to be the work of Thornburgh's attorneys, though it is not identified as such.

[3] Note that "common" areas are also to be identified pursuant to DCC 18.113.090(A).



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as with traffic on Cline Falls Highway, the Applicant should have to at least update the traffic analysis.

The Applicant also contends that it need not follow Goal 12 and only has to comply with the County Plan. That County Transportation System Plan, however, incorporates TPR TDMs. (Section 23.64.240)

Thornburgh repeatedly objects to providing details and objects to what it considers to be an onerous burden of explaining what its development will encompass. The Code's requirement of detail is entirely appropriate, however, given that these resorts are the size of small cities. *Johnson v Jefferson County*, ____ Or LUBA ____, ____ (LUBA No. 2007-16, *et al.*; Slip Opinion 32) (2008).

> **While responding to these particular claims will help me analyze compliance with the criteria and the CMP conditions of approval, response to the other identified deficiencies may also save me time in reviewing the file prior to rendering my decision."**

Inexplicably, the Applicant ignored this request and has chosen not to respond to most of our identified inconsistencies between the CMP and FMP and our identification of insufficient information in the FMP. Thornburgh states:

> "In his June 17, 2008, memorandum on behalf of Nunzie Gould, attorney Paul Dewey lists a series of changes between the CMP approval and the FMP application. The Hearings Officer's question indicate (sic) that she has concluded some of these changes may be significant, but she has not requested further comment on any other changes. In fact, these changes are minor and reflect the ongoing refinement process. Further refinements will occur during the subdivision and site plan process." (Thornburgh 7/15 Response, p. 13)

We wish to address just a few of these matters here.

1. Inconsistencies and changes between the CMP and FMP.

The Applicant provided essentially no information in response to our identification of inconsistencies between the FMP and CMP except to argue that the open space areas are essentially the same and are only 3% less in the FMP. (Thornburgh 7/15 Response, p. 2)

What the Applicant does not address is the substantial shifting of where the open space is and of the increased fragmentation of large blocks of open space that existed in the CMP. Attached is a map showing an example of areas of open space as identified in the CMP in the south part of the resort which are now going to be developed in the FMP. (Ex. 2)

We have also pointed to a substantial change in ownership and based on that change we believe the Applicant needs to re-establish its financial capability and bank assurances. DCC 18.113.070(C).



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2. Insufficient information in the FMP.

We identified approximately 18 examples of incompleteness in our original memorandum, associated with both Code standards and with CMP conditions of approval. The Applicant elected simply not to respond to most of them.

We will not repeat all these examples here, except to point out again that the Applicant has failed to provide a revised phasing plan for the development as required by LUBA in *Gould v Deschutes County*, 54 Or LUBA 205, 222-223 (2007). We have appealed the County's approval of the CMP on remand in part because of Thornburgh's failure to do a revised phasing plan. Attached is an excerpt from Mr. Livingston's brief to LUBA arguing that it is sufficient that the revised phasing plan be submitted with the FMP, citing Condition 36 (Ex. 3). Condition 36 requires:

> "Applicant shall present the corrected Phasing Plan..., consistent with this condition, during the Final Master Plan approval process."

However, Thornburgh still hasn't presented this revised phasing plan as part of the FMP.

Additionally, the proposed phasing in the Fire Evacuation Route map (FMP Ex. F.7.1) is not consistent with the CMP phasing plan. Ex. F.7.1 shows development of roads in Phases A, B, C, D and G. A road through the Pinnacle is shown in Phases B and E on the Phasing Plan map (Ex. Revised B-1.8), but in Phase D on the Fire Evacuation Route. Also, the Fire Evacuation Routes shown for Phases B and C are shown as being developed in Phases A and B in the Phasing Plan.

The second question asked by the Hearings Officer follows:

> **"2. The standard for deciding whether a criterion can be satisfied is whether the evidence shows that a proposal is 'possible, likely and reasonably certain to succeed.' *Meyer v. City of Portland*, 67 Or App 274, 678 P2d 741 (1984). How do I apply that standard to circumstances that are subject to other governmental/personal timetables? For example, DCC 18.113.070(D) requires a demonstration that the impact of the development on fish and wildlife will be fully mitigated, but some of the proposed mitigation depends on the development of programs in the future. Does compliance with the mitigation plan require a demonstration that the other entities are reasonably likely to follow through with their programs? Or is it enough to show that the plan, overall, is reasonably likely to succeed?"**

There are a number of reasons why the Applicant's Wildlife Mitigation Plan does not meet the "possible, likely and reasonably certain to succeed" standard. First, there is no "plan," but rather only a "procedure" and "possibilities." It is the same problem the Court of Appeals in *Gould v Deschutes County*, 216 Or App 150 (2007), identified earlier in this case. Second, where there is no baseline data or field work to determine what is actually there on the site and will be impacted, there is no way to determine that <u>any</u> negative impact will be <u>completely</u> mitigated so



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that there is no net loss or degradation of the resource. Third, there is no assurance of compliance where the role of the agencies is advisory and there are no mechanisms to enforce or even find compliance.

1) There is no plan on which compliance with the Code could be found.

The Court of Appeals explained at some length why the County's findings and the evidence at the CMP level were inadequate for a determination of compliance or feasibility of a wildlife plan. Even though the Applicant had described the kinds of work to be done and even the location of the work, the Masten Allotment (*Id.*, at 154-157), the Court concluded that "[w]ithout knowing the specifics of any required mitigation measures, there can be no effective evaluation of whether the project's effects" will be "completely mitigated." (*Id.*, at 159) The Court noted that "the particulars of the mitigation were to be based on future negotiations." (*Id.*, at 160) The Court also noted BLM's concerns about types of habitat conditions to be provided and its rejection of certain proposed mitigation measures. (*Id.*, at 162-163) The Court further noted that where the details of a plan were to be worked out later among the Applicant and public agencies, that the public would not have an opportunity to comment. (*Id.*, at 163)

The Applicant's wildlife plan here is a "procedure," not a plan. The Habitat Evaluation Procedures (HEP) analysis is merely an accounting method that estimates impacts (Tetra Tech April 15, 2008, Plan, p. 4) to estimate off-site acreage needed to mitigate development impacts. (Tetra Tech April 15, 2008, Plan, p. 5) The off-site mitigation described in the plan consists of two pages of general description of types of work, including weed management, vegetation enhancement, reduction of ORV use, maintenance of wildlife water sources and traffic speed monitoring. (Tetra Tech April 15, 2008, Plan, pp. 12-13) The work is to be done on an unspecified 4,501 acres somewhere in the Cline Butte Sub-Area. (Tetra Tech April 15, 2008, Plan, p. 12) The specific locations and work are to be determined later. In fact, though, the mitigation may not actually be done in the area and the money may go to ODFW for mitigation not identified in the plan:

> "If sufficient offsite mitigation areas are not available for mitigation actions at the time they are needed, the funding for implementing mitigation shall be placed in an account dedicated only to that purpose and the mitigation will be undertaken as soon as the land is available. In the event that the mitigation is not implemented by TRC when the land becomes available, this funding shall be available to ODFW to meet the intent of DCC 18.113.070D, which could include measures other than what are found in the mitigation plan, such as purchasing property or purchasing conservation easements within Deschutes County." (Tetra Tech April 15, 2008, Plan, p. 11)

What the Applicant has presented is not a plan in the sense the Court of Appeals thought of a plan and it is not a plan that the public can effectively comment on. It is just another procedure for Thornburgh, BLM and ODFW to work out in the future.



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2) There is no basis for a finding of complete mitigation.

In addition, this is not a real plan that addresses the Code requirements. As pointed out by our experts, David Dobkin and Brett Michalski, there needs to be a proper foundation of field work to assess what is there at Thornburgh in order to determine what should be mitigated and whether the mitigation is achieving the desired results of any negative impact being completely mitigated so that there is no net loss or degradation of the resource.

3) There is no assurance of compliance.

The Hearings Officer appropriately asked how the feasibility standard is met where the proposed mitigation depends on development of programs in the future and on governmental timetables and on whether other entities are reasonably likely to follow through with their programs.

In response, Thornburgh argues that it should not be assumed that the agencies won't enforce their own regulations. In particular, Thornburgh cites the ODFW "Fish and Wildlife Habitat Mitigation Policy" regulations of OAR 635, Division 415. (Thornburgh 7/15/08 Response to Hearings Officer Questions) Thornburgh cites the case of *Sanders v Yamhill County*, 34 Or LUBA 69, 88 (1998), where LUBA ruled that it was unacceptable to infer that "the county cannot rely on DEQ to enforce DEQ's regulations."

That case and reasoning are not applicable here where the BLM and ODFW would not be enforcing their own regulations. As made clear by ODFW at page 3 of its letter to Governor Kulongoski of November 2, 2007 (submitted as Ex. B to the 7/15/08 Supplemental Memorandum of Nunzie Gould in Opposition to the Proposed Development), the ODFW Fish and Wildlife Habitat Mitigation Policy regulations "are not binding unless the activity is regulated directly by ODFW." The Thornburgh activities are not regulated directly by ODFW or BLM and, as acknowledged by Thornburgh at page 6 to its 7/15/08 Response to the Hearings Officer's Questions, their role is simply "advisory." A requirement of "consultation" with agencies is not the same as an agency enforcing its own regulations.

Furthermore, the standards of OAR 633, Division 415 are not the same and are not as stringent as DCC 18.113.070(D). There is also no showing of comparable BLM regulations. The BLM letter of April 21, 2008, (a dated copy is submitted with this Memorandum as Ex. 4) introduces even further uncertainty by suggesting a connection of the Thornburgh "plan" with the still incomplete Cline Buttes Recreation Area (CBRA) plan. There is no indication of when the CBRA plan will be completed or what it will contain. The unspecified mitigation actions of the Thornburgh plan which have yet to be developed must also be found consistent with the Upper Deschutes Resource Management Plan (UDRMP) of BLM.

Adding further uncertainty is the lack of enforceability of this plan. It is too vague to be enforced and there is no enforcement mechanism in the plan. To the extent there is a potentially enforceable provision, it is only a dollar amount. Nothing requires that the actual mitigation be done so that impacts will be completely mitigated so that there is no net loss or degradation of the resource. As quoted above, the money can be spent anywhere in Deschutes County and on mitigation not related to what is impacted here.



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Several Gould exhibits submitted at the July 15 hearing also show a failure of follow through of wildlife mitigation by another destination resort in the area, Eagle Crest.[4] They also show ODFW not thoroughly monitoring and certainly not enforcing mitigation. Regarding the required installation of "100 mountain bluebird boxes along the open space edges on the 170 acres of juniper woodland open space," ODFW merely observes, "Several installed bluebird boxes were observed. No use was observed." (Gould Ex. 15, 6-17-08, p. 2) The Thornburgh plan also requires no assessment of actual use or effectiveness of the mitigation. The Code requires complete mitigation, however, not just an exercise of going through the motions of mitigating.

Furthermore, Thornburgh has shown no serious interest in developing or carry out a mitigation plan. No serious field work has been done and Thornburgh attempted (and still attempts) to defer coming up with a detailed plan until the future. Even the Habitat Evaluation Procedures (HEP) which Thornburgh used is not the standard HEP but rather a "modified" HEP using an older model. Thornburgh has been resistant from the beginning to taking this Code requirement seriously and only the Court of Appeals decision has made them increase their efforts. Under their "plan," however, they will control and decide what is ultimately done and continue avoiding the presentation of a true plan.

**B. Wildlife Mitigation Plan:**

The first question asked by the Hearings Officer under this heading is:

> **"1. I understand that the applicant applied a mathematical formula to calculate the likely impact its water use will have on surface waters in the Deschutes Basin based on the assumption that the consumptive use equals the estimated impact on the basin. The opponents have used a methodology developed by USGS for the entire basin. I would like the parties to provide a little more information regarding the two methodologies to help me better understand the relative advantages/disadvantages of each approach."**

The hydrologist, Mark Yinger, has responded to this question, but several comments in the Thornburgh 7/15 Response require correction.

1) Thornburgh's allegations of inconsistencies between Mr. Yinger and OWRD are not real.

First of all, Thornburgh attempts to portray Mr. Yinger's analysis of location of impacts as somehow inconsistent with OWRD which Thornburgh says at page 9 "determined the location of impact on the Deschutes Main Stem approximately five to eight miles north of the project." That isn't correct. What OWRD actually identified was not the "location of impact" but merely the nearest point where groundwater meets surface water. OWRD said:

[4] Thornburgh's reliance on the County's past acceptance of wildlife mitigation plans for other destination resorts is misplaced. After the Court of Appeals has emphasized that the Deschutes County Code requires that any impact be completely mitigated, it is assumed that the County will be taking this Code requirement more seriously.



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"WELLS WILL BE CONSTRUCTED INTO WATERBEARING ZONES WITHIN THE DESCHUTES FM GROUND WATER. FLOW IS TOWARDS THE NORTH WITH THE NEAREST DISCHARGE AREA (DESCHUTES RIVER) ABOUT 5.8 TO 8.0 MILES DISTANCE. WATER LEVEL IN THE WELLS WILL LIKELY BE BELOW THE ELEVATION OF THE NEAREST SURFACE WATER SOURCE (ALSO DESCHUTES RIVER). WELLS ARE LOCATED WITHIN THE DESCHUTES GROUND WATER STUDY AREA."

If OWRD had identified that place as the location of impact it would have identified the Middle Deschutes zone of impact rather than a "General" zone of impact (which includes the Whychus subbasin). Even Mr. Newton in his Figure 5 (Newton 4/15/08 Report) shows Whychus in the impact area.

Thornburgh also attempts to discredit Yinger's run of the USGS model as somehow inconsistent with OWRD and as not being peer reviewed. But as OWRD Regional Manager Kyle Gorman testified at the July 15 hearing:

"There's been lots of testimony about the modeling effects and how the department does or does not use the model and what the model says. And I think that one of the greatest misconceptions that may be discussed tonight is the fact that really the Yinger report and what our department found as far as impacts are the same. They're not opposing. Our department, if we ran the model, we wouldn't find that the impacts would be in the Sandy River. We'd find that they'd be in the exact same place that Yinger found."

Also, while models are peer reviewed, runs of models are not. No one has peer reviewed Mr. Newton's and Tetra Tech's reports in this case either. As shown by Mr. Huntington in his latest report, these consultants have been changing their mitigation water figures several times in their reports.

2) OWRD's consumptive use calculation doesn't control here.

Thornburgh argues that OWRD's 2007 determination of consumptive use is controlling in this land use case. There is no basis for that argument where we have shown that the underlying assumption of groundwater recharge from the septic and sewer system is incorrect. The assumption, as stated by Newton in his July 15, 2008, report at pages 2-3 is:

"Much of the water used for domestic, municipal and quasi-municipal purposes returns to ground water via septic systems and sewage treatment systems."



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The WPCF permit does not allow such recharge. OWRD simply didn't have that information before it when it made its determinations, just as it didn't have the Yinger Report which wasn't issued until February of 2008. The factual record is different in this land use proceeding.[5]

3) Mitigation at Deep Canyon Creek is irrelevant to Whychus Creek.

Thornburgh at page 11 asserts that the potential loss of cool water associated with Whychus Creek and Alder Springs can be mitigated by Big Falls Ranch water in springs at Deep Canyon Creek. Those springs go into the Middle Deschutes, not Whychus.

If Thornburgh is suggesting that mitigation under DCC 18.113.070(D) can be so broad that it needn't be on the same creek that is impacted or the same fish that is impacted (bull trout in Whychus), then it is wrong. It is "the resource" that is impacted for which mitigation must ensure no net loss.

4) Whychus Creek will be impacted.

Two types of impacts to fish habitat have been identified, water quantity and water quality. The Applicant states that OWRD mitigation rules address volume of impact and that ODFW addresses factors relating to the County mitigation standard.

What Thornburgh tries to avoid saying but apparently admits is that there will be a volume impact to Whychus Creek. It acknowledges that Mr. Yinger estimates an impact of 106 AF/year on Whychus Creek and Alder Springs "that is not specifically addressed in the applicant's plan." (p. 11) Thornburgh contends that the volume impact will be less than calculated by Mr. Yinger based on its consumptive use argument, but the bottom line is that there will a reduction in flow. The Applicant is providing no mitigation for Whychus Creek.

The Applicant tries to dismiss this impact on flow by claiming that potential temperature impacts to Whychus Creek are statistically insignificant. (p. 11) The DCC 18.113.070(D) provision, however, does not require that there be a showing of "significant" impact. It states:

> "Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource."

That standard, as recognized by the Court of Appeals, addresses "any" impact and requires that impacts to "the resource" be "completely" mitigated. The standard even gets at the subject of cumulative effects, discussed below, by prohibiting "no net loss" or "net degradation."

5) Cool habitat patches are being impacted.

Mr. Huntington in his reports has discussed the additional impact of loss of existing cool habitat patches (by 0.6% in the mainstem Deschutes). This impact has not been mitigated.

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[5] The suggestion that WaterWatch somehow endorsed the OWRD consumptive use determination is also unfounded. They also didn't have the WPCF permit or Yinger's Report when they settled their protest.



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**"2. The opponents argue that the applicant's wildlife study relies too heavily on the expert opinions of Tetra Tech and agency staff biologists and the HEP methodology but does little to analyze the actual habitat values on the property. The opponents argue that this analysis is improper in at least two respects: (1) it does not provide an accurate assessment of the existing habitat values on the property; and (2) it does not provide a baseline for assessing the success of the plan in the long term. I would like the applicant to respond to this argument, first by providing a more detailed history of the iterative process, especially with respect to choices made to establish 'habitat values' and the species that best represent those values. The applicant should explain why the loss of golden eagle habitat was identified but not quantified in its HEP analysis."**

The Applicant attempts to characterize our criticism of their wildlife mitigation approach as setting an impossible standard, including "all" species. Their exaggeration about 100 years of investigation and considering "microbes" is a distraction from the inadequacies of their approach, as explained by Dr. Dobkin and Mr. Michalski.

The Applicant's "modified" HEP methodology as applied in this case lacks the foundation of adequate field work on the site. Tetra Tech suggests that it relied upon some undefined field work done on Eagle Crest, but does not present that work or show how whatever it was compares with what is recommended by Dr. Dobkin. Further, the field work proposed by Dr. Dobkin isn't onerous. It could have been and could be easily done by the Applicant except that it has consistently tried to get by with as little effort as possible on fish and wildlife mitigation.

Repeatedly, Thornburgh refers to relying on ODFW for direction as if ODFW was directing this process and as if this mitigation plan is ODFW's. As explained above, ODFW's mitigation policy is not the same as the County Code. OAR Chapter 635-415 does not call for any impact to a resource to be completely mitigated. Its focus is solely on habitat (as opposed to the Code's more broad concern with "the resource") and the rules set priorities for native fish and wildlife. It is simply a different legal scheme than what is provided by the Code.

**"3. How do I evaluate the broader impacts of the development ascribed to the proposal? For example, the opponents argue that cumulative impacts must be considered in the wildlife analysis, but do not explain how those impacts can be quantified or measured against the proposed mitigation."**

The experts have addressed this issue which is of serious concern. The five-year mitigation study attached to Mr. Newton's report is a good example of the fact that there is a larger context to consider, namely that over 200 cfs has already been applied for under the mitigation rules. This fact makes it all the more important that this destination resort not have any negative impact and that there is no net loss or net degradation of the resource.

Regarding wildlife mitigation, Tetra Tech asserts that its "modified" HEP analysis considered both indirect and cumulative impacts. That formulaic procedure, however, is not grounded on



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what is in the area. A cumulative impacts analysis should at least consider an area addressed by the Upper Deschutes Resource Management Plan done by the BLM. See a map from the UDRMP, attached as Ex. 5.

> **"4. How do mitigation payments/fees assure that the 'no net loss' standard is satisfied? Also, how did the applicant reach the estimated value of the habitat in order to establish a fee-based system to address those impacts?"**

In the context of answering this question Tetra Tech states that ODFW "has concluded that the mitigation plan results in no net loss." We do not believe that that is an accurate reading of the ODFW letter which merely states that the wildlife mitigation plan "should address" the mitigation requirements. There is also no showing of adequate funding for assessment of whether or not the mitigation measures are in fact being effective. Monitoring for implementation of the mitigation is not enough. Furthermore, the estimation of costs for each mitigation measure that is based on "existing cost information provided by the BLM" will hardly be sufficient and should have an inflation factor if it is expected to cover "long-term maintenance."

### C. Transportation Issues:

> **"Is it enough to conclude that the applicant has satisfied the condition of approval that it enter into a MOU with ODOT to address traffic mitigation, or must I evaluate compliance with the CMP standard that requires that those impacts be addressed?"**

Thornburgh again refers to the findings of the Board of County Commissioners on the original CMP decision as answering this question of the Hearings Officer. However, where it has been several years since that approval and where opponents have shown substantial changes in the traffic, it is essential that new traffic impact analyses be done here.

## III. CONCLUSION

This application for a Final Master Plan should be denied where the Applicant has not sustained its burden of proof.

DATED this 29th day of July, 2008.

Respectfully submitted,

PAUL D. DEWEY



**Paul D. Dewey, OSB #78178**
1539 NW Vicksburg
Bend, Oregon 97701
(541) 317-1993

# THORNBURGH RESORT

## Document B-3: OPEN SPACE MANAGEMENT PLAN

### Mission Statement

The goal of the open space management plan for the Thornburgh Resort is to preserve and enhance natural open space areas and to provide for the operation and maintenance of the golf courses, parks, and related open space features for the benefit of resort owners and guests.

### Definition of open space

Open space at the Thornburgh resort will be defined and identified within Homeowner Association documents and buyer disclosures to be consistent with Deschutes County requirements for open space under the Destination Resort Overlay Zone. The Deschutes County zoning ordinance (DCC 19.106.030.e) specifically state that improvements, development and other alteration(s)... allowed within open space areas (include)...golf course fairways and greens, hiking and bike trails, lakes and ponds, and primitive picnic facilities including park benches and picnic tables. Existing natural landscape areas are allowed as open space, which would include natural landscape parks.

Open space includes that which is labeled "Open Space", "Common Area" and "Buffer". Open space is area owned and controlled by the Developer. This land at some time may change ownership and become owned by an association or group so long as the intended use remains the same in accordance with the Conditions, Covenants and Restrictions (CCR's) included in Document-16, Section 3.3. Common Area is open space that is owned in Common, by the Home Owners association. Buffer is area that is both Open Space and Common Area that borders the property at a width of 50'.

### Management Plan

Any development of open space areas must be consistent with the Deschutes County Ordinance 19.106 and the above mission statement. Open spaces that may be designated in the Thornburgh Resort include the following:

- Golf Courses: Golf courses are encouraged under the Deschutes County destination resort requirements and enhance the beauty of the resort. Golf courses provide benefit in the prevention or reduction of wildfires. Lakes and ponds associated with the golf course enhance the aesthetic value, provide valuable irrigation water storage for golf course operations, provide wildlife habitat, and improve the experiences of owners and guests. Golf courses provide the recreational amenity, stipulated by State statutes for destination resorts. The Golf Courses at Thornburgh will be developer owned Open Spaces. They will be protected as Open Space within the deed.

- Water Sports Lake. The lake for Water sports will be preserved for the activity and enjoyment of the resorts guests and homeowners. It will add to and enhance the beauty of the resort and also provide for recreational diversity. It will be included as a part of the recreational amenity stipulated by State and County statutes for destination resorts. The water sports lake will be developer owned Open Space although at some point a



Ex 1, p.1

transfer of ownership may occur in accordance with the CCR's, Document 16, Section 4.30.2 and 4.30.3.

- Natural Common Areas: Natural common areas will typically be identified during final design and platting of the property. Natural common areas will typically be preserved in their existing natural condition or enhanced to promote natural desert vegetation and features. Enhancements may include limbing trees, removal of young junipers, removal of brush and other ladder fuels, control of noxious weeds, restoration of native vegetation, and similar enhancement measures. Common areas will typically be dedicated to a Homeowners Association, following the filing of final plats on a phase-by-phase basis.

- Parks and Picnic Areas: Small pocket parks, regional landscape parks and picnic areas are expected to be identified on a phase by phase basis with final design and plats. Picnic and park areas may have small areas of manicured landscaping to accommodate resort owners and guests. Pocket parks and picnic areas will be dedicated to a Homeowners Association, unless directly associated with golf course activities.

- Trail Networks: Natural and paved trails are encouraged within applicable County ordinances. The Thornburgh Resort paths will allow guests and owners to experience the natural beauty of the high desert and still protect the natural landscape and the privacy of adjacent homes. The trails at Thornburgh will be be dedicated to a Homeowners Association following the filing of final plats on a phase-by-phase basis.

- Exterior Setbacks: Exterior perimeter setbacks are the Buffers. They will be typically maintained in a natural state providing buffers for neighboring properties, transitions between properties and a route opportunity for interconnected trails and paths. They are both Open Space and Common Area and will be dedicated as such.

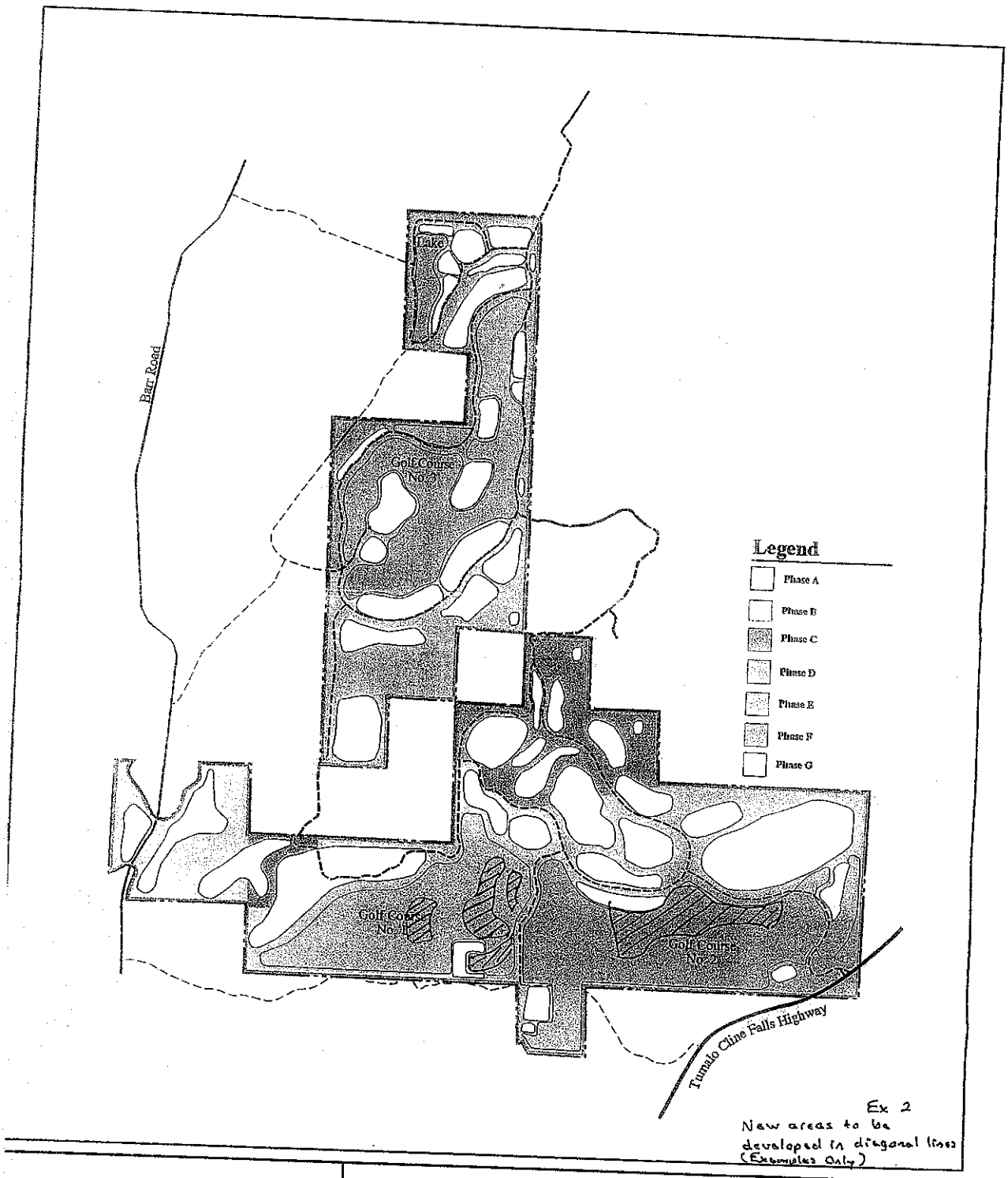
The Homeowners Association will collect owner dues for appropriate operation and maintenance of natural common areas, pocket parks, small picnic areas and similar common areas. The Homeowners Association will have a direct incentive to preserve, protect and maintain these common areas because of the value added to adjacent properties and the resort in general.

Golf course fairways, greens, tees, intermediate areas, roughs, and lands needed for golf course maintenance will be owned and operated by the developers or subsequent owners. The developer will have significant incentive to maintain the golf course elements in top condition in order to facilitate the recovery of capital investment in the initial constriction, to attract buyers to the resorts, and to maintain operational income and asset value over the long term. Golf courses will be available for the enjoyment of the golf club members, the resort owners and resort guests depending on the golf course.

The declaration of covenants, conditions and restrictions for Thornburgh Resort will accommodate the dedication of common areas, the use of the developers' golf courses, and related restrictions of opportunities for use. The Thornburgh Resort covenants conditions and restrictions will stipulate the preservation of common areas, and the operation of the golf courses. Some alternatives may be available for conversion of developer owned assets such as the golf courses to another use so long as that use meets the definition of stipulated open space.

A full range of open space management prescriptions will be considered including but not limited to the following:

- Use wildlife friendly fences wherever fences are necessary and remove unneeded fencing.
- Retain native vegetation and open spaces wherever possible and when compatible with the intended use.
- Use Open Space to protect the natural characteristics and features wherever possible.
- Create areas of high value wildlife habitat.
- Create bird roost or perch opportunities making them visible to visitors and owners with information signs along roads or trails.
- Provide an education program for visitors with specific brochures on wildlife, high desert vegetation and natural history of the area.
- Design on-site and off-site improvements to respect wildlife considerations.
- Provide wildlife water sources.
- Provide natural or artificial bird nesting structures.
- Use those pesticides, fertilizers, and other chemicals that have been determined to have no adverse impacts on wildlife and humans to the maximum extent possible.
- Use native plants for landscaping practices wherever practicable.
- Use native species to enhance existing habitat and restore disturbed areas.




THORNBURGH RESORT

*OPEN SPACE PHASING PLAN - EXHIBIT # AA-11*

DESCHUTES COUNTY OREGON

**REVISED B-1.9**

BEFORE THE LAND USE BOARD OF APPEALS

OF THE STATE OF OREGON

ANNUNZIATA GOULD,
Petitioner,
and

STEVE MUNSON,
Intervenor-Petitioner,
v.

DESCHUTES COUNTY,
Respondent.

LUBA Case No. 2008-068

# RESPONSE BRIEF OF RESPONDENT DESCHUTES COUNTY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Of Attorneys for Respondent
Deschutes County

B. **Response to Second Assignment of Error**: Petitioner errs in claiming that the County did not require corrections to the applicant's Phasing Plan when the new Condition 36 of the challenged decision does require Thornburgh to make necessary corrections to the Phasing Plan and Overnight and Density Calculations chart.

Petitioner contends that the County "erred in failing to make a condition of approval requiring correction of the phasing plan in the CMP." Petition for Review ("PR") 9. LUBA's opinion requires the County "to either require that Thornburgh make that correction [to the Phasing Plan and Overnight and Density Calculations chart], or impose a condition of approval that the correction be made, before it grants approval of the CMP." 54 Or LUBA at 222-23 (also at R 87).

The challenged decision complies to the letter with LUBA's instructions. Condition 36 takes a "belt and suspenders" approach. First, it requires Thornburgh to make the necessary corrections, which are set forth in a chart that was presented to the BOCC prior to the original decision, and which petitioner does not contend fails to satisfy the requisite standard, DCC 18.113.060(D).[2] *See* 54 Or LUBA at 222, n 16. (Also at R 86) Thus, it is "a condition of approval that the correction be made," which was imposed by the BOCC before it granted approval of the CMP.

Second, the condition requires Thornburgh to present the corrections during the Final Master Plan approval process. This additional step is almost superfluous, since the required changes are so clearly stated in Condition 36. Still, as a mechanism to ensure compliance, it gives the County and the public an opportunity to see that the changes are made in future plan submissions.

Because the County included the appropriate condition in the remanded CMP decision, the second assignment of error should be denied.

---

[2] There appears to be a word processing error in the challenged decision. (R 15). The reference to Condition 21 relates to the requirement that 50 units of overnight lodging be required prior to the closure of sale of individual lots or units. As stated, Condition 36 addresses modifications to the Phasing Plan and the Overnight and Density Calculations Table. (R 21-22). The staff memorandum to the BOCC made this [illegible] (R 49).

# United States Department of the Interior

TAKE PRIDE IN AMERICA

BUREAU OF LAND MANAGEMENT
Prineville District Office
3050 N.E. 3rd Street
Prineville, Oregon 97754

IN REPLY REFER TO:
2803 (OR056)

APR 21 2008

Ruth Wahl
Associate Planner
Deschutes County Community Development Department
117 NW Lafayette
Bend, Oregon 97701

Dear Ms. Wahl:

This letter is provided to clarify BLM Prineville District's role in the development of the Wildlife Mitigation Plan developed by the Thornburgh Resort Company, LLC.

BLM has reviewed several drafts of the mitigation plan and has met with Thornburgh Resort Company and the Oregon Department of Fish and Wildlife (ODF&W) to discuss what elements, of the mitigation plan may occur on public lands managed by the Prineville District. Our comments have been focused on clarifying what mitigation actions might occur on public lands. These mitigation actions must be consistent with the Upper Deschutes Resource Management Plan (UDRMP). Some of these mitigation actions could be implemented before the Cline Buttes Recreation Area (CBRA) plan is completed by BLM. When the BLM completes the CBRA plan (expected to be finalized in approximately 2 months), the BLM, in consultation with ODF&W and Thornburgh Resort, will specify the areas where remaining mitigation actions can take place. It is possible that any support or funding provided for mitigation actions can be used as a match for additional grant funding that allows larger scale benefits for public land management in the area.

The Prineville District BLM appreciates and supports the collaborative approach between Thornburgh Resort, ODF&W, and BLM. BLM has reviewed and approved the mitigation actions proposed for public lands.

Sincerely,

Molly M. Brown
Field Manager, Deschutes Resource Area

cc:
Thornburgh Resort

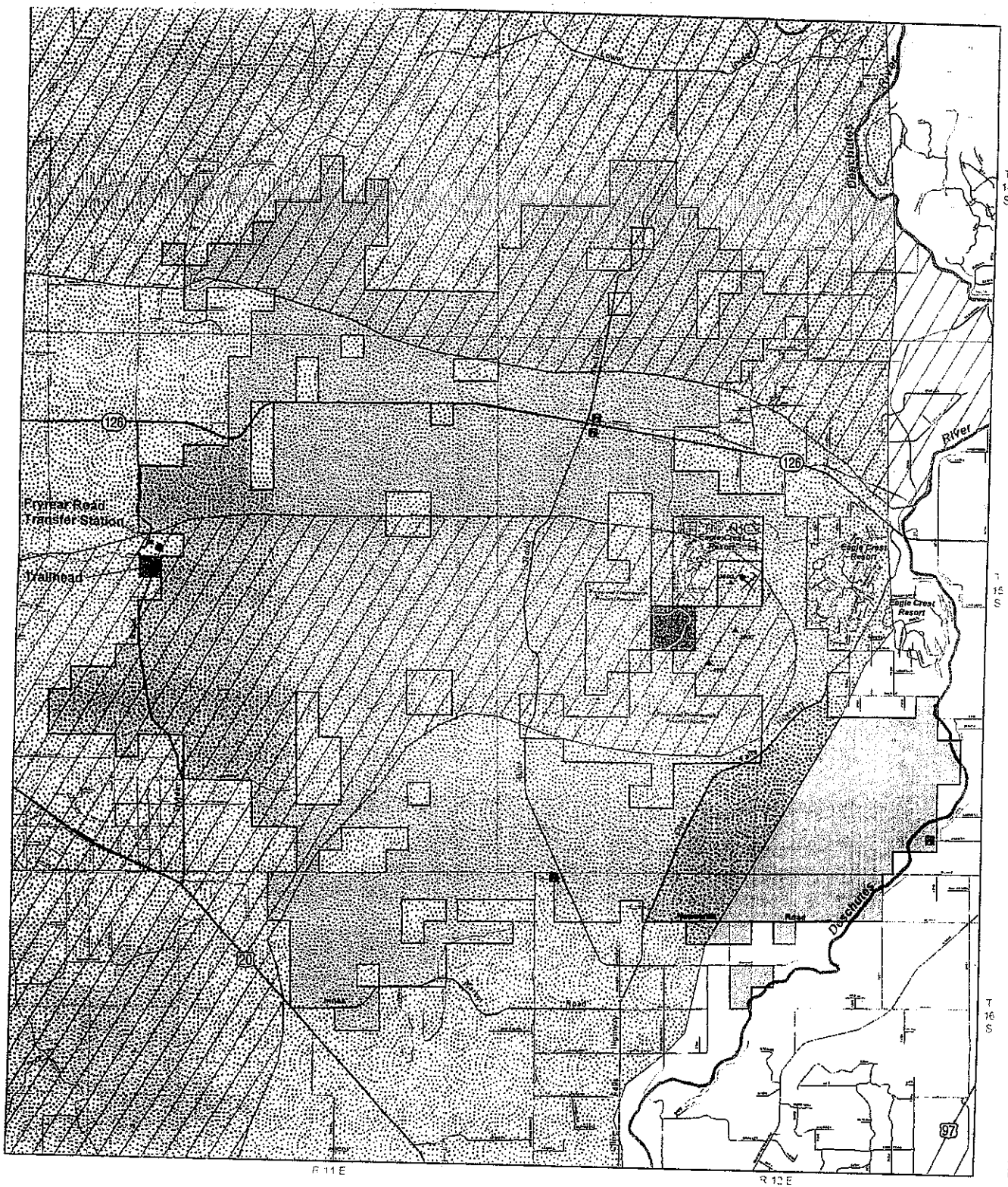
APR 23 2008

Ex. 4

LUBA #2008-203

00798

# Cline Buttes Wildlife Emphasis




## Legend

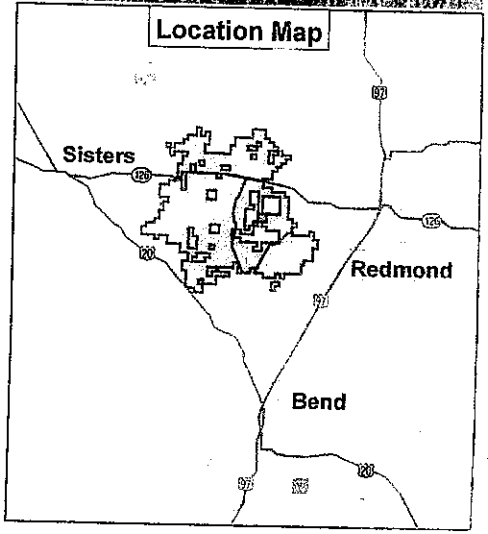
- Primary
- Secondary
- General
- Deer Winter Range
- Elk Winter Range
- KIOSK Information Board
- Cline Buttes Plan Area Boundary
- Bureau of Land Management
- Private or Undefined
- State

Scale 1:24,000
Contour Intervals = 40 Feet

0 0.5 1 2 Miles

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
PRINEVILLE DISTRICT
3050 NE Third Street
Prineville, OR 97754
(541) 416-6700

## Location Map




Ex. 5
LUBA #2008-203
00799

TO: Paul Dewey July 29, 2008

From: Bret Michalski
Consulting Wildlife Biologist
19325 Kiowa Road
Bend, OR 97702

RE: Thornburgh and Tetra Tech responses to Hearing Officers Questions

Paul –

I have reviewed the documents submitted by the Thornburgh Resort Company at the 15 July hearing which address the questions posed by the Hearing Officer at the 7 July hearing. I do not want to delve into a point-by-point defense of every point of disagreement, but simply to say that a standard to meet a county code has been put forth as a requirement, and it is my professional judgment that there are areas where it is difficult to say that this standard can be shown to be met.

I would like to respond to several points made.

All of my comments stem from my evaluation of the Thornburgh wildlife plan in light of Deschutes County Code 18.113.070(D): *"Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource."* My remarks are not intended to question the integrity, qualification, or intent of any of the agency, Tetra Tech, or Thornburgh personnel, but only to evaluate the meeting of the County code.

Throughout the materials I reviewed, the words "professional judgment" and "professional assessment" appear frequently. There is also reference to opinions which are "baseless" and "speculative". For instance, in the Tetra Tech memo (15 July 2008, "Specific responses to Opposition Letters", p.8), my assertions that the potential impacts of large numbers of pets was not considered in the HEP analysis was referred to as "baseless" and "speculative". I would say my assertions are no more baseless or speculative than any other use of professional judgment and assessment, upon which the entire HEP analysis rests. We could go through the entire set of documents and replace all use of "professional judgment" with "speculative" and "baseless".

In the brief submitted 15 July (Exhibit G, p. 12, paragraph 2), it is stated that I called for "exhaustive field study" in my letter to you dated 17 June 2008. This is a complete misrepresentation of what I said. What I said was "*As a biologist I thoroughly understand the difficulty in assessing impacts on species for which there may be little published literature, and no time or funds available to conduct exhaustive field study. However, this subjective assessment of habitat value, impacts, and improvement resulting from mitigation measures cannot conclusively be shown to meet the standard of Deschutes County Code 18.113.070(D)*". What this statement should be interpreted to mean, is that it is difficult to truly demonstrate compliance with the Code 18.113.070(D) when there is no data at all specific to the Thornburgh property.

The Oregon Department of Fish and Wildlife memo (13 June 2008) asserts that modified HEP analysis is probably the best model to use in assessing habitat impacts, because it is a "fair approximation of what a very expensive and time consuming field measurable HEP would produce". In general principle, I agree. However, a modest amount of field work (small mammal trap transects, bird point counts) conducted during breeding season and fall migration, would at least give some data with which to base the HEP analysis. A biologist would then have the ability to say what species were actually found on the property, and at what approximate densities, allowing a better assignment of habitat suitability indices for evaluation. For instance, I see that the species list included in the Tetra Tech memo (15 July 2008) does

not include the pinyon mouse (*Peromyscus truei*). I know from surveys conducted by myself that pinyon mice are found in the old-growth juniper woodlands less than 5 miles from the Thornburgh site. If the Thornburgh site and proposed mitigation site were to be surveyed for small mammals, they would know whether the pinyon mouse was present and what proportion of the small mammal community it represented, and we have at least an idea backed by data as to how good those areas were for pinyon mice. Then we could evaluate how well the proposed mitigation measures might allow Thornburgh to meet Deschutes County Code 18.113.070(D).

One of the Hearing Officer's questions (#3) asks how the effect of cumulative impacts might be considered in the plan, and evaluated against the proposed mitigation. The Thornburg and Tetra Tech response is that the modified HEP analysis *does* consider cumulative impacts. This is where I believe we are suffering from a fundamental difference in the way we are using the word "cumulative". If a juniper woodland or shrub/steppe habitat is converted into human homes, resort facilities, and roads, it is gone and no longer viable as a habitat. Mitigation as defined by most dictionaries attempts to "make less" the impact of an action. The county code inserts a somewhat higher standard by stating that actions will be *completely mitigated so that there is no net loss or net degradation of the resource.* To do this, in my opinion, you must know something about what you have, and you must know some specific things about the area to be enhanced. For instance, as I said in my letter to you on 17 June 2008, if we don't know where we are going to mitigate for the total loss of some known number of acres of a particular habitat type, how can even the best professional be reasonably sure that we will increase the quality of the mitigation acres to the point that it will make up for the loss of the habitat acres in question?

Thornburgh asserts that the county code should be possible to meet, and I agree with this assertion. But that does not mean that it should be easy to meet. My points regarding cumulative impacts center on the idea that you cannot mitigate for the total loss of habitat by improving other habitats indefinitely. At some point, there are no more acres available to mitigate for additional acres to be developed, and the loss of one acre of habitat adds to the acres lost from all previous development and no amount of mitigation can make up for it. Perhaps this idea is beyond the scope of Deschutes County Code 18.113.070(D), but my professional opinion is that unless habitat is re-created from existing lands in other land uses to replace the acres that are lost, one cannot say that we will stack animals on top of one another in increasingly shrinking acres to make up for acres lost. There is a cumulative impact in the loss of habitat and its fragmentation and isolation. To mitigate for this to meet Deschutes County Code 18.113.070(D), I believe you must take acres of non-habitat and replace the acres lost, not just enhance existing acres. If the acres to be enhanced have not been specifically identified, how can it be said that the Deschutes County Code 18.113.070(D) has been met?

Bret L. Michalski
Associate Professor Forest Resources Technology
Consulting Wildlife Biologist

RECEIVED
BY: AF 5:00pm
JUL 2 9 2008
DELIVERED BY:

**To Deschutes County Hearings Officer Anne Corcoran Briggs**
**re: FMP for Thornburgh Resort Company LLC M07-2, MA 08-6**
**Dated: 7/29/08**

**Re: Gould Revised Exhibit 1 submitted 7/15/08**

o Distance between primary access and secondary access (south) is 0.52 miles and equals **2745.60 feet** (0.52miles x 5280feet/mile = 2745.80feet)

o Maximum distance measured in a straight line for Phase A should not exceed **5491.20 feet = 1.04 miles** if the primary access and secondary access (south) are the fire evacuation routes for Phase A.

o The secondary access (north) must be constructed in Phase A once the density standard is reached per the Oregon Fire Code.

o Applicant has not identified where or in which phase the first 50 overnight units will be constructed.

o Secondary access (north) must be constructed to fire evacuation standards if Phase A exceeds 1.04 miles (distance measured in a straight line) and density limit is reached.

**Text accompanying Exhibit 24 submitted 7/15/08:** typographic errors are corrected to read: line 27: or not of, line 29 telescopic not telescpic.

**Exhibit 26.** 4 pages color "Who's Guarding Our Water?" by Mark Yinger Bend Business Review, Volumne 1, issue 2, 2007/2008 pp 87-89 with cover.

Kindly refer to CMP record
The BLM Prineville District Upper Deschutes Resource Management Plan Record of Decision (UDRMP ROD) dated September 2005 together with maps was introduced into the CMP Public Hearing record on December 21, 2005 by Marianne Thomas.

**Exhibit 27** Robert Towne, Field Manager, Deschutes Resource Area for Prineville District of BLM with attached 16 pages of Bureau of Land Management comments to CU-05-20 letter received August 16, 2005 and addressed to Devin Hearing, Deschutes County Community Development Department.

o I encourage the Hearings Officer to review this CMP submittal

o 1st page, 2nd paragraph last 2 sentences read:

"The Cline Buttes SRMA *(Special Recreation Management Area italics my emphasis)* surrounding the resort also includes the Tumalo Canal and Peck's Milkvetch Areas of Critical Environmental Concern (ACEC). Other uses and values of adjacent public lands include deer and elk winter range, raptor nesting and brooding habitat, livestock grazing, designated areas available for mineral sales and future potential hard rock mining, and a unique high quality old growth juniper woodland."

**Exhibit 28** 11x17" color BLM Prineville District Office, Cline Buttes Recreation Area Plan Newsletter dated May 2006

**Exhibit 29** 1 page text BLM Prineville District Office, Cline Buttes Recreation Area Plan,

Newsletter dated October 2006.

o In 2006, BLM commenced the Cline Buttes Recreation Area Plan (CBRA plan) giving site tours, taking testimony, hosting workshops which created six Group 1-6 Concept Maps for the CBRA.

o In November 2006, BLM released a collection of maps highlighting topics in the UDRMP for Cline Buttes Recreation Area Plan some of which are attached:

**Exhibit 30** 8.5x11 color 1 page Cline Buttes Recreation Emphasis (November 2006 BLM release).

**Exhibit 31** 8.5x11 color 1 page Cline Buttes Areas of Critical Environmental Concern (ACEC's) (November 2006 BLM release)

**Exhibit 32** 8.5x11 color 1 page Cline Buttes Wildland Urban Interface (November 2006 BLM release)

**Exhibit 33** 8.5x11 color 1 page BLM Cline Buttes Fire Starts (November 2006 BLM release)

o Also in November 2006, BLM released Cline Buttes Recreation Area Plan Concept Maps A-C (previously submitted as **Exhibit 2** at the 6/17/08 FMP hearing (My written testimony accompanying Exhibit 2 was submitted at the public hearing on 7/15/08). BLM received public input comment on these Concepts A-C and also received a no-motorized alternative and a wildlife alternative to their Concept Plans.

o BLM identified at a Tumalo Community Association presentation given 3/4/08 that it would soon be releasing CBRA Plan Alternatives 0-4 (where 0 is a no-action alternative).

o As of today, 7/29/08, BLM has not released any CBRA Plan Alternatives for public comment.

**Exhibit 34** 1 page large format map showing 150'x200' encroachment onto BLM land for Secondary Access (north) which is the Willett ROW. (CDD file #M08-7)

**Exhibit 35** 4 pages text Email correspondance between Suzanne Wiley, Realty Specialist BLM and Nunzie Gould dated 7/28/08 regarding Willett ROW which is the secondary access (north) for Thornburgh Resort.

"The correction is just a paper work exercise, the footprint that is on the ground will remain the same.

Here is a short explaination of what happened; the BLM wrote the legal for the road thinking it was on the corner of the Willetts property, it has come to our attention it is not on the corner, but approximately 150 to 200 feet from the corner...."

o The secondary access north (Willett ROW) has been constructed outside of the 60 ROW granted by BLM to Thornburgh Resort Company.

o Who is enforcing improvements approved on the land? Deschutes County?, BLM?, ODFW?

o What is the impact of paving a road outside of the approved BLM ROW?

o Who mitigates for what and who enforces?

**Exhibit 36** 8x11 2 color Photographs of Secondary Access (north) Willett ROW for Thornburgh Resort.

o Note Weeds along ROW contrary to ROW agreement with BLM

o Note ATV destruction and erosion of gravel median in secondary access (north) Willett ROW.

The ROW which BLM granted Thornburgh Resort Company for the secondary access (south) enters the Thornburgh Resort at the SW corner of taxlot 7700 at the NE corner of taxlot 7801 and the SE corner of taxlot 7800. This is identified on the Emergency Access Map in the FMP as one of the accesses for Phase A. However in the FMP application, the actual driveway/access permit identifies the property to be served is Township 17 S. Range 12 E. Taxlot 7900.
Since in the CMP, the applicants wanted to access Barr Road from Cline Falls Highway along the southern boundary of taxlot 7700, through taxlot 7801, weaving along a BLM recreation trail along often times BLM land and the southern boundary of taxlot 7900 and 7800 to Barr Road, I would like clarification of the driveway/access request to Deschutes County.
Does applicant request the Secondary Access (South) driveway/access permit to serve taxlot 7900 directly from Cline Falls Highway?

Nunzie Gould
19845 JW Brown Rd
Bend, OR 97701

Nunzie Gould

TBFMP 7/29/08 Gould Exhibit 26 4 pages

# WHO'S GUARDING OUR WATER?

## Groundwater management in Central Oregon

MARK YINGER, RPG HYDROGEOLOGIST

In August 2006, at the Deschutes Water Summit, Newton Consultants presented a study of the demand for groundwater to Deschutes River Basin stakeholders. The report is part of "a consensus process to develop a comprehensive water management plan," for Central Oregon's water supply, according to the water summit's website.

The paper, "Future Groundwater Demand in the Deschutes Basin," was sponsored by the federal Bureau of Reclamation, a wholesale water-supply agency under the Department of the Interior, and is part of a study to provide information for management of groundwater in the Deschutes River Basin. This groundwater is pumped from wells to supply almost all of our drinking water, farm and landscape irrigation and for industrial uses.

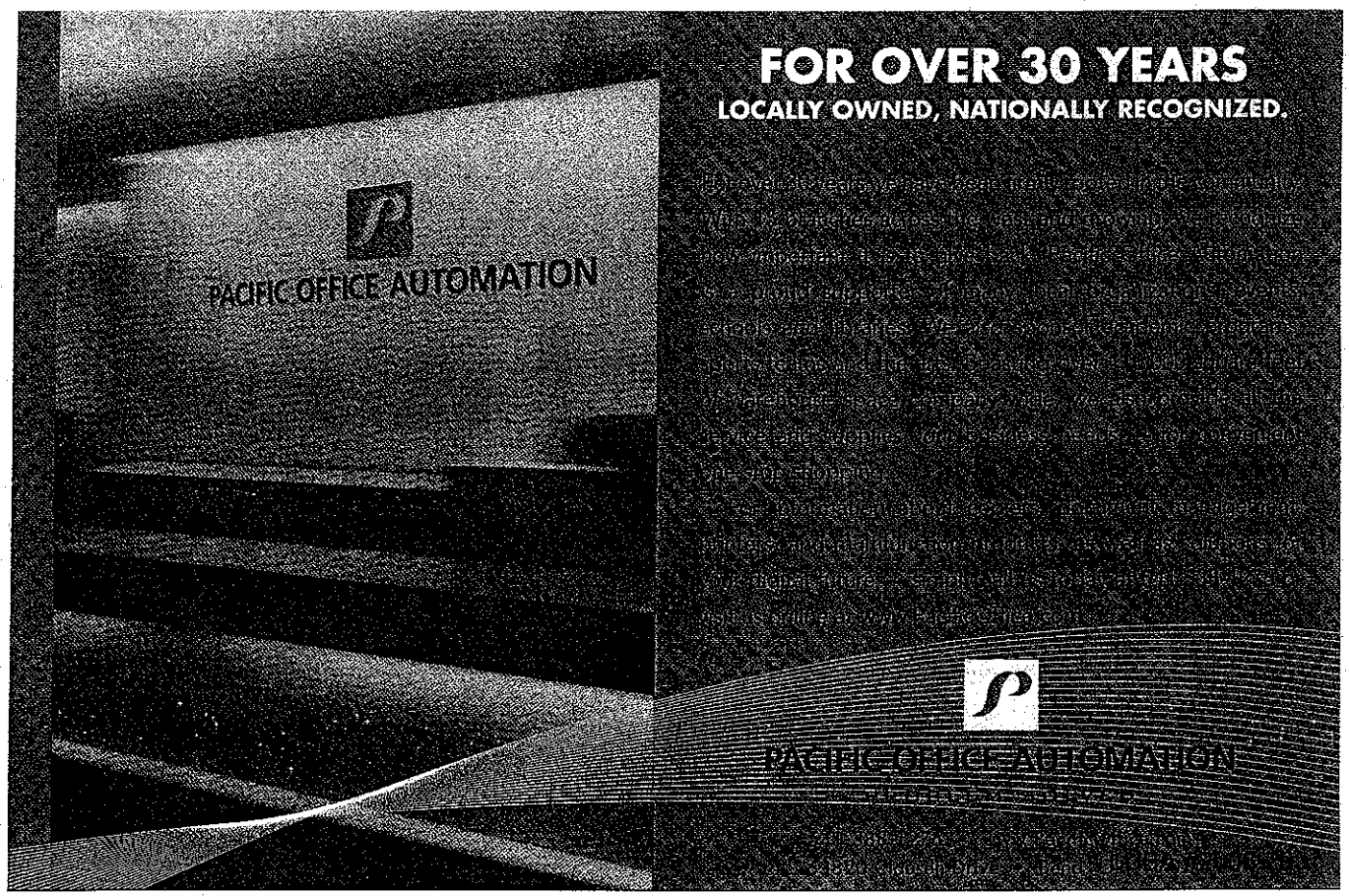
Comments from attendees of Newton's presentation that day ranged from skepticism and confusion to praise and gratitude. Breakout groups recorded these reactions: "Lots of new information, needs peer review to gain acceptance," and "Left me with a lot of questions on details behind conclusions [ex. what was the per capita number used in (municipal) calculation]," to "A lot of technical data. Good for me, but maybe not everyone" and "Excellent analysis of how much [groundwater] is there—if data is accurate."

### Accuracy and Assumption

The last comment—if data is accurate—is one I feel compelled to explore as a scientist and a resident who lives in the Deschutes River Basin in Sisters.

Overall, the Newton Consultants paper lacks references to backup the many assumptions and statements of fact. For example, the paper (page 4) makes the assumption that "Of the total amount of water used by the suppliers, 50 percent on an average annual basis is assumed consumed. It is assumed that the remaining 50 percent of the water used by the suppliers returns to the hydrologic system." Newton gave no reference to support this assumption. Near the end of paper (page 35), this assumption is used to estimate the total amount of water consumed in the basin by water suppliers within the urban growth boundaries.

When references are given, they are vague, incomplete and factually contradictory. For example, in sections *11.3.1 Groundwater Occurrence* and *11.3.2 Groundwater Availability*, the United States Geological Survey is cited as the source for the amount of total annual groundwater recharge given as 3.3 million acre-feet in the first section and then as 2.7 million acre-feet in the following section. This appears to be a factual contradiction.






00805

# WATER?

sorts of the size of Newton Consultants' other client Thornburgh, which Newton calculated would need 2,355 acre-feet annually.

Finally the discussion of groundwater availability is where the authors essentially dismiss all concerns, and they might just as well have dismissed all of the preceding discussion in the paper. The authors make the meaningless and misleading comparison between consumed groundwater, based on a 50 percent consumption rate, and the annual groundwater recharge of 2.7 million acre-feet. The projected 2025 groundwater use will amount to only 0.87 percent. It is meaningless because the 2.7 million acre-feet is not available for development, and it is misleading in that it gives the reader the impression there is an inexhaustible supply of groundwater.

The 2.7 million acre-feet is actually the sum of groundwater discharge in the confluence (head of Lake Billy Chinook) area plus the flow of the Metolius River (2004, USGS report 03-4195, page 10). This figure breaks down as 1.7 million acre-feet of groundwater discharge in the confluence area plus 1 million acre-feet of flow from the Metolius River. The entire flow of the Metolius River should not be considered potentially a groundwater resource for development.

Future development of groundwater will impact the Deschutes River. Mitigation schemes that reduce irrigation diversions on the Deschutes River in return for new groundwater development will impact the middle Deschutes River by reduced groundwater discharges into the river. Reducing groundwater discharge to the river in return for diverting less from the river at irrigation headworks is not a fair trade. Fish and riparian habitat depend on the cold groundwater discharges. It is not just about volumes of water, it is about distribution and quality.

Ultimately, this paper is as academically unfounded as it is flawed in analysis, and policy based on it will affect all water users in the Deschutes River Basin.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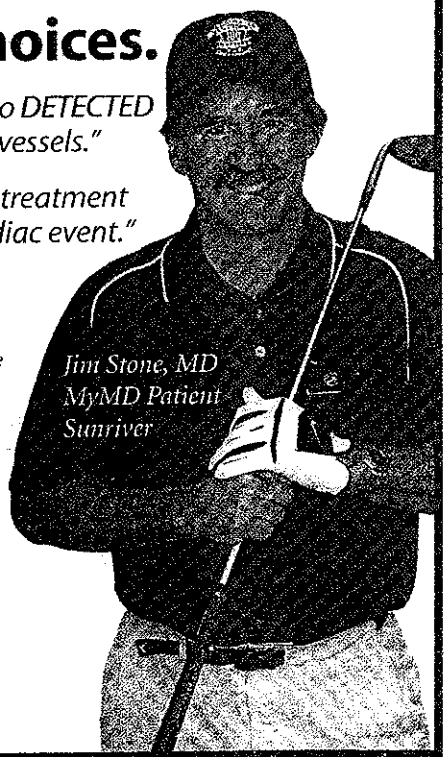
*"I chose a doctor who INITIATED treatment to reduce my risk of a future cardiac event."*

*"I chose Rich Mac Donell, MD."*

— *Jim Stone, MD*
*Director, Mountain Medical Immediate Care*

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# United States Department of the Interior

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3050 N.E. 3rd Street
Prineville, Oregon 97754

IN REPLY REFER TO:
OR 61170

RECEIVED
BY: [signature]
AUG 16 2005
DELIVERED BY:

Devin Hearing
Deschutes County Community Development Department
117 NW Lafayette Avenue
Bend, Oregon 97701-1764

Dear Mr. Hearing:

Thank-you for the opportunity to comment on the Thornburg Resort Conceptual Master Plan and Conditional Use Application (CU-05-20). The attached document provides detailed comments to supplement our initial letter dated March 31, 2005.

The BLM is currently finalizing the Upper Deschutes Resource Management Plan (UDRMP) which provides the long-term vision for BLM administered lands in Central Oregon, and includes specific management direction for lands that surround the proposed resort. The Upper Deschutes Record of Decision and final Resource Management Plan are expected in September 2005. The BLM administered public lands surrounding the resort have been identified as a Special Recreation Management Area (SRMA) in the UDRMP, based on the high level of interest in the area by the public, high levels of use, and management challenges of the area. The Cline Buttes SRMA surrounding the resort also includes the Tumalo Canal and Peck's Milkvetch Areas of Critical Environmental Concern (ACEC). Other uses and values of adjacent public lands include deer and elk winter range, raptor nesting and brooding habitat, livestock grazing, designated areas available for mineral sales and future potential hard rock mining, and a unique high quality old growth juniper woodland.

To implement the management direction and vision contained in the UDRMP, the BLM will develop specific area management plans that contain detailed implementation decisions. Chief among these decisions are identification of public land access points/trailheads, designation of road and trail systems that meet social and natural resource management goals, and vegetation management actions to maintain healthy ecosystems and fire safe wildland urban interface zones. In 2006, the BLM will prepare a detailed area management plan for the Cline Buttes Recreation Area. The development of the resort and the preparation of the Cline Buttes area plan offer significant positive opportunities for an integrated trail system and other features that benefit both private and public land users.

Given the recent development of the UDRMP and upcoming area plan proposal for Cline Buttes, the BLM appreciates the opportunity to provide comments. Many of the attached comments on the proposed resort conceptual plan and conditional use application are based on management direction and public input contained in the UDRMP – which utilized a collaborative public process with over 5,400 contributed hours of community participation. These comments include requests for clarification or correction of information contained in the application. Other comments focus on identification of impacts and issues, and suggestions for mitigation measures. To a great extent these mitigation measures are design elements, which could be further developed and incorporated into the conceptual and final master plans for the resort. Some of the comments raised in this letter may find final resolution through the applicant's and County's involvement in preparation and implementation of the BLM's Cline Buttes Integrated Area Plan.

There are many positive benefits of a well planned and designed resort community. This application is a great beginning and presents many esthetic attributes for future uses of the area. Clarification of many items, and further design development of the resort features, transportation systems, and a focus on long-term mitigation and enabling partnerships with appropriate funding and accountability mechanisms will result in a high quality development and a recreation and natural resource setting that benefits all. The BLM can help to provide specific mitigation costs and to collaborate further with the county, the applicant and other affected agencies to assist in finalizing specifics outlined in the conceptual plan, and insuring compatibility with existing and future uses on adjacent public lands.

Should you have any questions, please feel free to contact me at 541-416-6766, or you can contact the Cline Buttes area plan lead, Greg Currie, at 541-416-6711. Questions specific to the applicants ROW application with BLM should be directed to BLM Realty Specialist, Janet Hutchison at 541-416-6710.

Sincerely,

Robert B. Towne
Field Manager, Deschutes Resource Area

Attachment: Bureau of Land Management comments to CU-05-20

BLM comments on the Conceptual Master Plan are focused on the following Deschutes County Code requirements: 1) DCC 18.113.050 - Requirements for conditional use permit and conceptual master plan applications; 2) DCC 18.113.060 - Standards for destination resorts; and 3) DCC 18.113.070 - Approval Criteria. The following sections detail our response to each of these Deschutes County Code requirements.

**DCC 18.113.050 Requirements for Conditional Use Permit and Master Plan Applications.**

DCC 18.113.050 (A) (6) Proposed Methods of Access to the Development

Further clarification and conceptual design development for the road access at the resort is needed to assess potential impacts of the development and suggest possible mitigation measures.

1. The application states (A-6a, Circulation Plan) that emergency access roads are proposed west of the property that connect to Barr Road through BLM administered lands. The vehicular access and circulation map (Exhibit A-6) shows road connections to the existing, unimproved BLM roads located west of the resort in T 15 S, R 12 E, Sections 17, 18, 19 and 20. The applicant states that use of these roads is allowed in case of an emergency, and that the applicant will seek authorization from BLM to make minimal improvements to these existing roadways so that they are better suited as emergency access routes.

If the operation of the resort is dependent on the future use of these roads, clarification of the intended uses and improvements of these roads is needed in order to assess impacts and suggest possible mitigation measures, particularly if the permanent use of these roads is required for emergency ingress/egress by the County or Fire Department. The exact road standards deemed necessary by the fire department is needed to assess impacts and develop appropriate mitigation. The permanent improvement and regular use of these roads may increase fragmentation of wildlife habitat on public lands and may conflict with recreational trail goals for Cline Buttes by creating road crossings with trails, or because the roads in question may be converted to trails or closed to motorized access based on future transportation planning done by the BLM in the Cline Buttes area plan.

2. The application does not identify the existing road on the southern boundary of the resort and adjacent to the proposed Tumalo Canal Area of Critical Environmental Concern (ACEC) as part of the resort's transportation system presented in Exhibit A-6a. However, the application and Deschutes County Staff Report (CU-05-20) does state that: "Applicant will also utilize an existing unimproved roadway across federally owned land that provides a connection to the southern property boundary of the subject property in Section 29. This existing federal right-of-way connects with the Cline Falls Highway in Section 28 and Barr Road in Section 30."

The application does not specify how this road would be used. Clarification of the intended uses of this road for resort access and maintenance is needed in order to assess

the potential impacts to the recreational use and historic integrity of the proposed Tumalo Canal ACEC and suggest possible mitigation measures. While the portion of this road west of Cline Falls Highway and east of the Bennett parcel (Tax Lot 7801) is an existing utility line ROW granted to Qwest Communication, neither this portion of the road nor the portion west of Tax Lot 7801 and east of Barr Road is a road ROW. Therefore, these roads may be closed or converted to trails based on future transportation planning done by the BLM.

3. At the July 14th Deschutes County Hearings Officer presentation, the applicant identified the existing road reservation granted to the Federal Aviation Administration (FAA) in T 15 S, R 12 E, South ½ of Section 28 as adequate access for Phase 1 of the development. This road is not included in the applicants ROW request to the BLM. North of Cline Falls Highway, this road crosses approximately ¼ mile of BLM administered land. Although this is a road ROW granted to the FAA, it is not constructed or maintained for construction traffic. Clarification of how this road would be used for purposes other than the existing FAA ROW grant is needed to assess impacts to adjacent lands as well as to the roadway itself.

4. A portion of the resort (Phase G, Open Space Phasing Plan, and Exhibit B-9) is bisected by Barr Road. This portion of the resort includes proposed residential development (approximately 30 acres) on both sides of Barr Road. The Conceptual Master Plan does not identify any road connections between this residential development and the remainder of the Thornburg Resort, and does not specify whether Barr Road would be improved to provide access to the developed units in this area or to connect this development with the remainder of the resort

5. The application does not specify which roads, if any surrounding the resort would be used for construction, maintenance, security, or other operations of the resort. While roads on BLM administered lands are generally available for casual public use, identification of roads that would receive regular use for construction access, employee access, patrol, maintenance, security and other uses is needed so the effects of this use on surrounding land uses can be assessed.

DCC 18.113.050 (A) (7) Major pedestrian, equestrian and bicycle trail systems

The application and conceptual design for the trail system and trail access for the resort is unclear about the types of public amenities and facilities and the degree of public access to those facilities or to adjacent public lands.

The project application includes a description of hiking and biking trails on resort property. The application contains a public amenities map, which includes hiking/biking trails and vista points both on resort property and on State owned lands (Public Amenities Plan – Exhibit B-5). The Vehicular Access map shows roads in the same corridors as the trails map (Vehicular Access and Circulation – Exhibit A-6). The recreation amenities for the northern portion of the resort (The Pinnacle) are described in the application as being accessible to the general public.

It is unclear if these facilities (roads, trails, and vista points) would be open to the general public on a regular and ongoing basis, and under what conditions, if any, that vehicular access to the top of the butte on resort roads or access to State owned public lands (T 15 S, R 12 E, W 1/2 NW ¼, Section 21 and E ½ NE ¼, Section 20) would be allowed. It is also unclear if any public facilities for equestrian or motorized trail use would be allowed on the resort, since the public amenities map only identifies hiking/biking trails. As currently proposed, the resort and leased State lands would not provide opportunities for equestrian or motorized trail connectivity between public lands to the east and west of the buttes. Additional clarification of these points is needed to assess potential impacts and suggest mitigation measures.

DCC 18.113.050 (A) (11) All proposed recreational amenities

The list of proposed or allowable recreational amenities in the application (Pages 9 - 12, Item 11, Conceptual Master Plan and Conditional Use Application) includes stables and equestrian facilities. The application is unclear about whether these activities will be pursued just within the resort or on public lands. If these uses are provided on public lands, they will be considered only on designated trails that are part of BLM's transportation system. The BLM recommends that any facilities developed at the Thornburg Resort that might subsequently be the source of a proposal for commercial or group use of public lands and any potential trail connections to public lands be specifically identified in the final master plan. BLM further recommends that any subsequent county site review for specific phased developments that might contain such facilities be submitted for BLM review prior to county approval to avoid any potential future conflicts with public land management goals and objectives.

DCC 18.113.050 (B) (11) (a, b, c) Approval Criteria – Hydrology Study

According to the Hydrology Report in the application (Exhibit 16, B-26), the annualized volume required to meet the mitigation obligation for the resort would be 941 acre-feet. This is based on the determination that 40% of the water pumped for use at the resort would be consumptively used. It is not clear from the application whether the mitigation credits and projects the resort plans to use will actually off-set the effects of pumping from the groundwater aquifer. Many of the available mitigation credits and projects that result in conserved water to be utilized as mitigation are from irrigation canal piping and/or lining. Water that was leaking from unlined canals into groundwater was previously replenishing the groundwater aquifer which, in turn, provided spring flow to the federally designated Lower Crooked and Middle Deschutes Wild and Scenic rivers, and subsequently to the Lower Deschutes State Scenic Waterway and federally designated Wild and Scenic River. Water that no longer leaks from the canal system is considered by the BLM to be redistributed, not conserved. If the resort plans to utilize mitigation that was a result of canal lining or piping, there would be a net consumption of 941 acre-feet (584 gallons per minute), and flows in one or more of these river segments will be diminished by a similar amount.

The Middle Deschutes, Lower Crooked River, and Lower Deschutes are federally designated Wild and Scenic rivers. As administrators of Wild and Scenic Rivers, the BLM is charged with protecting the identified values for which these rivers were designated, free-flowing condition, and associated water quality in each river or river segment. In addition, the BLM is directed to protect and enhance instream flows sufficient to meet the purposes of the designated Wild and Scenic River. While the amount of water proposed for consumptive use by the resort does not in and of itself constitute a large quantity of water relative to current river flows, over the long-term, the cumulative effect of many small allocations will result in a significant amount of water lost from the rivers.

DCC 18.113.050 (B) (14) Wildfire prevention, control and evacuation plans

The conceptual plan for the resort includes a 25 acre lake. The application states that this lake could be used by helicopters for firefighting, but does not provide details on how this would be accomplished. The BLM recommends that a formal agreement be made with Central Oregon Fire Management Services (COFMS) and city fire departments for use of this water source to fight fires within a 20 mile radius of the resort site.

The wildfire/natural hazard protection plan (Exhibit 15, B-29) states that a well-planned evacuation plan and well-planned system of streets and roads (operationally functional and capable of effectively handling residential egress traffic as well as emergency equipment ingress) is needed. The system of roads capable of handling the range of expected emergency evacuation needs has not been identified. The application states that existing, unimproved roads on BLM administered lands would be used for this purpose. As noted in earlier comments, potential impacts and suggested mitigation measures cannot be identified without a clear description of the location and anticipated long-term condition of these roads; however, options such as the relocation of Barr Road may be options for providing access while mitigating impacts (See previous comments in Section DCC 18.113.050 (A) (6) – Proposed Methods of Access to the Development and recommended mitigation in Section DCC 18.113.070 (P)).

New residential development adjacent to public lands frequently results in additional wildfire protection burdens to federal firefighting resources. This development increases both fire hazard and risk to life and property, compared to agricultural uses of these lands. The wildfire/natural hazard protection plan does not address whether the resort development would require a reduction of fuels or specific fuels treatments on adjacent public lands.

The wildfire/natural hazard protection plan identifies ignition prevention measures of educational efforts for resort residents and visitors. Given the scale of the development and location surrounded by public lands, the BLM recommends that the educational efforts proposed by the applicant include an education component for public land visitors developed in conjunction with Redmond Fire Department and BLM.

**DCC 18.113.060 Standards for Destination Resorts**

DCC 18.113.060(C) Access onto state or county arterial or collector roadways

The applicant has requested ROWs and Temporary Use Permits for road and utility access to the resort. These requests will be evaluated by the BLM. Until this process is completed, the exact location and number of ROW roads granted to the resort is not certain. The BLM has requested that where technically feasible, the project proponent place all roads and utilities on resort property instead of using roads or placing utilities on public lands.

**DCC 18.113.070 Approval Criteria**

In addition to the above items of clarification, the BLM recommends the following suggestions for mitigation be considered in the review and development of the Conceptual Master Plan for the Thornburg Resort:

DCC 18.113.070 (D) Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource.

The applicant is working with ODF&W and BLM to prepare a wildlife report for the proposed resort. The report is in draft form, and the BLM looks forward to assisting in developing a final version of this report. The BLM suggests clarification and further development of items related to deer and elk winter range, proposed off-site mitigation, habitat conditions, and noxious or invasive species prior to the approval of the conceptual master plan.

Deer and Elk Winter Range:

The wildlife report identifies that deer and elk may be passing through the property and BLM lands, but these animals may also be using the area during the winter. The proposed resort is located within deer and elk winter range (Map S-9; Deer Habitats - Proposed UDRMP/FEIS) identified during the Upper Deschutes Resource Management Plan assessment process. The application does not address how the development of the resort will affect these uses, or what mechanisms will be used to prevent wildlife damage to golf courses or other resort features and how the resort development might affect traditional use areas or connectivity to habitats along the river.

Habitat Conditions:

It is unclear what types of habitat conditions the resort intends to provide on-site compared to off-site in the current draft of the report. The intent of the development is to maintain native populations of plants where possible. However, how this will be accomplished is unclear. For instance, the removal of large shrubs is included in the listed mitigation, but the rationale for this action is unclear. Snags and downed logs are also important habitat features to protect on resort property as well as old growth juniper. The

report does not quantify on-site or off-site mitigation related to old growth juniper, snags or downed logs retained.

Off-site Mitigation:

Off-site mitigation is a tool used to respond to conditional use requirements of compensating for loss of wildlife habitat resulting from resort development. These provisions have often, in the past, been identified as individual, one-time events such as juniper thinning or creation of structures. County decisions in the past have left the accomplishment of these activities – even when anticipated on public lands – to the discretion of the applicant. Habitat conditions are not static and a flexible, long-term approach to the mitigation of the loss of that habitat is needed to adequately compensate habitat loss through resort development. Off-site mitigation can be accomplished by a suite of actions that are outlined in the Upper Deschutes Resource Management Plan and will be detailed in the Cline Buttes area plan. Off-site mitigation proposed on public lands in the area will have to meet the criteria identified in those and future plans that would continue maintenance of desired wildlife habitat conditions for the area. Funding mechanisms such as endowments or foundations that could support the projected costs of a suite of actions over time that will meet the BLM criteria for off-site mitigation are needed to ensure the long-term maintenance of desired habitat conditions and the accountability that proposed mitigation will be effective. The BLM can work with the applicant and proponent to identify more specific long-term mitigation costs and to develop a suitable funding mechanism to provide for a suite of off-site mitigation measures that would meet the intent of fully mitigating loss of wildlife habitat.

Appropriate off-site mitigation measures that will meet the BLM criteria can be categorized as habitat conditions and disturbance factors. Several items included in the draft report would **not** be considered appropriate off-site mitigation. These include:

- Removal of grazing on the resort property and from off-site mitigation areas. Proper grazing practices can result in beneficial habitat conditions, and may be needed as a management tool to maintain desired vegetative conditions in the area, including weed control.

- Placing rock piles on offsite mitigation areas. Appropriate habitat mitigation on BLM administered lands would include improvement of naturally occurring features rather than creation of features.

- Creation of new water sources for wildlife. Wildlife water sources that exist are in need of maintenance - that would be more appropriate long term mitigation than creation of new sources.

- Individual closures of existing roads and/or trails. Assistance in the development and maintenance of a designated road and trail system would be more appropriate long term mitigation than focusing only on closures of roads or trails.

An example of the suite of actions that would be considered appropriate off-site mitigation for loss of wildlife habitat includes:

- Short-term treatment and long-term maintenance of specific desired conditions within the Cline Buttes SRMA. These could include but are not limited to:
  - Creation and maintenance of suitable wildlife habitat over time within a specific area
  - Designation of access points and trail links from the resort onto BLM administered lands consistent with final decisions of the Cline Buttes area plan.
  - Designation and long-term maintenance of roads and trails on public lands. This may include closure of roads and trails, conversion of roads to trails, creation of new roads or trails, and designation and maintenance of the final road and trail system that meets mitigation needs and BLM requirements. The wildlife report refers to funding implementation of BLM habitat enhancement actions as described in the UDRMP (Item 15, Off-site mitigation). Similar language could be used to describe implementation of travel management and trail use actions in the UDRMP.
  - Relocation of the portion of Barr Road located west of the Pinnacle section of the resort. Relocation of this road to the east, so it borders the resort development, would reduce fragmentation of public lands, and provide wildlife habitat benefits.

- Grade separated trail crossings of major highways, county arterials, or ROW roads.

  - Reduction in motorized recreation opportunities around the resort or in an offsite mitigation area may shift use to remaining portions of Cline Buttes and increase the need for safe, designated trail crossings of Barr Road, Eagle Crest Drive, and State Highway 126 to disperse the displaced trail use and minimize impacts. The increase in traffic on Eagle Drive, Cline Falls Highway and other area roads will result in greater barriers to trail connectivity between different areas of public land.

- Trash management and litter have an affect on the occurrence of some species. A trash and litter control program on adjacent lands could be included in a suite of appropriate mitigation measures.

- Acquisition of additional lands to be managed for suitable habitat in accordance with the Upper Deschutes Resource Management Plan.

Noxious or invasive species

The draft wildlife report is unclear on the potential threats from non-native species that may be introduced into the resort. Development of water sources and changes in vegetation communities within the resort represent potential habitat for new species that could affect native populations outside of the resort. Additional information and proposed

mitigation for unintended consequences of the introduction of non-native species such as bull frogs is needed to clarify this potential.

The agricultural assessment states that possible impacts include "...spread of noxious weeds..." (p.11), and that "Thornburgh Resort would be responsible for identifying and controlling noxious weeds on its land. Their self interest in this matter will induce them to maintain golf courses and other outdoor venues" (p.12). The assessment does not mention any noxious weed prevention measures that would be instituted on public land. The assessment only briefly mentions noxious weed identification and control on resort land, but there is no mention of identification, monitoring or control measures aimed at public land. The wildlife report indicates limitations on the types of noxious weed control the resort will use. Given the aggressive nature of the noxious weed population in the area, the BLM recommends that all methods for noxious weed control and control of non-native plants (chemical, biological, and mechanical) be considered. Other suggested mitigation includes:

- Limiting the amount of soil disturbance during construction activities.
- Include requirements for weed-free top soil
- Provide aggressive weed detection and control measures on disturbed sites. Seed with mixtures that can handle low precipitation levels and compete with cheatgrass.
- Maintain adequate buffers between irrigated landscaping on the resort and the resort boundary with public lands to prevent spread of non-native plants.
- Include a monitoring program over the length of the development/construction of the resort to identify the spread of noxious weeds and provide control measures.

DCC 18.113.070 (F) The development will not force a significant change in accepted farm or forest practices or significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use.

The Agricultural Assessment (prepared November 2004, Exhibit B-28 in Thornburgh Resort Conceptual Master Plan), is based on inaccurate assumptions regarding 1) The holder of the BLM grazing allotment permit, 2) the number of AUMs on Thornburgh grazing permit, and 3) BLM acres associated with allotments. The report also fails to address a number of issues related to the resort development that would affect agricultural uses. These assumptions and lack of consideration of other issues led to an inaccurate assessment of impacts and mitigation in the report. The inaccurate assumptions include:

1. The table on page 6 of the Agricultural Assessment lists Everett Thornburgh as the permit holder for the five allotments in the generally vicinity. In fact, he only holds the permit for one of these allotments. The others are held by persons who are, to BLM's knowledge, unrelated to and unassociated with Everett Thornburgh. On page 5 the report

states that the grazing permits are held by "the Thornburghs along with their grandson Kameron DeLashmutt." On page 14 the report states that Trail Crossing Trust "holds grazing allotments for 300 AUMs on 23,000 acres." In fact, the grazing permit is held by Everett Thornburgh alone (though Eva Thornburgh, deceased, is still listed as co-permit holder). These permits are still active therefore, mitigation should be addressed.

2. On page 5 the Thornburgh permit is described as having 300 AUMs. Everett Thornburgh holds the Cline Butte Allotment permit, which has 700 AUMs.

3. The BLM acres listed in the table on page 6 of the Agricultural Assessment are not correct for any of the allotments. Correct acres are listed in Appendix G of Upper Deschutes RMP/FEIS. The Cline Butte Allotment (Everett Thornburgh's only permit in the area) covers 10,671 publicly managed acres (not 23,000 as stated in document).

The BLM recommends that the applicant correct or clarify the information in the Agricultural Assessment and revise the findings of impact to reflect these changes and consider the following suggested mitigation:

1. Need for new fences and fence maintenance on resort boundary: The report mentions damage to existing fence (p.12, "Thornburgh Resort Company would coordinate with landowners [on] the replacement of fences…"), but does not discuss at all the need for new fence along the resort boundary. The resort boundary is approximately 14 miles in length. At least 12 of these miles border BLM-administered public land, and most of that boundary does not currently have a fence.

If provided, the approximately 12 miles of new boundary fence will need to be maintained and repaired. If there are livestock attractants near the boundary (such as green lawns, ponds), livestock are likely to push on the fence and increase maintenance needs/costs. The assessment did not mention the need to install or maintain boundary fencing.

- Provide funding for fence installation and maintenance to mark the public/private boundary, and to prevent adverse impacts to current grazing practices by resort operations. For 12 miles of new fence construction, there would be a cost of approximately $60,000 ($5,000 per mile of fence).
- Avoid construction near existing fences. Repair any damaged fences immediately during grazing periods.
- Develop fence patrol and maintenance agreement that provides for frequent checks and repairs.

2. Need for new fences and cattleguards/gates along access roads: The assessment did not discuss access roads or interconnecting trail systems and the potential effects of these roads or access points on current grazing practices.

Prior to master plan approval, include installation of cattleguards, gates, and fences at appropriate locations on access roads and entry points.

3. Vandalism, livestock harassment: Increased numbers of people using BLM administered land next to the resort will increase potential for gates left open, fences cut, cattle harassed or killed. Loose dogs may be more common, potentially chasing livestock, killing calves. The assessment did not discuss these issues.

The BLM recommends providing water in different locations selected to minimize conflicts. Install cattleguards and user friendly gates where road and trail use is designated or occurs frequently. Provide and post signs informing people when cattle are in area. Provide information to resort residents and guests about cattle grazing operations and living next to public lands. Provide funding/assistance for fence construction (to BLM's specifications) on the boundary of the resort. Provide for designation of access roads and trails from resort so gates or cattleguards can be installed.

4. Need for noxious weed prevention and control: See comments and suggested mitigation measures outlined previously in DCC 18.113.070 (D) – Wildlife (noxious or invasive species).

5. Construction related effects to grazing operations. These impacts may include dust, noise, and other disturbance that may shift cattle from one area to another. Drivers servicing the resort may not have time to open and close gates.

The BLM recommends that the applicant consider providing livestock water sources in additional locations during construction period. Avoid using roads that go through grazing allotments. Install heavy duty cattleguards if necessary.

**DCC 18.113.070 (M) The resort will mitigate any demands it creates on publicly owned recreational facilities on public lands in the surrounding area.**

1. Increase in use due to public access provided to State owned lands and BLM administered lands by provision of roads/trails and vista points (public amenities plan), resort residents and guests, and by provision of recreation-oriented services.

2. Displacement of existing trail use through the elimination of trails and roads historically used by recreationists on the resort property, and by fragmentation of existing roads and trails on the BLM and State lands adjacent to the resort by the resort development, fencing, and construction of access roads.

The development of the resort and the preparation of the Cline Buttes Area plan offer significant positive opportunities for an integrated trail system on the resort and adjacent public lands. This may result in benefits for resort residents/guests and the general public. However, the provision of certain facilities may increase recreational use of adjacent BLM lands as resort residents, guests or employees hike, ride horses, mountain bike, or drive vehicles on BLM administered lands. The combination of a large number of resort residents, workers and guests, along with development of paved roads accessible to the general public in the Pinnacle portion of the resort and on State owned lands, and

the potential for commercial recreational uses such as horse stables and equestrian trail rides, mountain bike rentals, etc. may increase trail use on BLM lands. If the trails/roads shown on the public amenities map are available to the public, it is reasonable to assume that greater numbers of people may use them to access the higher elevation portions of the public land (BLM and State lands) on Cline Buttes.

Further, with the development of the resort, many miles of existing roads and trails would be unavailable to the public, concentrating uses to the remaining adjacent public lands. In addition, creation of new access roads to the resort and increases in the traffic volumes on surrounding public roads may also serve to concentrate use in certain areas, increasing the conflicts between different trail user groups.

To compensate for loss of trail miles or trail connectivity, use levels may go up in the relatively small areas of BLM administered lands on the east side of the Buttes, including public lands located between Eagle Crest Phase 2 and 3. Due to the relatively small size of this area, the frequency of trail users crossing Cline Falls Highway may increase, as recreationists increasingly use the public lands between Cline Falls Highway and the Deschutes River. The BLM administered lands to the west of Cline Buttes would likely see an increase in use levels and more trail crowding. The amount of trail use crossing Barr Road may also increase.

To maintain historic trail use patterns, recreationists will seek to go around the resort property, resulting in more frequent crossings of Eagle Drive on the north, and multiple crossings of Cline Falls Highway or the private entry road for the Tribute portion of the resort.

The BLM recommends the application approval include the following suggested mitigation measures:

- Assistance in funding the design and long-term maintenance of a designated public use trail system in the area adjacent to the resort on both State and BLM lands that minimizes conflicts with adjacent landowners and with the communication sites on the buttes.
- The BLM recommends that the resort master plan be developed with public access trail corridors that would accommodate uses beyond the hiking/biking trails, since the surrounding BLM lands are likely to be used by equestrians and for some motorized trail uses also; and that it provide conditions so that all road and trail connections to public lands are consistent with the designated trail systems that will be developed in the Cline Buttes plan.
- Provision of signed and designated trail crossings of Eagle Drive, Cline Falls Highway and State Highway 126. Consideration could be given to providing designated trail links on the resort if these trail links provide safer connections than routes outside the resort property. For example: provision of a trail corridor from east to west across the Pinnacle portion of the resort may reduce the need for a designated trail crossing of Eagle Drive, which will undergo roughly a doubling of vehicle traffic due to the development of the Thornburg Resort. Provision of a trail corridor parallel

to the requested BLM road ROW located between the Pinnacle and Tribute sections of the resort may also reduce the need for trail crossing of Eagle Drive or of Cline Falls Highway in order to connect BLM lands to the east of the Buttes with the Tumalo Canal ACEC area and other BLM lands to the west.

2. Displacement of public land users through elimination of the road historically used to access higher elevation areas on the buttes.

The existing maintained road leading to the FAA site has been regularly used by recreationists to access the top of the southernmost butte. This road provides access to BLM lands adjacent to Cline Buttes before entering the resort property. At the top of the southernmost butte, the road enters a FAA withdrawal on BLM land. In many cases, public use of this road has occurred without knowledge or consent of the landowner. However, in other cases, trail users have requested and have been granted permission from the landowner to use this road. The road provides access to BLM lands at the top of the butte for motorists, OHV's, equestrians and mountain bicyclists, and also provides a place to park vehicle and trailers adjacent to Cline Falls Highway. The resort proposal includes realignment of this road to the southeastern property corner, to serve as the private access into the Tribute portion of the resort. With the resulting closure to casual public use, increased use of the following roads on public and private lands as replacement routes may result as public land visitors search for ways to reach the higher elevation portions of Cline Buttes:

a) The road ROW on BLM administered lands that connect to the communication sites on the middle butte and rock quarry immediately south of Eagle Crest Phase 3. The upper portion of this route is maintained by the communication site ROW holders only sufficient for their periodic maintenance access to the communication site. The upper portions of this road are not engineered or designed for high levels of motor vehicle use. Increases in motor vehicle use in this area are generally not consistent with the Cline Buttes management direction in the UDRMP.

b) The road Right-of-way across BLM connecting Eagle Crest Phase 2 with Eagle Crest Phase 3. This road is currently open to the public, and may see increased use as public land visitors look for a well maintained road access to public lands in the higher elevation portions of Cline Buttes.

c) Roads and/or trails constructed within the Pinnacle portion of the resort, and roads/trails built on State owned land located between the proposed Thornburg Resort and Eagle Crest phase 3. These roads are listed as recreational trail corridors in the public amenities plan; however, even if these roads/trails are open to the public, it is likely that for many years, trail access would not be developed until levels of home construction and resident populations on the resort warrant provision of recreation facilities (Thornburg Resort CUP, Page 26).

Possible mitigation measures could include one or several of the following:

- Provision of a trailhead/parking area on the remaining portion of the existing FAA Right-of-way road adjacent to Cline Falls Highway

- Provision of a trailhead/parking area off Cline Falls Highway and designated trail(s) that provide access to the top of the butte and to State owned lands and to BLM lands located further west.

- Provision of a trailhead/parking area at the northern entrance to the Thornburg Resort and a designated trail link to the State owned lands and BLM lands at the top of the butte. If public access trails are provided on the Thornburg Resort as per the Recreational Amenities plan, consideration should be given to not deferring these recreational trails until the resort is built out, but building them sooner to provide mitigation to the effects of early phases of construction.

**DCC 18.113.070 (N) Site improvements will be located and designed to avoid or minimize adverse effects of the resort on the surrounding land uses. Measures to accomplish this may include establishment and maintenance of buffers between the resort and adjacent land uses, including natural vegetation and appropriate fences, berms, landscaped areas and similar types of buffers; and setback of structures and other developments from adjacent land uses.**

The application does not identify recreational uses as an adjacent land use affected by the resort. The BLM lands surrounding the resort, the resort property itself, and the existing State lands adjacent to the proposed resort all receive high levels of recreational trail and road use from a wide variety of recreationists consistently over the past ten years or more.

Existing and well used trails cross from BLM into the resort property. Access to BLM lands at the top of the butte has historically occurred on roads and trails within the resort property.

1. Lack of identified trail crossings or easements on the resort eliminates existing trail connectivity between public lands to the east and west of Cline Buttes.

The conceptual master plan does not show any trail connections to BLM lands or any trail links or easements across resort property to maintain trail system connectivity on public (BLM and State of Oregon) lands. Given the lack of an existing designated trail system on BLM lands, and the conceptual nature of the proposed resort plan, identification of these links and corridors is difficult. However the BLM suggests the following:

- Final Master Plan identification of which roads and trails are available to the general public and identification of trail connections to public lands that correspond to BLM trail designations identified in the Cline Buttes area plan.

- Final Master Plan identification of trail corridors or easements and the types of trail users served (considering equestrian and ohv uses) so a coordinated approach to trail connectivity can be made between the resort and public lands.

- Final Master Plan identification of one or more recreational trail corridors on the State owned land leased by the resort, that provide trail connectivity between BLM lands to the east and west of the resort.

2. The development of a golf course and provision of infrastructure (sewage treatment ponds, electrical substation) at the southern boundary of the resort may affect the historic integrity, and the recreational/interpretive values of the proposed Tumalo Canal ACEC.

Resort development may affect the recreational and interpretive values in the Tumalo Canal ACEC. The proposed Tumalo Canal ACEC is located immediately south of the Tribute portion of the resort. While the application identifies buffers of fifty feet for structures, site-obscuring fences, and changes to the natural topography, it is not clear what buffers, if any are proposed between the golf course and the Tumalo Canal ACEC. The resort proposal also identifies infrastructure such as sewage treatment ponds and possibly an electrical substation at the south boundary of the resort. Views of irrigated golf courses and/or utilities may detract from the historic integrity of the proposed ACEC and diminish the interpretive and recreational use of the area.

The BLM recommends setbacks greater than 50 feet and retention of native plants or planting of native vegetation that is characteristic of the area to further screen views of the golf course and related facilities from the ACEC based on a visual resource analysis and BLM's contrast rating process. The use of photosimulations would be valuable in determining the level of impact and appropriate mitigation.

3. Management of user conflicts between resort residents/guests and public land visitors

Development of property adjacent to public lands often results in user conflicts, with unintentional trespass occurring on private lands, by posting of public lands as private or by unauthorized closing or blocking of trails on public lands by neighboring landowners. Conflicts occur as resort residents or resort operations and sales staff are presented with public land uses, including motorized vehicle use, hunting, target shooting, harvesting of forest products, grazing, etc. To some extent, the proper layout of a designated road and trail system on public lands and the use of appropriate buffers and fencing between resort development and public land boundaries can minimize some of these conflicts. However, given the high public interest in Cline Buttes and the opportunities for integrated trail systems, the BLM recommends the following mitigation to further minimize conflicts with resort residents and guests, and effects on public land visitors:

- Develop and provide informational brochures or maps to resort guests and visitors that outlines the management policy for the surrounding public lands, recreation opportunities and permitted uses.

**DCC 18.113.070 (P) The destination resort will not alter the character of the surrounding area in a manner that substantially limits, impairs or prevents permitted or conditional uses of surrounding properties.**

Increased traffic on area roads due to resort development and operation may create hazards for recreational trail users and motorists. The increased motorized traffic on area roads increases the need for designated, engineered, signed trail crossings. The construction of interior access roads on BLM lands located between the Tribute and Pinnacle sections of the resort would block roads/trails currently used by recreationists.

The roads located on BLM lands between the Tribute and Pinnacle sections of the resort will provide connections for motor vehicles and pedestrian/bicycle traffic as shown on resort maps contained in the application. However, since these proposed ROW roads are not included in the Public Amenities map, the application indicates they would not be open to the general public. These BLM parcels are currently used by a wide variety of recreationists, including ohv's and equestrians. These lands could provide important trail connections between BLM administered lands to the east of the buttes and BLM lands to the west. The BLM received consistent input during the Upper Deschutes RMP process on the public's desire for separate trails between motorized and non-motorized trail uses and between different types of non-motorized trail uses. We will be considering utilization of separate trail corridors during the grant process for the requested ROW. A complimentary consideration for portions of the ROW not on public land would help to mitigate the expected impacts of the reduced access. This could include such actions as:

- Provide for trail corridors on resort property that provide public access through BLM administered lands between the Pinnacle and Tribute portions of the resort.

- Provide designated trail crossings of ROW roads that cross BLM lands to connect the Tribute and Pinnacle sections of the resort to maintain access to public lands in the NE boundary of Section 30.

- Limit the number of connector roads between the Tribute and Pinnacle portions of the resort to one road on State owned lands to reduce barriers to trail connectivity.

Fragmentation of existing or future roads and trails on BLM administered lands by proposed road improvements.

The application identifies several roads between the resort's western boundary and Barr Road that are proposed for some level of improvement. The Vehicular access and circulation map (Exhibit A-6) shows road connections on the resort to these existing, unimproved BLM roads located west of the resort in T 15 S, R 12 E, Sections 17, 18, 19 and 20. The applicant states that use of these roads is allowed in case of an emergency, and that the applicant will seek authorization from BLM to make minimal improvements to these existing roadways so that they are better suited as emergency access routes.

If these roads are utilized for resort construction, operations, and maintenance over the long-term, the BLM makes the following recommendations:

- BLM recommends that a portion of Barr Road be relocated to the east, adjacent to the proposed resort. This would allow greater flexibility in routing trails on public lands adjacent to the resort while minimizing fragmentation of public lands and wildlife habitat. The rerouting of Barr Road would provide better ingress/egress for the resort and better fire safety and provide a possible connector road between Phase G of the resort and the remaining portions of the resort.

- BLM recommends that if permanent routes are needed linking the Pinnacle portion of the resort to Barr Road, that the existing ROW for the Central Electric Company (CEC) powerline in T 15 S, R 12 E, Sections 17 and 18 be considered for placement of an emergency access route. Unlike the other routes identified by the proponent, this is an existing ROW. Management direction in the UDRMP states that collocation of ROWs is a priority.

- If multiple routes are permanently needed for emergency access, collocation of designated trails within these corridors and closing other unneeded roads are appropriate mitigation measures that minimize fragmentation of public lands.

3. Limitations on public use by provision of a limited type of trail opportunities on the resort and adjacent State Land.

The Deschutes County Staff Report for the Thornburg Resort identifies that the applicant, Central Oregon Trails Alliance (mountain bike advocacy group) and BLM work together to enhance bicycle/pedestrian trail networks on the buttes. The provision of only certain types of trail use on the resort or the surrounding BLM administered lands may limit other recreation uses that have historically occurred in the area.

The provision of only pedestrian and bicycle trails, and the character of these trails (i.e., paved, Class 1 bikeways adjacent to roads) would limit opportunities for trail connections for equestrians, motorized trail users and not provide opportunities for separation of trail users on different types or locations of trails. Even if a portion of these trails are available to the public and located in a way to serve as critical links between different public land parcels, their design would not provide matching recreation trail opportunities.

In order to address trail connectivity and trail use issues, trails and trail corridors could be provided that serve equestrian use or mountain bike use on appropriate trail surfaces (non-paved) and separate these uses while providing critical connections between public land parcels.

# CLINE BUTTES RECREATION AREA PLAN

Exhibit 23

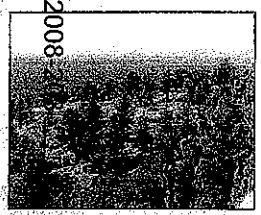
NEWSLETTER Gould 7/29/08 FMP TB MAY 2006

**Cline Buttes Recreation Area Plan Newsletter recipients:**

☐ To **remove** your name from the Cline Buttes mailing list, please check this box and return to us.

If we do not hear from you, we will leave your name on the mailing list and you will continue to receive updates for the Cline Buttes Recreation Area Plan.

If you wish to be placed on the mailing list, please contact the BLM Prineville District Office.



## Help Design and Create Central Oregon's Cline Buttes Recreation Area

The Bureau of Land Management (BLM) is in the beginning stages of a design and planning process for the 31,000-acre Cline Buttes Recreation Area. We will address issues such as design and management of trails, roads, and recreation sites; wildlife habitat management; and vegetation treatments to restore habitat and reduce wild land fire danger for adjacent private landowners. Our goal is to engage the public in a collaborative process and to build lasting partnerships that will enable us to implement this plan. During this process, we are committed to:

- Learning how the lands we manage are currently used by residents and visitors and identifying what they most value about those lands.
- Designing transportation, recreation, and vegetation management strategies for this highly used area that allow public access while protecting natural resources and reducing user conflicts.
- Designing trails for a variety of recreationists such as OHV enthusiasts, horseback riders, hikers, and mountain bicyclists.
- Working to protect key resources such as Peck's milkvetch, a rare plant, and portions of the historic Tumalo Irrigation Canals.
- Developing and encouraging partnerships among communities, government agencies, business, and non-governmental organizations to promote wise public lands management.

***How does this affect me?***

This planning process affects recreation opportunities and public access on public lands centrally located between the communities of Redmond, Bend, Tumalo, and Sisters. Cline Buttes Recreation Area public lands include portions of the buttes, large areas of old growth juniper forest, many striking canyons, and several public segments of the Deschutes River. The area offers many trail opportunities, particularly during the winter, as well as wildlife habitat and scenic views.

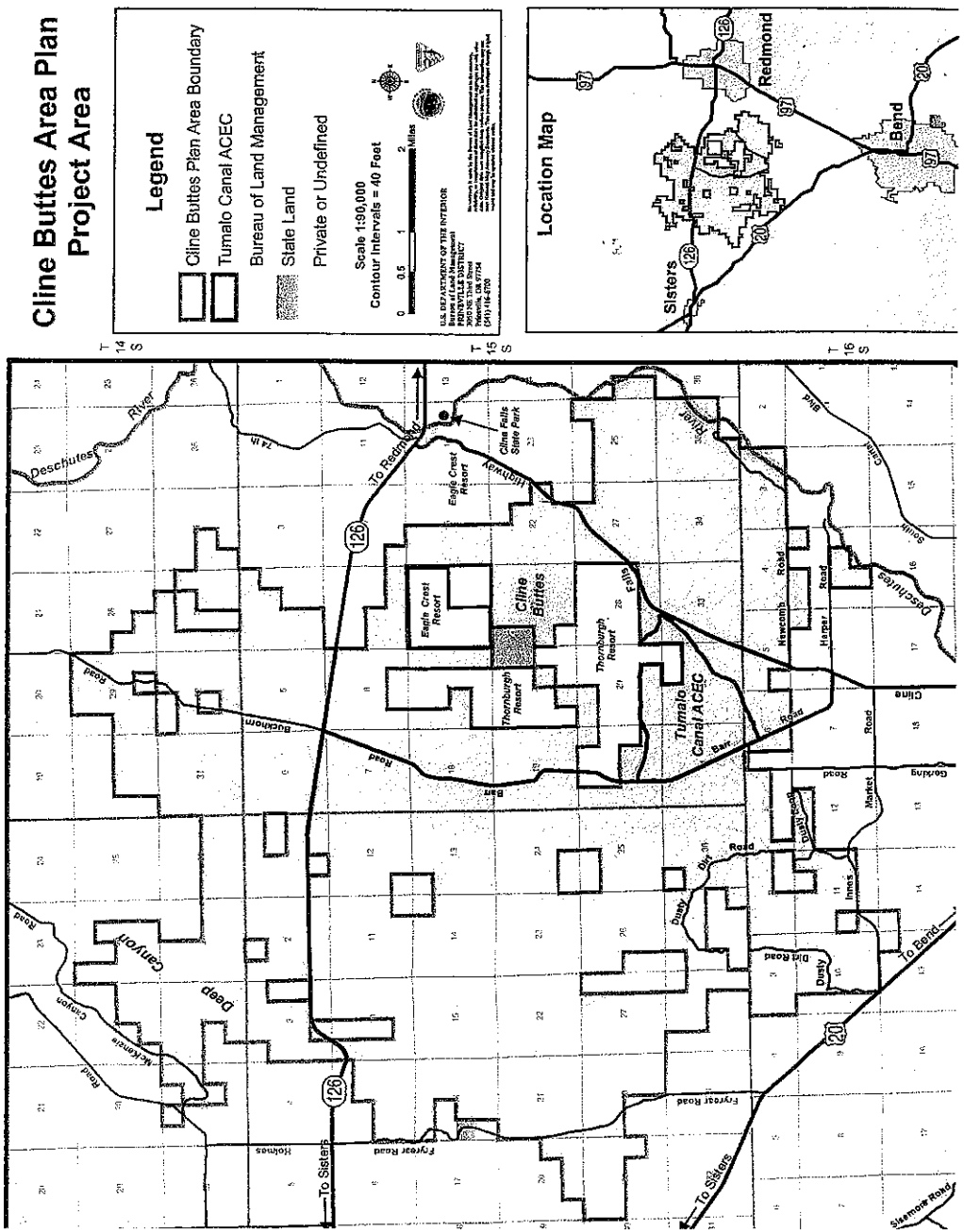
***How can I get involved?***

An initial public scoping meeting is scheduled for June 8, from 6:30 p.m. to 8:30 p.m. in the Juniper Conference Room at Eagle Crest Resort. The scoping meeting will review the existing management direction for Cline Buttes contained in the Upper Deschutes Resource Management Plan and outline the types of decisions being considered in the Recreation Area Plan. There will be other opportunities this summer and fall to attend public meetings and provide comments. The majority of the meetings will be an open house format.

### *Contact Information:*


**Cline Buttes Recreation Area Plan**
**c/o BLM Prineville District Office**
**3050 NE Third Street**
**Prineville, OR 97754**
**(541) 416-6700**
**E-mail: clinebuttes@blm.gov**
**Web site: http://www.blm.gov/or**


BLM
Prineville District Office


Cline Buttes Area Plan
Project Area
Legend
Cline Buttes Plan Area Boundary
Tumalo Canal ACEC
Bureau of Land Management
State Land
Private or Undefined
Scale 1:90,000
Contour Intervals = 40 Feet
Location Map
Redmond
Bend
Sisters
Deschutes River
To Redmond
Eagle Crest Resort
Cline Falls State Park
Cline Buttes
Tumalo Canal ACEC
Thornburgh Resort
To Sisters
To Bend
Deep Canyon
Buckhorn Road
Dodds Road
Dicke Road
Dicke Road
Dicke

# CLINE BUTTES RECREATION AREA PLAN

TB FMP

NEWSLETTER Gould Exhibit 29 7/29/08 OCTOBER 2006

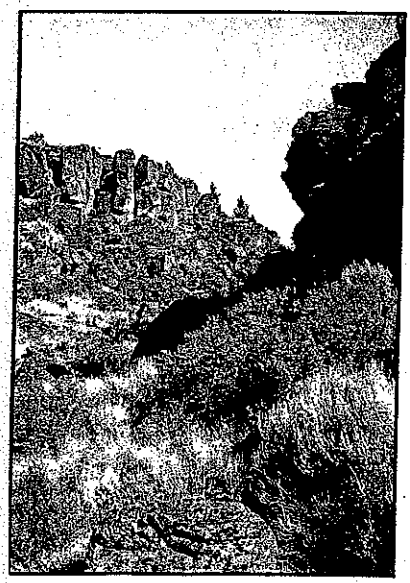
BLM Prineville District Office

**Mail list recipients: please tell us if you wish to remain on the mailing list for the Cline Buttes Recreation Area Plan:**

☐Please **retain** my name on the Cline Buttes mailing list (return the newsletter with the above box checked or contact BLM through the email address: clinebuttes@blm.gov)

If we do not hear from you, we will remove your name from the mailing list for the Cline Buttes Plan.

If you wish to be placed on the mailing list, please contact the BLM Prineville District Office.



## Cline Buttes Recreation Area Update

The BLM held a 2 day design workshop on the weekend of September 16th. During this workshop, participants formed into 6 different groups and helped develop concepts for road and trail uses, identifying desired trail use areas, routes and trailheads. Some of the key features of these different concept maps included:

- Location of trailheads/access points for the Maston area
- Whether to provide motorized access to the buttes themselves
- Differences in use areas for equestrian, hiking and mtn. bike trails
- The extent of the motorized trail system area, particularly the southern and western portion of the Cline Buttes planning area
- Different types of motorized use trail needs, including motorcycle, technical 4 wheel drive, and quad trails.
- Concerns over how trail use affects adjacent property owners

**Roads and trails Meeting:** BLM staff consolidated many of the concepts and interests developed by the 6 public groups during the design workshop, and has further developed concept plans for roads and trails in the area. An evening meeting is scheduled to present these trail and road use concept plans and get feedback from the public.

**Date:** **Tuesday, November 14th, 6pm to 9pm**
**Location:** **Eagle Crest Resort, Conference Center, Golden Eagle Room**

**Vegetation Management Meeting:** A second meeting is scheduled for Thursday, November 16th to focus on the vegetation management portion of the Cline Buttes Plan. There will be a presentation that covers the existing setting, vegetation assessment results, and the vegetation management goals/sideboards from the Upper Deschutes Resource Management Plan (UDRMP). BLM staff will discuss vegetation management considerations, including:

- Wildland Urban Interface areas
- Wildlife habitat
- Old Growth Juniper
- Sagebrush Steppe areas
- Pecks Milkvetch ACEC

Attendees will be asked to participate in a roundtable discussion of desired future conditions, management techniques, and desired outcomes.

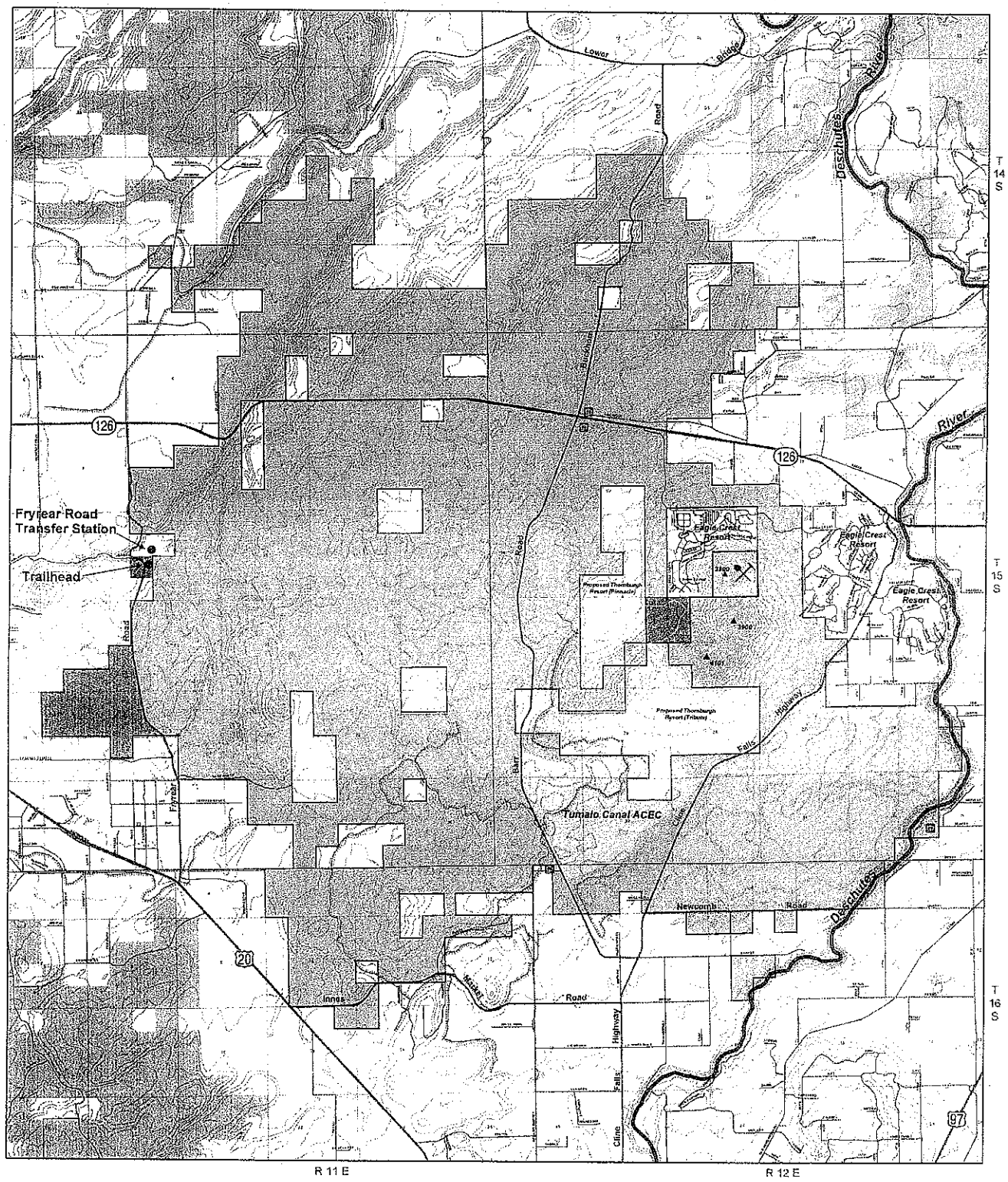
**Date:** **Thursday, November 16th, 6pm to 9pm**
**Location:** **Eagle Crest Resort, Conference Center, Golden Eagle Room**

**Contact Information:**

**Cline Buttes Area Plan**
**c/o Prineville BLM**
**3050 NE Third Street**
**Prineville, OR 97754**
**(541) 416-6700**
**E-mail: clinebuttes@blm.gov**

UBA #2008-203

# Cline Buttes Recreation Emphasis



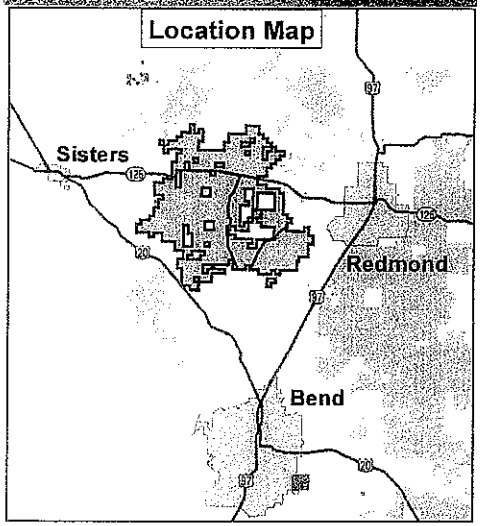

## Legend

- Multi-use separate facilities
- Non-motorized recreation emphasis
- Non-motorized recreation exclusive
- Canals
- KIOSK Information Board
- Cline Buttes Plan Area Boundary
- Bureau of Land Management
- Private or Undefined
- State

Scale 1:24,000
Contour Intervals = 40 Feet

0 0.5 1 2 Miles

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
PRINEVILLE DISTRICT
3050 NE Third Street
Prineville, OR 97754
(541) 416-6700




TB FMP Gound Exhibit 30 7/29/08

LUBA #2008-203
00828

TB FMP GOULD Exhibit 31 7/29/08

# Cline Buttes
# Areas of Critical Environmental Concern (ACEC's)





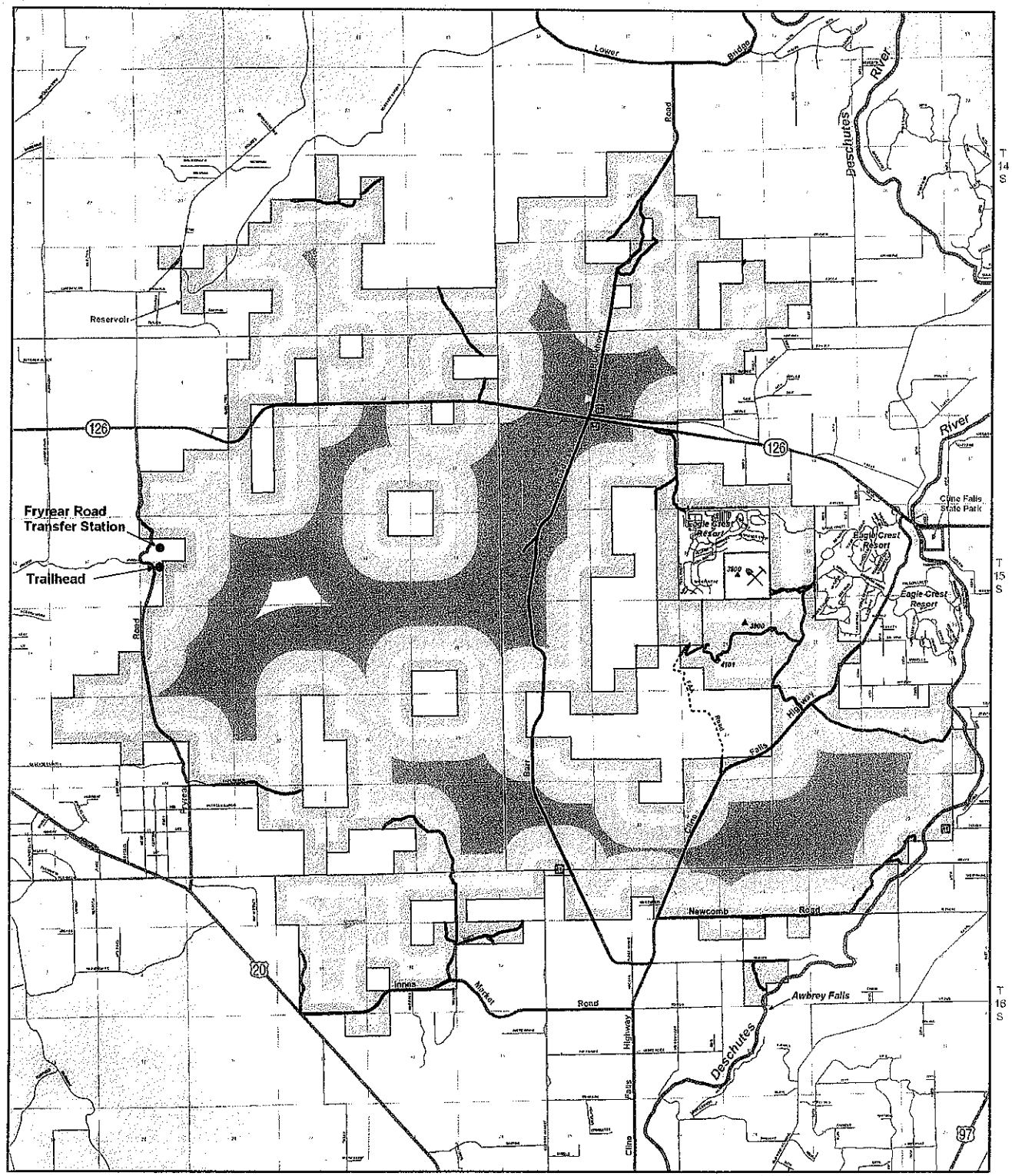







LUBA #2008-203

00829




# Cline Buttes
# Wildland Urban Interface

## Legend

**WUI Buffers**

- 0 to 1/8 mile / 8,649 acres
- 1/8 to 1/4 mile / 6,914 acres
- 1/4 to 1/2 mile / 9,453 acres
- 1/2 to 1 mile / 7,017 acres
- 1 mile plus / 116 acres
- Cline Buttes Plan Area Boundary

Scale 1:24,000
1 Inch = 2,000 Feet
Contour Intervals = 40 Feet

0 0.5 1 2 Miles

Acreage Representation

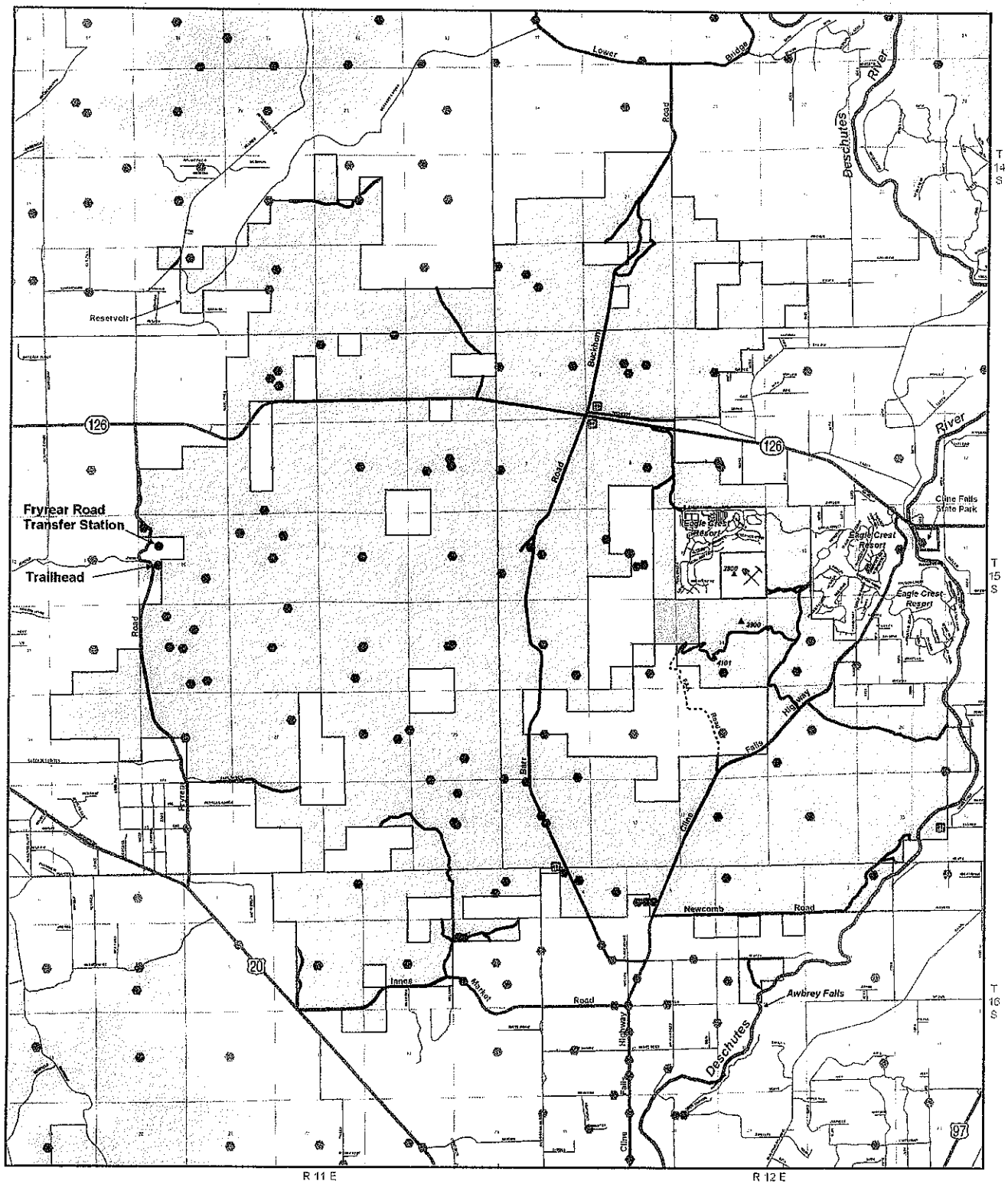
640 (1 sq mile)
160
40

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
PRINEVILLE DISTRICT
3050 NE Third Street
Prineville, OR 97754
(541) 416-6700

K:\51_IAD_63_Data\BLM_Prineville_Data\UDRMP_Implementation\MXDs\ClineButtes_Fire_Regime.mxd

TB PMP Board Exhibit 32 7/29/08

LUBA #2008-203
00830




# Cline Buttes Fire Starts

## Legend

- Fire Start Locations
- Cline Buttes Plan Area Boundary

Scale 1:24,000
1 inch = 2,000 Feet
Contour Intervals = 40 Feet

0 0.5 1 2 Miles

Acreage Representation

640 (1 sq mile)
160
40

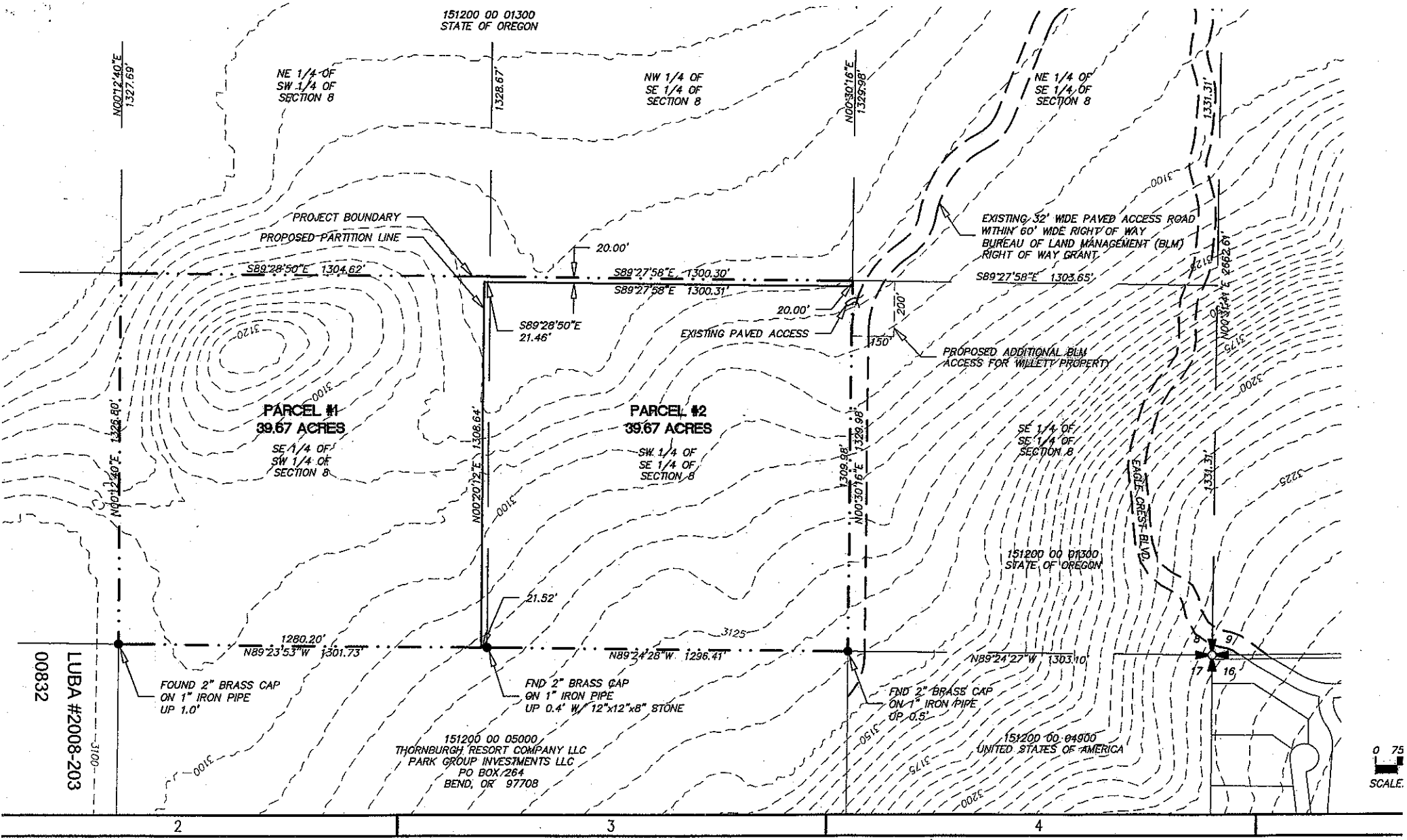
U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
PRINEVILLE DISTRICT
3050 NE Third Street
Prineville, OR 97754
(541) 416-6700

KM_IMD_03_Data\BLM_Prineville_Data\RMP_Implementation\MND\ClineButtes_Fire_Regime.mxd

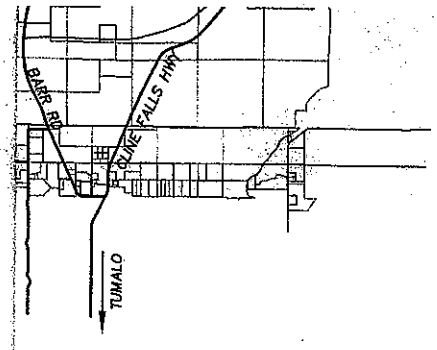
TB FMP Round 2 Exhibit 33 7/29/08

LUBA #2008-203

00831




GOULD Exhibit 34 JB FMP 7/29/08




## CINITY MAP

NOT TO SCALE

## OPMENT DATA

ART AND LORRAINE WILLET
PO BOX 1529
REDMOND, OR 97756

ART WILLET
PO BOX 1529
REDMOND, OR 97756

BUSSARD WILLIAMS
389 SW SCALEHOUSE CT, SUITE 100
BEND, OR 97702
TEL: (541) 389-9351

LIZ FANCHER
644 NW BROADWAY STREET
BEND, OR 97701
TEL: (541) 385-3067

EFUSC (SISTERS CLOVERDALE SUBZONE)

S: EFUSC (SISTERS CLOVERDALE SUBZONE)

R: 151200 00 01400

79.34 ACRES ±

OF PARCELS: 2

1

USE: PERSONAL ACCESSORY BUILDING

USE: RESIDENTIAL

USE: PUBLIC OPEN SPACE, RECREATION, DESTINATION RESORT

BLM ROAD, RIGHT OF WAY GRANT SERIAL #55575

N: DESCHUTES COUNTRY RURAL FIRE PROTECTION DISTRICT #1

RICT: NONE

CENTRAL ELECTRIC COOPERATIVE / SOLAR

AL: ON-SITE DISPOSAL SYSTEMS

SPOSAL: HIGH COUNTRY DISPOSAL

NONE

ON-SITE WELLS

NONE

NONE

NONE

## LEGEND

EXISTING PROPERTY LINE

PROPOSED PARTITION LINE

SECTIONAL SUBDIVISION LINE

EXISTING CONTOUR LINE**

**NOTE: CONTOURS CREATED UTILIZING U.S.G.S. DIGITAL ELEVATION MODEL

# TENTATIVE PARTITION PLAN
# TAX LOT 151200 00 01400
# FOR
# ART AND LORRAINE WILLETT

DESCHUTES COUNTY OREGON

REVISIONS
1.
2.
3.

DESIGNED BY: JAM
DRAWN BY: AME
CHECKED BY: DRW
SCALE: 1"=300'
FILE: 080610-TP.DWG

DATE: 06-30-08

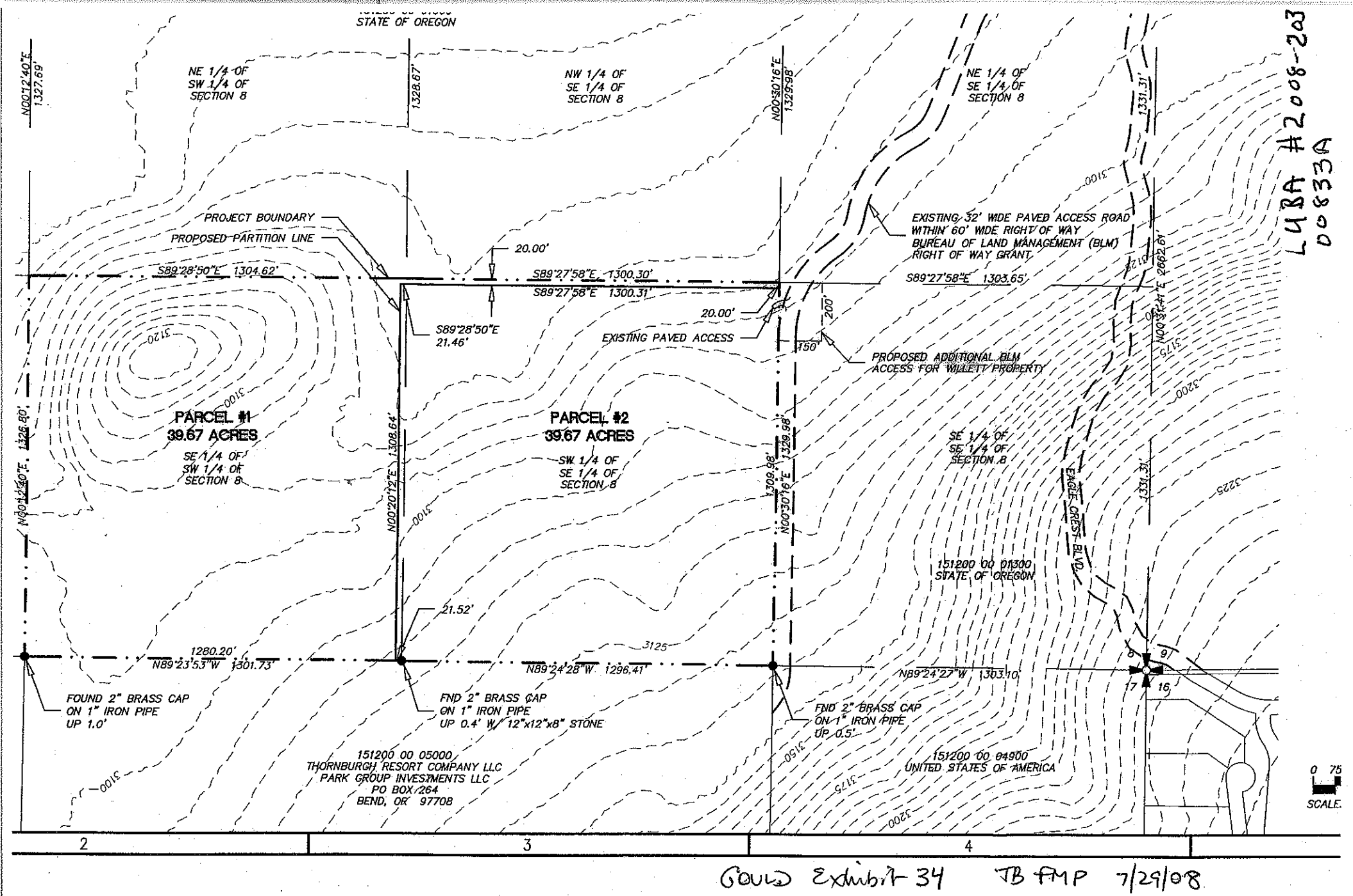
SHEET 1/1

BW # 080610

Good Exhibit 34 TB Amp 7/29/08



LUBA #2008-203
SCANNED JUL 1 2008
00833




LUBA #2006-203
D06334

GOULD Exhibit 34 JB FMP 7/29/08

Exhibit 35
4 pages
gmd
TB FMP 7/29/08

From: Suzanne_Wiley@blm.gov
Subject: **Fw: Willett ROW & Cline Buttes Recreation Area Plan**
Date: July 28, 2008 8:28:55 AM PDT
To: nunzie@pacifier.com
Cc: Linda_Christian@blm.gov, Greg_Currie@or.blm.gov

Good Morning,

The correction is just a paper work exercise, the footprint that is on the ground will remain the same.

Here is a short explaination of what happened; the BLM wrote the legal for the road thinking it was on the corner of the Willetts property, it has come to our attention it is not on the corner, but approximately 150 to 200 feet from the corner. So we are waiting for Prineville's Engineer to help us with the correction to the legals.

Suzanne Wiley
Realty Specialist
Deschutes Resource Area
Prineville District
3050 NE Third St
Prineville, OR
541-416-6783 fax 541-416-6798
----- Forwarded by Suzanne Wiley/PRFO/OR/BLM/DOI on 07/28/2008 07:55 AM -----

Linda E Christian/PRFO/OR/BLM/DOI
07/24/2008 03:59 PM

To: Suzanne Wiley/PRFO/OR/BLM/DOI@BLM
cc:
Subject: Fw: Willett ROW & Cline Buttes Recreation Area Plan

can you answer her questions about the size of the ROW I imagine the correction is the legal?

Linda Christian
Environmental Coordinator
Prineville BLM
541-416-6890
----- Forwarded by Linda E Christian/PRFO/OR/BLM/DOI on 07/24/2008 03:57 PM -----

Nunzie <nunzie@pacifier.com>

To: Linda_Christian@blm.gov

07/24/2008 03:52 PM

cc

Greg Currie <Greg_Currie@or.blm.gov>

Subject
Re: Willett ROW & Cline Buttes Recreation Area Plan

Thanks Linda:
Quote from the application materials at CDD: ..."A copy of the written access agreement with BLM that was granted to the applicants earlier this year to provide them with permanent legal access to the parcels is enclosed with this letter. The agreement contains an error that is being corrected by BLM. The applicant will file the corrected agreement with the County as soon as BLM issues the agreement."
Kindly elaborate on the error referenced above in the Willett ROW agreement. Please state the purpose and need for more land than the 60' ROW; please give the purpose and need for 150' x 200' of BLM land identified on the cdd map.
Please identify who is applying to amend the BLM Willett ROW agreement and what the timeline of this project is.
Thanks for your assistance, Nunzie Gould

On Jul 24, 2008, at 3:24 PM, Linda_Christian@blm.gov wrote:

Linda Christian
Environmental Coordinator
Prineville BLM
541-416-6890
----- Forwarded by Linda E Christian/PRFO/OR/BLM/DOI on 07/24/2008 03:24 PM -----

Suzanne Wiley/PRFO/OR/BLM/DOI

07/24/2008 03:10 PM

To
Linda E Christian/PRFO/OR/BLM/DOI@BLM

cc

Subject
Re: Fw: Willett ROW & Cline Buttes Recreation Area PlanLink

The Willett road location will stay where it is located today. Any corrections made with the county are to clarify the legal description.

Suzanne Wiley
Realty Specialist
Deschutes Resource Area
Prineville District
3050 NE Third St
Prineville, OR
541-416-6783 fax 541-416-6798

Linda E
Christian/PRFO/OR/BLM/DOI

07/24/2008 03:00 PM

To
Suzanne
Wiley/PRFO/OR/BLM/DOI@BLM
cc
Doug
Vandergon/PRFO/OR/BLM/DOI@BLM
Subject
Fw: Willett ROW & Cline Buttes
Recreation Area Plan

do you know anything about this?

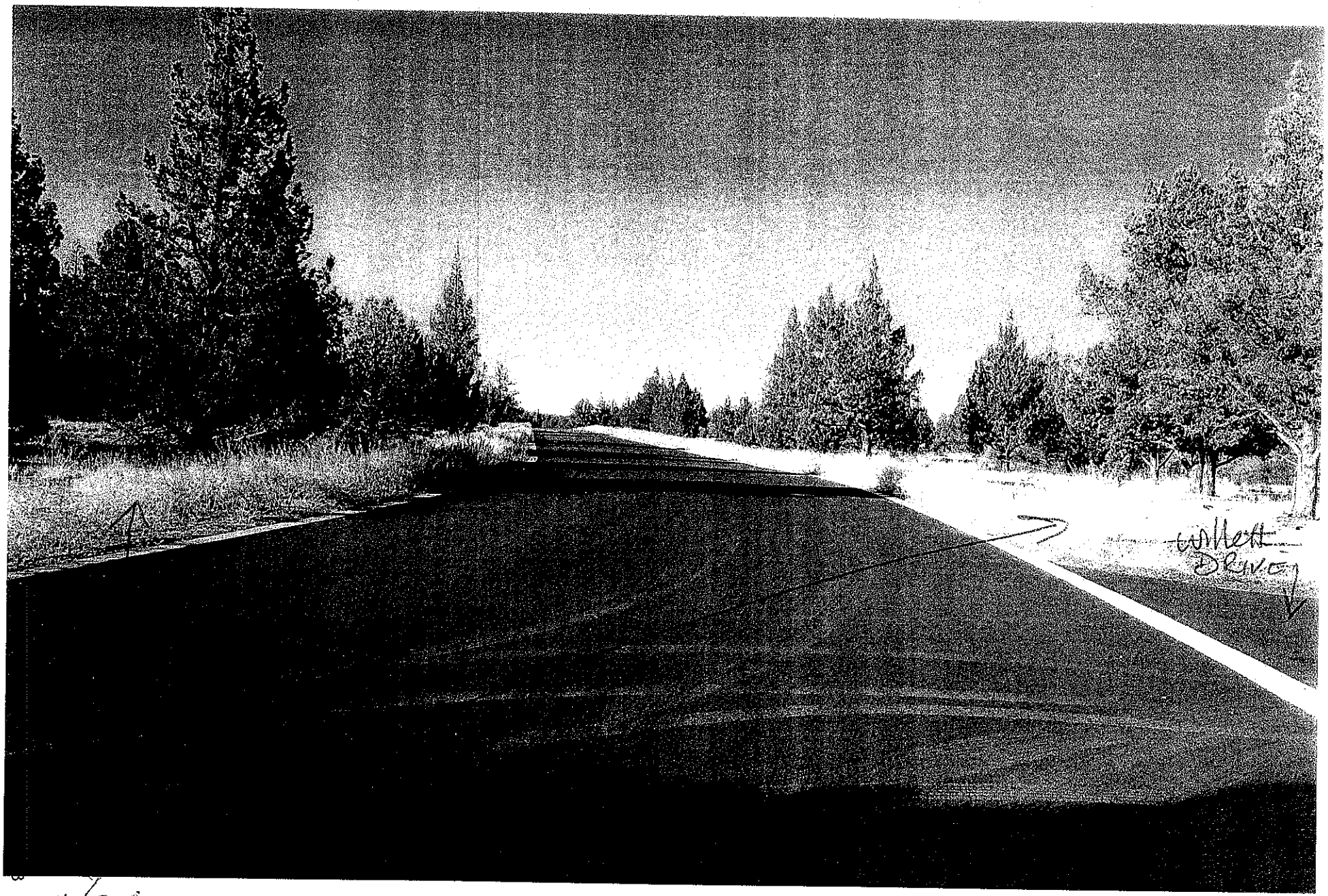
Linda Christian
Environmental Coordinator
Prineville BLM
541-416-6890
----- Forwarded by Linda E Christian/PRFO/OR/BLM/DOI on 07/24/2008 02:58 PM -----

Nunzie <nunzie@pacifier.com>

07/24/2008 02:43 PM

To
Linda Christian <
Linda_Christian@blm.gov>
cc
Greg Currie <
Greg_Currie@or.blm.gov>
Subject
Willett ROW & Cline Buttes
Recreation Area Plan

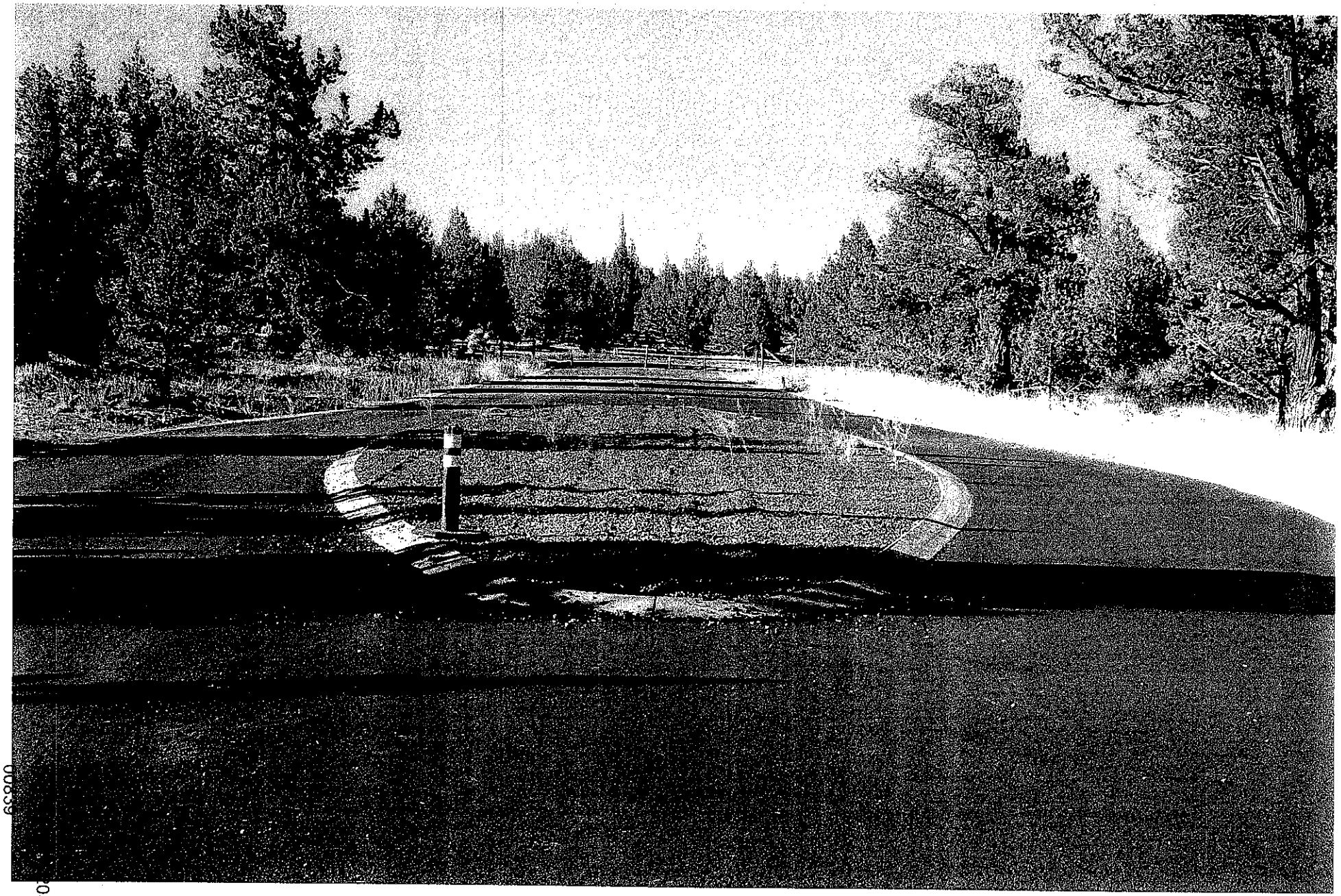
Hello Linda:
I understand there has been a request to revise the Willett ROW in Township 17 S. Range 12 E. W.M. Section 17.
Could you email me the application identifying the purpose.
The Deschutes County CDD file # M087 application contains a map showing a request to acquire a portion of BLM land in section 17 which will encroach on trail connectivity as proposed in the Cline Butes Recreation Area Plan.
Kindly advise and thanks in advance.
Nunzie Gould




00838

WEEDS ON EACH SIDE ROAD

TB PAP 7/29/08 GOULD EXHIBIT 36A



ATV DAMAGE
+ WEEDS

GOULD Exhib. 4 36 AB 7/29/08
TB RMP

RECEIVED
BY: LAF 5:00 PM

JUL 29 2008

DELIVERED BY:
Nunzio Gould

July 29, 2008
Hearings Officer Ms. Briggs
c/o Ruth Herzer
Deschutes County Planning Department

RE: Thornburgh Resort FMP M07-2, MA08-6

Herewith submittals regarding destination resorts in Central Oregon:
Remington Ranch
Deschutes County Record 2008-229465 (Architect Fees)
Deschutes County Record 2208-226245
State of Oregon UUC Liens: 7765798, 7765809, 7765821, 7904067, 7913577
Deschutes County Record 2008-226057 (Hooker Creek Ranch supplies heavy construction and infrastructure)

Arrowood / Tetherow Developemnt
Deschutes County Record 2008-23635 (Architect Fees)
Deschutes County Record 2008-21972
Deschutes County Record 2008-13410
Deschtues County Record 2008-11174
Deschutes County Record 2007-66051 (Landscaping Fees)

Sincerely,
Jim Guild
19845 JW Brown Rd
Bend, OR 97701

40 pages attached

Crook County Official Records 2008-229465
LIEN-LCON
Cnt=1 Stn=6 CCOUNTER 07/01/08 03:49 PM
$40.00 $11.00 $5.00 $56.00

01042041200802294650060062

I, Deanna Berman, County Clerk for Crook County, Oregon, certify that the instrument identified herein was recorded in the Clerk records.

Deanna L. Berman

ENTERED JUL 0 1 2008

**CLAIM OF CONSTRUCTION LIEN**
**ARCHITECT**

*Lien claimant's name and address:*
Hart Howerton, Ltd.
One Union Street
San Francisco, CA 94111

*Owner's name and address:*
Remington Ranch LLC
1814 SW Remington Ranch Drive
Powell Butte, OR 97753

Catherine E. Cushman
60530 Sunset View Drive
Bend, OR 97702

*After recording, return to:*
Kenneth P. Childs
Stoel Rives LLP
900 SW Fifth Avenue, Suite 2600
Portland, OR 97204

On March 27, 2007, Hart, Howerton, Ltd. ("Claimant") entered into a contract with Winchester Land Co., LLC dba Winchester Development (collectively the "Contract") for the preparation of plans, drawings, and specifications intended for use in or to facilitate the construction of an improvement upon the site or land known as the Remington Ranch-Wicked Pony project ("Improvement") and for the supervision of the construction of the Improvement. The Improvement is situated upon certain land ("Land") in the County of Crook, State of Oregon, which is the site of the Improvement, described in Exhibit A attached hereto and incorporated herein by this reference.

The property is commonly known as Remington Ranch in Crook County, Oregon. The address of the Improvement is 1814 SW Remington Ranch Drive, Powell Butte, Crook County, Oregon 97753.

The name of the owner or reputed owner of the Land is Remington Ranch LLC, as to Tracts I through VII, and Catherine E. Cushman, as to Tract VIII and Tract IX. The name of the owner or reputed owner of the Improvement is either Remington Ranch LLC and Catherine E. Cushman and/or Winchester Land Co., LLC dba Winchester Development.

The name of the person that employed Claimant to provide the above-described services is Winchester Land Co., LLC dba Winchester Development. At all times mentioned herein, Remington Ranch LLC, Catherine E. Cushman, and Winchester Land Co., LLC dba Winchester Development had knowledge of the construction.

Claimant commenced performance of the Contract on October 5, 2006 and ceased performance thereof on September 28, 2007.

The following is a true statement of Claimant's demand after deducting all just credits and offsets:

| | |
|---|---|
| Contract price for services performed (see Exhibit B attached hereto and incorporated herein by this reference) | $609,039.40* |
| Less all just credits and offsets | ($318,743.86) |
| Balance due Claimant (see Exhibit B) | $290,295.54** |

* Plus accumulated interest as required by the Contract or applicable law.
**Plus accumulated interest as required by the Contract or applicable law and recording fees for recording this Claim of Construction Lien.

Claimant hereby claims a lien pursuant to ORS 87.001 - 87.093 for the amount last stated above upon the Improvement and upon the site of the Improvement within the Land, together with such additional Land as may be required for the convenient use and occupation of the Improvement as determined by the Court at the time of the foreclosure of the lien.

The time in which Claimant must file this Claim of Construction Lien for recording with the recording officer of the county in which the Improvement is situated has not expired.

DATED: 6/25/08, 2008. Claimant: HART HOWERTON, LTD.

By: _____
Brian K. Depolo

STATE OF CALIFORNIA )
) ss.
County of San Francisco )

I, Brian K. Depolo, being first duly sworn, do hereby depose and state: I am the CFO of Hart Howerton, Ltd., Claimant named in the foregoing instrument. I have knowledge of the facts set forth therein. All statements made in the instrument are true and correct as I verily believe.

_____
Brian K. Depolo

Signed and sworn to before me on JUNE 25, 2008.

_____
Notary Public for California
My commission expires: JAN. 18, 2012

ANTONIO LOCATELLI
Commission # 1789067
Notary Public - California
San Francisco County
My Comm. Expires Jan 18, 2012

**EXHIBIT A**

**PROPERTY DESCRIPTION**

The legal description of the Land is as follows:

Located in CROOK COUNTY, OREGON:

TRACT I:
Parcels One (1) and Three (3) of Partition Plat No. 1999-31 Recorded December 17, 1999, in Partitions MF No. 152743, Records of Crook County, Oregon, Located in a portion of the NW ¼ and the SW ¼ of Section 4, Government Lot 1, the SE ¼ NE ¼ and the E ½ SE ¼ of Section 5 and the NW ¼ of Section 9, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT II:
Parcel One (1) and Two (2) of Partition Plat No. 2000-22, Recorded June 30, 2000 in Partitions MF No. 156385, Records of Crook County, Oregon, Located in the W½W½ of Section 3, in Section 4, and in the NE¼ of Section 9, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT III:
Parcel One (1) and Two (2) of Partition Plat No. 2001-21, Recorded June 29, 2001 in Partitions MF No. 163559, Records of Crook County, Oregon, Located in the SW1/4 of Section 4 and in the E1/2SE1/4 of Section 5, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT IV:
Parcels One (1) and Two (2) of Partition Plat No. 2001-23, Recorded June 29, 2001 in Partitions MF No. 163587, Records of Crook County, Oregon, Located in Section 4, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT V:
Parcel Three (3) of Partition Plat No. 2001-23, Recorded June 29, 2001 in Partitions MF No. 163587, Records of Crook County, Oregon, Located in the W½W½ of Section 3, in Section 4, in the NE¼ of Section 9 and in the SW¼NW¼ of Section 10, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT VI:
Parcel Three (3) of Partition Plat No. 2001-39, Recorded December 11, 2001 in Partitions MF No. 167111, Records of Crook County, Oregon, Located in Section 33 and a portion of Section 34, Township 14 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT VII:
In Township 14 South, Range 14 East of the Willamette Meridian:
Section 34: The SW ¼ of the NW ¼ of the NW ¼

TRACT VIII
A parcel of land located in the Northwest ¼ of Section 9, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon, more particularly described as follows:

Beginning at a point lying North 48°01'25" East, a distance of 1542.23 feet, from the ¼ corner common to Sections 8 & 9, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon, marked by an iron rod with a 2" diameter aluminum cap stamped CROOK COUNTY SURVEYOR; S8/S9 T15S R14E//S2/S3 T15S; LS 1026; 1994; Thence, North 73°37'53" East, a distance of 340.67 feet, to a point; Thence, North 32°08'11" West, a distance of 195.52 feet, to a point; Thence, South 65°40'32" West, a distance of 334.07 feet, to a point; Thence, South 35°26'19" East, a distance of 53.74 feet, to a point of tangency with a curve to the right, having a radius of 825.00 feet; Thence, along said curve through a central angle of 6°34'49", an arc distance of 94.75 feet (the long chord of which bears South 32°08'55" East, a distance of 94.70 feet), to the Point of Beginning. (Lot 33, Remington Ranch, Phase 1)

TRACT IX
A parcel of land located in the Northwest ¼ of Section 9, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon, more particularly described as follows:

Beginning at a point lying North 48°01'25" East, a distance of 1542.23 feet, from the ¼ corner common to Sections 8 & 9, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon, marked by an iron rod with a 2" diameter aluminum cap stamped CROOK COUNTY SURVEYOR; S8/S9 T15S R14E // S2/S3; T15S; LS 1026; 1994; Thence, North 73°37'53" East, a distance of 340.67 feet, to a point; Thence, South 35°51'42" East, a distance of 24.38 feet, to a point; Thence, South 6°20'37" East, a distance of 156.14 feet, to a point; Thence, South 73°37'53" West, a distance of 297.61 feet, to a point; Thence, North 22°27'16" West, a distance of 86.27 feet, to a point of tangency with a curve to the left, having a radius of 825.00 feet; Thence, along said curve through a central angle of 6°24'14", an arc distance of 92.21 feet (the long chord of which bears North 25°39'23" West, a distance of 92.16 feet), to the Point of Beginning. (Lot 34, Remington Ranch, Phase 1)

**EXHIBIT B**

**BREAKDOWN OF CONTRACT AND CLAIM OF LIEN**

The total amount to be have been paid for Claimant's complete performance of the entire Contract, including but not limited to performance of additional services there under, is $760,000 for preparation of plans and drawings and $152,000 for construction administration. As of September 28, 2007, the date Claimant ceased performance of the Contract, the total amount due for Claimant's partial performance under the Contract, including but not limited to performance of additional services there under, is $290,295.54.

The amount of the claim (other than recording fees and accumulated interest as required by the Contract or applicable law), $290,295.54, is for preparation of plans, drawings, and specifications.

A breakdown of the claim ($290,295.54) is broken down on pages 2-4 of Exhibit B.

Reporting Period:
As of 12/31/2008

Selection: P
(Project ID One of: '06-036')

# Hart Howerton - SF

## AR Transaction Record

Project: [06-036] Remington Ranch - Wicked Pony

Client: [Winchester] Winchester Development Company

Project Active? No

Project Manager: [JK] Jin Kim

| Inv-Trx# | Recd | BillGrp | Type | Date | Prof.Serv. | Reimb.Exp. | Outs.Serv. | Other | Finance Charges | Taxes | Total Billed | Linked Retainage* | Discounts | Payments/ Uncollectibles | Balance Due |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9277-23418 | | 200 | IV | 1/10/2007 | 38,682.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 38,682.50 | | | | 38,682.50 |
| | 8312 | | PAY | 2/28/2007 | | | | | | | | | 0.00 | 38,682.50 | 0.00 |
| 9277-23420 | | 900 | IV | 1/10/2007 | 0.00 | 3,971.18 | 0.00 | 4.31 | 0.00 | 0.00 | 3,975.49 | | | | 3,975.49 |
| | 8313 | | PAY | 2/28/2007 | | | | | | | | | 0.00 | 3,975.49 | 0.00 |
| | | | Invoice 9277 Totals: | | 38,682.50 | 3,971.18 | 0.00 | 4.31 | 0.00 | 0.00 | 42,657.99 | 0.00 | 0.00 | 42,657.99 | 0.00 |
| 9353-23664 | | 200 | IV | 2/10/2007 | 14,900.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 14,900.00 | | | | 14,900.00 |
| | 8313 | | PAY | 2/28/2007 | | | | | | | | | 0.00 | 14,900.00 | 0.00 |
| 9353-23665 | | 900 | IV | 2/10/2007 | 0.00 | 0.00 | 0.00 | 136.01 | 0.00 | 0.00 | 136.01 | | | | 136.01 |
| | 8313 | | PAY | 2/28/2007 | | | | | | | | | 0.00 | 136.01 | 0.00 |
| | | | Invoice 9353 Totals: | | 14,900.00 | 0.00 | 0.00 | 136.01 | 0.00 | 0.00 | 15,036.01 | 0.00 | 0.00 | 15,036.01 | 0.00 |
| 9436-24016 | | 200 | IV | 3/10/2007 | 9,837.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9,837.50 | | | | 9,837.50 |
| | 8467 | | PAY | 4/18/2007 | | | | | | | | | 0.00 | 9,837.50 | 0.00 |
| 9436-24017 | | 900 | IV | 3/10/2007 | 0.00 | 16.53 | 0.00 | 171.05 | 0.00 | 0.00 | 187.58 | | | | 187.58 |
| | 8467 | | PAY | 4/30/2007 | | | | | | | | | 0.00 | 187.58 | 0.00 |
| | | | Invoice 9436 Totals: | | 9,837.50 | 16.53 | 0.00 | 171.05 | 0.00 | 0.00 | 10,025.08 | 0.00 | 0.00 | 10,025.08 | 0.00 |
| 9515-24249 | | 200 | IV | 4/10/2007 | 11,500.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11,500.00 | | | | 11,500.00 |
| | 8599 | | PAY | 6/5/2007 | | | | | | | | | 0.00 | 11,500.00 | 0.00 |
| 9515-24250 | | 900 | IV | 4/10/2007 | 0.00 | 0.00 | 0.00 | 70.84 | 0.00 | 0.00 | 70.84 | | | | 70.84 |
| | 8599 | | PAY | 6/5/2007 | | | | | | | | | 0.00 | 70.84 | 0.00 |
| | | | Invoice 9515 Totals: | | 11,500.00 | 0.00 | 0.00 | 70.84 | 0.00 | 0.00 | 11,570.84 | 0.00 | 0.00 | 11,570.84 | 0.00 |
| 9652-24661 | | 201 | IV | 5/10/2007 | 76,000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 76,000.00 | | | | 76,000.00 |
| | 8732 | | PAY | 7/23/2007 | | | | | | | | | 0.00 | 76,000.00 | 0.00 |
| 9652-24669 | | 202 | IV | 5/10/2007 | 33,000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 33,000.00 | | | | 33,000.00 |
| | 8732 | | PAY | 7/23/2007 | | | | | | | | | 0.00 | 33,000.00 | 0.00 |
| 9652-24670 | | 900 | IV | 5/10/2007 | 0.00 | 176.25 | 0.00 | 197.69 | 0.00 | 0.00 | 373.94 | | | | 373.94 |
| | 8732 | | PAY | 7/23/2007 | | | | | | | | | 0.00 | 373.94 | 0.00 |
| | | | Invoice 9652 Totals: | | 109,000.00 | 176.25 | 0.00 | 197.69 | 0.00 | 0.00 | 109,373.94 | 0.00 | 0.00 | 109,373.94 | 0.00 |
| 9718-24895 | | 201 | IV | 6/10/2007 | 27,902.50 | 0.00 | 0.00 | 48,136.25 | 0.00 | 0.00 | 76,038.75 | | | | 76,038.75 |
| | 8804 | | PAY | 8/27/2007 | | | | | | | | | 0.00 | 50,000.00 | 26,038.75 |
| | 8808 | | PAY | 8/29/2007 | | | | | | | | | 0.00 | 26,038.75 | 0.00 |
| 9718-24896 | | 202 | IV | 6/10/2007 | 3,245.00 | 0.00 | 0.00 | 29,755.00 | 0.00 | 0.00 | 33,000.00 | | | | 33,000.00 |
| | 8801 | | PAY | 8/23/2007 | | | | | | | | | 0.00 | 13,161.25 | 19,838.75 |
| | 8857 | | PAY | 9/13/2007 | | | | | | | | | 0.00 | 19,838.75 | 0.00 |
| 9718-24897 | | 601 | IV | 6/10/2007 | 0.00 | 0.00 | 1,542.35 | 0.00 | 0.00 | 0.00 | 1,542.35 | | | | 1,542.35 |
| | 8857 | | PAY | 9/13/2007 | | | | | | | | | 0.00 | 1,542.35 | 0.00 |
| 9718-24898 | | 602 | IV | 6/10/2007 | 41.00 | 0.00 | 6,716.77 | 0.00 | 0.00 | 0.00 | 6,757.77 | | | | 6,757.77 |
| | 8857 | | PAY | 9/13/2007 | | | | | | | | | 0.00 | 6,757.77 | 0.00 |
| 9718-24899 | | 604 | IV | 6/10/2007 | 0.00 | 0.00 | 2,241.65 | 0.00 | 0.00 | 0.00 | 2,241.65 | | | | 2,241.65 |
| | 8857 | | PAY | 9/13/2007 | | | | | | | | | 0.00 | 2,241.65 | 0.00 |
| 9718-24900 | | 900 | IV | 6/10/2007 | 0.00 | 50.25 | 0.00 | 141.98 | 0.00 | 0.00 | 192.23 | | | | 192.23 |
| | 8857 | | PAY | 9/13/2007 | | | | | | | | | 0.00 | 192.23 | 0.00 |
| | | | Invoice 9718 Totals: | | 31,280.50 | 50.25 | 80,512.77 | 78,945.23 | 0.00 | 0.00 | 190,788.75 | 0.00 | 0.00 | 190,788.75 | 0.00 |

Transaction Types: IV = Invoice, RT = Retainage, DM = Debit Memo, CM = Credit Memo, CN = Cancellation, PAY = Payment, RT = Retainage, UC = Uncollectible

CMs, PAYs, RTs, and UCs are cancelled transactions. The cancellation is identified by type CN

* - Linked Retainage amount is assigned when an Invoice or Debit Memo is created. The amounts in this column are also reflected in the Total Billed column

** - Invoice, Retainage, or Debit Memo entry has an Unassigned or Unbalanced status

**EXHIBIT B**
**Page 2 of 4**



LUBA #2008-203

000440

Reporting Period:
As of 12/31/2008

Selection, P
(Project ID One of '06-036')

# Hart Howerton - SF

## AR Transaction Record

Project 06-036 (Continued)

| Inv-Trx# | Rec# | BillGrp | Type | Date | Prof.Serv. | Reimb.Exp. | Cons.Serv. | Other | Finance Charges | Taxes | Total Billed | Linked Retainage* | Discounts | Payments/ Uncollectibles | Balance Due |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10011-25713 | | 201 | IV | 7/10/2007 | 42,770.00 | 0.00 | 0.00 | -42,770.00 | 0.00 | 0.00 | 0.00 | | | | 0.00 |
| | | | Invoice 10011 Totals: | | 42,770.00 | 0.00 | 0.00 | -42,770.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10012-25714 | | 202 | IV | 7/10/2007 | 14,207.50 | 0.00 | 0.00 | -14,207.50 | 0.00 | 0.00 | 0.00 | | | | 0.00 |
| | | | Invoice 10012 Totals: | | 14,207.50 | 0.00 | 0.00 | -14,207.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9824-25200 | | 201 | IV | 7/10/2007 | 68,400.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 68,400.00 | | | | 68,400.00 |
| | 8857 | | PAY | 9/13/2007 | | | | | | | | | 0.00 | 68,400.00 | 0.00 |
| 9824-25201 | | 202 | IV | 7/10/2007 | 21,500.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 21,500.00 | | | | 21,500.00 |
| | 8857 | | PAY | 9/13/2007 | | | | | | | | | 0.00 | 855.21 | 20,644.79 |
| 9824-25202 | | 601 | IV | 7/10/2007 | 0.00 | 0.00 | 6,049.95 | 0.00 | 0.00 | 0.00 | 6,049.95 | | | | 26,694.70 |
| 9824-25203 | | 603 | IV | 7/10/2007 | 0.00 | 0.00 | 6,591.81 | 0.00 | 0.00 | 0.00 | 6,591.81 | | | | 33,286.51 |
| 9824-25204 | | 990 | IV | 7/30/2007 | 0.00 | 112.61 | 0.40 | 25.48 | 0.00 | 0.00 | 338.49 | | | | 33,625.00 |
| | | | Invoice 9824 Totals: | | 89,900.00 | 112.61 | 12,641.76 | 25.48 | 0.00 | 0.00 | 101,880.25 | 0.00 | 0.00 | 69,255.25 | 33,625.00 |
| 9952-25526 | | 201 | IV | 8/10/2007 | 31,758.75 | 0.00 | 0.00 | 36,241.25 | 0.00 | 0.00 | 68,000.00 | | | | 101,625.00 |
| 9952-25527 | | 202 | IV | 8/10/2007 | 18,972.50 | 0.00 | 0.00 | 10,027.50 | 0.00 | 0.00 | 29,000.00 | | | | 130,625.00 |
| 9952-25528 | | 601 | IV | 8/10/2007 | 0.00 | 0.00 | 8,430.70 | 0.00 | 0.00 | 0.00 | 8,430.70 | | | | 139,055.70 |
| 9952-25529 | | 602 | IV | 8/10/2007 | 0.00 | 0.00 | 18,755.64 | 0.00 | 0.00 | 0.00 | 18,755.64 | | | | 157,811.34 |
| 9952-25530 | | 990 | IV | 8/10/2007 | 0.00 | 5,321.76 | 0.00 | 73.15 | 0.00 | 0.00 | 5,394.91 | | | | 163,206.25 |
| | | | Invoice 9952 Totals: | | 43,731.25 | 5,321.76 | 27,186.34 | 46,343.90 | 0.00 | 0.00 | 122,581.25 | 0.00 | 0.00 | 0.00 | 163,206.25 |
| 10036-25915 | | 201 | CN | 8/31/2007 | -58,000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -58,000.00 | | | | 98,206.25 |
| 10036-25916 | | 202 | CN | 8/31/2007 | -16,200.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -16,200.00 | | | | 82,006.25 |
| 10036-25917 | | 601 | CN | 8/31/2007 | 0.00 | 0.00 | -12,650.48 | 0.00 | 0.00 | 0.00 | -12,650.48 | | | | 69,355.77 |
| 10036-25918 | | 602 | CN | 8/31/2007 | 0.00 | 0.00 | -4,949.91 | 0.00 | 0.00 | 0.00 | -4,949.91 | | | | 64,405.86 |
| 10036-25919 | | 603 | CN | 8/31/2007 | 0.00 | 0.00 | -1,864.15 | 0.00 | 0.00 | 0.00 | -1,864.15 | | | | 62,541.71 |
| 10036-25920 | | 990 | CN | 8/31/2007 | 0.00 | -1,785.45 | 0.00 | -27.72 | 0.00 | 0.00 | -1,813.17 | | | | 60,728.54 |
| | | | Invoice 10036 Totals: | | -74,200.00 | -1,785.45 | -19,464.54 | -27.72 | 0.00 | 0.00 | -95,477.71 | 0.00 | 0.00 | 0.00 | 60,728.54 |
| 10036-25981 | | 201 | IV | 9/10/2007 | 58,000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 58,000.00 | | | | 118,728.54 |
| 10036-25982 | | 202 | IV | 9/10/2007 | 16,200.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 16,200.00 | | | | 134,928.54 |
| 10036-25985 | | 601 | IV | 9/10/2007 | 0.00 | 0.00 | 12,650.48 | 0.00 | 0.00 | 0.00 | 12,650.48 | | | | 147,579.02 |
| 10036-25986 | | 602 | IV | 9/10/2007 | 0.00 | 0.00 | 4,949.91 | 0.00 | 0.00 | 0.00 | 4,949.91 | | | | 152,528.93 |
| 10036-25987 | | 603 | IV | 9/10/2007 | 0.00 | 0.00 | 1,864.15 | 0.00 | 0.00 | 0.00 | 1,864.15 | | | | 154,393.08 |
| 10036-25988 | | 990 | IV | 9/10/2007 | 0.00 | 1,785.45 | 0.00 | 27.72 | 0.00 | 0.00 | 1,813.17 | | | | 156,206.25 |
| | | | Invoice 10036 Totals: | | 74,200.00 | 1,785.45 | 19,464.54 | 27.72 | 0.00 | 0.00 | 95,477.71 | 0.00 | 0.00 | 0.00 | 156,206.25 |
| 10066-25926 | | 201 | IV | 9/10/2007 | 58,000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 58,000.00 | | | | 214,206.25 |
| 10066-25927 | | 202 | IV | 9/10/2007 | 16,200.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 16,200.00 | | | | 230,406.25 |
| 10066-25928 | | 601 | IV | 9/10/2007 | 0.00 | 0.00 | 12,650.48 | 0.00 | 0.00 | 0.00 | 12,650.48 | | | | 243,056.73 |
| 10066-25929 | | 602 | IV | 9/10/2007 | 0.00 | 0.00 | 4,949.91 | 0.00 | 0.00 | 0.00 | 4,949.91 | | | | 248,006.64 |
| 10066-25930 | | 603 | IV | 9/10/2007 | 0.00 | 0.00 | 1,865.31 | 0.00 | 0.00 | 0.00 | 1,865.31 | | | | 249,871.95 |
| 10066-25931 | | 990 | IV | 9/10/2007 | 0.00 | 1,785.45 | 0.00 | 27.72 | 0.00 | 0.00 | 1,813.17 | | | | 251,685.12 |
| | | | Invoice 10066 Totals: | | 74,200.00 | 1,785.45 | 19,465.70 | 27.72 | 0.00 | 0.00 | 95,478.87 | 0.00 | 0.00 | 0.00 | 251,685.12 |
| 10121-26135 | | 201 | IV | 9/10/2007 | -9,971.25 | 0.00 | 0.00 | 9,971.25 | 0.00 | 0.00 | 0.00 | | | | 251,685.12 |
| | | | Invoice 10121 Totals: | | -9,971.25 | 0.00 | 0.00 | 9,971.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 251,685.12 |
| 10122-26111 | | 202 | IV | 9/10/2007 | -12,620.00 | 0.00 | 0.00 | 12,620.00 | 0.00 | 0.00 | 0.00 | | | | 251,685.12 |

Transaction Types: IV = Invoice, RC = Retainage, DM = Debit Memo, CM = Credit Memo, CN = Cancellation, PAY = Payment, RT = Returns, UC = Uncollectible
CMs, PAYs, RTs, and UCs are cancelled transactions. The cancellation is identified by type CN.
* = Linked Retainage amount is assigned when an Invoice or Debit Memo is created. The amounts in this column are also reflected in the Total Billed column.
** = Invoice, Retainage, or Debit Memo entry has an Unassigned or Unbalanced status.

**EXHIBIT B**
**Page 3 of 4**



LUBA #2008-203
00847

Reporting Period:
As of 12/31/2008

# Hart Howerton - SF

## AR Transaction Record

Selection: P
(Project ID Like of '06-036?)

Project: 06-036 (Continued)

| Inv-Trxt | Recd | BillGrp | Type | Date | Prof.Serv. | Reimb.Exp. | Outs.Serv. | Other | Finance Charges | Taxes | Total Billed | Linked Retainage* | Discounts | Payments/ Uncollectibles | Balance Due |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Invoice 10122 Totals: | | -12,620.00 | 0.00 | 0.00 | 12,620.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 251,685.12 |
| 10159-26232 | | 201 | IV | 10/10/2007 | 21,000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 21,000.00 | | | | 272,685.12 |
| 10159-26233 | | 202 | IV | 10/10/2007 | 20,000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 20,000.00 | | | | 292,685.12 |
| 10159-26234 | | 601 | IV | 10/10/2007 | 0.00 | 0.00 | 1,937.10 | 0.00 | 0.00 | 0.00 | 1,937.10 | | | | 294,622.42 |
| 10159-26235 | | 602 | IV | 10/10/2007 | 0.00 | 0.00 | 1,285.55 | 0.00 | 0.00 | 0.00 | 1,285.55 | | | | 303,907.97 |
| 10159-26236 | | 900 | IV | 10/10/2007 | 0.00 | 1,345.57 | 0.00 | 42.00 | 0.00 | 0.00 | 1,387.57 | | | | 305,295.54 |
| 10159-26496 | | 201 | IV | 10/10/2007 | -11,831.25 | 0.00 | 0.00 | 11,831.25 | 0.00 | 0.00 | 0.00 | | | | 305,295.54 |
| 10159-26495 | | 202 | IV | 10/10/2007 | -16,815.00 | 0.00 | 0.00 | 16,815.00 | 0.00 | 0.00 | 0.00 | | | | 305,295.54 |
| | | | Invoice 10159 Totals: | | 12,353.75 | 1,345.57 | 11,222.85 | 29,688.25 | 0.00 | 0.00 | 54,610.42 | 0.00 | 0.00 | 0.00 | 305,295.54 |
| 10247-26502 | | 201 | IV | 11/10/2007 | 0.00 | 0.00 | 0.00 | 0.00 | 3,311.50 | 0.00 | 3,311.50 | | | | 308,607.04 |
| 10247-26663 | | 202 | IV | 11/10/2007 | 0.00 | 0.00 | 0.00 | 0.00 | 3,311.50 | 0.00 | 3,311.50 | | | | 311,918.54 |
| | | | Invoice 10247 Totals: | | 0.00 | 0.00 | 0.00 | 0.00 | 6,623.00 | 0.00 | 6,623.00 | 0.00 | 0.00 | 0.00 | 311,918.54 |
| 10417-27040 | | 201 | IV | 12/10/2007 | 0.00 | 0.00 | 0.00 | 0.00 | 1,861.97 | 0.00 | 1,861.97 | | | | 313,780.51 |
| 10417-27041 | | 202 | IV | 12/10/2007 | 0.00 | 0.00 | 0.00 | 0.00 | 1,861.97 | 0.00 | 1,861.97 | | | | 315,642.48 |
| | | | Invoice 10417 Totals: | | 0.00 | 0.00 | 0.00 | 0.00 | 3,723.94 | 0.00 | 3,723.94 | 0.00 | 0.00 | 0.00 | 315,642.48 |
| 10418-27042 | | 201 | IV | 1/10/2008 | 0.00 | 0.00 | 0.00 | 0.00 | 2,545.38 | 0.00 | 2,545.38 | | | | 318,187.86 |
| 10418-27043 | | 202 | IV | 1/10/2008 | 0.00 | 0.00 | 0.00 | 0.00 | 2,545.38 | 0.00 | 2,545.38 | | | | 320,733.24 |
| | | | Invoice 10418 Totals: | | 0.00 | 0.00 | 0.00 | 0.00 | 5,090.76 | 0.00 | 5,090.76 | 0.00 | 0.00 | 0.00 | 320,733.24 |
| 10591-27710 | | 201 | IV | 2/10/2008 | 0.00 | 0.00 | 0.00 | 0.00 | 2,333.86 | 0.00 | 2,333.86 | | | | 323,067.10 |
| 10591-27711 | | 202 | IV | 2/10/2008 | 0.00 | 0.00 | 0.00 | 0.00 | 2,333.86 | 0.00 | 2,333.86 | | | | 325,400.96 |
| | | | Invoice 10591 Totals: | | 0.00 | 0.00 | 0.00 | 0.00 | 4,667.72 | 0.00 | 4,667.72 | 0.00 | 0.00 | 0.00 | 325,400.96 |
| 10609-27783 | | 201 | IV | 3/10/2008 | 0.00 | 0.00 | 0.00 | 0.00 | 4,703.89 | 0.00 | 4,703.89 | | | | 330,104.85 |
| 10609-27784 | | 202 | IV | 3/10/2008 | 0.00 | 0.00 | 0.00 | 0.00 | 4,703.89 | 0.00 | 4,703.89 | | | | 334,808.74 |
| | | | Invoice 10609 Totals: | | 0.00 | 0.00 | 0.00 | 0.00 | 9,407.78 | 0.00 | 9,407.78 | 0.00 | 0.00 | 0.00 | 334,808.74 |
| | | | Project 06-036 Totals: | | 469,698.75 | 12,969.80 | 81,049.42 | 120,222.13 | 29,513.20 | 0.00 | 713,452.50 | 0.00 | 0.00 | 378,643.86 | 334,808.74 |

Aged Accounts Receivable

| Unreleased Retainage | Current | 31-60 | 61-90 | 91-120 | >120 |
|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 334,808.74 |

Project Retainer Analysis

| Assigned To | Recd | Receipt Date | Amount | Unapplied | Reference |
|---|---|---|---|---|---|
| Client [Winchester] Winchester Development Company Project: 06-036 | 7969 | 10/8/2008 | 14,000.00 | 14,000.00 | 06-036 Kennington Reach |
| | | Totals | 14,000.00 | 14,000.00 | |

Transaction Types: IV - Invoice, RG - Retainage, DM - Debit Memo, CM - Credit Memo, CN - Cancellation, PAY - Payment, RT - Retainer, UC - Uncollectible
CNIV, PAYN, RTN, and UCN are cancelled transactions. The cancellation is identified by type CN.
* - Linked Retainage amount is assessed when an Invoice or Debit Memo is created. The amounts in this column are also reflected in the Total Billed column.
** - Invoice, Retainage, or Debit Memo entry has an Unassigned or Unbalanced status.

EXHIBIT B
Page 4 of 4



LUBA #2009-202

00848

ENTERED JAN 18 2008

Crook County Official Records 2008-226245
LIEN-LCON 01/16/08 03:03 PM
Cnt=1 Stn=6 CCOUNTER $36.00
$20.00 $11.00 $5.00
01037769200802262450040044
I, Deanna Berman, County Clerk for Crook County Oregon, certify that the instrument identified herein was recorded in the Clerk records.
Deanna E. Berman

After recording return to:
Mitchell Law Office, LLC
PO Box 14247
Portland, OR 97293
File: UNITEDE0003

**Lien Claimant:** United Pipe & Supply Co., Inc.
**Lien Debtor:** Remington Ranch, LLC
**Owner(s) or Reputed Owner(s):** Remington Ranch, LLC; Destination Resort Group, LLC
**Lien Amount:** $33,317.05, together with interest at the rate of 18% per annum on the amount of $33,281.05 from December 31, 2007 until paid, together with the sum of $1,815.50 as service charges accrued prior to December 31, 2007.

## CLAIM OF CONSTRUCTION LIEN

### 1. Description Of The Property

KNOW ALL MEN BY THESE PRESENTS: The undersigned, hereinafter called the claimant, performed labor, transported or furnished materials to be used in or rented equipment under an agreement between claimant and Remington Ranch, LLC, who was the owner or original contractor or construction agent or other person having charge of the construction of that improvement commonly known as the Wicked Pony Golf Course. Said improvement is situated upon certain land in the County of Crook, State of Oregon, which is the site of said improvement, described as follows:

Portion of Partition 2001-39; Portion of Partition 1999-31; Portion of Partition 2001-21; Portion of Partition 2000-22; and Portion of Partition 2001-23, Crook County, Oregon.

And also known as Tax Lots 1800, 1802, and 1806 on Map 14 South 14 East, and Tax Lots 201, 204, 205, 206, 207, 208, 209, 210, and 211 on Map 15 South 14 East.

### 2. Address, If Known

The address of said land is 5000 Overland Ranch Road and/or no site address, Redmond, Oregon, in said county and state and is otherwise unknown.



AMERITITLE
0001111P

Recorded by AmeriTitle as an accommodation only. No liability is accepted for the condition of title or for the validity, sufficiency, or effect of this document.

**3. Names Of Owners Or Reputed Owners**

The names of the owners or reputed owners of said land and improvement are Remington Ranch, LLC and/or Destination Resort Group, LLC. All of said owners at all times herein mentioned had knowledge of the construction of said improvement.

**4. Person By Whom Claimant Was Employed**

The name of the person who employed claimant to furnish said materials and to perform said agreement is Remington Ranch, LLC.

**5. Performance Of Work**

Claimant completed its performance on November 5, 2007, and provided and furnished all materials required by said agreement and actually used in the construction of said improvement, after which it ceased to transport or furnish materials.

**6. True Statement Of Demand Less Just Credits And Offsets**

As set forth on Exhibit "A" attached hereto and incorporated herein, the following is a true statement of claimant's demand after deducting all just credits and offsets. The reasonable value and contract amount of claimant's materials is:

| | |
|---|---|
| Materials | $ 33,281.05 |
| Recording fees | $ 36.00 |
| Total | $ 33,317.05 |
| Less all just credits and offsets | $ <0.00> |
| Balance due claimant | $ 33,317.05* |

*Together with interest at the rate of 18% per annum on the amount of $33,281.05 from December 31, 2007 until paid, together with the sum of $1,815.50 as service charges accrued prior to December 31, 2007.

**7. Perfection Of Lien**

Claimant claims a perfected lien for the amount last stated, $33,317.05*, upon the said improvement and upon the site, to-wit: the land upon which said improvement is constructed, together with the land that may be required for the convenient use and occupation of the improvement constructed on said site, to be determined by the court at the time of the foreclosure of this lien.

**8. Miscellaneous**

a) In construing this instrument, the masculine pronoun means and includes the feminine and the neuter and the singular includes the plural, as the circumstances may require.

b) The paragraph captions are of convenience only and shall not be deemed to limit the terms or provisions of this claim of lien.

DATED this 15 of January, 2008.

**United Pipe & Supply Co., Inc.**

By: _____
Louie Jauregui, Its Credit Manager

STATE OF OREGON )
) ss.
County of Clackamas )

I, Louie Jauregui, say as follows: that, subject to the penalties for false swearing provided under ORS 162.075, I am the Credit Manager of the claimant in the foregoing instrument; that I have knowledge of the facts therein set forth; that all statements made in said instrument are true and correct as I verily believe.

_____
Louie Jauregui

Signed and sworn to before me on this 15 day of January, 2008 by Louie Jauregui.

OFFICIAL SEAL
JO ANN WILLIAMS
NOTARY PUBLIC-OREGON
COMMISSION NO. 413681
MY COMMISSION EXPIRES MARCH 5, 2011

_____
Notary Public for Oregon

NOTICE TO THE OWNER(s) and to Mortgagee(s) pursuant to ORS 87.039 of the land described in the foregoing copy of claim of lien:

Please be advised that the original claim of lien of which the foregoing is a true copy was filed and recorded in the office of the recording officer of **Crook** County, Oregon, on January ____, 2008.

By: _____
Its: Attorney

| Invoice # | Inv. Date | Amount |
|---|---|---|
| | | |
| 7587389 | 8/2/2007 | $ 12.29 |
| 7501657 | 8/3/2007 | $ 714.00 |
| 7580556 | 8/7/2007 | $ 12,600.00 |
| 7587408 | 8/7/2007 | $ 54.06 |
| 7590732 | 8/9/2007 | $ 786.40 |
| 7604184 | 8/22/2007 | $ 1,760.00 |
| 7604082 | 8/23/2007 | $ 784.40 |
| 7622702 | 8/27/2007 | $ 6,490.00 |
| 7680147 | 10/10/2007 | $ 9.70 |
| | Principal #1 | $ 23,210.85 |
| | | |
| SC89724 | 9/30/2007 | $ 348.02 |
| SC91121 | 10/31/2007 | $ 348.02 |
| SC92605 | 11/30/2007 | $ 348.16 |
| SC93916 | 12/31/2007 | $ 348.16 |
| | SC #1 | $ 1,392.36 |
| | | |
| 7606615 | 8/28/2007 | $ 128.59 |
| 7612971 | 8/28/2007 | $ 1,936.80 |
| 7625775 | 8/29/2007 | $ 168.66 |
| 7625777 | 8/29/2007 | $ 69.29 |
| 7630872 | 8/31/2007 | $ 298.93 |
| 7630998 | 9/6/2007 | $ 320.50 |
| 7625760 | 9/11/2007 | $ 191.30 |
| 7606164 | 9/12/2007 | $ 1,620.00 |
| 7652407 | 9/18/2007 | $ 244.21 |
| 7630770 | 9/21/2007 | $ 399.60 |
| 7654103 | 9/26/2007 | $ 929.40 |
| 7676811 | 10/9/2007 | $ 172.92 |
| 7654703 | 10/17/2007 | $ 2,750.00 |
| 7669068 | 11/14/2007 | $ 840.00 |
| | Principal #2 | $ 10,070.20 |
| | | |
| SC89725 | 9/30/2007 | $ 39.03 |
| SC91122 | 10/31/2007 | $ 94.61 |
| SC92606 | 11/30/2007 | $ 138.45 |
| SC93917 | 12/31/2007 | $ 151.05 |
| | SC #2 | $ 423.14 |
| | | |
| **TOTAL PRINCIPAL** | | **$ 33,281.05** |
| **Service Charges as of 12/31/07** | | **$ 1,815.50** |

**Exhibit A**
**Page 1 of 1**

# State of Oregon

Corporation Division - UCC

Public Service Building - 255 Capitol Street NE, Suite 151
Salem, OR 97310-1327
(503) 986-2200 Facsimile (503) 373-1166

## DEBTOR INFORMATION REPORT

GUILD, JIM
19845 J.W. BROWN RD
BEND, OR 97701

**Date Searched:** 03/28/2008 12:34 PM
**By:** THEJOH
**Search Number:** 8031820509
**Search String:** REMINGTON RANCH LLC

**The Secretary of State of Oregon certifies that the attached list shows all presently effective Uniform Commercial Code filings and statements of assignment which are on file in this office as of 03/25/2008.**

**The list ends with the words 'NOTHING FOLLOWS'.**

---

**Search Result #** 1 **Lapse Date:** 10/09/2012
**Lien Number:** 7765798 **Type:** UCC

| File Number | File Date | Filing Type | Filing Action | Page Count |
|---|---|---|---|---|
| 7765798 | 10/09/07 03:06 PM | New Filing | | 1 |

**Debtor(s):**

Organization: REMINGTON RANCH, LLC
1814 SW REMINGTON RANCH DR
POWELL BUTTE, OR 97753

**Secured Parties:**

Organization: GENERAL ELECTRIC CAPITAL CORP.
1961 HIRST DRIVE
MOBERLY, MO 65270

**Search Result #** 2 **Lapse Date:** 10/09/2012

**Lien Number:** 7765809 **Type:** UCC

| File Number | File Date | Filing Type | Filing Action | Page Count |
|---|---|---|---|---|
| 7765809 | 10/09/07 03:06 PM | New Filing | | 1 |

**Debtor(s):**

Organization: REMINGTON RANCH, LLC
1814 SW REMINGTON RANCH DR
POWELL BUTTE, OR 97753

**Secured Parties:**

Organization: GENERAL ELECTRIC CAPITAL CORP.
1961 HIRST DRIVE
MOBERLY, MO 65270

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**Search Result #** 3 **Lapse Date:** 10/09/2012

**Lien Number:** 7765821 **Type:** UCC

| File Number | File Date | Filing Type | Filing Action | Page Count |
|---|---|---|---|---|
| 7765821 | 10/09/07 03:06 PM | New Filing | | 1 |

**Debtor(s):**

Organization: REMINGTON RANCH, LLC
1814 SW REMINGTON RANCH DR
POWELL BUTTE, OR 97753

**Secured Parties:**

Organization: GENERAL ELECTRIC CAPITAL CORP.
1961 HIRST DRIVE
MOBERLY, MO 65270

---

**Search Result #** 4 **Lapse Date:** 03/13/2013

**Lien Number:** 7904067 **Type:** UCC

| File Number | File Date | Filing Type | Filing Action | Page Count |
|---|---|---|---|---|
| 7904067 | 03/13/08 01:51 PM | New Filing | | 1 |

**Debtor(s):**

Organization: REMINGTON RANCH, LLC
5 NW MINNESOTA AVE. STE. 220
BEND, OR 97701

**Secured Parties:**

Organization: TEXTRON FINANCIAL CORPORATION
11575 GREAT OAKS WAY #210
ALPHARETTA, GA 30022

**Search Result #** 5 **Lapse Date:** 03/21/2013

**Lien Number:** 7913577 **Type:** UCC

| File Number | File Date | Filing Type | Filing Action | Page Count |
|---|---|---|---|---|
| 7913577 | 03/21/08 02:41 PM | New Filing | | 1 |

**Debtor(s):**

Organization: REMINGTON RANCH LLC
5 NW MINNESOTA AVE #220
BEND, OR 97701

**Secured Parties:**

Organization: WESTERN EQUIPMENT DISTRIBUTORS INC
20224 80TH AVE SOUTH
KENT, WA 98032

**** NOTHING FOLLOWS ****

State of Oregon
Initial Filing 1 Page(s)

9030286509

7765798
10/09/07 03:06 PM
OR Sec. of State

# UCC FINANCING STATEMENT

FOLLOW INSTRUCTIONS (front and back) CAREFULLY

A. NAME & PHONE OF CONTACT AT FILER [optional]
CSC DILIGENZ, INC. 1-800-858-5294

B. SEND ACKNOWLEDGMENT TO: (Name and Address)
29538078
CSC DILIGENZ, INC.
6500 HARBOUR HEIGHTS PKWY, SUITE 400
MUKILTEO, WA 98275

Filed In: Oregon (S.O.S.)

THE ABOVE SPACE IS FOR FILING OFFICE USE ONLY

1. DEBTOR'S EXACT FULL LEGAL NAME - insert only one debtor name (1a or 1b) - do not abbreviate or combine names

1a. ORGANIZATION'S NAME
REMINGTON RANCH, LLC

OR 1b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX

1c. MAILING ADDRESS: 1814 SW REMINGTON RANCH DR | CITY: POWELL BUTTE | STATE: OR | POSTAL CODE: 97753 | COUNTRY: USA

1d. SEE INSTRUCTIONS | ADD'L INFO RE ORGANIZATION DEBTOR | 1e. TYPE OF ORGANIZATION: LIMITED | 1f. JURISDICTION OF ORGANIZATION: OR | 1g. ORGANIZATIONAL ID #, if any: 300269-91 ☐ NONE

2. ADDITIONAL DEBTOR'S EXACT FULL LEGAL NAME - insert only one debtor name (2a or 2b) - do not abbreviate or combine names

2a. ORGANIZATION'S NAME

OR 2b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX

2c. MAILING ADDRESS | CITY | STATE | POSTAL CODE | COUNTRY

2d. SEE INSTRUCTIONS | ADD'L INFO RE ORGANIZATION DEBTOR | 2e. TYPE OF ORGANIZATION | 2f. JURISDICTION OF ORGANIZATION | 2g. ORGANIZATIONAL ID #, if any ☐ NONE

3. SECURED PARTY'S NAME (or NAME of TOTAL ASSIGNEE of ASSIGNOR S/P) - insert only one secured party name (3a or 3b)

3a. ORGANIZATION'S NAME
GENERAL ELECTRIC CAPITAL CORP.

OR 3b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX

3c. MAILING ADDRESS: 1961 HIRST DRIVE | CITY: MOBERLY | STATE: MO | POSTAL CODE: 65270 | COUNTRY: USA

4. This FINANCING STATEMENT covers the following collateral:
ALL EQUIPMENT, DESCRIBED HEREIN OR OTHERWISE, LEASED TO OR FINANCED FOR THE DEBTOR BY SECURED PARTY UNDER THAT CERTAIN MASTER LEASE AGREEMENT NO.8336815-003 INCLUDING ALL ACCESSORIES, ACCESSIONS, REPLACEMENTS, ADDITIONS, SUBSTITUTIONS, ADD-ONS AND UPGRADES THERETO, AND ANY PROCEEDS THEREFROM.

5. ALTERNATIVE DESIGNATION [if applicable]: ☐ LESSEE/LESSOR ☐ CONSIGNEE/CONSIGNOR ☐ BAILEE/BAILOR ☐ SELLER/BUYER ☐ AG. LIEN ☐ NON-UCC FILING

6. ☐ This FINANCING STATEMENT is to be filed [for record] (or recorded) in the REAL ESTATE RECORDS. Attach Addendum [if applicable] | 7. Check to REQUEST SEARCH REPORT(S) on Debtor(s) [ADDITIONAL FEE] [optional] ☐ All Debtors ☐ Debtor 1 ☐ Debtor 2

8. OPTIONAL FILER REFERENCE DATA
MOBERLY - EFS 8336815003

29538078
LUBA #2008-203

FILING OFFICE COPY — UCC FINANCING STATEMENT (FORM UCC1) (REV. 05/22/02)

00856

[redacted]

State of Oregon
Initial Filing 1 Page(s)

9030286609

7765809
10/09/07 03:06 PM
OR Sec. of State

# UCC FINANCING STATEMENT

FOLLOW INSTRUCTIONS (front and back) CAREFULLY

A. NAME & PHONE OF CONTACT AT FILER [optional]
CSC DILIGENZ, INC. 1-800-858-5294

B. SEND ACKNOWLEDGMENT TO: (Name and Address)

29538239
CSC DILIGENZ, INC.
6500 HARBOUR HEIGHTS PKWY, SUITE 400
MUKILTEO, WA 98275

Filed In: Oregon (S.O.S.)

THE ABOVE SPACE IS FOR FILING OFFICE USE ONLY

1. DEBTOR'S EXACT FULL LEGAL NAME - insert only one debtor name (1a or 1b) - do not abbreviate or combine names

1a. ORGANIZATION'S NAME
REMINGTON RANCH, LLC

OR

| 1b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX |
|---|---|---|---|
| | | | |

| 1c. MAILING ADDRESS | CITY | STATE | POSTAL CODE | COUNTRY |
|---|---|---|---|---|
| 1814 SW REMINGTON RANCH DR | POWELL BUTTE | OR | 97753 | USA |

| 1d. SEE INSTRUCTIONS | ADD'L INFO RE ORGANIZATION DEBTOR | 1e. TYPE OF ORGANIZATION | 1f. JURISDICTION OF ORGANIZATION | 1g. ORGANIZATIONAL ID #, if any |
|---|---|---|---|---|
| | | LIMITED | OR | 300269-91 ☐ NONE |

2. ADDITIONAL DEBTOR'S EXACT FULL LEGAL NAME - Insert only one debtor name (2a or 2b) - do not abbreviate or combine names

2a. ORGANIZATION'S NAME

OR

| 2b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX |
|---|---|---|---|
| | | | |

| 2c. MAILING ADDRESS | CITY | STATE | POSTAL CODE | COUNTRY |
|---|---|---|---|---|
| | | | | |

| 2d. SEE INSTRUCTIONS | ADD'L INFO RE ORGANIZATION DEBTOR | 2e. TYPE OF ORGANIZATION | 2f. JURISDICTION OF ORGANIZATION | 2g. ORGANIZATIONAL ID #, if any |
|---|---|---|---|---|
| | | | | ☐ NONE |

3. SECURED PARTY'S NAME (or NAME of TOTAL ASSIGNEE of ASSIGNOR S/P) - insert only one secured party name (3a or 3b)

3a. ORGANIZATION'S NAME
GENERAL ELECTRIC CAPITAL CORP.

OR

| 3b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX |
|---|---|---|---|
| | | | |

| 3c. MAILING ADDRESS | CITY | STATE | POSTAL CODE | COUNTRY |
|---|---|---|---|---|
| 1961 HIRST DRIVE | MOBERLY | MO | 65270 | USA |

4. This FINANCING STATEMENT covers the following collateral:
ALL EQUIPMENT, DESCRIBED HEREIN OR OTHERWISE, LEASED TO OR FINANCED FOR THE DEBTOR BY SECURED PARTY UNDER THAT CERTAIN MASTER LEASE AGREEMENT NO.8336815-002 INCLUDING ALL ACCESSORIES, ACCESSIONS, REPLACEMENTS, ADDITIONS, SUBSTITUTIONS, ADD-ONS AND UPGRADES THERETO, AND ANY PROCEEDS THEREFROM.

5. ALTERNATIVE DESIGNATION [if applicable]: ☐ LESSEE/LESSOR ☐ CONSIGNEE/CONSIGNOR ☐ BAILEE/BAILOR ☐ SELLER/BUYER ☐ AG. LIEN ☐ NON-UCC FILING

6. ☐ This FINANCING STATEMENT is to be filed [for record] (or recorded) in the REAL ESTATE RECORDS. Attach Addendum [if applicable]

7. Check to REQUEST SEARCH REPORT(S) on Debtor(s) [ADDITIONAL FEE] [optional] ☐ All Debtors ☐ Debtor 1 ☐ Debtor 2

8. OPTIONAL FILER REFERENCE DATA
MOBERLY - EFS 8336815003

29538239
LUBA #2008-203

FILING OFFICE COPY — UCC FINANCING STATEMENT (FORM UCC1) (REV. 05/22/02)

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State of Oregon
Initial Filing 1 Page(s)

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OR Sec. of State

# UCC FINANCING STATEMENT

FOLLOW INSTRUCTIONS (front and back) CAREFULLY

A. NAME & PHONE OF CONTACT AT FILER [optional]
CSC DILIGENZ, INC. 1-800-858-5294

B. SEND ACKNOWLEDGMENT TO: (Name and Address)
29542215
CSC DILIGENZ, INC.
6500 HARBOUR HEIGHTS PKWY, SUITE 400
MUKILTEO, WA 98275

Filed In: Oregon (S.O.S.)

THE ABOVE SPACE IS FOR FILING OFFICE USE ONLY

1. DEBTOR'S EXACT FULL LEGAL NAME - insert only one debtor name (1a or 1b) - do not abbreviate or combine names

1a. ORGANIZATION'S NAME: REMINGTON RANCH, LLC

OR 1b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX

1c. MAILING ADDRESS: 1814 SW REMINGTON RANCH DR | CITY: POWELL BUTTE | STATE: OR | POSTAL CODE: 97753 | COUNTRY: USA

1d. SEE INSTRUCTIONS | ADD'L INFO RE ORGANIZATION DEBTOR | 1e. TYPE OF ORGANIZATION: LIMITED | 1f. JURISDICTION OF ORGANIZATION: OR | 1g. ORGANIZATIONAL ID #, if any: 300269-91 ☐ NONE

2. ADDITIONAL DEBTOR'S EXACT FULL LEGAL NAME - insert only one debtor name (2a or 2b) - do not abbreviate or combine names

2a. ORGANIZATION'S NAME

OR 2b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX

2c. MAILING ADDRESS | CITY | STATE | POSTAL CODE | COUNTRY

2d. SEE INSTRUCTIONS | ADD'L INFO RE ORGANIZATION DEBTOR | 2e. TYPE OF ORGANIZATION | 2f. JURISDICTION OF ORGANIZATION | 2g. ORGANIZATIONAL ID #, if any ☐ NONE

3. SECURED PARTY'S NAME (or NAME of TOTAL ASSIGNEE of ASSIGNOR S/P) - insert only one secured party name (3a or 3b)

3a. ORGANIZATION'S NAME: GENERAL ELECTRIC CAPITAL CORP.

OR 3b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX

3c. MAILING ADDRESS: 1961 HIRST DRIVE | CITY: MOBERLY | STATE: MO | POSTAL CODE: 65270 | COUNTRY: USA

4. This FINANCING STATEMENT covers the following collateral:
ALL EQUIPMENT, DESCRIBED HEREIN OR OTHERWISE, LEASED TO OR FINANCED FOR THE DEBTOR BY SECURED PARTY UNDER THAT CERTAIN MASTER LEASE AGREEMENT NO. 8336815-004 INCLUDING ALL ACCESSORIES, ACCESSIONS, REPLACEMENTS, ADDITIONS, SUBSTITUTIONS, ADD-ONS AND UPGRADES THERETO, AND ANY PROCEEDS THEREFROM.

5. ALTERNATIVE DESIGNATION [if applicable]: ☐ LESSEE/LESSOR ☐ CONSIGNEE/CONSIGNOR ☐ BAILEE/BAILOR ☐ SELLER/BUYER ☐ AG. LIEN ☐ NON-UCC FILING

6. ☐ This FINANCING STATEMENT is to be filed [for record] (or recorded) in the REAL ESTATE RECORDS. Attach Addendum [if applicable]

7. Check to REQUEST SEARCH REPORT(S) on Debtor(s) [ADDITIONAL FEE] [optional] ☐ All Debtors ☐ Debtor 1 ☐ Debtor 2

8. OPTIONAL FILER REFERENCE DATA
MOBERLY - EFS 8336815004

29542215
~~LUBA #2008-203~~

FILING OFFICE COPY — UCC FINANCING STATEMENT (FORM UCC1) (REV. 05/22/02)

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[redacted]

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OR Sec. of State

# UCC FINANCING STATEMENT

FOLLOW INSTRUCTIONS (front and back) CAREFULLY

A. NAME & PHONE OF CONTACT AT FILER [optional]
Phone:(800) 331-3282 Fax: (818) 662-4141

B. SEND ACKNOWLEDGEMENT TO: (Name and Address)
11891 TFC-ALPHARETTA

UCC Direct Services
P.O. Box 29071
Glendale, CA 91209-9071

13719573

ORORR

THE ABOVE SPACE IS FOR FILING OFFICE USE ONLY

1. DEBTOR'S EXACT FULL LEGAL NAME - insert only one debtor name (1a or 1b) - do not abbreviate or combine names

1a. ORGANIZATION'S NAME: Remington Ranch, LLC

OR

| 1b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX |
|---|---|---|---|
| | | | |

| 1c. MAILING ADDRESS | CITY | STATE | POSTAL CODE | COUNTRY |
|---|---|---|---|---|
| 5 NW Minnesota Ave. Ste. 220 | Bend | OR | 97701 | USA |

| 1d. SEE INSTRUCTIONS | ADD'L INFO RE ORGANIZATION DEBTOR | 1e. TYPE OF ORGANIZATION | 1f. JURISDICTION OF ORGANIZATION | 1g. ORGANIZATIONAL ID #, if any |
|---|---|---|---|---|
| | | LLC | OR | 300269-91 ☐ NONE |

2. ADDITIONAL DEBTOR'S EXACT FULL LEGAL NAME - insert only one debtor name (2a or 2b) - do not abbreviate or combine names

2a. ORGANIZATION'S NAME

OR

| 2b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX |
|---|---|---|---|
| | | | |

| 2c. MAILING ADDRESS | CITY | STATE | POSTAL CODE | COUNTRY |
|---|---|---|---|---|
| | | | | |

| 2d. SEE INSTRUCTIONS | ADD'L INFO RE ORGANIZATION DEBTOR | 2e. TYPE OF ORGANIZATION | 2f. JURISDICTION OF ORGANIZATION | 2g. ORGANIZATIONAL ID #, if any |
|---|---|---|---|---|
| | | | | ☐ NONE |

3. SECURED PARTY'S NAME (or NAME of TOTAL ASSIGNEE of ASSIGNOR S/P) - insert only one secured party name (3a or 3b)

3a. ORGANIZATION'S NAME: Textron Financial Corporation

OR

| 3b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX |
|---|---|---|---|
| | | | |

| 3c. MAILING ADDRESS | CITY | STATE | POSTAL CODE | COUNTRY |
|---|---|---|---|---|
| 11575 Great Oaks Way #210 | Alpharetta | GA | 30022 | USA |

4. This FINANCING STATEMENT covers the following collateral:

All equipment and inventory, financed by Textron Financial Corporation wherever located, in which debtor now or hereafter has rights, none of which the debtor is authorized to sell, lease or otherwise dispose of without the written consent of secured party, all present and future attachments, accessories and accessions to such equipment and inventory, all spare parts, replacements; substitutions and exchanges therefore; all trade-ins relating thereto; all instruments, accounts and chattel paper arising therefrom (including leases and conditional sale contracts); and the proceeds of all of the foregoing, including proceeds in the form of goods, accounts, chattel paper, documents, instruments and/or general intangibles. All cash and non-cash proceeds of any of the foregoing, in whatever form (including proceeds in the form of inventory, equipment or any other form of personal property), including proceeds of proceeds. Notice - pursuant to an agreement between debtor and secured party, debtor has agreed not to further encumber the collateral described herein, the further encumbering of which may constitute the tortuous interference with secured party's rights by such an encumbrance.

5. ALTERNATIVE DESIGNATION [if applicable] ☐ LESSEE/LESSOR ☐ CONSIGNEE/CONSIGNOR ☐ BAILEE/BAILOR ☐ SELLER/BUYER ☐ AG. LIEN ☐ NON-UCC FILING

6. ☐ This FINANCING STATEMENT is to be filed [for record] (or recorded) in the REAL ESTATE RECORDS. Attach Addendum [if applicable]

7. Check to REQUEST SEARCH REPORT(S) on Debtor(s) [ADDITIONAL FEE] [optional] ☐ All Debtors ☐ Debtor 1 ☐ Debtor 2

8. OPTIONAL FILER REFERENCE DATA
13719573

3110022866

LUBA #2008-203

00859

FILING OFFICE COPY - NATIONAL UCC FINANCING STATEMENT (FORM UCC1) (REV. 05/22/02)

Prepared by UCC Direct Services, P.O. Box 29071, Glendale, CA 91209-9071 Tel (800) 331-3282

[redacted]

State of Oregon
Initial Filing 1 Page(s)

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OR Sec. of State

**UCC FINANCING STATE.**
FOLLOW INSTRUCTIONS (front and back) CAREFULLY

A. NAME & PHONE OF CONTACT AT FILER (optional)
KATHY THOMPSON 253-239-5407

B. SEND ACKNOWLEDGMENT TO: (Name and Address)

WESTERN EQUIPMENT DISTRIBUTORS INC
20224 80TH AVE SOUTH
KENT, WA 98032

THE ABOVE SPACE IS FOR FILING OFFICE USE ONLY

1. DEBTOR'S EXACT FULL LEGAL NAME – Insert only one debtor name (1a or 1b) - do not abbreviate or combine names

1a. ORGANIZATION'S NAME: REMINGTON RANCH LLC
OR
1b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX

1c. MAILING ADDRESS: 5 NW MINNESOTA AVE #220 | CITY: BEND | STATE: OR | POSTAL CODE: 97701 | COUNTRY: USA

1d. SEE INSTRUCTIONS [redacted] | ADD'L INFO RE ORGANIZATION DEBTOR | 1e. TYPE OF ORGANIZATION: LLC | 1f. JURISDICTION OF ORGANIZATION: OREGON | 1g. ORGANIZATIONAL ID #, if any: 300269-91 ☐ NONE

2. ADDITIONAL DEBTOR'S EXACT FULL LEGAL NAME - Insert only one debtor name (2a or 2b) - do not abbreviate or combine names

2a. ORGANIZATION'S NAME
OR
2b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX

2c. MAILING ADDRESS | CITY | STATE | POSTAL CODE | COUNTRY

2d. SEE INSTRUCTIONS [redacted] | ADD'L INFO RE ORGANIZATION DEBTOR | 2e. TYPE OF ORGANIZATION | 2f. JURISDICTION OF ORGANIZATION | 2g. ORGANIZATIONAL ID #, if any ☐ NONE

3. SECURED PARTY'S NAME (or NAME of TOTAL ASSIGNEE OF ASSIGNOR S/P) - Insert only one secured party name (3a or 3b)

3a. ORGANIZATION'S NAME: WESTERN EQUIPMENT DISTRIBUTORS INC
OR
3b. INDIVIDUAL'S LAST NAME | FIRST NAME | MIDDLE NAME | SUFFIX

3c. MAILING ADDRESS: 20224 80TH AVE SOUTH | CITY: KENT | STATE: WA | POSTAL CODE: 98032 | COUNTRY: USA

4. This FINANCING STATEMENT covers the following collateral:

(2) TORO SANDPRO 3040 S/N270000618, S/N270000819 - INCLUDING ACCESSORIES
(1) LAWNBOY MODEL #22270 S/N270000081
(8) BROYHILL 1000 LB CAPACITY TRAILER'S W/HOLD-DOWN KITS
(2) GREENSIRON 3000 S/N th0731765-r & S/N th0731764-r
(1) VICON SPREADER WITH MOUNTING KIT (1) QAS SPIKER S/N270000201
(1) VICON SPREADER WITH MOUNTING KIT S/N270000233 & S/N270000234
(2) TORO TOOTH RAKE ATTACHMENT S/N270000191 & S/N270000192
(2) BERNHARD EXPRESS DUAL 3000 S/N17818 & SN18162
(1) DEBRIS BLOWER 600 S/N270000207 (10) GRASS BASKETS (1) VICON PS HOPPER COVER

5. ALTERNATIVE DESIGNATION [if applicable]: ☐ LESSEE/LESSOR ☐ CONSIGNEE/CONSIGNOR ☐ BAILEE/BAILOR ☐ SELLER/BUYER ☐ AG. LIEN ☐ NON-UCC FILING

6. ☐ This FINANCING STATEMENT is to be filed [for record] (or recorded) in the REAL ESTATE RECORDS. Attach Addendum [if applicable]

7. See Instruction Debtor(s)

8. OPTIONAL FILER REFERENCE DATA

401 FILING OFFICE COPY — NATIONAL UCC FINANCING STATEMENT (FORM UCC1) (REV. 8/05)

LUBA #2008-203

00860

Crook County Official Records 2008-226057
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Cnt=1 Stn=6 CCOUNTER $36.00
$20.00 $11.00 $5.00

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I, Deanna Berman, County Clerk for Crook County, Oregon, certify that the instrument identified herein was recorded in the Clerk records.

Deanna E. Berman

# RECORDING COVER SHEET

Any errors in this cover sheet DO NOT affect the transactions(s) contained in the instrument itself.

KEY PUNCHED

JAN 0 3 2008

**AFTER RECORDING RETURN TO:**

Martin E. Hansen
Francis Hansen & Martin
1148 NW Hill St.
Bend, OR 97701

**UNTIL A CHANGE IS REQUESTED, ALL TAX STATEMENTS SHALL BE SENT TO THE FOLLOWING ADDRESS** (only for instruments conveying or contracting to convey fee title to any real estate):

**NAME(S) OF TRANSACTION(S):** AMENDED CLAIM OF CONSTRUCTION LIEN
ORIGINAL DOCUMENT 2007-226001

**GRANTOR (DIRECT) or CLAIMANT (PLAINTIFF) OWNER** HOOKER CREEK COMPANIES, LLC

**GRANTEE (INDIRECT) or DEBTOR (DEFENDANT) SECURITY INTEREST HOLDER** REMINGTON RANCH, LLC

**TRUE AND ACTUAL CONSIDERATION PAID** (only for instruments conveying or contracting to convey fee title to any real estate):

$

**THE AMOUNT OF THE CIVIL PENALTY OR THE AMOUNT, INCLUDING PENALITES, INTEREST AND OTHER CHARGES, FOR WHICH THE WARRANT, ORDER OR JUDGMENT WAS ISSUED** (for instruments to be recorded in Lien Records):

$

LUBA #2008-203

00861

After Recording Return to:
Martin E. Hansen
Francis Hansen & Martin
1148 NW Hill St
Bend, OR 97701

**AMENDED**
**CLAIM OF CONSTRUCTION LIEN**

Hooker Creek Companies, LLC ("Claimant") entered into a contract for the performance of labor, transporting or furnishing materials to be used in or renting equipment used in the construction of an improvement with Remington Ranch, LLC. Claimant claims a lien created under ORS 87.010 on the real property and improvements described in this document (the property) and further claims perfection of such lien under ORS 87.035 by the filing of this Claim of Lien.

1. The description of the property situated in Crook County, Oregon, is as follows:

*See Exhibit A*

2. The property is commonly known as Remington Ranch in Crook County, Oregon.

3. The name of the Owner or Reputed Owner of the property is: Remington Ranch, LLC

4. The name of the person by whom the Claimant was employed or to whom the Claimant furnished labor or materials or rented equipment or to whom contributions are owed is: Remington Ranch, LLC.

5. The person(s) just named, at all times herein mentioned had knowledge of the construction.

6. Claimant commenced performance of the contract on or around April 25, 2007, provided and furnished all labor, materials and equipment required by the contract and actually used in the construction of the improvement, and completed the work on November 27, 2007, after which claimant ceased to provide labor, transport or furnish materials and/or transport, furnish or rent equipment for improvement.

7. The contract was for labor and materials of which a reasonable value of the labor, materials, equipment, and services was charged. Total balance owed to Claimant for work completed is $4,430,405.76.

The breakdown for the total balance includes:

| | |
|---|---|
| Labor | $ 736,363.59 |
| Material | $ 899,055.97 |
| Equipment | $ 1,750,277.29 |
| Services | $ 817,920.30 |
| Finance Charges | $ 226,788.61 |
| **SUBTOTAL** | $ 4,430,405.76 |
| Less Credits and Offsets | $ 0 |
| **TOTAL** | $ 4,430,405.76 |

8. The true statement of the Claimant's demand after deducting all just credits and offsets is the principal amount of: $4,430,405.76
and recording fees of: $ 31.00

9. The Claimant claims a lien on the property described above, extending to the improvement and its site, and together with the land that may be required for the convenient use and occupancy of the improvement as determined by the court at the time of foreclosure of this claim lien of $4,430,436.76.

Francis Hansen & Martin, LLP
1148 N.W. Hill Street • Bend, Oregon 97701-1914
(541) 389-5010

DATED: January 3, 2008

HOOKER CREEK COMPANIES, LLC

By: Howard M Day
Its: Member

STATE OF OREGON )
) ss.
County of Deschutes )

I, Howard M. Day, say as follows: that, subject to the penalties for false swearing provided under ORS 162.075, I am a Member of the claimant in the foregoing instrument; that I have knowledge of the facts therein set forth; that all statements made in said instrument are true and correct as I verily believe.

OFFICIAL SEAL
TAMARA L HARRIS
NOTARY PUBLIC-OREGON
COMMISSION NO. 391076
MY COMMISSION EXPIRES MAR. 27, 2009

SUBSCRIBED and SIGNED to before me this 3 day of January, 2008.

Notary Public for Oregon

Francis Hansen & Martin, LLP
1148 N.W. Hill Street • Bend, Oregon 97701-1914
(541) 389-5010

EXHIBIT A

TRACT I:
Parcels One (1) and Three (3) of Partition Plat No. 1999-31 Recorded December 17, 1999, in Partitions MF No. 152743, Records of Crook County, Oregon, Located in a portion of the NW ¼ and the SW ¼ of Section 4, Government Lot 1, the SE ¼ NE ¼ and the E ½ SE ¼ of Section 5 and the NW ¼ of Section 9, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT II:
Parcel One (1) and Two (2) of Partition Plat No. 2000-22, Recorded June 30, 2000 in Partitions MF No. 156385, Records of Crook County, Oregon, Located in the W ½ W ½ of Section 3, in Section 4, and in the NE ¼ of Section 9, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT III:
Parcel One (1) and Two (2) of Partition Plat No. 2001-21, Recorded June 29, 2001 in Partitions MF No. 163559, Records of Crook County, Oregon, Located in the SW ¼ of Section 4 and in the E ½ SE ¼ of Section 5, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT IV:
Parcels One (1) and Two (2) of Partition Plat No. 2001-23, Recorded June 29, 2001 in Partitions MF No, 163587, Records of Crook County, Oregon, Located in Section 4, Township 13 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT V:
Parcel Three (3) of Partition Plat No. 2001-23, Recorded June 29, 2001 in Partitions MF No. 163587, Records of Crook County, Oregon, Located in the W ½ W ½ of Section 3, in Section 4, in the NE ¼ of Section 9 and. in the SW ¼ NW ¼ of Section 10, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT VI:
Parcel Three (3) of Partition Plat No. 2001-39, Recorded December 11, 2001 in Partitions MF No. 167111, Records of Crook County, Oregon, Located in Section 33 and a portion of Section 34, Township 14 South, Range 14 East of the Willamette Meridian, Crook County, Oregon.

TRACT VII:
In Township 14 South, Range 14 East of the Willamette Meridian: Section 34: The SW ¼ of the NW ¼ of the NW ¼

TRACT VIII:
A portion of Section 3, 4, 9, and 10, Township 15 South, Range 14 East of the Willamette Meridian, Crook County, Oregon, being described as follows: Beginning at the Northwest corner of said Section 4, begin a 2 ½ " brass cap mounted on a 2 ½" x 30" galvanized iron pipe; thence North 89°59'39" East along the North line of said Section 4, a distance of 2652.66 feet to the North one-quarter corner of said section, being a 2 ½" brass cap on a 2 ½" iron pipe; thence South 89°38'49" East along said section line a distance of 2645.22 feet to the Northeast corner of said Section 4, being a 2 ½" brass cap on a 2 ½" iron pipe, thence North 89°59'08" East along the North line of said Section 3, a distance of 1251.42 feet to a 5/8" iron rod on the westerly boundary of the plat of Twin Lakes Ranch according to the official plat thereof on file and of record in the office of the County Clerk for Crook County, Oregon thence leaving said section line along said westerly plat boundary along the following courses, South 14°14' 16" West 4216 feet to a 5/8" iron rod, thence South 37°46' 17" East 784.06 feet to a 5/8" iron rod, thence South 17°33'10" West 156.97 feet to the true point of beginning, as marked by a ½" iron rod, thence continue South 17°33'10" West 629.68 feet to a 5/8" iron rod, thence North 89°57'54" West 600.18 feet to a 5/8" iron rod, thence North 600.00 feet to a ½" iron rod, thence Easterly 790.08 feet to the true point of beginning.

DESCHUTES COUNTY OFFICIAL RECORDS
NANCY BLANKENSHIP, COUNTY CLERK

2008-23635

$21.00

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L-PS Cnt=1 Stn=1 BN
$10.00 $11.00

AFTER RECORDING, RETURN TO:
Joseph A. Tripi, Esq.
Motschenbacher & Blattner
117 SW Taylor Street, Suite 200
Portland, Oregon 97204-3029

## PARTIAL SATISFACTION OF CONSTRUCTION LIEN

KNOW ALL MEN BY THESE PRESENTS, that the undersigned having received the sum of Two Hundred Dollars ($200,000.00) as a partial payment on that certain Construction Lien, ANKROM MOISAN ASSOCIATED ARCHITECTS, Claimant, and Arrowood Development and Arrowood Tetherow LLC., Owners, recorded May 20, 2008, Fee No. 2008-21972. In consideration of the partial payment, and to allow the sale of Tract AA, Lien Claimant agrees to release from its lien, the following described real property **only**:

Tetherow Phase 1, Lot: P/O Development Tract AA Block: Account 260626 Map/TL: R 1-016 181112 00 02100 Bend, Deschutes County, Oregon.

This release, however, does not apply to Tetherow Phase 1, Lot: Development Tract AB Block: Account 260625 Map/TL: R 1-016 181112 00 02000 Bend, Deschutes County, Oregon. The remainder of the property described in the above-referenced Construction Lien shall remain subject thereto as heretofore.

In constructing this Partial Satisfaction of Construction Lien, where the context so requires, the singular includes the plural and all grammatical changes shall be made so that this instrument shall apply equally to corporations and to individuals.

IN WITNESS WHEREOF, the undersigned has executed this instrument; if a limited liability company or corporation, Grantor, it has caused its name to be signed by an officer or other person duly authorized by order of its members, managers or Board of Directors.

Dated this 29th day of May, 2008.

Jeffrey Hamilton, Principal
Authorized Representative for Lien Claimant

Recorded by Western Title as an accommodation only. No liability accepted for condition of title or validity, sufficiency or affect of document.
9012

STATE OF OREGON )
) ss.
County of Multnomah )

This instrument was acknowledged before me this 29th day of May, 2008 by Jeffrey Hamilton, a principal of Ankrom Moisan Associated Architects, Inc., an Oregon corporation, on behalf of the corporation.

Notary for the State of Oregon
My Commission Expires: June 13, 2010

OFFICIAL SEAL
RYAN BRESLIN
NOTARY PUBLIC-OREGON
COMMISSION NO. 407157
MY COMMISSION EXPIRES JUNE 13, 2010

DESCHUTES COUNTY OFFICIAL RECORDS
NANCY BLANKENSHIP, COUNTY CLERK

2008-21972

$46.00

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L-L Cnt=1 Stn=1 BN
$35.00 $11.00

After Recording Return to:
Joseph A. Tripi
Motschenbacher & Blattner LLP
117 SW Taylor, Suite 200
Portland, OR 97204

**Lien Creditor:** Ankrom Moisan Associated Architects

**Lien Debtor(s):** **Arrowood Development, LLC; Arrowood Tetherow, LLC.**

**Owner(s):** **Arrowood Tetherow, LLC; Arrowood Development, LLC**

**Lien Amount:** $457,735.91, together with interest at the Contract rate plus $41.00 recording fees

## CLAIM OF CONSTRUCTION LIEN

**1. Description of the Property**

KNOW ALL MEN BY THESE PRESENTS: The undersigned, hereinafter called the claimant, prepared plans, specifications, and/or drawings that are intended to be used in or facilitate the construction of an improvement and/or supervised construction under a contract between claimant and **Arrowood Development, LLC** and **Arrowood Tetherow, LLC**, who were the owners or the original contractor having charge of the construction of the improvement upon real property commonly known as the Tetherow Development Phase I located at Tracts AA and AB in Deschutes County, Oregon. Said real property and improvement are situated upon certain land in the County of Deschutes, State of Oregon, and is more fully described as follows:

See Exhibits A and B.

**2. Address of the Property**

Tetherow Phase 1, Lot: PT Development Tract AA Block: Account 260626 Map/TL: R 1-016 181112 00 02100 Bend, Deschutes County, Oregon.

Tetherow Phase 1, Lot: Development Tract AB Block: Account 260625 Map/TL: R 1-016 181112 00 02000 Bend, Deschutes County, Oregon.

THIS DOCUMENT FILED FOR RECORD BY DESCHUTES COUNTY TITLE COMPANY AS AN ACCOMMODATION ONLY. IT HAS NOT BEEN EXAMINED AS TO ITS EXECUTION OR AS TO ITS EFFECT UPON THE TITLE.

3. **Names of Owners or Reputed Owners**

The names of the owner(s) or reputed owner(s) of said parcels/lots and improvements is are **Arrowood Development, LLC** and **Arrowood Tetherow, LLC**, who at all times herein mentioned had knowledge of the construction of the improvement.

4. **Persons by Whom Claimant was Employed**

The name(s) of the person(s) who employed claimant to furnish the labor, materials, services and/or equipment at issue, and to perform said contract are Arrowood Development, LLC and Arrowood Tetherow, LLC.

5. **True Statement of Demand Less Just Credits and Offsets**

The following is a true statement of claimant's demand after deducting all just credits and offsets, to-wit:

The reasonable value and contract amount of claimant's labor, services, materials and equipment is:

| | |
|---|---|
| Contract price for performed work | $2,627,690.00 |
| Amount billed | $1,077,255.74 |
| Less all just credits and offsets | $ 619,519.83 |
| Contract balance due claimant | $ 457,735.91* |
| Recording fees | $ 41.00 |

*Plus interest at 9% per annum.

***See Exhibit C***

6. **Perfection of Lien**

Claimant claims a perfected lien for the amount last stated, $457,735.91 plus interest and $ 41.00 in recording fees upon the property described above extending to the improvement and its site and together with the land that may be required for the convenient use and occupation of the improvement, to be determined by the court at the time of the foreclosure of this lien.

7. **Miscellaneous**

**a)** In construing this instrument, the masculine pronoun means and includes the feminine and the neuter and the singular includes the plural, as the circumstances may require.

**b)** The paragraph captions are of convenience only and shall not be deemed to limit the terms or provisions of this claim of lien.

DATED this 19 day of May, 2008.

ANKROM MOISAN ASSOCIATED ARCHITECTS

By: _____
Jeff Hamilton, AIA
Authorized Representative.

STATE OF OREGON )
) ss.
County of Multnomah )

I, JEFF HAMILTON, first duly sworn, depose and say: that, subject to the penalties for false swearing provided under ORS 162.075, I am an authorized representative for claimant in the foregoing instrument; that I have knowledge of the facts therein set forth; that all statements made in said instrument are true and correct as I verily believe.

_____
Jeff Hamilton
Authorized Representative.

SUBSCRIBED AND SWORN to before me this 19 day of May, 2008.

_____
Notary Public for Oregon
My commission expires: 6-09-2011

OFFICIAL SEAL
RUTH LLOYD
NOTARY PUBLIC-OREGON
COMMISSION NO. 417909
MY COMMISSION EXPIRES JUNE 9, 2011

## EXHIBIT A

All that portion of Tetherow Phase 1, in Sections 11 and 12, Township 18 South, Range 11 East, Willamette Meridian, in Deschutes County, Oregon, as per the plat thereof recorded in Volume 2007, page 51564, Official Records, Deschutes County, Oregon, more particularly described as follows:

Development Tract 'AA', Common Area Tracts 'DB', and 'L', and all that portion of Meeks Trail (private road) lying southerly of the following described line,

Commencing at the southwest corner of Development Tract 'AJ' of said Tetherow Phase 1:

Thence North 0°41'57" East 29.47 feet to the southerly line of said Meeks Trail;

Thence easterly along said southerly line, and the arc of a 360.00 foot radius curve to the left, through a central angle of 13°44'07", an arc length of 86.30 feet, the chord of which bears North 68°47'53" East 86.10 feet;

Thence continuing along said southerly line of Meeks Trail North 61°55'49" East 119.10 feet to the true point of beginning;

Thence North 40°11'40" West 61.37 feet

**EXHIBIT B**

All that portion of land located in Section 12, Township 18 South, Range 11 East, Willamette Meridian, in Deschutes County, Oregon, more particularly described as follows:

Development Tracts 'AB'of Tetherow Phase 1, as per the plat thereof recorded in Volume 2007, Page 51564, Official Records, Deschutes County, oregon.

## EXHIBIT C

| Description | Approved Budget | Amount Billed | Amount Paid | Balance Due | TRACTS |
|---|---|---|---|---|---|
| Cascade Highland | | 24,223.02 | (24,223.02) | - | |
| Tetherow Resort | | 330,889.23 | (330,889.23) | - | |
| Bridge | | 10,400.00 | (10,400.00) | - | |
| Lodge & Pool House | 1,255,446.25 | 222,032.09 | (137,499.05) | 84,533.04 | AA/AB |
| Spa | 735,043.75 | 99,625.17 | (27,022.04) | 72,603.13 | AA |
| Master Plan Ph 2 | | 24,332.04 | | 24,332.04 | AA/AB |
| Recreation & Fitness Center | | 21,039.17 | | 21,039.17 | AA/AB |
| Hotel Interiors | 284,000.00 | 66,698.70 | (66,698.70) | - | |
| Hotel FF&E | | 4,945.00 | (4,945.00) | - | |
| Lodge & Pool House Interiors | | 31,848.95 | (17,842.79) | 14,006.16 | AA/AB |
| Spa Interiors | 180,000.00 | 78,955.38 | | 78,955.38 | AA |
| Spa FF&E | | 1,100.00 | | 1,100.00 | AA |
| Lodge & Pool House FF&E | | 2,875.22 | | 2,875.22 | AA/AB |
| Lodge Homes | 173,200.00 | 149,505.77 | | 149,505.77 | AB |
| Lodge Homes XS | | 8,786.00 | | 8,786.00 | AB |
| | 2,627,690.00 | 1,077,255.74 | (619,519.83) | 457,735.91 | |

30
21

DESCHUTES COUNTY OFFICIAL RECORDS
NANCY BLANKENSHIP, COUNTY CLERK
2008-13410
$21.00
00805686200800134100020022
03/26/2008 11:30:33 AM
L-PS Cnt=1 Stn=1 BN
$10.00 $11.00

After Recording Return to:
Mitchell Law Office, LLC
PO Box 14247
Portland, OR 97293
File: ILBINC001

2

**Lien Claimant:** International Line Builders, Inc.
**Lien Debtor:** Arrowood Development, LLC
**Owner(s) or Reputed Owner(s):** Arrowood Development, LLC; TD Cascade Highlands, LLC; Proterra-Bend I, LLC

**RELEASE OF CONSTRUCTION LIEN –**
**PARTIAL FOR GOLF COURSE PROPERTY ONLY**

KNOW ALL MEN BY THESE PRESENTS, that International Line Builders, Inc. does hereby waive, release and discharge only the property described on Exhibit "A" attached hereto, from that certain Claim of Construction Lien filed against the real property therein-described, in which the above parties are named as the owners or reputed owners of the property and International Line Builders, Inc. as the Lien Claimant, recorded in Deschutes County on March 12, 2008 as **Document Number 2008-11174** of said records. In all other aspects including attachment of the Claim of Construction Lien to the remaining property described therein, the debts owing to International Line Builders, Inc. and the remaining security interest claimed by the Claim of Construction Lien shall remain in full force and effect as though this release had not been executed. IN WITNESS WHEREOF, the undersigned corporation has caused its name to be signed and seal affixed by its officers, duly authorized thereunto by order of its Board of Directors.

International Line Builders, Inc.
By: _____
Marla Jordan, As its Vice President

STATE OF OREGON )
) ss.
County of Washington )

Signed and sworn to before me on this 21st day of March, 2008 by Marla Jordan, as Vice President of International Line Builders, Inc.

_____
Notary Public / State of Oregon

OFFICIAL SEAL
WANDA J. TAYLOR
NOTARY PUBLIC - OREGON
COMMISSION NO. 382476
MY COMMISSION EXPIRES AUG. 17, 2008

RECORDED BY
WESTERN TITLE & ESCROW CO.
5708

LUBA #2008-203
00874

DESCHUTES COUNTY OFFICIAL RECORDS
NANCY BLANKENSHIP, COUNTY CLERK 2008-11174

$31.00

00603280200800111740040045

03/12/2008 04:04:40 PM

L-L Cnt=1 Stn=7 TM
$20.00 $11.00

31

*After Recording Return to:*
Mitchell Law Office
PO Box 14247
Portland, OR 97293
File No. ILBINC001

4

**Lien Claimant:** International Line Builders, Inc.
**Lien Debtor:** Arrowood Development, LLC
**Owner(s) or Reputed Owner(s):** Arrowood Development, LLC; TD Cascade Highlands, LLC; Proterra-Bend I, LLC
**Lien Amount:** $145,213.27, together with interest at 9% per annum on the principal sum of $145,182.27 from the date of accrual until paid.

## CLAIM OF CONSTRUCTION LIEN

**1. Description Of The Property**

KNOW ALL MEN BY THESE PRESENTS: The undersigned, hereinafter called the claimant, transported or furnished labor and/or materials under a contract between claimant and Arrowood Development, LLC, who was the owner or original contractor or construction agent or other person having charge of the construction of that commercial improvement known as the relocation of overhead 115kV transmission lines to underground situated upon certain land in the County of Deschutes, Oregon, which is the site of said improvement, described as follows:

Parcel 1, Partition Plat 2006-23, Deschutes County, Oregon; and
Parcel 2, Partition Plat 2006-23, Deschutes County, Oregon,

and further described as Tax Lots 100 and 120, Township 18 South, Range 11 East of the Willamette Meridian.

**2. Address, If Known**

The address of said land is 19200 Century Drive and/or no site address Century Drive, Bend, Oregon, in said county and state and is otherwise unknown.

**3. Names Of Owners Or Reputed Owners**

The names of the owners or reputed owners of said land and improvement are Arrowood Development, LLC and/or TD Cascade Highlands, LLC and/or Proterra-Bend I, LLC, who at all times herein mentioned had knowledge of the construction of said improvement.



RECORDED BY FIRST AMERICAN TITLE INSURANCE COMPANY OF OREGON AS AN ACCOMODATION ONLY. NO LIABILITY IS ACCEPTED FOR THE CONDITION OF TITLE OR FOR THE VALITITY, SUFFICIENCY, OR EFFECT OF THIS DOCUMENT.

LUBA #2008-203

00875

**4. Person By Whom Claimant Was Employed**

The name of the person who employed claimant to provide said labor and materials and to perform said contract is Arrowood Development, LLC

**5. Performance Of Work**

Claimant commenced its performance on or about June 18, 2007 and completed its performance on January 2, 2008, and transported and/or furnished all labor, materials, services and equipment required by said contract and actually used in the construction of said improvement, after which it ceased to provide labor and/or materials.

**6. True Statement Of Demand Less Just Credits And Offsets**

As set forth on Exhibit "A" attached hereto and incorporated herein, the following is a true statement of claimant's demand after deducting all just credits and offsets, to-wit:

The reasonable value and contract amount of claimant's labor and materials are:

| | |
|---|---|
| Labor | $122,399.70 |
| Bond | $ 3,440.00 |
| Materials | $ 19,342.57 |
| Recording fees | $ 31.00 |
| Total | $145,213.27 |
| Less all just credits and offsets | $ 0.00 |
| Balance due claimant | $145,213.27* |

*Together with interest at 9% per annum on the principal sum of $145,182.27 from the date of accrual until paid.

**7. Perfection Of Lien**

Claimant claims a perfected lien for the amount last stated, $145,213.27*, upon the said improvement and upon the site, to-wit: the land upon which said improvement is constructed, together with the land that may be required for the convenient use and occupation of the improvement constructed on said site, to be determined by the court at the time of the foreclosure of this lien.

**8. Miscellaneous**

**a)** In construing this instrument, the masculine pronoun means and includes the feminine and the neuter and the singular includes the plural, as the circumstances may require.

//

//

b) The paragraph captions are for convenience only and shall not be deemed to limit the terms or provisions of this claim of lien.

DATED this 10 day of March, 2008.

**INTERNATIONAL LINE BUILDERS, INC.**

By: Gary A. Martin
Gary Martin, As its Project Manager

STATE OF OREGON )
) ss.
County of Washington )

I, Gary Martin, say as follows: that, subject to the penalties for false swearing provided under law, I am the Project Manager of International Line Builders, Inc., the claimant in the foregoing instrument; that I have knowledge of the facts therein set forth; that all statements made in said instrument are true and correct as I verily believe.

Gary A Martin
Gary Martin

Signed and sworn to before me this 10th day of March, 2008 by Gary Martin.

OFFICIAL SEAL
GELENE A HUTCHENS
NOTARY PUBLIC – OREGON
COMMISSION NO. 397838
MY COMMISSION EXPIRES OCTOBER 22, 2009

Gelene A Hutchens
Notary Public - State of Oregon

NOTICE TO THE OWNER(s) and to Mortgagee(s) pursuant to ORS 87.039 of the land described in the foregoing copy of Claim of Construction Lien.

Please be advised that the original Claim of Construction Lien of which the foregoing is a true copy was filed and recorded in the office of the recording officer of Deschutes County, Oregon, on March ____, 2008.

By: _____
As its Attorney

| BILLINGS | | |
|---|---|---|
| Invoice # | Invoice Date | Amount |
| 40163 | 8/23/2007 | $ 43,192.69 |
| 40215 | 9/26/2007 | $ 676,057.56 |
| 40261 | 10/25/2007 | $ 270,057.04 |
| 40317 | 11/28/2007 | $ 211,703.55 |
| 40386 | 12/26/2007 | $ 54,657.22 |
| TOTAL | | $ 1,255,668.06 |

| PAYMENTS | | |
|---|---|---|
| Check # | Check Date | Amount |
| 1156 | 10/31/2007 | $ 166,068.83 |
| 1160 | 11/15/2007 | $ 156,615.92 |
| 1163 | 11/28/2007 | $ 208,119.95 |
| 70148 | 11/29/2007 | $ 328,490.27 |
| 1194 | 1/10/2008 | $ 251,190.82 |
| TOTAL | | $ 1,110,485.79 |

| NET BALANCE | | $ 145,182.27 |
|---|---|---|

| | |
|---|---|
| Labor | $ 122,399.70 |
| Bond | $ 3,440.00 |
| Materials | $ 19,342.57 |
| **Total** | **$ 145,182.27** |

**EXHIBIT "A"**
**Page 1 of 1**

FORM No. 1161 – CONSTRUCTION LIEN – Original Contractor Only. © 1999-1998 STEVENS-NESS LAW PUBLISHING CO., PORTLAND, OR www.stevensness.com

EA NO PART OF ANY STEVENS-NESS FORM MAY BE REPRODUCED IN ANY FORM OR BY ANY ELECTRONIC OR MECHANICAL MEANS.

# CLAIM OF CONSTRUCTION LIEN
## ORIGINAL CONTRACTOR

Winter Creek Restoration
63405 Deschutes Market Rd.
Bend, Oregon 97701
Lien Claimant's Name and Address

Tetherow Investments, LLC
1201 NW Wall St. Ste. 300
Bend, Oregon 97701
Owner's Name and Address

After recording, return to (Name, Address, Zip):
T. Spear
Sheashy & Spear LLP
PO Box 1274
Bend, OR 97709-1274

DESCHUTES COUNTY OFFICIAL RECORDS
NANCY BLANKENSHIP, COUNTY CLERK
2007-66051

$21.00

00590466200700660510020021

12/28/2007 11:01:13 AM

L-L Cnt=1 Stn=23 PG
$10.00 $11.00

SPACE RESERVED FOR RECORDER'S USE

and/or as fee/file/instrument/microfilm/reception No. _____, Records of said County.

Witness my hand and seal of County affixed.

NAME TITLE

By _____, Deputy.

KNOW ALL BY THESE PRESENTS that Winter Creek Restoration, hereinafter called claimant, did on May 1, 2007, enter into a contract for the performance of labor, transporting or furnishing materials to be used in or renting equipment used in the construction of an improvement known as wetlands landscaping, and property improvements including installing trees and shrubs to commercial + residential property. The improvement is situated upon certain land in the County of Deschutes, State of Oregon, which is the site of the improvement, described as follows: Tetherow Development between Skyliner Rd. and Century Dr. East of the Deschutes National Forrest, and West of the Broken Top Development. The Tetherow Development is a sub division containing ≈ 376 residential lots, a luxury hotel, a spa, a wellness center, and a golf course.

(IF SPACE INSUFFICIENT, CONTINUE DESCRIPTION ON REVERSE)

The address of the improvement is (if unknown, so state) 19200 Century Dr. Bend, OR 97701

The name of the owner or reputed owner of the land is Tetherow Investments LLC

The name of the owner or reputed owner of the improvement is Tetherow Investments LLC

The name of the person who employed claimant to furnish the labor, materials, and/or equipment, and to perform the contract is Chris Condon

The person(s) just named, at all times herein mentioned, had knowledge of the construction.

Claimant commenced performance of the contract on May 1, 2007, provided and furnished all labor, materials and equipment required by the contract and actually used in the construction of the improvement, and fully completed the contract on November 9, 2007, after which claimant ceased to provide labor, transport or furnish materials and/or transport, furnish or rent equipment for the improvement.

The following is a true statement of claimant's demand after deducting all just credits and offsets, to-wit:

| | |
|---|---|
| Contract price | $ 126,334.31 |
| This price includes materials and supplies in the amount of | $ 24,987.50 |
| and the reasonable ~~rental~~ value of ~~equipment~~ labor which is | $ 101,346.81 |

If no contract price, the reasonable value of claimant's labor, materials and equipment is:

| | |
|---|---|
| Labor | $ |
| Materials | $ |
| Equipment | $ |
| Other (specify) | $ |
| Recording fees | $ 21.00 |
| Total | $ 126,355.31 |
| Less all just credits and offsets | ($ ) |
| Balance due claimant | $ 126,355.31 |

Note: If claimant is other than original, use S-N Form No. 1162, or the equivalent.
For the time and place of recording to make this lien a valid claim, see quotation from ORS 87.035 on next page.

LUBA #2008-203

Claimant claims a lien for the amount last stated upon the improvement and upon the site, to-wit: the land upon which the improvement is constructed, together with the land that may be required for the convenient use and occupation of the improvement constructed on the site, to be determined by the court at the time of the foreclosure of this lien.*

In construing this instrument, the singular pronoun includes the plural, as the circumstances require.

Dated 12-28-07 Kevin Carolan for TJ Spear

for Winter Creek Restoration Claimant

STATE OF OREGON, County of Deschutes )ss.

I, Kevin Carolan, being first duly sworn, depose and say that: I am the attorney for TJ Spear, TJ Spear is the attorney for Winter Creek Restoration, claimant named in the foregoing instrument. I have knowledge of the facts set forth therein. All statements made in this instrument are true and correct as I verily believe.

(Kevin Carolan #05475)

OFFICIAL SEAL
DEBRA J GALLINO
NOTARY PUBLIC-OREGON
COMMISSION NO. 409342
MY COMMISSION EXPIRES SEPT. 23, 2010

SIGNED AND SWORN TO before me on December 28, 2008

Notary Public for Oregon

My commission expires Sept. 23, 2010

ORS 87.005. "'Original Contractor' means a contractor who has a contractual relationship with the owner."

The foregoing lien is created by subsection 1 of ORS 87.010. ORS 87.035 provides: "Every person claiming a lien created under ORS 87.010 (1) or (2) shall perfect the lien not later than 75 days after the person has ceased to provide labor, rent equipment or furnish materials or 75 days after completion of construction, whichever is earlier. Every other person claiming a lien under ORS 87.010 shall perfect the lien not later than 75 days after the completion of construction.***" ORS 87.035 also provides that the lien claim "shall be perfected by filing a claim of lien with the recording officer of the county or counties in which the improvement, or some part thereof, is situated."

---

NOTICE TO THE OWNER of the land described in the foregoing copy of claim of lien:

Please be advised that the original claim of lien, of which the foregoing is a true copy, was filed and recorded in the office of the recording officer of _____ County, Oregon, on _____.

_____
Claimant

By _____

*See ORS 87.021 to determine whether a Notice of Lien need be furnished in accordance with the terms of that statute.

ORS 87.039 provides:

"A person filing a claim of lien pursuant to ORS 87.035 shall mail to the owner and to the mortgagee a notice in writing that the claim has been filed. A copy of the claim of lien shall be attached to the notice. The notice shall be mailed not later than 20 days after the date of filing.***"

(DESCRIPTION CONTINUED)

# Native Restoration Fund

*A mission of Vulcan Power Company*

July 29, 2008

Ruth Herzer, Associate Planner
Deschutes County CDD
117 NW Lafayette Ave.
Bend, OR 97701-1925

Re: Thornburgh Final Master Plan M-07-2; MA-08-6

Enclosed are the following documents for submission as additional testimony to the Thornburgh Final Master Plan M-07-2; MA-08-6.

1. **Additional Comments by Sandy Lonsdale (3 pages text)** with both large and small print versions of maps labeled Exhibit A through E.

2. **Mark Yinger Associates Rebuttal and comment. (12 pages text)**

3. **Steve Munson's Comments (7 pages) with the following exhibits:**

A. Upper Deschutes Resource Management Plan – Management Direction
-Ecosystem Health and Diversity -Wildlife
B. Assessing the Cumulative Effects of Linear Recreation Routes on Wildlife Habitats on the Okanogan and Wenatchee National Forests
C. Dept of the Interior Fish and Wildlife Service-50CFR Part 17 Endangered and Threatened Wildlife Plants; Designation of Critical Habitat for the Bull Trout; Final Rule
D. On The Prowl-Wisconsin Natural Resources Magazine -Dec 1996
E. Washington Fish and Wildlife-Burrowing Owl
F. Article-Oregon Natural Desert Assoc.- Pygmy rabbits win in court! Judge orders further consideration under Endangered Species Act- Oct 02, 2007

RECEIVED
BY:
JUL 29 2008
DELIVERED BY:

LUBA ~~#2008-203~~

RECEIVED
BY: _____
JUL 2 9 2008
DELIVERED BY:
_____

July 28, 2008
Ruth Herzer, Associate Planner
Deschutes County CDD
117 NW Lafayette Ave.
Bend, OR 97701-1925

RE: File # M-07-2; MA-08-6

## Additional Comments on the Thornburgh Resort Final Master Plan

By Sandy Lonsdale, concerned local resident and chair of the Native Restoration Fund. 345 SW Cyber Drive, Suite 103, Bend, OR 97702. Residence address: 64925 McGrath Road, Bend, OR 97701 slonsdale@copper.net

Dear hearings officer,

In my earlier comments I referred to comments made by Water Watch of Oregon regarding the adequacy of Thornburgh's water mitigation plan to mitigate the effects of pumping groundwater at the resort site to supply all the water needed by the resort, or roughly 1 million gallons of groundwater per day.

Water Watch has since had an op/ed published in the Bend Bulletin dated 6/2/08 where they describe how the Deschutes Basin Groundwater Mitigation Plan is not a plan that results in water returning to surface flows in amounts that satisfy current deficiencies in lower Deschutes River flows at critical times of the year for fish spawning and rearing. The lower Deschutes is already deficient in flows during late fall and early spring when protected fish (salmon and steelhead) need critical flows to reproduce.

Why this is important to clarify for the record is that Thornburgh states in their mitigation plan that reduced flows in the lower river are insignificant because the lower river, outside normal irrigation season, has plenty of water to satisfy fish needs. This is simply not true, the flows in the lower river are already deficient and Thornburgh will reduce these flows further below their mandated minimum flows. Thornburgh must have no impacts to any flows in the Deschutes at any time of the year in order to meet the Deschutes County requirement of no net loss to area resources.

This op/ed is available to me only in paper form so I request that when the copy of this letter arrives at your office it be added to the record.

Also in my earlier comments I referred to a letter that I attached to my comments from the Prineville BLM regarding Thornburgh's mitigation requirements. The BLM's reference number for this document is 2803 (OR056), it appears in the Tetra Tech Wildlife Impacts Mitigation Plan.

What I failed to note in my comments, and what does not appear in the Tetra Tech report is the date stamped on the BLM's letter, the date that BLM sent the letter. The date stamped on the BLM letter is April 21, 2008. Why I bring this up for clarification to my

comments is that in the BLM letter they state that the Cline Buttes Rec Area Plan (CBRA) is "expected to be finalized in approximately 2 months", which would be approximately June 21, 2008. In speaking with the BLM's Rec Planner Greg Currie on July 18, 2008 he stated to me that the CBRA may finally be complete "in a month and a half to two months". This makes the new date for completion of the CBRA plan approximately mid-September. How can we be assured now that Thornburgh can and will mitigate their impacts to area fish and wildlife with the BLM's blessing if the plans are not yet final and the BLM has not seen a final mitigation plan from Thornburgh?

Why this is important to note in the context of Thornburgh's wildlife impacts mitigation plan is that it is not at all sure that Thornburgh will be able to meet these requirements given the delays and difficulties that BLM experiences in preparing these sorts of plans. The BLM states that Thornburgh's actions must be consistent with the Upper Deschutes Resource Management Plan (UDRMP) but in fact Thornburgh proposes significant changes to the environment around Cline Buttes if their FMP is approved, therefore significantly straying from the resolutions contained in the UDRMP. Also, the BLM states that they have "reviewed several drafts of the mitigation plan" not the plan submitted by Thornburgh in the FMP.

These seem to be significant hurdles that Thornburgh has not addressed and that the BLM has not addressed adequately. More clarification is needed before the FMP is approved.

A third point I made in my comments regarding Golden Eagles and their protection status was challenged by the witness for Tetra Tech in their rebuttal to the July 15, 2008 hearing. While I admit that the golden eagle is not a federally listed T&E species, it is a federal species of concern, it is a Keystone Species and as such it is due certain protections under the federal ESA. The definition of keystone species as provided by the conservation organization Forest Guardians is attached to these comments.

Additionally, the Tetra Tech wildlife report makes no mention of golden eagles nesting or foraging on or near the proposed Thornburgh Resort when in fact goldens do nest and forage on and near the proposed resort. We have identified these sites on a map labeled Exhibit E, and I hereby reference that map to show these sites. Thornburgh should mitigate their impacts to Golden Eagle just as Eagle Crest had to mitigate its impacts when their resort was approved.

At the hearing on July 15, Rex Barber criticized Mark Yinger for allegedly misrepresenting or challenging the validity of his Big Falls Ranch water rights. His criticisms are unfounded and are, in fact, misrepresentations themselves.

Mr. Yinger at page 2 of his letter of June 13 merely stated that "[n]o evidence is given that the 464.9 acres of Big Falls Ranch irrigation water rights on Deep Canyon Creek are valid water rights." He pointed out that no proof is given that all of the 464.9 acres have been irrigated within the past five years and he identified an aerial photo showing that some of the acreage was not irrigated on the date of the photo. He further pointed out that no data or evidence is given to substantiate flow volume of Deep Canyon Creek.

At page 3 of his letter, Mr. Yinger further stated that no evidence had been presented to justify the claim that there would be 5.5 cfs of flow in Deep Canyon Creek during the irrigation season. Mr. Yinger also asked for evidence of the water temperature of the Creek.

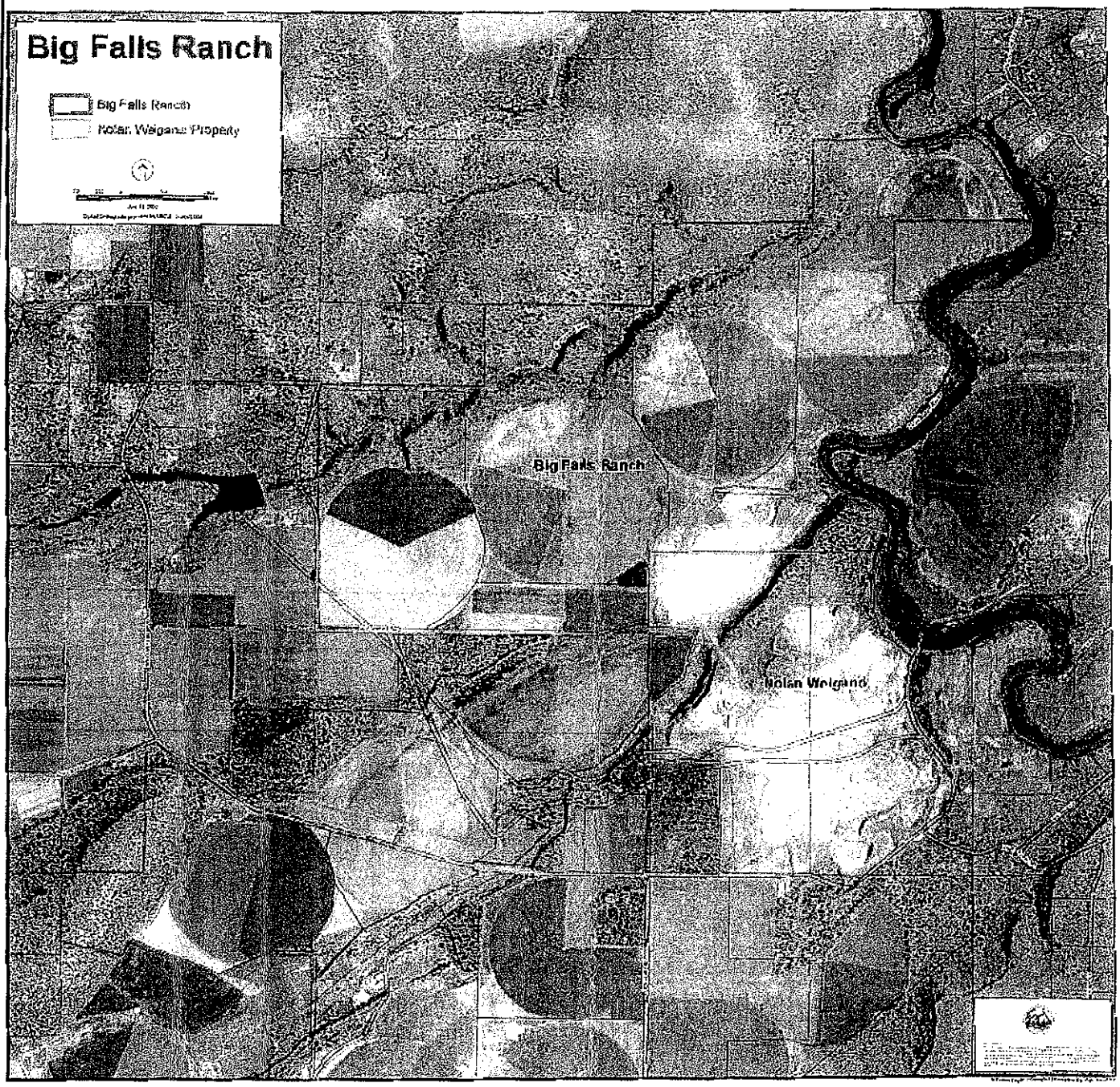
Rather than respond to these points with the evidence that Mr. Yinger was requesting, Mr. Barber accused Mr. Yinger of misrepresenting his water rights. Mr. Barber's expression of indignation cannot substitute for the responsibility of the applicant here to provide evidence of what it asserts.

Mr. Barber's further criticism of Mr. Yinger for referring to "Nolan Weigand" as if that was a first and last name is similarly misplaced. Mr. Yinger did not say those were first and last names but was merely referring to the two names shown on the County GIS map. Those are apparently last names of two of the owners of the property.

We have done some investigation into the Barber water, the Big Falls Ranch water, proposed as mitigation for Thornburgh's water impacts to the middle and lower Deschutes River and Whychus Creek. In Thornburgh's FMP application they state that the 5.5 cfs groundwater right that Barber proposes to transfer to Thornburgh to mitigate the cold water flows reduced by the groundwater pumping of the resort's new wells is fully proven and is available as mitigation water. Those statements are not supported with evidence to the record.

Attached to these comments are the supporting documents proving that the Deep Canyon Creek water (5.5cfs) is phantom water, not fully proven, and not available for use as mitigation for Thornburgh. Other comments will reference these documents as well; I only reference them and attach them here to be sure that they are entered into the record. We are submitting large maps in paper form so that it is easy for a reviewer to locate details on the maps, and we are also submitting smaller versions (8 1/2x11 inches) so that when the record advances these maps will still be in the record.

# Exhibit A

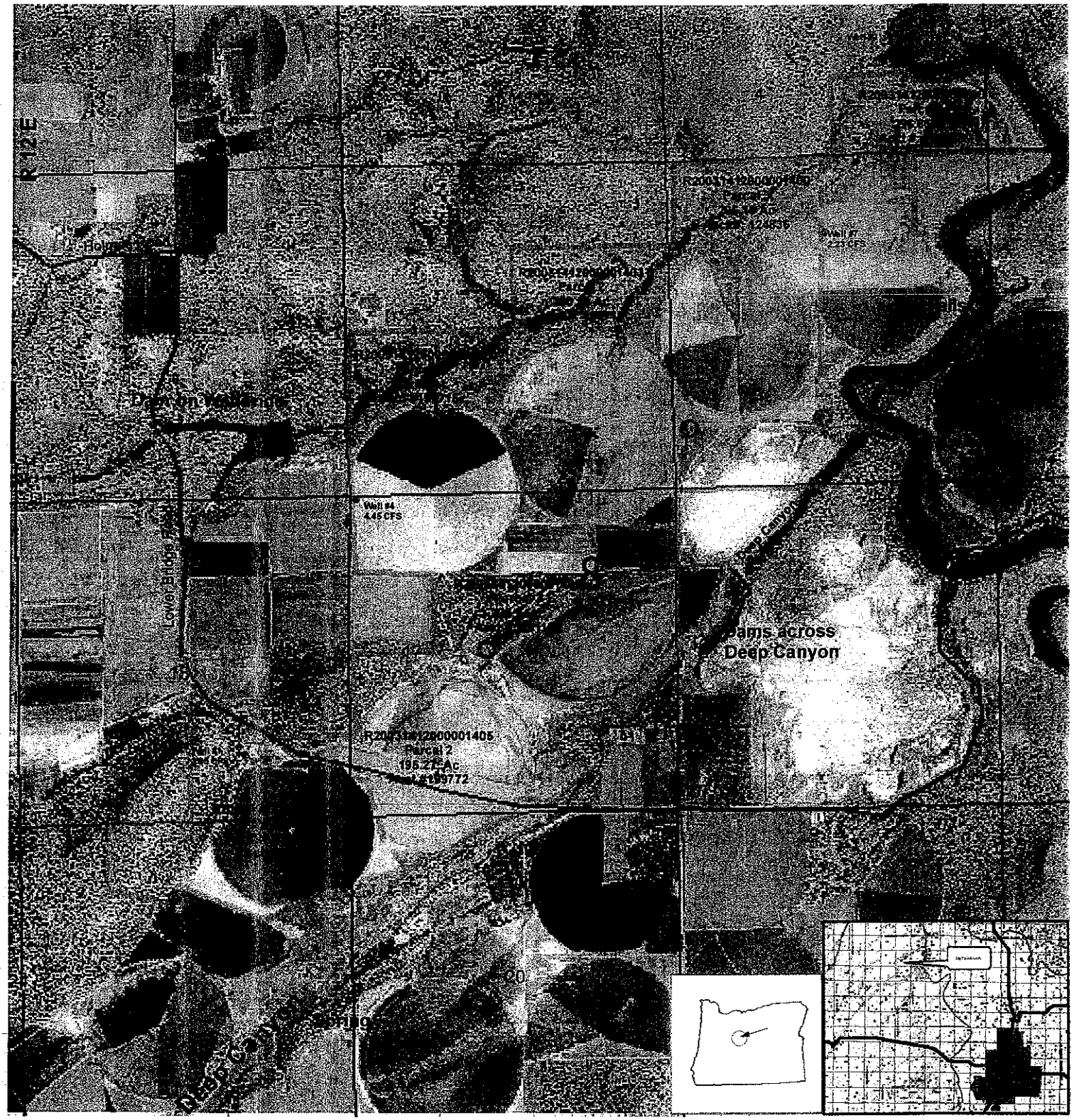

Big Falls Ranch
Big Falls Ranch
Nolan Welgand Property
Big Falls Ranch
Nolan Welgand

# Exhibit B

## Big Falls Ranch Co

T 14 S/ R 12 E

7/18/08




Wells Locations (Source: Anderson Engineering & Surveying )

Approx. Pond Locations (per Oregon Water Resources Web Mapping Application)

Spring (Per USGS 24K Topo Map)

Dams

Big Falls Ranch (Per Deschutes County GIS Dept)

Interior Parcel Boundaries ( Per Deschutes County Platt Map)

*Digital Orthophoto provided by USGS June 2005*

VULCAN POWER COMPANY

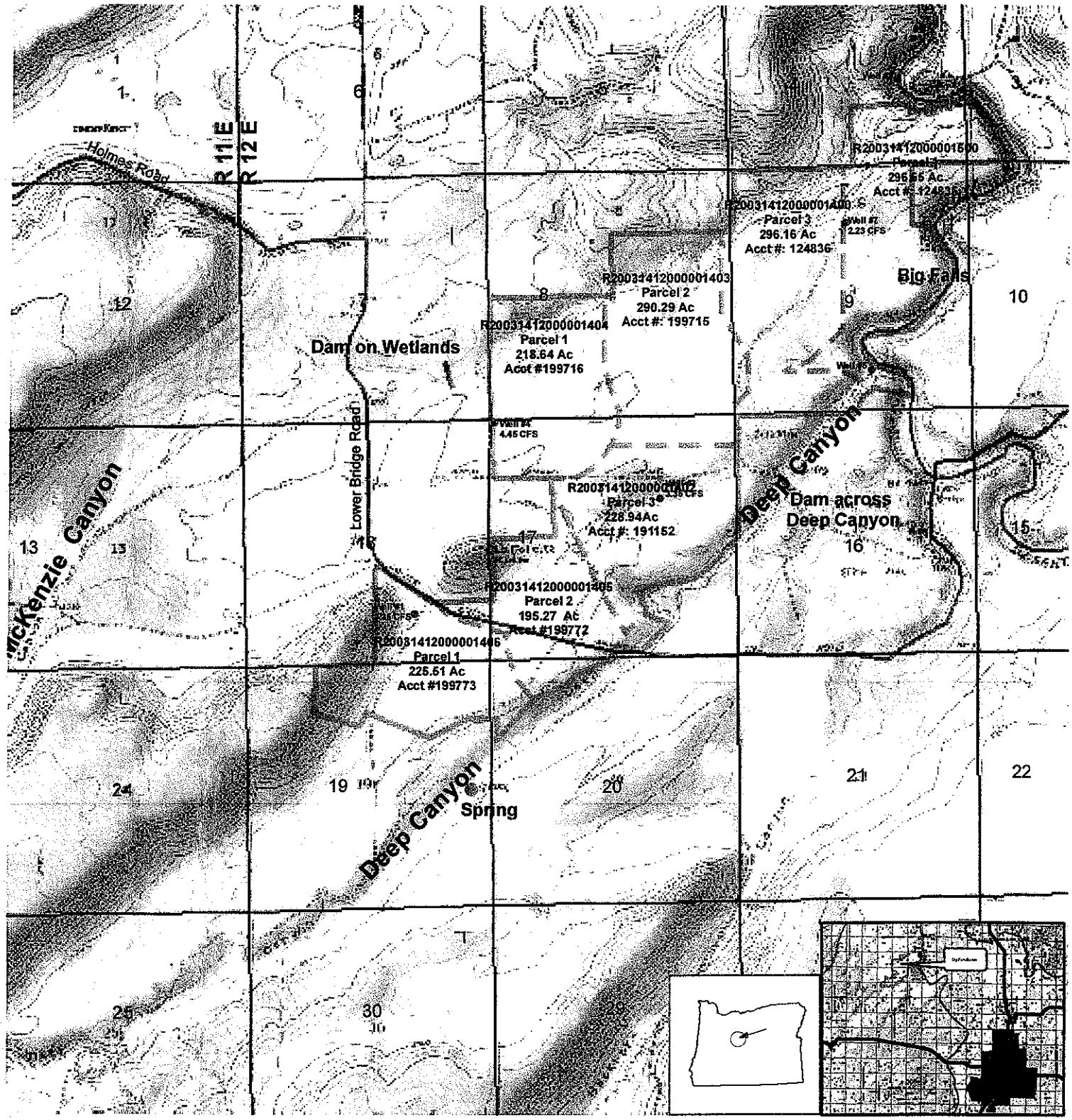
N

0 0.5 1 Miles

LUBA #2008-203

# Exhibit C
## Big Falls Ranch Co
T 14 S/ R 12 E

7/18/08




- Wells Locations (Source: Anderson Engineering & Surveying )
- Spring (Per USGS 24K Topo Map)
- Dams
- Big Falls Ranch (Per Deschutes County GIS Dept)
- Interior Parcel Boundaries ( Per Deschutes County Platt Map)

*Digital Orthophoto provided by USGS June 2005*

0 0.5 1 Miles

N

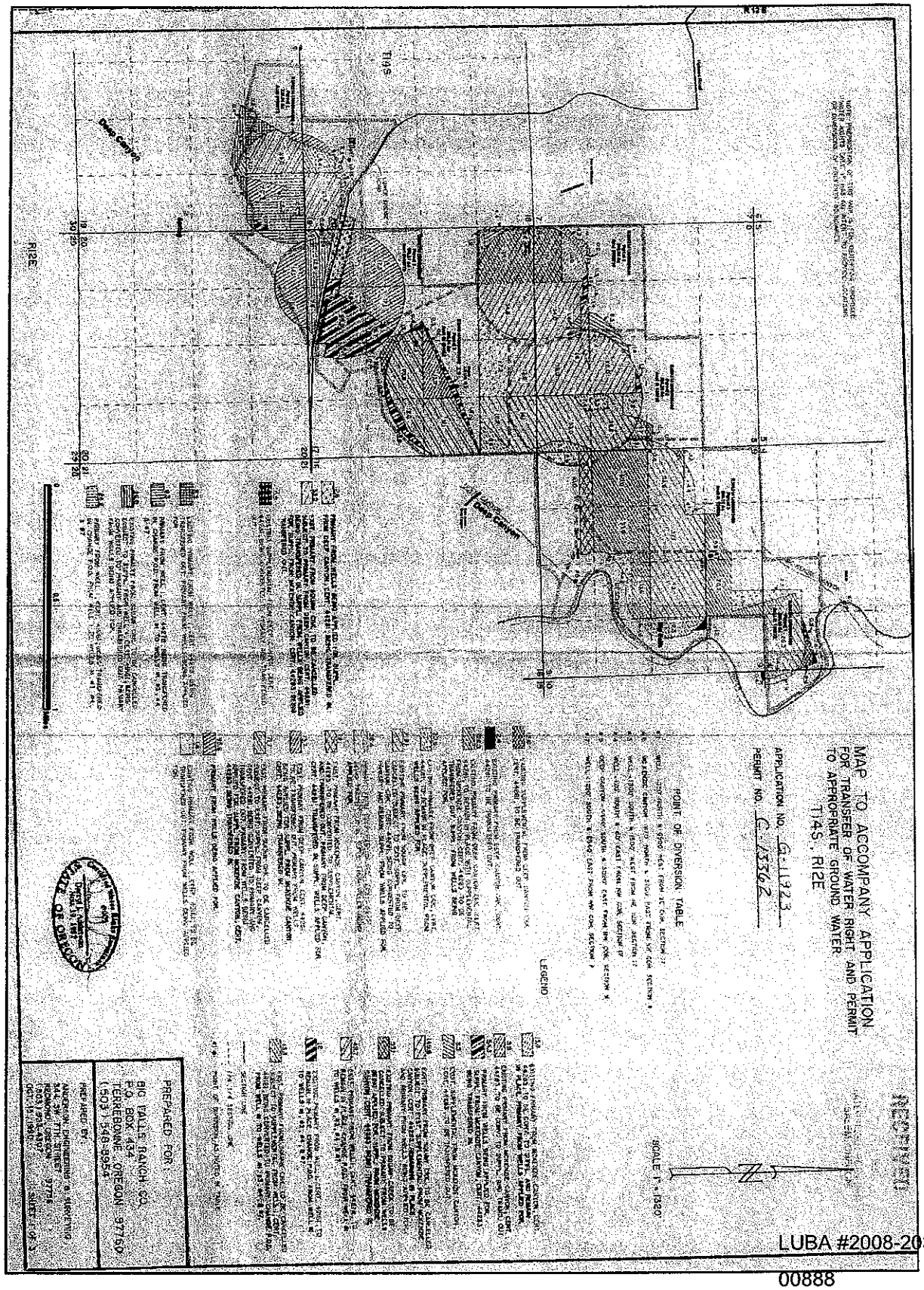
VULCAN POWER COMPANY

LUBA #2008-203

00887

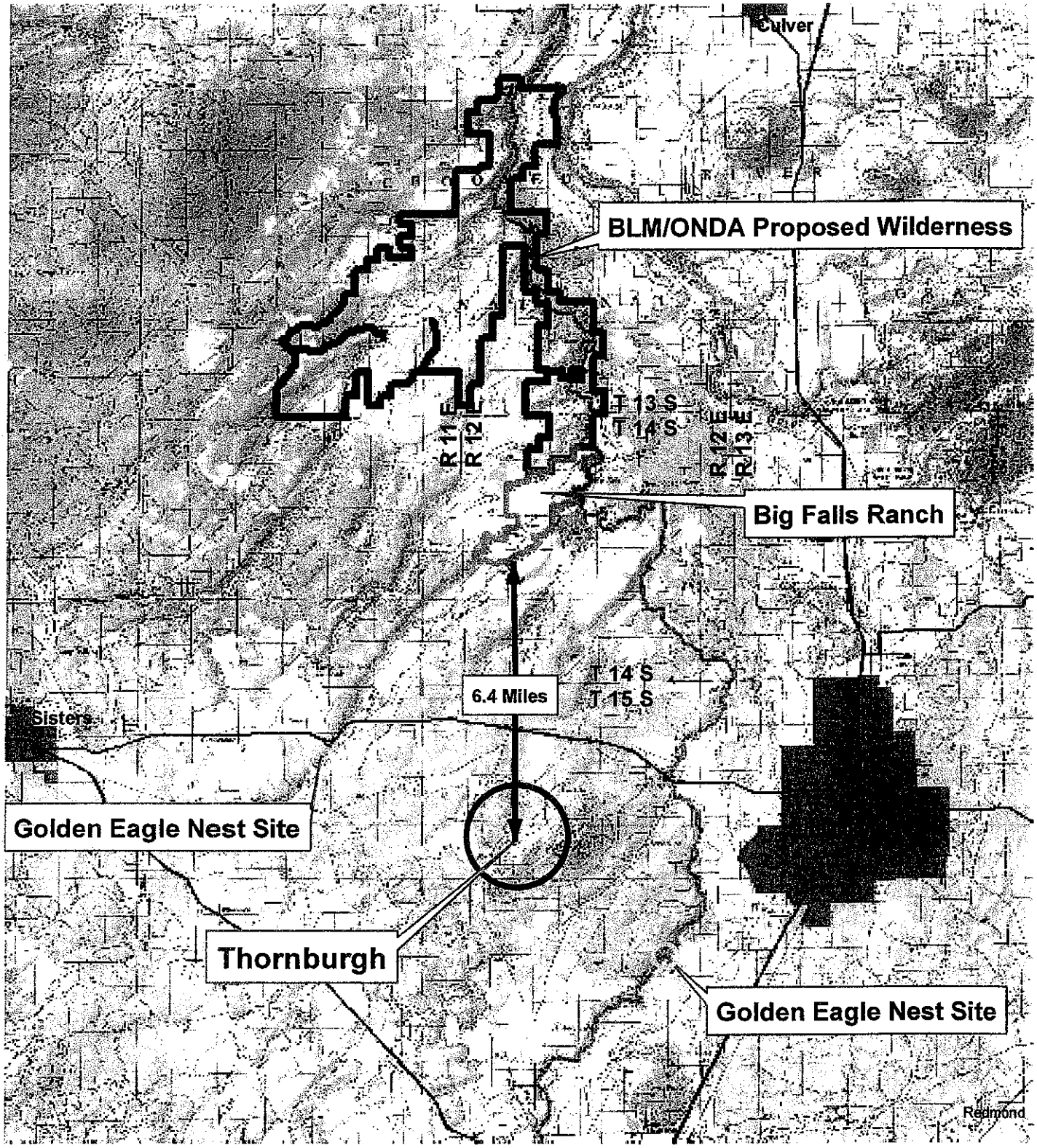
# Exhibit D

## Big Falls Ranch Co.
## Transfer of Water Right and Permit to Appropriate Ground Water



# Exhibit E
# Thornburgh Locator Map

7/23/08




LUBA #2008-203

Groundwater & Environmental Consultants

**Mark Yinger Associates**

69860 Camp Polk Road, Sisters, OR 97759 – 541-549-3030

RECEIVED

BY: _____

JUL 2 9 2008

DELIVERED BY:

_____

July 23, 2008

Steve Munson
Vulcan Power Company - Native Restoration Fund
345 SW Cyber Drive, Suite 103
Bend, OR 97702

Ref: Thornburgh Resort - rebuttal and comment in response to applicants written and oral testimony submitted to Anne Corcoran Briggs, Deschutes County Hearings Officer, on July 15, 2008.

Dear Mr. Munson:

The following are my responses to written and oral testimony given to Anne Corcoran Briggs, the hearings officer for the Thornburgh Master Plan proceedings, presented by the applicant's representatives on July 15, 2008.

**Thornburgh Memo, Exhibit G**

The Thornburgh memo is incorrect when it states that we "attempts(ed) to run the USGS model". We did run the model using an installation of the model that was verified to be operating correctly on our computer. The only change to the USGS groundwater flow model was to add the Thornburgh wells and their pumping rate. We also used a newer numerical solver to improve computing efficiency.

The Thornburgh memo also incorrectly characterizes our use of the USGS groundwater flow model as inadequate or inappropriate to "determine site specific impacts". The model is simply used to evaluate the impact of the pumping of the Thornburgh wells. The modeling results show both near and distant effects on groundwater levels and discharges to streams. The model was calibrated by the USGS and model simulation runs done by the USGS closely fit observed data in the area most significantly impacted by the pumping of the Thornburgh wells. Our use of the model is appropriate. The USGS demonstrated the usefulness of the model by using it to evaluate the impact of a hypothetical well near Redmond on groundwater discharge to the Deschutes River (Gannett and Lite, 2004).

The Thornburgh memo also characterizes our results as being in conflict with OWRD's determination of the zone of impact to be the general zone. There is no conflict here at all. It is simply that our approach used the peer reviewed and calibrated flow model to produce a much more detailed evaluation of where the impact of Thornburgh's groundwater pumping will occur. OWRD's evaluation (OWRD, 2005) merely states that the Thornburgh wells will withdraw water from the Deschutes Formation and that groundwater discharges to the Deschutes River 5.8 to 8

miles north of the proposed resort. Thornburgh misused this simple description to justify ignoring impacts to Whychus Creek and focus mitigation only on the Deschutes River.

Kyle Gorman, OWRD's South Central Region Manager, in his oral testimony on July 15, 2008 stated:

> "Our department, if we ran the model, we wouldn't find that the impacts would be in the Sandy River. We'd find that they'd (impact) be in the exact same place that Yinger found."

If OWRD had run the model to evaluate the impact of the pumping of the Thornburgh wells they would have found that there are impacts to Whychus Creek, just as we have.

By repeated reference to OWRD's use of "site specific" information Thornburgh further attempts to show a conflict between our evaluation and OWRD's evaluation where there is none. The site specific information used by both Mark Yinger Associates and OWRD is the same. We both used the same well locations and pumping rates provided by the applicant in their water right application.

On page nine the Thornburgh memo admits that using the USGS model can yield more site-specific information concerning impacts. I agree. The memo then suggests that because our data inputs and results are not peer reviewed our results cannot be relied on. This is unfounded. Again, the data input for our USGS model runs was the well locations and pumping rate specified by the applicant in its water right application. The USGS model is peer reviewed therefore; there is no point in a peer review of the modeling results. Has the work of the applicant's consultants been peer reviewed? It has not been. Thornburgh's insistence on peer review of our work by extension must also apply to the work of the applicant's consultants.

I disagree with the consumptive water volume of 1,356 acre feet per year for several reasons:

1. The intent of the mitigation is to protect fish habitat from impact by this particular project. The USGS groundwater flow model is the best method to define where that impact will occur. Mitigation must be targeted to these areas and address both water quantity and quality; the cold groundwater crucial to fish in the impacted reaches. It is not sufficient protection of the habitat in the impacted stream reaches to simply return water back into the surface water system anywhere. It is unlikely that the potentially unconsumed water will actually end up discharging to the streams where it would have if it had not been pumped in the first place. The potentially unconsumed water cannot be presumed to mitigate the impact resulting from the withdrawal of groundwater by this particular project on streamflow and fish habitat. This is one reason we used the full annual volume specified by the applicant in their water right application for our groundwater modeling.

2. The applicant's assumptions concerning consumptive use are not supported. The claim that standard irrigation is 60% consumed and 40% recharges the aquifer would only be reasonable if flood irrigation were used, which will not be the case. In the USGS groundwater hydrology report for the upper Deschutes Basin, modern sprinkler irrigation is assumed to result in no recharge (Gannett and others, 2001). This is based on a review

of irrigation practices in the basin. The following statement is made in the USGS hydrology report:

> "In areas of sprinkler irrigation with efficiencies of 94 percent, only 6 percent of applied water is lost (mostly to evaporation and wind drift), and no water is assumed to be lost to deep percolation [recharge]."

The applicant's use of the consumptive/non-consumptive ratio of 40%/60% for standard irrigation is based on an OWRD study that compared the water meter totals to outfalls of sewage treatment plants. The difference between water metered to customers and sewage treatment plant outfall flow is assumed to be the amount of water consumed. It is inappropriate to apply this reasoning to modern irrigation practices.

Early in our study we did an informal poll of golf courses managers in the area. The universal response of greenskeepers and agronomist, was that 100% percent of the water applied to the golf course is consumed by the turf and direct evaporation, leaving none to recharge groundwater.

The claim that only 40% of the 971 acre feet for quasi-municipal use is consumed is not supportable. The portion of this water that is not directly consumed will end up in the resort's sewage system which is designed to evaporate the waste water to prevent it from potentially impacting groundwater quality. This is a requirement of the resorts waste water treatment permit issued by the DEQ. In Newton Consultant's July 15, 2008, response letter the following statement is made:

> "Much of the water used for domestic, municipal and quasi-municipal purposes returns to ground water via septic systems and sewage treatment systems, and through seepage from landscape irrigation."

This is contrary to the conditions of the DEQ issued permit for waste water treatment and the design of the sewage treatment system.

If we had assumed, for the purpose of our groundwater modeling, that 90% of the pumped water was consumed and 10% recharged groundwater it would not have had a substantial impact on our modeling results. The use of a mitigation obligation of 1,356 acre feet is not realistic and will result in unmitigated impacts to streams and fish habitat. The mitigation obligation should be at least 1,916 acre feet.

On page 10 the Thornburgh memo attempts to related their determination of consumptive use with the intended use of the USGS model. The determination of consumptive use has nothing to do with the USGS model. In fact, their determination of consumptive use ignores pertinent findings in the USGS Deschutes Basin hydrology study (Gannet and others, 2001), such as the rate of recharge attributed to different irrigation practices.

On page 11 the Thornburgh memo states to the effect that using the Big Falls Ranch water will mitigate impacts to Whychus Creek. The use of Big Falls Ranch water will not mitigate impacts to Whychus Creek. Whychus Creek is not down stream of Deep Canyon Creek. The memo goes on to imply that ODFW agrees that Big Falls Ranch water will mitigate impacts to

Whychus Creek. In their June 13, 2008, letter ODFW did not say that Big Falls Ranch water will mitigate impact to Whychus Creek (ODFW letter attached).

The Thornburgh memo is correct, that we did not quantify temperature impacts to streams. However, the applicant's consultants have quantitatively confirmed that there would be stream temperature increases. The statement that Tetra Tech's analysis indicates that temperature impact to Whychus Creek is "statistically insignificant" is not correct. No statistical analysis was done by Tetra-Tech.

**Tetra Tech Memo of July 2, 2008**

The stated purpose of the Tetra Tech memo of July 2, 2008 is to review Thornburgh's mitigation plan assuming that our conclusions that there will be impacts to the Deschutes River and Whychus Creek are correct. They then go on to describe at length mitigation flows to address impacts to the Deschutes River. These impacts would result in a stream temperature increase in a reach of the Deschutes River that includes listed bull trout habitat. However, they ignore Whychus Creek because the Thornburgh mitigation plan provides no mitigation for Whychus Creek. The abandonment of three domestic wells on the Thornburgh property and providing funds for thermal modeling of Whychus Creek does not mitigate the impacts that this particular project will have on Whychus Creek.

**Tetra Tech Memo of July 8, 2008**

On page one of Tetra Tech's memo of July 8, 2008, under "Similarities of the Two Methodologies" the statement that both we and Tetra-Tech based analysis on the *Simulation of Regional Ground-Water Flow in the Upper Deschutes basin, Oregon* prepared by the USGS (Gannett and Lite, 2004) is misleading. Tetra Tech has not run the groundwater flow model, which is presented in USGS report, to evaluate the impacts of the pumping Thornburgh wells. Our analysis used the USGS model and is much more thorough and detailed.

On page 4 in the third bulleted item the statement is made that their calculations are conservative because if local lithology were considered the "direction proportional connection between groundwater pumping and stream flow" would become less. That is not supported by any significant discussion of geology either in this memo or early work by Tetra Tech. The fact is that they have not used the best analytical tool available which is the USGS groundwater flow model, which accounts for complex heterogeneous geology through defining 171 zones of hydraulic conductivity and model calibration.

At the beginning of the memo Tetra Tech says that they based their analysis on the USGS modeling report (Gannet and Lite, 2004) and then on page 5 in the first bulleted item under "Comments Regarding the Yinger and NWLW, Inc. Methodology" they attempt to dismiss the use of the USGS model. This is a contradiction. They present the same argument they presented in their May 2008 evaluation (Tetra Tech, May 2008). Their argument is simply an excuse for not using the groundwater flow model themselves.

The use of the USGS groundwater flow model to evaluate the impacts of Thornburgh pumping is appropriate and the best method for the following reasons:

1. The USGS groundwater flow model for the upper Deschutes River Basin is a calibrated model, peer reviewed and published. Our input to the model consisted of only well locations and pumping rate specified in the applicant's water right application.

2. The USGS groundwater flow model utilizes a large body of observed data. This data includes: geologic mapping, boring logs, well logs, geophysical logs, groundwater levels from observation wells, private wells and public wells, well and aquifer tests, precipitation, streamflow, groundwater seepage, evapotranspiration and pumpage. The numerical model is the best method to synthesize all of this data and a conceptual model in order to predict the behavior of a complex natural system in response to new stress such as the pumping of wells.

3. The USGS groundwater flow model does account for complex heterogeneous geology through defining many zones of hydraulic conductivity within each model layer and through the calibration of the model. The eight layers of the model are divided into a total of 171 zones based on hydraulic conductivity. To demonstrate the use of the model the USGS used it to simulate the impact on streamflow for a hypothetical well in the Redmond area (Gannett and Lite, 2004).

4. In the area of interest, the groundwater discharge to streams simulated by the model closely matches measured or estimated discharge values, which are based on data from seepage runs, gauging stations and streamflow measurements (Gannett and Lite, 2004). The fit between simulated and measured or estimated discharge of groundwater is close for the Deschutes River between Lower Bridge and the gauge near Culver.

The first bulleted item on page 6, is not correct in saying that we did not use "site-specific pumping scenarios for the proposed water supply wells because it is not applicable to apply the USGS model .... to localized impacts from pumping." First, we used the used well locations and pumping rates specified by the applicant in their water right application. This is the same site specific data used by OWRD in their analysis contained in the Public Interest Review for Ground Water Applications (OWRD, 2005). Second, it is applicable to use the USGS model to evaluate the impact of the proposed pumping. The modeling results show both near and distant impacts to groundwater level and discharges to streams. Again, the authors of the USGS groundwater flow model chose to demonstrate its usefulness by modeling the impacts on streamflow for a hypothetical well in the Redmond area.

The second bulleted item on page 6 is correct in that we did not quantify stream temperature changes. We did predict temperature changes and Tetra Tech's calculations appear to confirm our prediction. I find it hard to understand how they can claim here that an increase in water temperature "*may be*, valid" when in fact they show that there will be an increase in temperature by their own calculations.

I addressed the issue raised in the third and fourth bulleted items on page 6 regarding consumptive use above. Our use of the actual annual pumping rate is justified. For mitigation to

be effective it must be targeted at the areas impacted by the pumping. Returning water anywhere in the hydrologic system will not mitigate the impacts of this particular groundwater withdrawal.

The last bulleted item, page 6, cites some of the good reasons to use the USGS calibrated groundwater flow model to evaluate the impact of the pumping of the proposed Thornburgh wells. We use site specific data based on the information contained in the applicant's water right application. The results of the modeling show both local and distant impacts on groundwater level and groundwater discharges to streams.

The following addresses only some of the issues I have with the table attached to Tetra Tech's memo:

1. The first item in the summary table deals with our use of the USGS groundwater flow model. It is inappropriate to complain that it is difficult to evaluate our modeling results. All the information that is needed to exactly duplicate our modeling results are contained in our report (Yinger and Strauss, 2008). Tetra Tech can acquire the groundwater model from the USGS and run it themselves.

To raise the issue of a natural hydrograph is simply a pointless obfuscation. The flow conditions on the middle Deschutes River and Whychus Creek have not been remotely near a natural hydrograph for many decades.

2. On page 38 of our report we do have a typo error. The instantaneous pumping rate given as 9.26 cfs should have been 9.28 cfs. Everywhere else in the report the value of 9.28 cfs is given. This typo has no impact on our modeling results.

3. Tetra Tech questions our use of the figure of 31.2 cfs. The USGS report does not contain the figure of 31.2 cfs for total pumpage used in the USGS steady state model (Gannett and Lite, 2004). However, the figure of 31 cfs is given in Table 5 of the USGS report. The values in this table are apparently rounded to whole numbers. The exact figure of 31.2 cfs comes from the well input file of the steady state groundwater flow model. The rest of Tetra Tech's discussion related to 31.2 cfs is confused and pointless. Again, if they disagree with our modeling results they can acquire the model from the USGS and run it themselves.

**Tetra Tech Memo of July 14, 2008**

Tetra Tech's July 14, 2008 memo addresses the impacts to lower Whychus Creek.

On page 2, the first bulleted item is not correct when it states that the flow from Alder Springs is 100 cfs. The source of their data cannot be checked as it is not identified adequately. To the point, the flow from Alder Springs is much less. In Table 1 of *Deschutes River, Whychus Creek, and Tumalo Creek Temperature Modeling* prepared by Watershed Sciences (2008) for the DEQ the value given for the flow from Alder Springs is 8.7 cfs on July 26, 2000. The 100 cfs volume is approximately the total flow gain on Whychus Creek between Alder Springs and the mouth of the creek.

If the reduction of groundwater discharge, at 0.15 cfs, as indicated by our use of the USGS groundwater flow model occurs at Alder Springs there will be a significant increase in the temperature of Whychus Creek. Alder Springs is located at the top of the spring system and significantly lowers the temperature of lower Whychus Creek. Using the 0.15 cfs reduction in cold groundwater discharge and Tetra Tech's thermal mass balance approach the increase in temperature of Whychus Creek at Alder Springs would be 0.07° C. This is based on a pre-pumping Alder Springs flow of 8.7 cfs at a temperature of 11° C and a Whychus Creek flow of 10.85 cfs above the spring at a temperature of 26.7° C (Watershed Sciences, 2008). The 0.07° C increase in the temperature of Whychus Creek at Alder Springs as a result of the pumping of the Thornburgh wells is much greater than the "less than 0.01" value calculated by Tetra Tech. This is due to the error in the first bulleted item discussed above. The Thornburgh mitigation plan provides no mitigation for Whychus Creek.

The general form of the equation used to calculate the temperature resulting from the mixing of two flows of water is, $T_{resulting} = \frac{(T_{stream} \times Q_{stream}) + (T_{\inf low} \times Q_{\inf low})}{(Q_{stream} + Q_{\inf low})}$

$T_{resuslting}$ : Stream temperature after mixing
$T_{stream}$ : Stream temperature
$Q_{stream}$ : Stream flow rate
$T_{\inf low}$ : Inflowing water temperature
$Q_{\inf low}$ : Inflow rate.

**Newton Consultants, Inc July 15, 2008 Response Letter**

The statement in the bulleted item on bottom of page 2 of the Newton Consultants letter says that "much of the water for domestic, municipal and quasi-municipal purposes returns to ground water via septic systems and sewage treatment systems, and through seepage from landscape irrigation". This is not correct, the DEQ permit for waste treatment requires that waste water be surface applied during the irrigation season and stored in lined lagoons during the non-irrigation season. The intent of the permit and treatment system is to prevent waste water from recharging groundwater and impacting water quality. This is significant because a large portion of the annual 971 acre feet of groundwater withdrawn for quasi-municipal use will end up in the sewage treatment system and thus not recharging groundwater. The consequence is that the proposed mitigation will not fully mitigate impacts to streamflows and fish habitat.

**Cumulative Impact**

Anne Corcoran Briggs, the hearings officer, asked the following question in her memo date July 7, 2008.

*How do I evaluate the broader impacts of the development ascribed to the proposal? For example, the opponents argue that the cumulative impacts must be considered in the wildlife*

*analysis, but do not explain how those impacts can be quantified against the proposed mitigation.*

The impacts of the Thornburgh resort groundwater withdrawal on the middle Deschutes River and Whychus Creek should be considered in the context of whatever other groundwater permits have been issued but not yet fully developed and the location of their proposed mitigation. The rivers and creeks have not yet seen these impacts, but will. The applicant could determine the relevant groundwater withdrawal volumes from OWRD records and then run the USGS model.

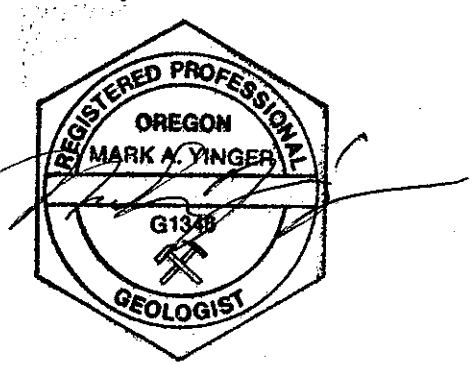
Additionally, the impacts of the Thornburgh resort development on streams, fish and wildlife should be considered in the context of future developments that will also depend on groundwater withdrawals. There are proposed destination resorts in various stages of planning that would likely also impact the middle Deschutes River and Whychus Creek. These include the following:

- Ponderosa Land & Cattle Company on Green Ridge, 2,350 homes, two golf courses, 150 overnight accommodations, water right 7,550 af, 10.4 cfs
- Aspen Lakes expansion as a destination resort
- Skyline Forest development of potentially 1,000 homes and a golf course
- Thornburgh II potentially needing an additional 2,100 af, 2.9 cfs

The cumulative impact of these developments will likely have significant impacts on streamflow and temperature. Groundwater pumping scenarios for these developments could be modeled using the USGS groundwater flow model to evaluate the cumulative impact to streamflow and water temperature.

Given that it will take 20 to 30 years for the impact of the Thornburgh groundwater pumping to be fully realized, it is critical that the cumulative impact of this particular groundwater use and future groundwater uses be critically evaluated. The failure to mitigate the impact of each new groundwater withdrawal fully will add up to substantial loss of fish and wildlife resources. It would be difficult and costly to recover the lost resources.

Sincerely,




Mark Yinger, R.G.
Hydrogeologist

Attachments:

ODWF letter dated June 13, 2008

References:

Gannett, Marshall and others, 2001, Ground-Water Hydrology of the Upper Deschutes Basin, Oregon, USGS Water-Resources Investigation Report 00-4162.

Gannett, Marshall and Lite, Kenneth, 2004, Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon, USGS Water Resources Investigation Report 03-4195.

OWRD, 2005, Public Interest Review For Ground Water Application, prepared by Kenneth Lite for the application G-16385.

Tetra Tech EC, Inc., May 2008, Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat, prepared for Thornburgh Resort Co. LLC.

Watershed Sciences and MaxDepth Aquatics, 2008, Deschutes River, Whychus Creek and Tumalo Creek Temperature Modeling, prepared for the Oregon Department of Environmental Quality.

Yinger, Mark and Strauss, Laura, 2008, A Case Study: Thornburgh Resort Water Resources Impact Evaluation Upper Deschutes Basin, Oregon, for Steve Munson and Sandy Lonsdale, Native Restoration Fund, Vulcan Power Co.

Oregon
Theodore R. Kulongoski, Governor

Department of Fish and Wildlife
High Desert Region
61374 Parrell Road
Bend, OR 97702
(541) 388-6363
FAX (541) 388-6281

June 13, 2008

Deschutes County
Community Development Department
Planning Division
117 NW Lafayette Ave
Bend, OR 97701

ATTN: Ruth Wahl
RE: Thornburgh Resort Company – Final Master Plan Approval

Oregon Department of Fish and Wildlife (ODFW) has reviewed the Thornburgh Resort Company's (Resort) application for a Final Master Plan approval relative to meeting Deschutes County Code 18.113.070(D): "*Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource*" (DCC). Since November 2004, ODFW has invested hundreds of hours providing recommendations to the Resort and Deschutes County regarding assessing projected Resort impacts on fish and wildlife resources and measures the Resort could implement to mitigate those projected impacts.

ODFW follows the direction provided in ODFW's Fish and Wildlife Habitat Mitigation Policy – Oregon Administrative Rules (OARs) 635-415-0000 to 0025, http://www.dfw.state.or.us/lands/mitigation_policy.asp when working with others on land management actions. The purpose of these rules is to further the Wildlife Policy (ORS 496.012) and the Food Fish Management Policy (ORS 506.109) of the State of Oregon through the application of consistent goals and standards to mitigate impacts to fish and wildlife habitat caused by land and water development actions.

**Wildlife Habitat Impact Assessment**

The wildlife habitat impact assessment (WHIA) submitted by the Resort in their Final Master Plan is the most complete WHIA conducted for the siting of a destination resort in central Oregon. ODFW recommended the Resort use a modified Habitat Evaluation Procedures (HEP) methodology to assess projected impacts on the wildlife resource. ODFW has recommended the use of a modified HEP to all proposed destination resort sitings in central Oregon since 1994. As described in the Resort's wildlife mitigation plan and Appendix E, the modified HEP has its limitations. All of the wildlife habitat values and projected impacts were subjective, based on the Resort consultant and ODFW staff professional judgment, rather then on scientifically measurable field factors. ODFW believes the modified HEP outputs, based on resource value input from both the consultant and ODFW, results in a fair approximation of what a very expensive and time consuming field measurable HEP would produce. However, if a field measurable HEP was developed, subjective inputs would also be needed to build new or modify existing HEP models. To build a field measurable HEP, a separate assessment model would need to be developed for each of the seven selected wildlife evaluation species in central Oregon. Model factors and factor weights within each model would be based on subjective professional judgment garnered from literature reviews.

For some potential impacts, such as wildlife impacts associated with increased traffic along Cline Falls Highway, there is not a good methodology to assess those projected impacts. This leaves the developer's consultant and ODFW relying more extensively on professional judgment rather than a methodology that could provide a more quantifiable finding that could be more quantifiably mitigated.

**Wildlife Mitigation Plan**

The Resort's wildlife mitigation plan (WMP) described both onsite and offsite mitigation measures that will need to be implemented to meet DCC. Many of the measures are tied to Resort construction phases and access to proximate Bureau of Land Management (BLM) land, rendering the measures conceptual until implemented. To improve the feasibility that the mitigation measures will be implemented as described, there are provisions within the WMP to help Deschutes County, the regulatory agency, ODFW, and BLM track implementation. The following statement summarizes those provisions (page 14 WMP):

*"TRC [Thornburgh Resort Company] shall prepare an annual report for Deschutes County, BLM, and ODFW by December 31, which describes the mitigation tasks completed and associated expenditures. TRC, Deschutes County, ODFW, and BLM will meet annually to review and confirm that mitigation is being implemented as designed until mitigation is fully completed and a funding source is in place to assure long-term maintenance is established. Any of these entities may perform an annual inspection upon request."*

**Potential Impacts of Ground Water Withdrawals on Fish Habitat and Mitigation Measures**

The Thornburgh Resort development plans to use up to 9.97 cfs (2,129 acre feet) of groundwater to provide water for the resort and will do so in two phases. The company applied for a groundwater permit within the Deschutes Groundwater Study Area. When obtaining a groundwater permit in the Deschutes Groundwater Study Area a proposed water use generates a "Mitigation Obligation" which must be offset by "Mitigation Credits" for the volume of consumptive use of the groundwater permit application. The Oregon Water Resources Department, (OWRD) determined the mitigation requirement to be 1,356 acre feet. As required by the Deschutes Basin Groundwater Mitigation Rules (OAR 690-505-0600 to 0630) Thornburgh Resort LLC obtained these "Mitigation Credits" to offset their new use of groundwater. The OWRD determined the zone of impact to be the "General Zone of Impact". To meet their mitigation obligation the resort development company proposes transferring water in-stream from a combination of Central Oregon Irrigation District (COID) and Big Falls Ranch water rights.

Under state law the Thornburgh Resort LLC has fully met its mitigation requirements for offsetting its groundwater use in the Deschutes Groundwater Study Area. However, the Deschutes County Code ("DCC") 18.113.070 (D), has a different standard that applies. The county code states, "Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource." The OWRD groundwater use mitigation requirements do not cover all impacts of pumping groundwater in the Deschutes Groundwater Study Area. The Oregon Water Resource Department and United States Geological Service's groundwater model indicates that groundwater in the Deschutes Groundwater Study Area is hydro-geologically connected to the surface water within the basin; therefore, any groundwater pumping within the study area will have an effect on local springs.

Springs and seeps are important groundwater dependent ecosystems in the Deschutes Groundwater Study Area providing unique habitat for a number of plant and animal species including fish. Springs provide a natural relative constancy of water temperature. Spring and seep flows especially in the summer and fall, are typically cooler than the water flowing in the main stream. This cooler water provides thermal refugee for salmonid which thrive in cooler water.

The unique habitat that springs provide typically warrants them being classified as Category 1 habitat under ODFW's mitigation criteria because they are considered irreplaceable. However, in this particular case a component of the mitigation proposed by the resort developer is to acquire water rights that would open up a spring source currently being used for irrigation. As directed in ODFW's mitigation policy, habitat that can be mitigated is in categories 2 through 6. In this particular case the potential impact to springs and seeps will likely be mitigated by transferring springs flows used for irrigation directly back into Deep Canyon Creek and the Deschutes River. These springs should provide similar habitat and help with water temperatures in the Deschutes River.

The resort developer has proposed, at full build out of the resort, providing 519.18 af of water from COID and 836.82 af from Big Falls Ranch for a total of 1,354 af. These water rights are both irrigation rights with a season of use of April 1st to November 1st (214 days). The 1,354 af will be a consumptive use spread out over the entire year or an average daily impacted of 3.715 af/day which equates to 1.87 cfs. As shown in Table 1, during the irrigation season the resort is proposing to provide water instream above their average daily impacted both in total and as spring water from the Deep Canyon Creek water right.

Table 1

| Phase | COID | | | Big Falls Ranch | | |
|---|---|---|---|---|---|---|
| Phase 1 | 153.43 af | .717 af/day | .36 cfs | 315.0 af | 1.472 af/day | .74 cfs |
| Phase 2 | 365.75 af | 1.709 | .86 cfs | 527.82 af | 2.467 af/day | 1.24 cfs |
| Total | 519.18 af | 2.426 af/day | 1.22 cfs | 836.82 af | 3.910 af/day | 1.97 cfs |

During the irrigation season when ODFW is most concerned about impacts to springs and flows in the Deschutes River; the mitigation water from the springs in Deep Canyon Creek exceeds the flows needed to mitigate for potential spring and seep impacts from the development (1.97 cfs vs 1.87 cfs). Flows from COID during the irrigation season provide a net benefit in instream flows for the Deschutes River.

There will be a potential net deficit of 1.87 cfs to springs and seeps from the resort between November 1st and March 31st because the mitigation water is being provide during the irrigation season. However, because flows are higher and stream temperatures lower during this time period ODFW does not believe there will be an adverse impact to the fish and wildlife habitat during this time period.

To facilitate necessary habitat functions, the dam associated with the transferred Deep Canyon Creek water right should be removed prior to the beginning construction of phase 1. Ultimately prior to the beginning of phase 2, other dams upstream of the Deep Canyon Creek point of diversion should be removed to provide for unimpeded spring flow. The water to be used for mitigation of resort groundwater should be acquired and transferred instream, with existing priority date prior too the implementation of each phase of development.

The resort developer has also proposed to abandon domestic wells located on the development property and have proposed to provide funds to help complete an on-going thermal modeling project on Whychus Creek which ODFW considers contributing to the net benefit requirements of the Mitigation Policy.

ODFW has determined that providing the proposed mitigation outlined above should mitigate for potential impacts on springs and seeps and provide a net benefit to the resource.

ODFW appreciates the opportunity to work with Deschutes County and the Resort to assess potential impacts to fish and wildlife resources and to propose measures that should mitigation those impacts as directed by DCC 18.113.070(D). Mitigation will be conceptual until measures are implemented, some of which will need to be maintained in perpetuity.

Sincerely,

Amy Stuart
Deschutes District Watershed Manager

**Native Restoration Fund**
*A mission of Vulcan Power Company*

July 29, 2009

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Ruth Herzer, Associate Planner
Deschutes County CDD
117 NW Lafayette Ave.
Bend, OR 97701-1925

Re: File # M-07-2; MA-08-6

**Additional Comments on the Thornburgh Resort Final Master Plan**
Native Restoration Fund
Steve Munson, Local Citizen

Violation Of Federal Law

The proposed Thornburgh Resort, if approved as proposed, will more likely than not violate Federal law under the Endangered Species Act of 1970 (the Act).

The Endangered Species Act states in relevant part: "...it is the policy of Congress that all Federal agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of this Act."

This Act has been incorporated into the Upper Deschutes Management Plan and it guides proper USBLM actions with respect to cold water springs providing protected critical habitat for the Bull Trout. (See USBLM Erred section below)

The proposed resort will reduce effectiveness, diminish and adversely affect Federally protected cold water springs "refugia" critical habitat of the Bull Trout in the Deschutes River. Furthermore this county and this application consideration process has been warned about adverse impacts upon that threatened species critical habitat by the third party independent hydrology report of Mark Yinger Associates and Northwest Land and Water concerning Thornburgh Resort water aquifer impacts.



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Furthermore it is more likely than approval of this application after knowledge of this hydrology report may open Deschutes County government and perhaps those involved in the resort approval processes to Federal legal action and potential sanctions under the Act.

Adverse Effects On The Critical Cold Springs Habitat

Parties to this process have informed the process as to the very cold fresh water requirements of the Bull Trout. The record includes professional study summaries that this species requires temperatures in the 3 degrees C range to 5 to 8 degrees C to spawn, live and thrive. At higher temperatures spawning is adversely affected and Bull Trout become susceptible to disease and loss. Reducing cold water spring temperatures adversely affect Bull Trout yet the Act states there is to be no critical habitat reduction.

Review of the original Federal listing Bull Trout endangered ruling document contains over 15 citations to the importance of the cold water springs and that critical habitat to the endangered Bull Trout. The segments of the protected Bull Trout habitat south of Lake Billy Chinook which are mapped in the Federal listing document are the areas containing the cold water springs outflowing from the Deschutes Aquifer. (See Bull Trout Federal listing document attached).

These are the same cold water springs which applicants own water consultant testified on the record are the outflow springs from the Deschutes Basin. In short the applicant testified to the connectivity of the aquifer water to these protected springs.

USGS Model Use Is Sound Science

He stated that there is so much water in the aquifer that it is essentially limitless implying that even with the Thornburgh water use it would not adversely affect water supplies for local residents or fish in the nearby river.

The data relied upon was over 10 years old, long before the massive increase of wells in the aquifer, long before the recent large new wells in the aquifer. I placed in the record a description of the importance of USGS hydrology



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reports and techniques for evaluating hydrologic systems and other resources. They are broadly used by industry and government to evaluate effects. The 171 rock strata in the USGS model which Yinger Associates utilized with new data of the past ten years of massive growth in Central Oregon water use was the appropriate model.

Even the county water master who appeared in the last hearing stating incongruously (incorrectly) he was appearing as a neutral party I believe after appearing as a resort proponent earlier if memory serves me, stated on record that the model is a good one and basically the Yinger Associates report modeling is sound.

Professional Fish Scientists Inform This Process

Importantly the adverse effects on Federally protected Bull Trout and their protected critical habitat this review process has also been informed by professionally trained fish biologists and wildlife professionals that the adverse effects of reducing cold water spring flows are both calculated directly in those critical and essential cold water spring refugia and not on some artificial construct, such as an average river temperature advanced by the resort applicants to attempt to show some small impact.

The adverse impacts upon the Bull Trout happen in the fresh cold water refugia critical for breeding. As the Federal listing states in essence the cold water springs refugia are especially important during the summer when river flows are down. It is in essence it is in the summer when the critical springs habitat is most important to the Federally protected Bull Trout that the Thornburgh golf course and its other wells will be creating maximum drawdown. The greatest adverse impacts when all cold water is most needed.

USBLM Erred Approving Thornburgh MOU Use Of Public Lands

The Upper Deschutes Resource Management Plan and Environmental Impact Statement states in relevant part that: BLM has been directed to contribute to the protection and recovery or species Federally listed or proposed for listing...by maintaining and restoring habitat quality, quantity and effectiveness (The Act, et seq as amended and BLM Manual 6840).



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Meeting of these responsibilities requires maintenance of suitable habitat and restoration of degraded habitat necessary for recovery of species. See Upper Deschutes Plan excerpts attached.

In short, the BLM is specifically prohibited from taking actions or making decisions which will reduce, degrade or adversely effect the critical habitat of either proposed species or listed species. When the resort hearings process began Bull Trout were proposed for endangered listing. That alone was sufficient to cancel the MOU and the Federal agency should have done so in consultation with US Fish and Game which maintains an office in Bend OR.

This was pointed out by myself and others in the now infamous missing cd hearing. Fish concerns were also pointed out later. The BLM was actually criticized in this hearing process for having approved the MOU allowing use of public lands for access to enable three golf courses and other activities which will use water and adversely affect fish.

This applicant, this county, this process and the Prineville BLM have all been on notice for several years through this process attended by BLM personnel that the BLM action approving the Thornburgh MOU more likely than not would have to be revoked.

Since the process was put on notice the Bull Trout was listed as endangered several years ago and the independent hydrology report has proven the protected Bull Trout critical habitat will be irreparably degraded, reduced in effectiveness, harmed.

The county approved the applicant plan on the assumption the MOU was properly issued. Knowing now it was improperly issued is yet another reason the county should deny the applicant plan.

Wildlife Report Inadequacies

This report was not a season-by-season report of the wildlife that actually lives upon the proposed resort lands. It was little more than a compilation of the species that might live on this land and on the adjacent public lands.



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I lived upon this land for a period of nearly three years. I personally observed that the wildlife using this land included the predators at the top of the food chain arboreal owls, hawks, rattlesnakes and cougars. Two Species of Concern lived upon this land while I lived there. They are the Burrowing owl which raised a family there one year and the Pygmy Rabbit.

The Federal legal definition of Species of Concern is: "taxa which the US Fish and Wildlife Service is reviewing for consideration as Candidates for listing under the Endangered Species Act of 1070."

This applicant report was so poor that these very rare species in this area upon this land itself were not even described as to their actually having lived upon despite my testimony several times in this process that they did so, nor was any plan evolved to protect them.

Much is known about these intensively studies species of concern. Attached are examples of the amount of detail available to inform and proper seasonal analysis of the actual impacts of the proposed resort upon the species that live there all year and/or seasonally. (See Burrowing Owl Report updated in 2003 and Pygmy Rabbit May Be Put On Endangered List Article of June 28, 2008)

All of these species are adversely affected by human activities which alter the land, make it unusable to them, create noise and night lights, reduce pray species, spray chemicals on the land, and add cats and dogs to the lands in great numbers which are documented to kill birds, particularly smaller birds the size of the Burrowing Owls which are a Species of Concern. The massive increase in cats and dogs upon this land will likely also eliminate the Pygmy Rabbit also a Species of Concern. (See two reports on adverse impacts of cats upon bird and other populations attached, "Casts and Wildlife" and On the Prowl")

Cumulative Adverse Impacts On Habitat and Wildlife

Professional wildlife managers and educators are also local opponents to the proposed resort precisely because they more than others are very aware of



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the adverse effects upon wildlife of massive new resorts of this proposed type.

They and other parties like myself are very familiar with the types of environmental reports which are typically undertaken to review the actual impacts of a proposed use or action upon public lands. We advised this process, acting as individual concerned citizens that the applicant alleged wildlife report was not a proper report upon the actual species utilizing this land and adjacent public lands and the effects upon them this proposed resort will have.

It did not contain a season-by-season study of the species and the effects upon them of a massive resort and construction put down in their midst and covering large parts of it with roads, houses, lodge and other activities.

It contained no species counts. It quantified basically nothing. It was full of unhelpful aphorisms and generalities which could have applied anyplace.

It gave away no clues for cause of concern about Federally identified Species of Concern that live there and reared young there. It basically even continued the actual fiction laid down by the applicant water consultant by stating that there were no adverse effects upon fish despite many concerns raised at multiple hearings about adverse effects upon fish.

There should be multi season baseline studies of the land and its surrounds first to catalog what species are there and then to protect those which require protecting, including Burrowing Owls, other owls and Pygmy Rabbits and perhaps native plants as well.

The interaction of the loss of cougar, rattlesnake and other predators upon the system should be studied as well as the aforementioned effects during the hearing process of: noise, massive proliferation of dirt bikes cutting fences on the Masden allotment adjacent to the proposed resort, night lights, hunting, cats and dogs and other adverse effects including roads and structures.



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This all needs to be studied as the effects are many and they are cumulative. A simple count of the potential guests alone demonstrated to the hearing process that this resort and its workers will generate over ONE MILLION person days of cumulative effects upon the lands in the application and the adjacent public lands.

Local Sierra Club members who have spent many hours protecting the Masden allotment along the Deschutes next to the proposed resort gave a detailed description of the problems protecting the adjacent Masden allotment native grass and wildflower area from already rampant dirt bike users who insist on cutting protective fences and then cutting the fragile bunchgrass habitat to shreds. It is clear another million person days means much greater impact.

The wildlife professionals (including a professor with a doctorate) described the types of cumulative impacts that need to be studied and that his students and other professionals can conduct to inform processes of this type. He and others testified these sorts of reports are necessary and the only basis of informed decision making.

Attached as one informative report on cumulative impacts see the attached report Cumulative Impacts of Linear Trails, which offers a glimpse at the types of effects concentrations of humans have on ecosystems. The applicant reports fail badly in this regard and are further cause for application denial.

Native Restoration Fund



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# Upper Deschutes Resource Management Plan

The Bureau of Land Management's Prineville District completed the Upper Deschutes Resource Management Plan (RMP) in September 2005. The Plan directs management of approximately 400,000 acres of BLM-administered lands in Klamath, Deschutes, Crook, and Jefferson Counties, Oregon.

**Upper Deschutes Record of Decision and Resource Management Plan**

- Dear Interested Party Letter and ROD (PDF)
- Table of Contents and Acronyms (PDF)
- Introduction, Goals and Vision (PDF)
- Management Direction
  - Ecosystem Health and Diversity (PDF)
  - Land Uses (PDF)
  - Visual Resources (PDF)
  - Recreation (PDF)
  - Transportation and Utilities (PDF)
  - Land Ownership (PDF)
  - Public Health and Safety (PDF)
  - Archaeology (PDF)
- Management of Newly Acquired Lands (PDF)
- Operations and Maintenance Actions (PDF)
- Plan Implementation (PDF)
- Monitoring (PDF)
- Glossary and References (PDF)
- Appendices
- Maps

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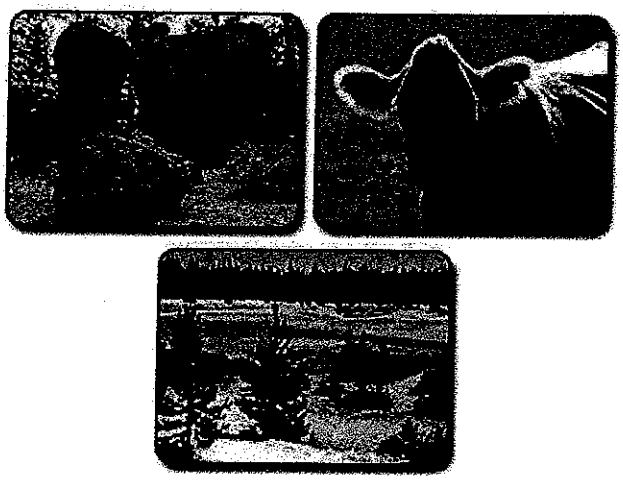
**Contact Us**

**Upper Deschutes Record of Decision and Resource Management Plan**
c/o BLM Prineville District Office
3050 NE Third Street
Prineville, OR 97754
(541) 416-6700



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d. Burning under dry conditions to increase combustion efficiency in target fuel size classes.
e. Rapidly moping-up to reduce smoldering phase of combustion.
f. Using aerial ignition/mass ignition to speed combustion.
g. Using air curtain incinerators, large metal containers or pits in which combustion is aided by powerful fans to force additional oxygen into combustion process.

7. Redistribute emissions by:
   a. Burning when dispersion is good with an unstable atmosphere.
   b. Sharing the air shed with other agencies and smoke producers to reduce the likelihood of smoke impacts, by coordinating with the Oregon Department of Forestry (ODF) in compliance with the Smoke Management Plan for Oregon.
   c. Avoiding sensitive areas, burning when winds are favorable to carry smoke away from highways, populated areas, and scenic vistas.
   d. Burning larger units in smaller subunits over several days to limit short-term emissions.
   e. Burning more frequently, managing fuel accumulation and producing fewer emissions with each burn.

# Wildlife

All objectives in the wildlife section apply to the entire planning area. Specific allocations, allowable uses and guidelines for wildlife for each geographic area are described after Objective W-4d. See the Recreation section for corresponding recreation allocations and guidance for specific geographic areas.

## Planning Area Wide Direction

**Objective W – 1: Conserve federally listed species and the ecosystems on which they depend. Ensure that actions requiring authorization or approval by the BLM are consistent with the conservation needs of special status species and do not contribute to the need to designate additional special status species.**

**Rationale:**
The BLM has been directed to contribute to the protection and recovery of species federally listed or proposed for listing (or subspecies or populations) across their ranges by maintaining and restoring habitat quality, quantity and effectiveness (Endangered Species Act of 1973, 16 USC 1531 et seq., as amended; and BLM Manual 6840, Special Status Species Management). Meeting these responsibilities requires maintenance of suitable habitat and restoration of degraded habitats necessary for the recovery of these species.

The Standards for Rangeland Health (USDI-BLM, 1997) provide a clear statement of agency policy and direction to promote healthy sustainable rangeland ecosystems, restore and improve public rangelands and to provide sustainable resources to support the livestock industry.

The Bureau is directed under Executive Order No. 13186 to protect, restore, enhance and manage habitat of migratory birds and prevent the loss or degradation of remaining habitats on BLM. Also, this executive order directs the BLM to "ensure that environmental analysis of federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern."

**Allocations/Allowable Uses:**
1. Locate new roads and trails away from important habitats[3] (e.g., at least ¼ mile from bald eagle habitats).



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2. During seasonally sensitive periods (e.g., breeding, nesting, winter roosting), or in sensitive sites (e.g., raptor roosts, great blue heron rookeries) avoid or mitigate for impacts from activities occurring in or near habitats of species listed or proposed to be listed as threatened or endangered. See Table 1 for a list of species that may require seasonal restrictions, seasonal restriction dates and distance buffers.
   a. Disturbance activities include, but are not limited to, people walking or running; riding a bike, horse or motorized vehicle; creating loud noises (chain sawing, blasting); on-site or at a distance of ¼ to 1 mile, depending on species.
   b. Mitigation may include but not be limited to seasonal use restrictions and/or distance buffers around sensitive sites.
   c. For nest sites, seasonal closures may be ended early if, through monitoring, the nest is determined to be unoccupied. However, the closure period must include dates that will allow late nesting birds. Prior to disturbing activities, conduct surveys to determine presence/absence of special status species; allow the action to proceed if field exam indicates the nest is inactive.
3. Bald eagles: Include current and potential habitat4 into an overall Bald Eagle Habitat conservation strategy where current populations occur near Prineville Reservoir and Grizzly Mountain.
4. Sage grouse:
   a. Design and implement management activities to be consistent with adopted sage grouse conservation strategies and current, accepted science.
   b. Vegetation altering activities may occur in sage grouse habitat where it does not result in the long-term loss of habitats or contribute to the need to list.
   c. Disturbance activities may occur in sage grouse habitat if they do not disrupt breeding and over-wintering activities or compromise habitat suitability.

**Guidelines:**

*General*

1. Enhance health of roost and nest trees by reducing competing vegetation.
2. Enhance conditions for future large perch/nest trees.
3. As new habitat areas or potential habitat areas become known, consider including them into the Bald Eagle Habitat Conservation Strategy and managing them with an emphasis on bald eagles.
4. Action will be taken, when practical, to determine the distribution, abundance, reason for current status, and management needs of special status species occurring on BLM administered lands, and will evaluate needed management for the conservation of these species. The District will also document observations of, and minimize impacts to Bureau assessment and Bureau tracking species.
5. Assess habitat potential within all caves and identify which caves (if any) contain potentially suitable habitat for bats (especially, Townsend's big-eared bat).
6. Consider providing suitable habitat for the restoration of bat populations (including Townsend's big-eared bats) in a portion of the Redmond Caves lava tube system.
7. In coordination with other federal and state natural resource management agencies develop a long-term conservation strategy for managing sage grouse habitats. Until that time, use the guidelines from the Greater Sage Grouse and Sagebrush-Steppe Ecosystems Management Guidelines (USDI-BLM et al., 2000).

*Habitat Modification and Disturbance*

8. Vegetative habitats may be maintained or improved using a variety of techniques, such as mowing shrubs, altering or removing trees and shrubs, prescribed burning,

[3]"Important habitat" is a general term that includes seasonal habitats, such as winter ranges and breeding sites; habitat structure, such as snags and down logs; and unique features, such as cliffs and caves.
[4]"Potential habitats" are areas that either historically were or naturally have the potential to develop into bald eagle habitat. These areas will typically consist of ponderosa pine stands or individual trees, cliffs or rock outcrops that could be restored or grow to provide nesting, perching or roosting habitats.

## Table 1: General Guidelines* for Seasonal Restriction and Distance Buffers

| Species | Habitat | Spatial Buffer | Restriction Dates |
|---|---|---|---|
| Bald eagle | Nest | ¼ mile non-line of sight ½ mi line of sight<br>1.0 mile blasting | January 1 – August 31 |
| | Winter Roosts | ½ mile | December 1 – April 1 |
| Golden eagle | Nest | ¼ to ½ mile | February 1 – August 31 |
| Northern goshawk | Nest | ¼ mile | March 1 – August 31 |
| Cooper's hawk | Nest | ¼ mile | March 1 – August 31 |
| Sharp-shinned hawk | Nest | ¼ mile | March 1 – August 31 |
| Ferruginous hawk | Nest | ½ mi direct line of sight<br>¼ mi with visual buffer | March 1 – August 1 |
| Red-tailed hawk | Nest | ¼ mile | March 1 – August 31 |
| Swainson's hawk | Nest | ¼ - ½ mile | April 1 – August 31 |
| Peregrine falcon | Nest | 1.0 mile | January 1 – August 15 |
| Prairie falcon | Nest | ¼ - ½ mile | March 15 – August 15 |
| Osprey | Nest | ¼ mile | March 1 – August 31 |
| Burrowing owl | Nest | ¼ mile | March 1 – August 31 |
| Flammulated owl | Nest | ¼ mile | April 1 – September 30 |
| Great gray owl | Nest | ¼ mile | March 1 – July 31 |
| Sage grouse | Lekking | 0.6 mile | March 1st – May 15<br>** February 15– May 1 |
| | Nesting, Brooding and Rearing | Not applicable (N/A) | April 1 – July 31<br>*March 15– July 31 |
| | Winter Habitat | N/A | November 15 – March 15<br>**November 1– March 31 |
| Great blue heron | Nest | 660 ft – ¼ mile | 15 March – 15 July |
| Mule deer | Winter Range | N/A | 01 December – 30 April<br>**01 November – 01 May |
| Rocky Mountain elk | Winter Range | N/A | 01 December – 30 April<br>**01 December – 01 May |
| | Calving | N/A | May 15 – Jun 30 |
| Pronghorn | Winter Range | N/A | 01 December – 30 April<br>**01 November – 01 April |
| Townsend's big-eared bat | Hibernaculum | N/A | November 1 – April 15 |
| | Nursery | N/A | April 15 – October 31 |

*These general guidelines are typical restrictions that could be applied. Specific dates and distances may vary depending on the type of action proposed and the local breeding chronology of species or the local weather patterns.
** Millican Dates



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managed wildland fire, planting, livestock grazing, and commercial and non-commercial tree cutting.

9. Balance the need for restorative actions to address long-term threats to special status species with the short-term need to protect special status species and their habitats.
10. Management activities in the habitat of federally listed, candidate threatened, or endangered and sensitive species will maintain or improve habitat conditions and/ or not prevent or retard attainment of future desirable habitat conditions.
11. Develop a species response matrix that includes documented (from literature searches) responses of the species to management activities or natural phenomena. This information will be used to determine management activities for which mitigation measures should be recommended or are needed.
12. Identify needs to protect special status species and their habitats when authorizing activities by conducting an appropriate assessment of the wildlife resources depending upon the level of anticipated impacts. Include consideration of:
    a. The Wildlife Observations Database and conduct field surveys during appropriate seasons to identify existing habitat conditions and species occurrences and habitat associations.
    b. Impacts and develop mitigation measures to be applied to project implementation requirements.
    c. Opportunities for habitat enhancement as part of project design.
    d. Contract stipulations to allow work to be stopped if special status species are discovered to be present in or adjacent to a project area.
    e. Adjustment of clearance and mitigation activities to accommodate additions or deletions in official listings of special status species.
13. Evaluate effects of Bureau actions on federally listed, proposed, candidate, state listed, Bureau sensitive or assessment species in accordance with management direction. Impacts to these species will be evaluated through the NEPA process (Instruction Memorandum No. OR-91-57).
14. Seek opportunities to conserve and improve habitats for special status species and native animals in BLM authorized activities.
15. Design and implement relevant management activities to be consistent with BLM adopted recovery plans, conservation strategies, and other appropriate reports.
16. In situations where data are insufficient to make an assessment of proposed actions, surveys of potential habitats will be made before a decision is made to take any action that could affect special status species.
17. Maintain existing shrub-steppe habitats in the existing sage grouse range in order to sustain sage grouse populations and protect options for the future (Information Bulletin No. OR-200-334).
18. Where possible, design or redesign travel routes to contribute to the conservation of special status species, and relocate roads and trails away from important habitats.
19. Conduct periodic surveys of potential raptor habitats and monitor active and historic sites to determine occupancy and management consistency.

**Objective W - 2: Protect and restore special habitat features that contribute to the productivity of species. These special habitat features include, but are not limited to caves, cliffs, playas, riparian areas and wetlands, foraging areas, and snags and down wood. Maintain and/or recruit adequate numbers, species and sizes of snags and levels of downed wood to contribute meaningfully to the needs of wildlife, invertebrates, fungi, bryophytes, saprophytes, lichens, other organisms, long-term soil productivity, nutrient cycling, carbon cycles and other ecosystem processes (See also Vegetation).**

**Rationale:**

Under the Federal Land Policy and Management Act of 1976, public lands are to be managed in a manner that protects ecological values, maintains their natural condition

and provides food and habitat for wildlife. Special habitat features are often limited across the landscape, and thus are more important to those species that depend upon those features for some portion of their lifecycle than more abundant features of the landscape.

Snags and downed logs are important components of forest and woodland ecosystems. They provide essential habitat for wildlife and other organisms, long-term soil productivity and several ecosystem processes. They store carbon and nutrients and provide site improvement following extreme disturbance. Large diameter snags are especially valuable to a wide array of species because they offer greater surface area, more opportunity for cavities, and greater longevity. Hann et al. (1997) found that snag and coarse woody debris levels have declined in roaded and harvested areas. Providing for the appropriate species, numbers and sizes of snags maintains the value of the stand for wildlife.

The special habitat features described here were identified as critical to the long-term conservation of a variety of species in Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin (USDA & USDI, 2000a) and in Assessment of Ecosystem Components (USDA & USDI, 1997, p. 64, modified). The Federal Cave Resources Protection Act (FCRPA) of 1988 directs the agency to: Prohibit any person who, without prior authorization from the Secretary knowingly destroys, disturbs, defaces, mars, alters, removes or harms any significant cave or alters the free movement of any animal or plant life into or out of any significant cave located on Federal lands.

The Interim Cave Management Policy (Instruction Memorandum No. OR-95-021) provides for the following:

- Where known or potential adverse impacts from human use to threatened, endangered, and/or sensitive plants or animals, cultural resources, biological deposits (i.e. middens, skeletal remains, etc.), or geologic/paleontologic/mineral features are present, then the responsible authorized officer shall act to protect these resources. Such actions could include information/education, closures (seasonally or yearlong), written authorization for activities, or other appropriate measures.
- On public lands administered by the BLM, no new surface disturbing activities will be authorized within a 350 foot radius of a cave opening or any known cave passages which may adversely impact any significant or potentially significant cave resource value.

**Allocations/Allowable Uses**

1. Special habitats and features may be maintained or improved using a variety of techniques, such as mowing shrubs, prescribed burning, livestock grazing, commercial and non-commercial tree cutting, spatial buffers and seasonal closures.
2. Mineral material mining may be allowed on cliffs or talus slopes not occupied by special status species provided that special habitat features are provided in appropriate amounts and arrangements across the landscape to support general species needs.
3. Also see specific management direction for caves in the section on Special Management Areas.

**Guidelines:**

1. Consider presence and abundance of wildlife values when evaluating proposed mining reclamation/rehabilitation plans.
2. Whenever practical, avoid special habitat features when authorizing activities.
3. Provide reasonable mitigation, by reducing, avoiding, restoring or compensating for important special habitats that are altered by management actions such as mineral material mining, road construction, et cetera.
4. Consider the natural variability in number and size of snags and downed logs



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across landscapes, through time, and in context of biomass levels under which soils and species evolved.

5. Except where public safety is a concern, forest and woodland management activities will retain an adequate number of snags and large coarse woody debris in treatment areas at levels sufficient to support species of cavity-nesting birds at 100 percent of potential population levels. Except for safety concerns and fire hazards management actions will:
   a. Retain all soft snags
   b. Retain scattered hard snags and large live trees, both to provide the current needs of hard snag dependent species and to serve as a source of future hard and soft snags.
   c. Retain approximately 8 large live trees per acre in regeneration harvest units to provide a legacy, bridging past and future forests. These trees are not to be counted toward future snag recruitment as described above.
   d. Where snag densities are below the established, desired range, initiate management activities to increase snag levels (USDA-BLM and USDI-BLM, 2000a, p. 48).
   e. Retain and consider increasing snag numbers and coarse woody debris levels in areas that have been burned.
   f. Trees retained for current and future snags and as "legacy trees" will be chosen from the largest trees available.
6. The potential population levels for snags described above will be determined using one the following three methods:
   a. Use the amounts described in Wildlife-Habitat Relationships in Oregon and Washington (Johnson and O'Neil, 2001, Chapter 24, p. 596, Tables 1, 2 and 3), or;
   b. Use the interim standard densities described in the Interior Columbia Basin Supplemental Draft EIS (USDA & USDI, 2000c, Vol. 2, Appendix 12, pp. 12-13, Tables 1, 2 and 3) for snags and downed wood to be used in designing field projects, or;
   c. Determine site specific natural variability of snag and down log amounts for the planning area using the snag analysis and coarse woody debris process described in the Interior Columbia Basin Supplemental Draft EIS (USDA & USDI, 2000c, Vol. 2, Appendix 12, pp. 12-13, Tables 1, 2 and 3), or use or develop a similar process appropriate for local conditions. If using or developing a new process, it must have a scientific basis, using information from the literature and/or studies on historical conditions to determine snag sizes and average numbers.
7. Dead and down woody material will be retained in amounts that are within the range of natural variability for the plant community, to the extent compatible with reforestation objectives, fire hazard reduction standards, and public safety/trail use.
8. Coarse woody debris will be left in place across treatment areas rather than piled and burned (unless precluded for safety reasons, see Fire/Fuels Management section).
9. Salvage dead and down material only where an adequate amount of such material will be retained to provide sufficient habitat to maintain populations of dependent wildlife.
10. When approving habitat modification activities, determine the importance of special habitat features to special status species, and maintain the integrity of the site.
11. Where possible, avoid or minimize changes to special habitat features.

*Disturbance actions*

12. Minimize activities that could adversely influence wildlife use of special habitat features by using one or more techniques appropriate to the species' needs and status. These techniques may include:
    a. Seasonal restrictions
    b. Distance buffers

c. Signs
d. Closures
e. Relocating disturbance (i.e. moving trails, etc.)

13. Identify, and, where appropriate, maintain, restore or enhance wetland habitats such as playas, springs, and other riparian habitats.

**Objective W - 3: Determine the distributions, abundance, reasons for current status, habitat, and management needs of Species of Focus (which include special status species and species of local interest) occurring on BLM administered lands, and evaluate the significance of these lands and BLM actions for the conservation of these species.**

**Rationale:**
Inventory and conservation of habitats for Bureau designated special status species, and other state or federally protected species, is directed by FLPMA, NEPA, and Bureau policy in BLM Manual 6840 and BLM Fish and Wildlife 2000. This manual also directs the agency to provide habitat for species listed or proposed to be listed as threatened or endangered. Meeting these responsibilities requires maintenance of high quality habitat and restoration of degraded habitats necessary for species recovery.

**Guidelines:**

1. Map the habitat of all Species of Focus (see Table 2). Periodically update the maps as new information becomes available and as habitats change relative to land management actions and natural events.
2. Map the locations of active and historic important wildlife habitats (i.e. raptor nests, deer, elk and pronghorn winter range, sage grouse leks, etc.). Periodically monitor these habitats and survey potential habitats for additional activity. Map the land use activities that may cause negative impacts to these habitats.
3. Record observations of and minimize impacts to BLM assessment and tracking species.
4. Prior to initiating ground disturbing projects within potential habitat of Species of Focus, review habitat and management relationships for these species to assess key wildlife issues concerning these species and identify conservation measures and management opportunities to address these issues.
5. Conduct literature searches and identify potential disturbance or habitat altering actions that may have a negative impact on important wildlife resources and develop mitigating measures to lessen the negative affects.
6. Conduct and record systematic inventories of populations and distributions of Species of Focus.
7. Conduct monitoring and evaluation studies on Species of Focus on a regular periodic basis.
8. Evaluate potential effects of management actions (i.e., grazing, recreation and timber management plans, right-of-way applications, etc) on fish and wildlife habitat on a case-by-case basis as part of project-level planning. Consider the significance of the proposed projects and the sensitivity of fish and wildlife habitats in the affected areas. Stipulations will be attached as appropriate to assure compatibility of projects with management objectives for fish and wildlife habitat.

**Objective W - 4: Maintain or improve habitats to support healthy, productive and diverse populations and communities of native plants and animals (including species of local importance) appropriate to soil, climate and landform. Where consistent with habitat capabilities, meet ODFW management objective numbers for deer, elk, and pronghorn.**

**Rationale:**
As directed under the Federal Land Policy and Management Act of 1976 public lands will be managed in a manner that protects ecological values, maintains their natural



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## Table 2: Species of Focus

| | Common Name | *Scientific Name* | Source Habitat |
|---|---|---|---|
| **Federally Listed Species (Threatened)** | | | |
| Birds | Northern bald eagle | *Haliaeetus leucocephalus* | Old growth ponderosa pine, riparian |
| **Federal Candidate Species** | | | |
| Amphibians & reptiles | Columbia spotted frog | *Rana luteiventris* | Riparian |
| | Oregon spotted frog | *Rana pretiosa* | Riparian |
| **Bureau Sensitive Species** | | | |
| Birds | American peregrine falcon | *Falco peregrinus anatum* | Riparian |
| | Black-backed woodpecker | *Picoides arcticus* | Ponderosa pine/lodgepole pine forest |
| | Burrowing owl | *Athene cunicularia* | Shrub-steppe |
| | Ferruginous hawk | *Buteo regalis* | Shrub-steppe |
| | Flammulated owl | *Otus Flammeolus* | Ponderosa pine/lodgepole pine forest |
| | Lewis's woodpecker | *Melanerpes lewis* | Ponderosa pine/lodgepole pine forest |
| | Northern goshawk | *Accipiter gentilis* | Ponderosa pine/lodgepole pine forest |
| | Northern pygmy owl | *Glaucidium gnoma* | Ponderosa pine/lodgepole pine forest |
| | Northern three-toed woodpecker | *Picoides tridactylus* | Ponderosa pine/lodgepole pine forest |
| | Pygmy nuthatch (BM) | *Sitta pygmaea* | Ponderosa pine/lodgepole pine forest |
| | Sage grouse | *Centrocercus urophasianus* | Shrub-steppe |
| | Upland sandpiper | *Bartramia longicauda* | Riparian, grassland |
| | White-headed woodpecker | *Picoides albolarvatus* | Ponderosa pine/lodgepole pine forest |
| Mammals | Fisher | *Martes pennanti* | Riparian |
| | Townsend's big-eared bat | *Corynorhinus townsendii* | Generally associated with all; close association with riparian |
| **Bureau Assessment Species** | | | |
| Birds | Black-throated sparrow | *Amphispiza bilineata* | Shrub-steppe |
| | Northern water thrush | *Seiurus noveboracensis* | Riparian |
| | Tricolored blackbird | *Agelaius tricolor* | Riparian |
| Mammals | Pygmy rabbit | *Backylagus idahoensis* | Shrub-steppe |
| | Brazilian free-tailed bat | *Tadarida brasiliensis* | Generally associated with all |
| | Spotted bat | *Euderma maculatum* | Generally associated with shrub-steppe, forest, woodland, riparian |
| **Bureau Tracking Species** | | | |
| Amphibians & reptiles | Cascade frog | *Rana cascadae* | Riparian |
| | Northern sagebrush lizard | *Sceloporus grasiosus graciosus* | Shrub-steppe |
| | Western toad | *Bufo Boreas* | Generally associated with all |

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| | | | |
|---|---|---|---|
| | Bank swallow | *Riparia riparia* | Riparian, shrub-steppe |
| | Great gray owl | *Strix nebulosa* | Ponderosa pine/lodgepole pine forest |
| | Greater sandhill crane | *Grus Canadensis tabida* | Riparian |
| | Loggerhead shrike | *Lanius ludocicianus* | Shrub-steppe, juniper woodland |
| | Long-billed curlew | *Numenius americanus* | Shrub-steppe, Riparian |
| | Mountain quail | *Oreortyx pictus* | Ponderosa pine, juniper woodland |
| Birds | Olive-sided flycatcher | *Contopus borealis* | Ponderosa pine/lodgepole pine forest |
| | Pileated woodpecker | *Cryocopus pileatus* | Ponderosa pine/lodgepole pine forest |
| | Pine grosbeak | *Pinicola enucleator* | Ponderosa pine/lodgepole pine forest |
| | Pygmy nuthatch (EC, HP) | *Sitta pygmaea* | Ponderosa pine/lodgepole pine forest |
| | Sage sparrow | *Amphispiza billi* | Shrub-steppe |
| | Williamson's sapsucker | *Sphyrapicus throideus* | Ponderosa pine/lodgepole pine forest |
| | Willow flycatcher | *Empidomax traillii brewsteri* | Riparian/woodland |
| | American marten | *Martes Americana* | Ponderosa pine/lodgepole pine forest |
| | Bighorn sheep | *Ovis canadensis* | Shrub-steppe and woodlands near steep, rugged terrain |
| | Long-eared myotis | *Myotis evotis* | Forest, shrub-steppe, woodland, riparian |
| | Long-legged myotis | *Myotis volans* | Forest, shrub-steppe, woodland, riparian |
| | Pallid bat | *Antozous pallidus* | Shrub-steppe, riparian, ponderosa pine, juniper woodland |
| Mammals | Preble's shrew | *Sorex Preblei* | Shrub-steppe, riparian |
| | Silver-haired bat | *Euderma maculatum* | Ponderosa pine/lodgepole pine forest |
| | Spotted bat | *Lasionycteris noctivagans* | Shrub-steppe, woodland |
| | Western gray squirrel | *Sciurus griseus* | Ponderosa Pine Forest |
| | Western small-footed myotis | *Myotis ciliolabrum* | Shrub-steppe, ponderosa pine, juniper, riparian |
| | White-tailed jackrabbit | *Lepus townsendii* | Shrub-steppe, ponderosa pine, juniper |
| | Yuma myotis | *Myotis yumanensis* | Generally associated with all; closely associated with riparian |
| **Species of Local Interest** | | | |
| | Birds | Golden eagle | *Aquila chrysaetos* | Shrub-steppe |
| | Mammals | Mule deer | *Odocoileus hemionus* | Generally associated with all |
| | | Pronghorn | *Antilocapra Americana* | Shrub-steppe |
| | | Rocky Mountain elk | *Cervus elaphus nelsoni* | Generally associated with all |



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condition and provides food and habitat for wildlife. As directed in BLM Manual 6840 - Special Status Species Management, the BLM will take actions that progress towards the conditions indicating attainment of the Fundamentals of Rangeland Health (described in 43 CFR 4180.1) and associated Standards (43 CFR 4180.2).

As noted by Johnson and O'Neil (2001), the conservation of wildlife and of biological diversity at large has taken various approaches in the U.S. Sometimes the focus is on the provisions of life requisites for a single species, sometimes for a suite of species (i.e.: guild or biological community such as cavity-dependent or wetland and riparian dependent species), and sometimes the focus is on ecosystems (i.e.: integrated systems of land, water, and biota in contiguous areas such as watersheds, landscapes, or regions).

In this plan, management considerations are directed at some individual species such as sage grouse, deer, elk, and pronghorn by designating wildlife management emphasis levels described here; at groups of species represented by the emphasis on management of source habitats such as shrub-steppe, juniper woodlands, or riparian in the vegetation section; and on ecosystem function represented by the emphasis on restoration of the historic structure and extent of vegetation conditions and hydrologic function in high priority watersheds.

For individual and groups of species, habitat factors that most influence wildlife use in an area include habitat patch size, quality, connection to habitats that provide for all life requisites, and disturbance – most often from human activities and most prominently from open motorized travel routes. Objectives and guidelines focus on providing effective wildlife habitat at various emphasis levels based on those factors. Habitat effectiveness[5] is one model that provides guidance for evaluating the influences of disturbances caused by open motorized travel routes. Use of the model in this planning process was described in detail on pages 357-358 of the Draft Upper Deschutes RMP/EIS (USDI-BLM, 2003).

**Allocations/Allowable Uses:**

1. Avoid or minimize actions that may cause disturbance to important or seasonally important wildlife habitats.
2. Designate areas for primary, secondary, or general wildlife management emphases in winter range, breeding and rearing habitats, connectivity areas, and source habitats.

**Guidelines:**

*General*

1. Consider partnering with ODFW, OMD, USFWS and others in developing a multi-species habitat conservation strategy for the Bend/Redmond, Horse Ridge, Mayfield Pond, Millican Plateau, North Millican and Prineville Reservoir geographic areas. Focal species for this strategy are to include, but not be limited to sage grouse, deer, elk, pronghorn and golden eagles.

*Habitat Modification*

2. Maintain or improve habitats using a variety of techniques, such as, mowing vegetation, prescribed burning, livestock grazing, commercial timber harvest, non-commercial tree cutting and planting and seeding.
3. In order to restore native plants, areas disturbed during project construction will be seeded with a mix of native grasses, forbs, and shrubs to meet site-specific needs or habitat requirements.

[5]Habitat effectiveness is used as an index to measure the percentage of available habitat that is usable by elk and is used as a guideline for some alternatives. The Habitat Effectiveness Index for Elk on Blue Mountain Winter Ranges developed by Thomas and others (USDA-FS, 1988) was used (with modifications) in developing this RMP, and may be used with other research (e.g., Roloff et al., 2001, and Rowland et al., 2000) to assess impacts caused by motorized travel. Note that because of fragmented ownership and differing road jurisdictions, this guideline may not be achievable in some geographic areas.

4. Non-native species may be used when they will contribute to the recovery of the site, contribute to soil conservation, help manage against weeds, and/or prepare the site for eventual occupation by native plant species and will not impede the growth of native plants.
5. Activities authorized by permit (with interdisciplinary team review) will be restricted in all areas where vegetation manipulation (human or naturally caused) occurs and results in sensitive soil and plant conditions, or the site already has sensitive soils and/or plant conditions. These permitted activities include, but are not limited to, livestock grazing, off-road vehicle travel, recreational events, construction of new roads and trails, and timber harvests.
6. Range developments will be designed to achieve both wildlife and livestock grazing management objectives.
7. Where natural springs exist and are developed, the development will provide a more dependable water source for wildlife as well as livestock. Water troughs will accommodate use by wildlife and livestock, and will be constructed with wildlife escape devices. The spring area and the overflow will be fenced to exclude livestock trampling.
8. Where pipelines are developed to deliver water more than two miles from an existing water source, the water system will be designed to provide water for wildlife between July and October.

*Structural Developments*

9. Guzzlers (artificial structures that collect rain water and then regulate the flow to a drinking basin) will be installed only where they facilitate distribution of target wildlife species. Maintenance of existing guzzlers will receive priority funding over the development of new guzzlers, except when managing for special status species.
10. To the maximum extent feasible, new guzzlers will be located away from existing designated trails to avoid the potential for seasonal trail closures or rerouting of trails.
11. In suitable habitats, where important nesting structures are absent, consider installing nesting platforms, nest boxes, and other structures to improve habitat conditions for snag dependent species.
12. New fences will be built to standard Bureau wildlife specifications to allow wildlife passage, with the exception of fences built specifically to keep wild ungulates out of an area or fences built to meet specific public safety or other administrative purposes. Existing fences not meeting standard Bureau wildlife specification will be modified to meet the standard when major reconstruction is done or as funding allows.

*Disturbance Actions*

13. Manage important wildlife habitats to minimize human disturbance by maintaining seasonal closures throughout the sensitive period (See Table 1 for a list of species that may require seasonal restrictions, the restriction dates, and distance buffers).
14. In seasonally important wildlife habitats (winter range, nest sites, roosts, etc.), major construction and maintenance work will be scheduled to avoid or minimize disturbance to wildlife.
15. Timber sales will be designed to provide sufficient cover to maintain the existing deer migration corridor through the La Pine area.

**Objective W – 4a – Primary Wildlife Emphasis: Provide habitat that benefits wildlife and retains high wildlife use. Wildlife habitat is a primary management consideration in these areas.**

**Guidelines:**

1. Habitat effectiveness should advance toward 70 percent or greater.
2. Where possible, maintain large un-fragmented patches (1,000 to 2,000 acres).



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3. Where possible, manage for low densities of open motorized travel routes (approximately<1.5 mi/mi$^2$).
4. Rate as a high priority for habitat restoration treatments.
5. Group use restrictions may be applied in some areas or during some seasons.
6. Seasonal closures.

**Objective W-4b – Secondary Wildlife Emphasis: Provide habitats that support wildlife and maintain a moderate level of wildlife use. Wildlife habitats may receive a secondary management emphasis in these areas.**

**Guidelines:**
1. Habitat effectiveness should advance toward 50 percent or greater.
2. Maintain moderate size un-fragmented habitat patches (400 to 800 acres).
3. Target low to moderate densities of open motorized travel routes (approximately ≤ 2.5 mi/mi2).

**Objective W-4c – General Wildlife Emphasis: Provide habitat that contributes to species occurrence and distribution. Wildlife habitats typically are not the focus of management in these areas.**

**Guidelines:**
1. Consider focused management effort to maintain or improve the condition of important habitat areas (i.e., nest sites of special status species or connectivity corridors of species of local importance)
2. When opportunities arise, employ management actions that will maintain or improve wildlife habitat conditions.

**Objective W-4d – Jurisdictional Limitations: Provide habitat conditions that move toward primary or secondary wildlife management emphasis to the extent practicable within jurisdictional limitations.**

**Rationale:**
Northwest, Tumalo, La Pine (Northern Area and Southern Area), Prineville Reservoir (Chimney Rock, Eagle Rock, West Eagle Rock, Taylor Butte and Reservoir North) and Prineville Geographic Areas are examples of geographic areas where guidelines for primary or secondary emphasis may not be achievable because of conditions (such as fragmented land ownership or occurrence of county/state roadways) outside of BLM jurisdiction. In those or other areas with similar conditions the guidance is to manage toward those objectives.

**Guidelines:**
1. During the development of management facilities (mineral sites, access roads, etc.) or infrastructure (trails) emphasize maintenance of relatively large un-fragmented habitat patches. The term "relatively large un-fragmented habitat patches" means the size of the patch is related to the size of the BLM parcel(s) in the area and the goal is to minimize the amount of human disturbance of wildlife and human influence on the physical condition of the habitat.
2. Non-motorized trail systems will be developed in a manner that leaves some un-fragmented areas across the geographic area.
3. Motorized travel routes will be kept to a minimum. Roads and driveways that access private land and are not needed for general public access may be gated to limit use only to land owners. Consider building roads and driveways to the minimum standard necessary that allows reasonable access and has the least impact on wildlife resources possible.

B

United States Department of Agriculture

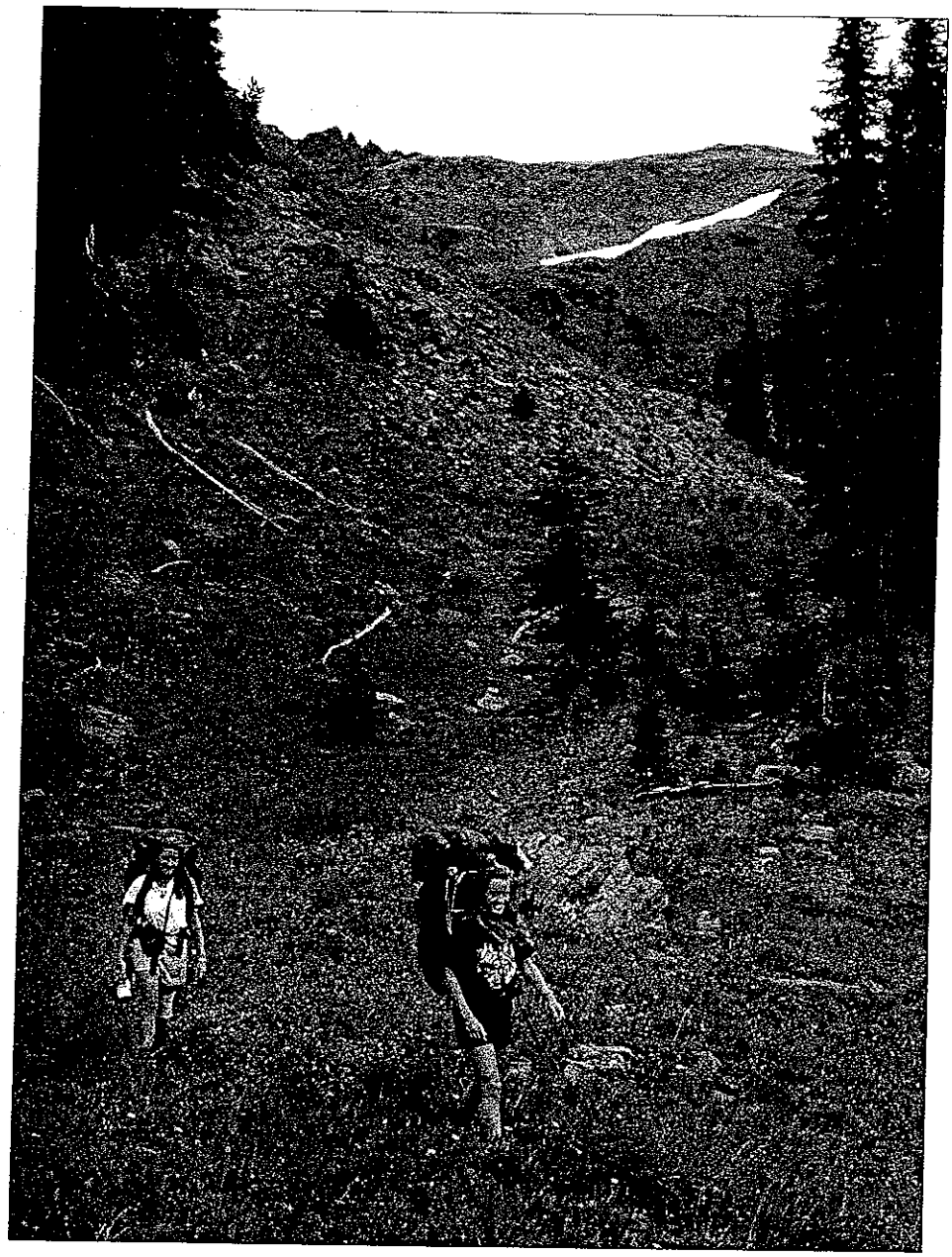
Forest Service

Pacific Northwest Research Station

General Technical Report
PNW-GTR-586
November 2003

# Assessing the Cumulative Effects of Linear Recreation Routes on Wildlife Habitats on the Okanogan and Wenatchee National Forests

William L. Gaines, Peter H. Singleton, and Roger C. Ross



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## Abstract

**Gaines, William L.; Singleton, Peter H.; Ross, Roger C. 2003.** Assessing the cumulative effects of linear recreation routes on wildlife habitats on the Okanogan and Wenatchee National Forests. Gen. Tech. Rep. PNW-GTR-586. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 79 p.

We conducted a literature review to document the effects of linear recreation routes on focal wildlife species. We identified a variety of interactions between focal species and roads, motorized trails, and nonmotorized trails. We used the available science to develop simple geographic information system-based models to evaluate the cumulative effects of recreational routes on habitats for focal wildlife species for a portion of the Okanogan and Wenatchee National Forests in the state of Washington. This process yielded a basis for the consistent evaluation of the cumulative effects of roads and recreation trails on wildlife habitats, and identified information gaps for future research and monitoring. We suggest that managers use an adaptive management approach to address wildlife and recreation interactions because of the complexity and uncertainty of these issues.

Keywords: Okanogan and Wenatchee National Forests, linear recreation routes, focal wildlife species, cumulative effects.

## Summary

We conducted a literature review to document the effects of linear recreation routes (roads, motorized trails, nonmotorized trails, designated and groomed ski and snowmobile routes) on wildlife and to assess the current level of human influences on focal wildlife species habitats on a portion of the Okanogan and Wenatchee National Forests in the state of Washington. The assessment consisted of seven steps: (1) identification of wildlife species and groups, ( 2) identification of focal species within each wildlife group, (3) identification of the road- and trail-associated factors for each focal species, (4) development of assessment processes and geographic information system (GIS) models to evaluate the influence of road- and trail-associated factors on focal species habitats, (5) application of the models to assess the current conditions of focal species habitats, (6) identification of information gaps, and (7) monitoring and adaptive management. Completion of this process yields a basis for the consistent evaluation of the cumulative effects of roads and recreation trails on wildlife habitats relative to the existing baseline conditions.

We identified 238 articles on the effects of recreation trails, roads, and related subjects on wildlife. Of these, 183 articles were used to identify the interactions between roads and recreation trails and 29 focal wildlife species. These articles included technical publications, books, agency publications, theses, and dissertations.

There is more science available to describe the interactions between focal wildlife species and roads than between focal species and recreation trails. Much of the research has been focused on wide-ranging carnivores and ungulates. Other lesser known species could benefit from additional research on the effects of roads, especially for less mobile species where roads may inhibit movements or fragment habitats. The most common reported interactions included displacement and avoidance where animals were reported as altering their use of habitats in response to roads or road networks. Disturbance at a specific site was also commonly reported and included disruption of animal nesting, breeding, or wintering areas. Collisions between animals and vehicles were commonly reported and affected a diversity of wildlife species, from large mammals to amphibians. Finally, edge effects associated with roads or road networks constructed within habitats, especially late-successional forests, were commonly identified.

Fewer wildlife species have been studied relative to their interactions with motorized trails. Ungulates and some wide-ranging carnivore species were the most studied, and many wildlife species could benefit from further research designed to identify these interactions. The most common interaction identified in the literature includes displacement and avoidance where animals altered their use of habitats in response to motorized trails or trail networks. Disturbance at a specific site also was identified and, as with roads, was usually associated with wildlife breeding or rearing young.

The most common interactions reported in the literature that we reviewed between nonmotorized trails and focal wildlife species were displacement and avoidance, which altered habitat use, and disturbance at a specific site during a critical period. The interactions of the focal species and motorized or nonmotorized trails were quite similar. Depending on the wildlife species, some were more sensitive to motorized trail use, whereas others were more sensitive to nonmotorized trail use. Based on our current understanding, both forms of recreation have effects on wildlife. Motorized trails had a somewhat greater magnitude of effects, such as longer distances in which wildlife were displaced, for a greater number of the focal species we reviewed. Additional research would be useful to further refine the interactions of specific species with motorized and nonmotorized trails.

The interactions between snowmobile routes and focal wildlife species are poorly documented for many species. These interactions need to be further refined with additional research and monitoring. The most common interactions that we documented from the literature included trapping as facilitated by winter human access, displacement and avoidance, and disturbance at a specific site, usually wintering areas. An additional interaction that occurred on winter recreation routes was the effect of snow compaction on the subnivean sites used by small mammals. Small mammals can either be suffocated as a result of the compaction, or their subnivean movements can be altered owing to impenetrable compact snow. Snow compaction associated with snowmobiling also was identified as altering the competitor/predator communities because the packed snow routes provide winter access to areas not normally available to some species.

We documented only a few interactions between ski trails and focal wildlife species because of the limited literature available on the subject. Ungulates were the most thoroughly studied group, and few others had been investigated. The most common interactions that we found in the literature included trapping facilitated by winter route access, displacement and avoidance, and disturbance at a specific site (wintering areas in this case). As with snowmobile routes, ski trails also included the interactions of snow compaction and competitor/predator community alterations.

We developed 18 simple GIS models to estimate the current level of influence of linear recreation routes on focal wildlife species habitats. Four of the models addressed winter recreation, 11 nonwinter, and 3 included winter and spring periods. Fifteen of these models were applied to a case study area on a portion of the Okanogan and Wenatchee National Forests to illustrate their use and interpretation. The application of the cumulative effects models showed that, in general, nonwinter activities had a higher level of cumulative effects than groomed and designated winter route activities. Habitats in which cumulative effects were ranked as having a high level of human influence in many analysis units included core areas for grizzly bears (*Ursus arctos*), late-successional habitats, riparian habitats, and lake and riverine habitats. The effectiveness of these habitats could be restored by using some of the approaches described in this document.

During this review, we noted information gaps that hindered our understanding of wildlife, road, and recreation trail interactions. More and better defined information of the following suggested areas of study could help fill these gaps: (1) the interactions between wildlife and nonmotorized trails, snowmobile routes, and ski trails for many wildlife species, especially those with small home ranges and limited mobility; (2) the interactions between wildlife and the intensity of human use on recreation trails (such as trail density or number of hikers per unit time); (3) the interactions between wildlife habitat use and the spatial extent (such as the proportion of a home range or watershed) of recreational activity; and (4) finally, the relation of recreation trail and wildlife interactions to the demography of a species of management interest. Adaptive management and monitoring designed to lead to greater understanding of any of these areas would greatly facilitate our management goals of conserving ecosystem processes and functions while providing recreation opportunities. These areas of study all could be accomplished through the use of an adaptive management approach and well-designed monitoring and research.

The information provided in this review, and subsequent development and application of cumulative effects models, improves the knowledge base that can be used to evaluate project proposals and make informed decisions. The findings of our review agree with the findings of other reviews. In addition, this information can be used to develop and apply mitigation tools to address the kinds of interactions that have been described for each focal wildlife species or group. Tools that have been used to mitigate recreational activities include (1) Spatial separation of humans and wildlife in key habitats. This could be used to address situations where displacement and avoidance interactions have been identified for a wildlife species of management interest. (2) Temporal separation of humans and wildlife at critical periods. This tool could be applied where the interaction of displacement at a specific site has been identified for a wildlife species of management interest. (3) Human behaviors that reduce the effects of recreation on wildlife. These can be taught through information and education programs. (4) Identification of wildlife habitat issues in the early stages of projects. The information provided in this assessment may help address habitat issues proactively through project design.

To proactively address wildlife conservation and recreation opportunities, we need to begin addressing these issues through our landscape-scale planning processes. In this manner, important habitats for wildlife and recreational opportunities for humans can be identified. This process could be accomplished by using the following approach: (1) assess the existing level of influence that recreational activities have on wildlife habitats, (2) set compatible wildlife habitat goals and recreation goals, (3) gain further knowledge about wildlife and recreation interactions through an adaptive management approach, and (4) adapt habitat and recreation goals based on new information. By using this approach, we can address the mutual goals of conserving wildlife species while providing recreation opportunities. These goals have many commonalities, not the least of which is the desire of people to experience wildlife during their recreational outings.

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## The Assessment Process

### Introduction

Increasing demand for recreational opportunities and facilities (Burchfield et al. 2000, USDA FS 2000b) has resulted in controversy over the potential effects of these activities on wildlife (Flather and Cordell 1995). On national forest lands, management is focused on providing recreational opportunities compatible with ecosystem processes and functions (USDA FS 2000b). Understanding how recreational activities influence ecosystem processes and functions is necessary to evaluate different management options and to make informed decisions.

As demands for recreation increase, so do cumulative effects on wildlife species and their habitats over space and time. Cumulative effects can be defined as the combined effect on a species or its habitat caused by the activity or program at hand, as well as other reasonably foreseeable events that are likely to have similar effects on the species or habitat (Weaver et al. 1987). Cumulative effects analysis assesses the effects on a system of spatial and temporal perturbations resulting from human activities (Beanlands et al. 1986). Cumulative effects analysis explicitly deals with effects and whether those effects exceed or fall short of thresholds compatible with the population or habitat goals for a given species or group of species. Hence, cumulative effects analysis and its attendant models are tools to perform proactive conservation for wildlife species and habitats (Weaver et al. 1987).

Although a considerable and growing body of research is available concerning recreation and wildlife interactions (Joslin and Youmans 1999, Knight and Gutzwiller 1995), significant gaps in our knowledge remain. Gathering reliable knowledge can be time consuming and costly because of the difficulty in controlling an array of variables that influence how wildlife reacts to human activities. Because of this, the investigation of wildlife and recreation interactions is well suited to an adaptive management approach (Gutzwiller 1993, Knight and Gutzwiller 1995).

Recreation on national forest lands includes a wide variety of activities with a correspondingly wide range of effects on wildlife. Because of this, it was necessary to narrow the scope of recreational activities considered in this assessment. Therefore, this assessment is focused on linear recreational routes; including motorized and nonmotorized trails, winter ski trails, snowmobile routes, and forest roads. These activities account for most of the recreational activities and potential effects on wildlife habitats that occur on the Okanogan and Wenatchee National Forests. Future efforts should be focused on providing a summary of the available science about other types of recreational activities and wildlife interactions such as helicopter skiing, rock-climbing, snow-play areas, and several others, which were beyond the scope and funding of this effort. The processes and methods developed in this assessment would greatly facilitate the incorporation of these other recreational activities.

This assessment has been designed with three primary objectives in mind: (1) develop a baseline of information about roads, recreation trails, and wildlife interactions through a review of relevant literature; (2) develop assessment processes and geographic information system (GIS) models for the consistent evaluation of the cumulative effects of these activities on wildlife habitats; and (3) use the processes and models to complete a case study assessment of the effects of existing roads and recreation trails on wildlife habitats for the Okanogan and Wenatchee National Forest lands located between Interstate 90 and Lake Chelan.



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## Methods

The assessment process consists of seven steps: (1) identify wildlife species and groups; (2) identify focal species within each wildlife group; (3) identify the road- and trail-associated factors for each focal species; (4) develop assessment processes and GIS models to evaluate the influence of road- and trail-associated factors on focal species habitats, including the development of preliminary cumulative effects thresholds; (5) apply the models to assess the current conditions of focal species habitats; (6) identify information gaps; and (7) monitor and apply adaptive management approaches. This process yields a basis for the consistent evaluation of the cumulative effects of roads and recreation trails on wildlife habitats relative to the existing baseline conditions. In addition, this process can be used to address other types of recreational activities and assess their cumulative effects on wildlife habitats.

**Step 1. Identify wildlife species and groups**—We used existing information about the distribution of wildlife species on the Okanogan and Wenatchee National Forests to develop a list of wildlife species and to develop groups of species based on their biology (e.g., wide-ranging carnivores, late-successional species, riparian-associated species, etc.) and interactions with road- and recreation trail-associated factors. These information sources included watershed assessments, late-successional reserve assessments (USDA FS 1997), and information from the Washington gap analysis program (GAP) (Dvornich et al. 1997, Johnson and Cassidy 1997, Smith et al. 1997).

In all, 395 species are included in this assessment (see app.). These included 9 amphibian species, 11 reptile species, 286 bird species, 84 mammal species, and 5 mollusks. These species were placed into six groups (some species occurred in more than one group and habitat generalist species were not assigned to any group), which included:

1. Wide-ranging carnivores (9 species)
2. Ungulates (6 species)
3. Late-successional forest habitat-associated species (71 species)
4. Riparian-associated species (144 species)
5. Waterfowl and colonial nesting birds (97 species)
6. Primary cavity excavators (11 species)

**Step 2. Identify focal wildlife species**—Many systems have been used by ecologists to evaluate or rank potential emphasis species (Kuhnke and Watkins 1999, Lambeck 1997, Lehmkuhl et al. 2001, Millsap et al. 1990, Noss et al. 1997). One approach that has been proposed is the "focal species" concept (Lambeck 1997, Noss et al. 1997) in which species that are most sensitive to a particular activity (habitat fragmentation, disturbance from a motorized trail, etc.) are used to define the acceptable levels of the activity for a group of species (such as wide-ranging carnivores). Lindenmayer et al. (2002) pointed out some of the limitations of the focal species concept, including a lack of testing to validate the approach. However, the focal species approach has recently been empirically tested for wide-ranging carnivores (Carroll et al. 2001) and birds (Watson et al. 2001) with favorable results. We, therefore, used this concept to select focal wildlife species that represented groups of wildlife species (table 1).

Focal species, as described in the federal planning regulations (CFR Vol. 65 No. 218, November 2000), are species selected for use as surrogate measures in the assessment of ecological integrity. Their distribution and abundance over time provide

**Table 1—Focal wildlife species that were identified for each of the 6 wildlife groups used in this assessment**

| Wildlife group | Focal species |
|---|---|
| Wide-ranging carnivores | Grizzly bear, lynx, gray wolf, wolverine |
| Ungulates | Mule deer, elk, bighorn sheep, mountain goats |
| Late-successional-forest-associated species | Northern spotted owl, northern goshawk, brown creeper, American marten, fisher, northern flying squirrel, pygmy nuthatch, white-breasted nuthatch, white-headed woodpecker |
| Riparian associated species | Cascade frog, tailed frog, harlequin duck, bald eagle, water shrew, black-capped chickadee |
| Waterfowl and colonial nesters | Common loon, great blue heron, eared grebe, wood duck |
| Primary cavity excavators | White-headed woodpecker, three-toed woodpecker, pileated woodpecker |

insights into the integrity of the larger ecological system to which they belong. We selected species that represent the range of environments within the assessment area, and that serve an umbrella function, or play key roles in maintaining community structure or processes. Therefore, we selected focal species (1) whose habitat associations represented the range of habitats associated with the wildlife group, (2) whose road- and recreation trail-associated factors were representative of the range of the group, (3) whose populations or habitats could be monitored, (4) for which viability concerns were known such as federally listed or USDA Forest Service "sensitive" species, and (5) that were relatively well studied relative to the effects of road and trails on their habitat use.

**Step 3. Identify road- and trail-associated factors**—Liddle (1997) provided a three-tier disturbance classification scheme for the effects recreational activities have on wildlife. Disturbance type 1 occurs when an animal sees, hears, smells, or otherwise perceives the presence of a human but no contact is made and it may or may not alter its behavior. Disturbance type 2 is when habitat is changed in some way by pathway creation, camping, the presence of food, or clearing of vegetation. Disturbance type 3 involves human actions in which there is a direct and damaging contact with the animal such as hunting, fishing, collisions with vehicles, and other accidental contact in which the results are similar to hunting. Alternatively, Knight and Cole (1995) provided a conceptual model of the responses of wildlife to recreational activities. They grouped the causes of recreation impacts to wildlife into harvest, habitat modification, pollution, and disturbance.

For this assessment, these two broad classification schemes were refined to focus on road- and recreation trail-factors that affected wildlife, based on a review of relevant literature. The road- and recreation trail-associated factors were initially based on the factors developed by Wisdom et al. (1999) and a literature review by Singleton and Lehmkuhl (1998). These reviews were expanded to include additional factors associated with winter and nonwinter human use of recreation trails. The relationship between the general classification schemes proposed by Liddle (1997) and Knight and Cole

(1995), and the road- and trail-associated factors used in this assessment are shown in table 2. Table 3 lists the road- and trail-associated factors along with their effects and groups of wildlife species that are affected by them.

Based on a review of the scientific literature, road- and recreation trail-associated factors were identified for "focal" wildlife species for which information was available. The effects of road- and recreation trail-associated factors can be direct, such as habitat loss and fragmentation, or indirect, such as displacement or avoidance of areas near roads in relation to motorized traffic and associated human activities (Blakesley and Reese 1988, Miller et al. 1998, Reed et al. 1996, Wisdom et al. 2000). Recreation trail-associated factors were identified for nonmotorized trails, motorized trails, snowmobile routes, and ski trails. In addition, the road-associated factors developed by Wisdom et al. (1999) were summarized and expanded upon.

**Step 4. Processes and models**—Assessment processes and models were developed to provide a consistent approach to the evaluation of the cumulative effects of roads and recreation trails on wildlife habitats. These were based on the habitat requirements of the focal species and the trail- and road-associated factors found to affect the focal species. The models and assessment processes were developed to use GIS and corresponding data layers that included roads, trails, wildlife habitats, watersheds, and subbasins. Ideally, these models would incorporate the following variables: (1) spatial extent of the immediate effect of the factor (such as distance a species was displaced from a road or trail), (2) the level of intensity of human use on a road or trail that resulted in a factor being identified as affecting the focal species (such as number of people per day or density of roads), and (3) the extent, or a threshold, of human influence (assessed by 1 and 2 above) on wildlife habitats within a given area, such as a watershed or subbasin (such as 50 percent of a watershed within a trail zone of influence with >10 people per day).

Relatively reliable information was available for many focal species concerning the immediate spatial effect, or the zone of influence, of a particular road- or trail-associated factor. Less information was available relating to the intensity of human use (number of vehicles per unit time or density of open roads) on the effect on wildlife and, consequently, it was included in only a few of the models. There was even less information on the extent of human influence (such as the proportion of a home range within a zone of influence when use by a particular species significantly changes) on focal species habitat use; this area is ripe for research.

The size of the analysis area used to evaluate cumulative effects was based on the mobility of focal species, and whether the focal species were habitat generalists or specialists. For example, wide-ranging carnivores typically have large home ranges, can travel large distances, and are habitat generalists. As a result, we chose large areas in which to address cumulative effects for these species. Conversely, several late-succession- and riparian-associated wildlife species have smaller home ranges, are less mobile, and are habitat specialists. Therefore, cumulative effects were assessed by using specific habitats within 5$^{th}$-field watersheds or habitat reserves.

Because quantitative evaluation of cumulative recreation effects was not possible owing to data limitations for many species, we developed a qualitative ranking scheme. We assumed that the lower amount of roads and trails in an assessment area, the higher the probability of focal species persistence and the higher the probability that ecosystem processes and functions would be conserved (fig. 1). Consequently, we ranked cumulative linear recreation route effects to focal species as high, moderate,

**Table 2—Comparison of classification schemes used to describe the effects of recreation on wildlife and the road- and trail-associated factors used in this assessment**

| Road- and trail-associated factors[a] | Disturbance type[b] | Recreation activity[c] | Definition of associated factors |
|---|---|---|---|
| Hunting and trapping | Disturbance type 3 | Harvest | Mortality from hunting or trapping as facilitated by road and trail access |
| Poaching | Disturbance type 3 | Harvest | Increased illegal take of animals as facilitated by trails and roads |
| Collisions | Disturbance type 3 | Harvest | Death or injury resulting from a motorized vehicle running over or hitting an animal |
| Negative human interactions | Disturbance type 3 | Harvest | Increased mortality of animals (euthanasia or shooting) owing to increased contact with humans, as facilitated by road and trail access |
| Movement barrier or filter | Disturbance type 2 | Habitat modification | Interference with dispersal or other movements as posed by a road or trail itself or by human activities on or near roads, trails, or networks |
| Displacement or avoidance | Disturbance type 1 | Disturbance | Spatial shifts in populations or individual animals away from human activities on or near roads, trails, or networks |
| Habitat loss and fragmentation | Disturbance type 2 | Habitat modification | Loss and resulting fragmentation of habitat owing to the establishment of roads, trails, or networks, and associated human activities |
| Edge effects | Disturbance type 2 | Habitat modification | Changes to habitat microclimates associated with the edge induced by roads or trails |
| Snag or downed log reduction | Disturbance type 2 | Habitat modification | Reduction in density of large snags and downed logs owing to their removal near roads as facilitated by road access |
| Collection | Disturbance type 3 | Harvest | Collection of live animals for use as pets (such as amphibians and reptiles) as facilitated by the physical characteristics of roads or trails or by road or trail access |
| Route for competitors and predators | Disturbance type 2 | Habitat modification | A physical human-induced change in the environment that provides access for competitors or predators that would not have existed otherwise |
| Disturbance at a specific site | Disturbance type 1 | Disturbance | Displacement of individual animals from a specific location that is being used for reproduction and rearing of young |
| Snow compaction | Disturbance type 3 | Habitat modification | Direct mortality of animals crushed or suffocated as a result of snow compaction from snowmobile routes or groomed ski trails |
| Physiological response | Disturbance type 1 | Disturbance | Increase in heart rate or stress hormones when near a road or trail or network of roads or trails |

[a] Based in part on Wisdom et al. 1999.

[b] Disturbance type 1 occurs when an animal sees, hears, smells, or otherwise perceives the presence of a human but no contact is made and it may or may not alter its behavior. Disturbance type 2 is when habitat is changed in some way. Disturbance type 3 involves human actions in which there is direct and damaging contact with the animal. From Liddle 1997.

[c] From Knight and Cole 1995.

**Table 3—Recreation trail- and road-associated factors with documented effects on habitat or populations of wildlife species, and the affected wildlife species groups**

| Road- and trail-associated factors | Effects of the factors | Wildlife group affected |
|---|---|---|
| Hunting and trapping | Mortality from hunting or trapping as facilitated by road and trail access | Wide-ranging carnivores<br>Ungulates<br>Waterfowl |
| Poaching | Increased illegal take of animals, as facilitated by trails and roads | Wide-ranging carnivores<br>Ungulates<br>Waterfowl |
| Collisions | Death or injury resulting from a motorized vehicle running over or hitting an animal | Wide-ranging carnivores<br>Late successional<br>Riparian associated<br>Ungulates |
| Negative human interactions | Increased mortality of animals (e.g., euthanasia or shooting) owing to increased contact with humans, as facilitated by road and trail access | Wide-ranging carnivores<br>Ungulates<br>Late successional |
| Movement barrier or filter | Alteration of dispersal or other movements as posed by a road or trail itself or by human activities on or near a road or trail or network | Wide-ranging carnivores<br>Late successional<br>Riparian associated<br>Ungulates |
| Displacement or avoidance | Spatial shifts in populations or individual animals from a road or trail or network in relation to human activities on or near a road or trail or network | Wide-ranging carnivores<br>Late successional<br>Riparian associated<br>Ungulates |
| Habitat loss and fragmentation | Loss and resulting fragmentation of habitat owing to the establishment of roads and trails, road and trail networks, and associated human activities | Wide-ranging carnivores<br>Late successional<br>Riparian associated<br>Ungulates<br>Primary cavity excavators |
| Edge effects | Changes to habitat microclimates associated with the edge induced by roads or trails | Late successional |
| Snag or downed log reduction | Reduction in density of large snags and downed logs owing to their removal near roads or campsites, as facilitated by road access | Late successional<br>Riparian associated<br>Primary cavity excavators |
| Collection | Collection of live animals for use as pets (such as amphibians and reptiles), as facilitated by the physical characteristics of roads and trails or by road and trail access | Late successional<br>Riparian associated |
| Route for competitors or predators | A physical human-induced change in the environment that provides access for competitors or predators that would not have existed otherwise | Wide-ranging carnivores<br>Late successional<br>Riparian associated<br>Primary cavity excavators |
| Disturbance at a specific site | Displacement of individual animals from a specific location that is being used for reproduction and rearing young | Wide-ranging carnivores<br>Late successional<br>Riparian associated<br>Ungulates |
| Snow compaction | Direct mortality of animals crushed or suffocated as a result of snow compaction from snowmobile routes or groomed ski trails | Late successional<br>Riparian associated |
| Physiological response | Changes in heart rate or level of stress hormones as a result of proximity to a road or trail | Ungulates<br>Late successional |

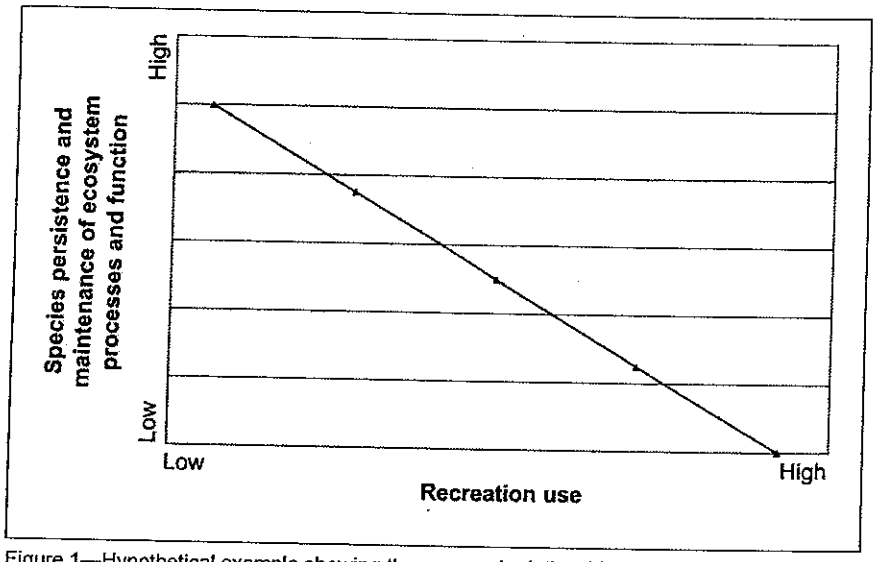


Figure 1—Hypothetical example showing the assumed relationship between increasing recreational use within wildlife habitats and the probability of focal species persistence and maintenance of ecosystem processes and functions.

or low depending largely on the extent of influence that these activities had on wildlife habitats within a given analysis area. Where possible, we linked these rankings to biological thresholds derived from our literature review. Where these data were lacking, we generally split the effects levels into quartiles to assign relative ranks.

The assessment processes and models described in the document were designed to address broad-scale issues, such as cumulative effects, and to provide information that could be used to evaluate project-level effects. These models could best be viewed as working hypotheses about the interactions between roads, trails, and wildlife. As such, wildlife responses should be monitored and models adapted as new information becomes available.

**Step 5. Assess the current condition**—We applied the assessment processes and models to evaluate the current condition of wildlife habitats for each of the effects of associated factors of the recreation activities (table 2) associated with roads and recreation trails. To complete this assessment, district recreation specialists updated GIS-based road and trail maps and attributed each trail or trail segment with information on trail use levels. This was completed for all the recreation trails that occurred in the assessment area.

**Step 6. Identify information gaps**—The literature review, model-building exercises, and pilot study allowed for the identification of information gaps. These were summarized and prioritized, and potential research topics were identified for each group of wildlife species.

**Step 7. Monitor and apply adaptive management approaches**—Because of our incomplete knowledge about many of the road, recreation trail, and wildlife interactions, assumptions were made to complete the assessment. Appropriate monitoring was identified to test the validity of our assumptions and to make management adjustments based on monitoring results.

### Document Organization

The next section of this document focuses on different types of linear recreational routes and the documented effects they have on focal wildlife species. This overview is provided for different types of recreational routes, highlights the most common road- and trail-associated factors, and describes how pervasive these effects are across focal species. This section provides the reader with an idea of the range of road- and trail-associated factors and their likelihood of affecting focal species.

The six sections (beginning on page 13) following the overview shifts the focus to wildlife species groups and focal wildlife species within each group. We describe documented specific effects of linear recreation routes on species groups and focal species to provide insights into how severe effects are likely to be when they occur. In these sections, we present assessment models and tools for specific focal species and species groups.

Taken together, the overview and following sections for each species group provide information about the likelihood and magnitude of effects that is necessary to estimate cumulative effects. Examples of how these work together are presented for a case study area by using a portion of the Okanogan and Wenatchee National Forests, and includes interpretations of model outputs. The final section of this document discusses monitoring and adaptive management, and provides a hypothetical example of how these concepts can be applied to learn from recreation projects that could influence wildlife habitats.

## Overview of Interactions Between Focal Wildlife Species and Linear Recreation Routes

Here we provide an overview of the road- and trail-associated factors that were documented in the literature between the five types of linear recreation routes and 29 focal wildlife species (table 1). We provide this overview to illustrate the frequency with which various road- and trail-associated factors were documented in the literature and to summarize the relative status of our scientific understanding of how each of the five types of linear recreation routes affect focal wildlife species.

### Literature Review

We reviewed 238 articles on the effects of recreation trails and roads on wildlife. Of these, 183 articles were used to identify the interactions between roads, recreation trails, and focal wildlife species. These articles included technical publications, books, agency publications, theses, and dissertations. Many of these references came from previous reviews (Boyle and Samson 1985, Joslin and Youmans 1999, Knight and Gutzwiller 1995, Liddle 1997).

**Road and focal wildlife species interactions**—The science available to describe the interactions between focal wildlife species and roads is more developed than that available to describe the interactions between focal wildlife species and recreation trails. Much of the research has been focused on wide-ranging carnivores and ungulates. Other lesser known species could benefit from additional research on the effects of roads; this is especially true for less mobile species where roads may inhibit movements or fragment habitats.

The most commonly reported interactions included displacement or avoidance where animals were reported as altering their use of habitats in response to roads or road networks (Cassier and Groves 1990, Hutto 1995, Johnson et al. 2000, Klein 1993, Mace et al. 1996, 1998) (fig. 2). Disturbance at a specific site was also commonly reported and included disruption of animal nesting, breeding, or wintering areas (Linnell et al. 2000, Papouchis et al. 2001, Skagen et al. 1991). Collisions between animals and vehicles were commonly reported and affected a diversity of wildlife species, from large mammals (Gibeau and Heuer 1996, Lehnert et al. 1996) to amphibians (Ashley

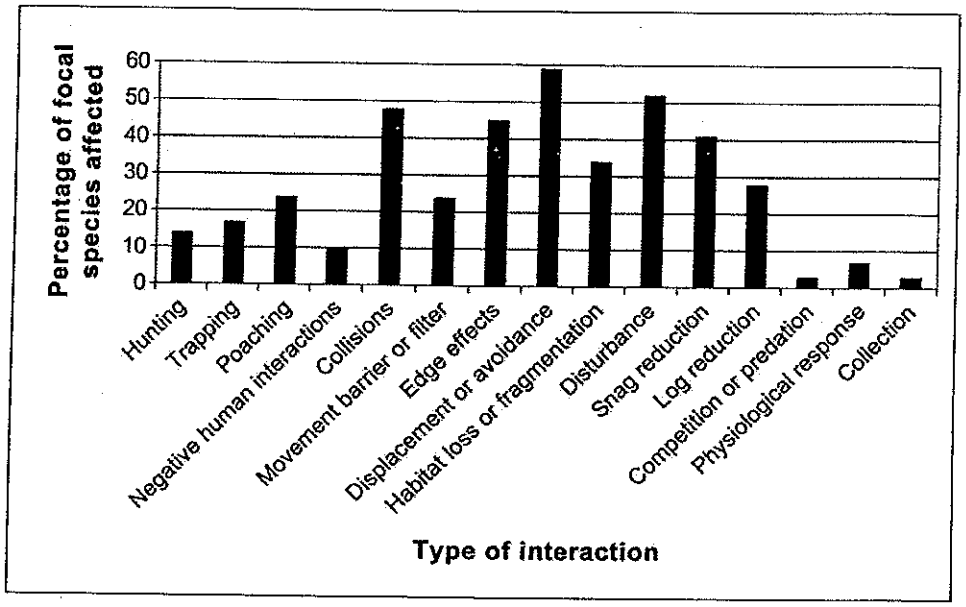


Figure 2—Interactions between the 29 focal wildlife species and roads documented from the literature review.

and Robinson 1996). Finally, edge effects associated with roads or road networks constructed within habitats, especially late-successional forests, were commonly identified (Hickman 1990, Miller et al. 1998).

**Motorized trails and focal wildlife interactions**—Fewer wildlife species have been studied relative to the interactions with motorized trails compared to studies that have investigated wildlife and road interactions. Ungulates and some wide-ranging carnivore species were the best studied, and many wildlife species could benefit from further research designed to identify common factors involved in these interactions.

One of the most common interactions identified in the literature includes displacement or avoidance where animals altered their use of habitats in response to motorized trails or trail networks (Kasworm and Manley 1990, Mace et al. 1996) (fig. 3). Disturbance at a specific site also was identified and, as with roads, was usually associated with breeding or rearing young (Foppen and Reijnen 1994, Phillips and Alldredge 2000).

**Nonmotorized trail and focal wildlife species interactions**—The most common interactions reported in the literature that we reviewed between nonmotorized trails and focal wildlife species were displacement and avoidance, which altered habitat use (Kasworm and Manley 1990, Klein 1993, Miller et al. 1998, Swarthout and Steidl 2001), and disturbance at a specific site during a critical period (Ashley 1994, Cassier and Groves 1989) (fig. 4). The interactions of focal species and motorized or nonmotorized trails were quite similar. Depending on the wildlife species, some were more sensitive to motorized trail use, whereas others were more sensitive to nonmotorized trail use. Based on our current level of understanding, both forms of recreation have effects on wildlife. Motorized trails had a somewhat greater magnitude of effects, such



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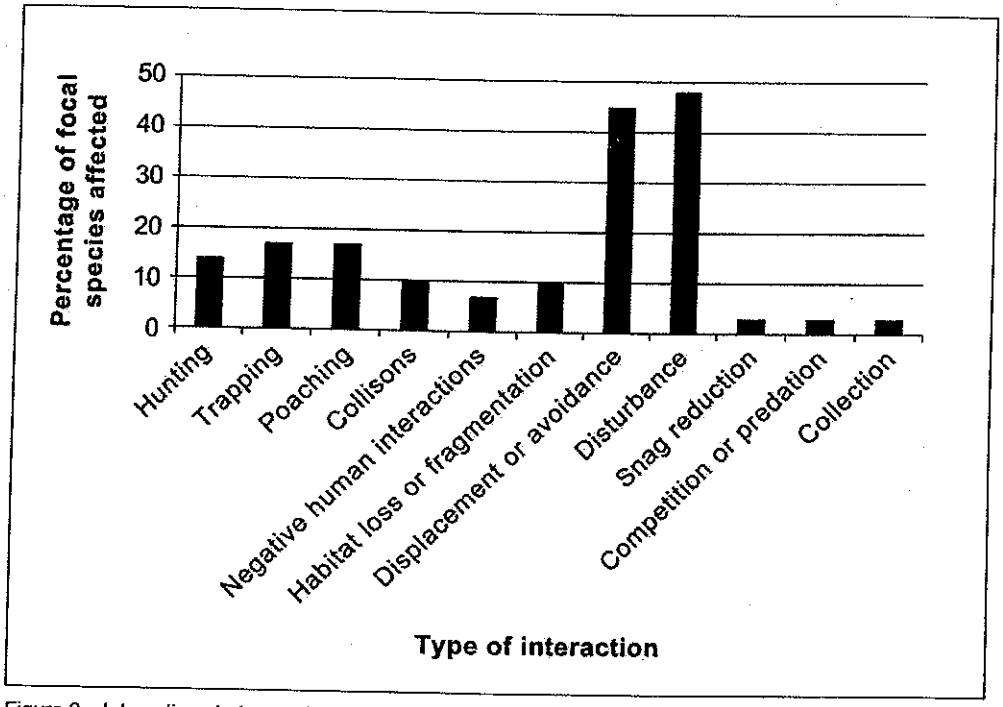


Figure 3—Interactions between the 29 focal wildlife species and motorized trails documented from the literature review.

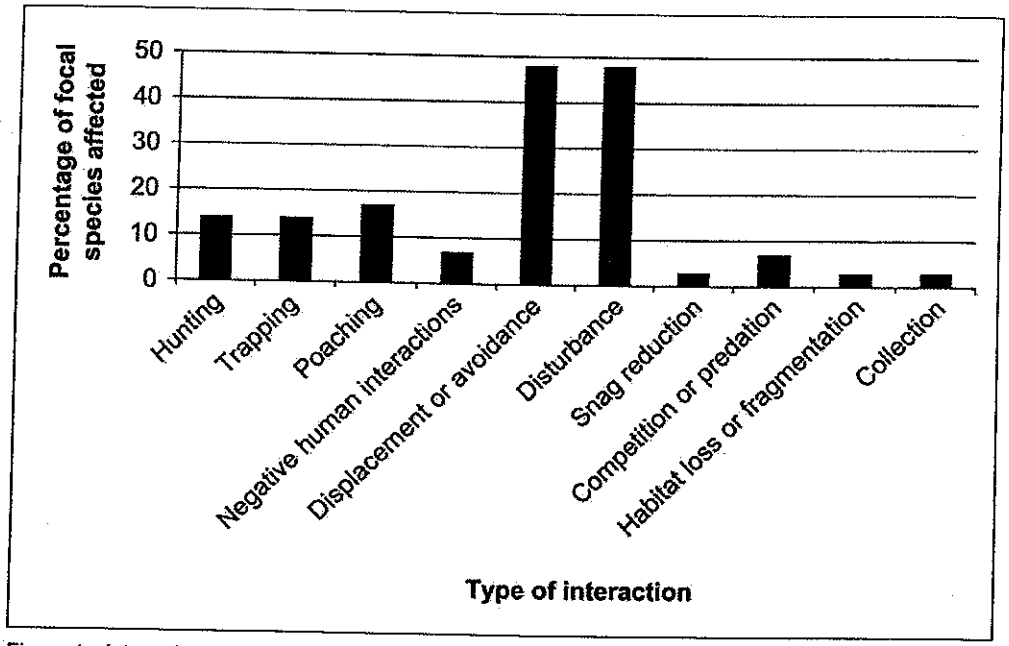


Figure 4—Interactions between the 29 focal wildlife species and nonmotorized trails documented from the literature review.

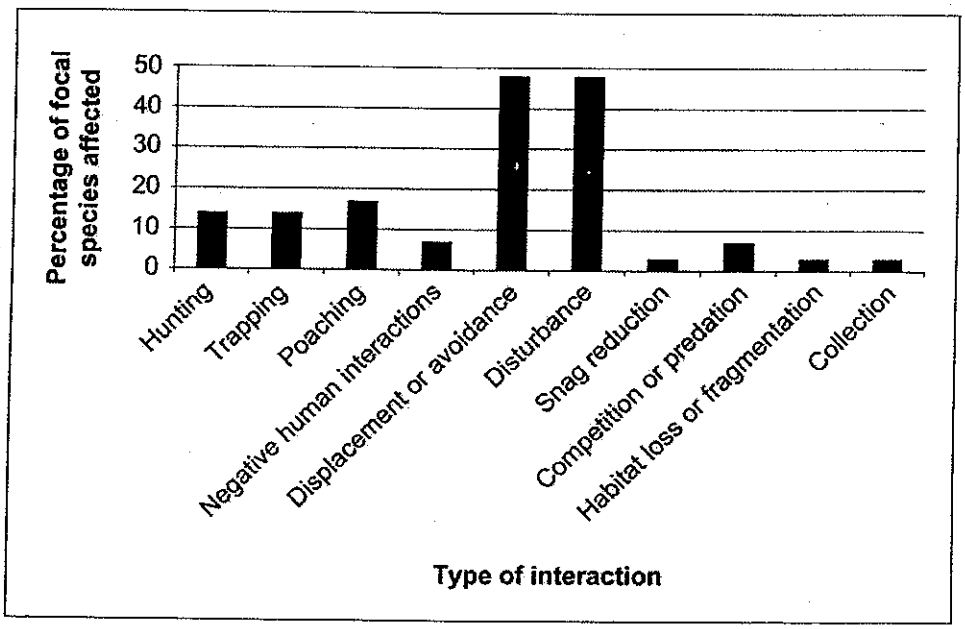


Figure 5—Interactions between the 29 focal wildlife species and snowmobile routes documented from the literature review.

as longer distances in which wildlife were displaced, for a greater number of the focal species we reviewed. Additional research would be useful to further refine the interactions of specific species with motorized and nonmotorized trails.

**Snowmobile route and focal wildlife species interactions**—The interactions between snowmobile routes and focal wildlife species are poorly documented for many species. These interactions need to be further refined with additional research and monitoring. The most common interactions that we documented from the literature included trapping and poaching facilitated by winter human access (Claar et al. 1999, Wisdom et al. 2000), displacement and avoidance (Cassier et al. 1992), and disturbance at a specific site (Copeland 1996, Hornocker and Hash 1981, Jonkel 1980, Linnell et al. 2000, Reynolds et al. 1986), usually wintering areas (fig. 5). An additional interaction that occurred for winter recreation routes was the effect that snow compaction has on the subnivean sites used by small mammals (Schmid 1972). Small mammals can either be suffocated as a result of the compaction, or their subnivean movements can be altered owing to impenetrable compact snow. Snow compaction associated with snowmobiling also was identified as altering the competitor/predator communities because the packed snow routes provide winter access to areas not normally available to some species (Buskirk 1999, Koehler and Aubry 1994, Ruediger et al. 2000).

**Ski trails and focal wildlife interactions**—We documented only a few interactions between ski trails and focal wildlife species owing to the limited literature available on the subject. Ungulates were the most thoroughly studied group, and few others had been investigated. The most common interactions that we found in the literature included trapping facilitated by winter route access (Claar et al. 1999), displacement and avoidance (Ferguson and Keith 1982, Freddy et al. 1986), and disturbance at a



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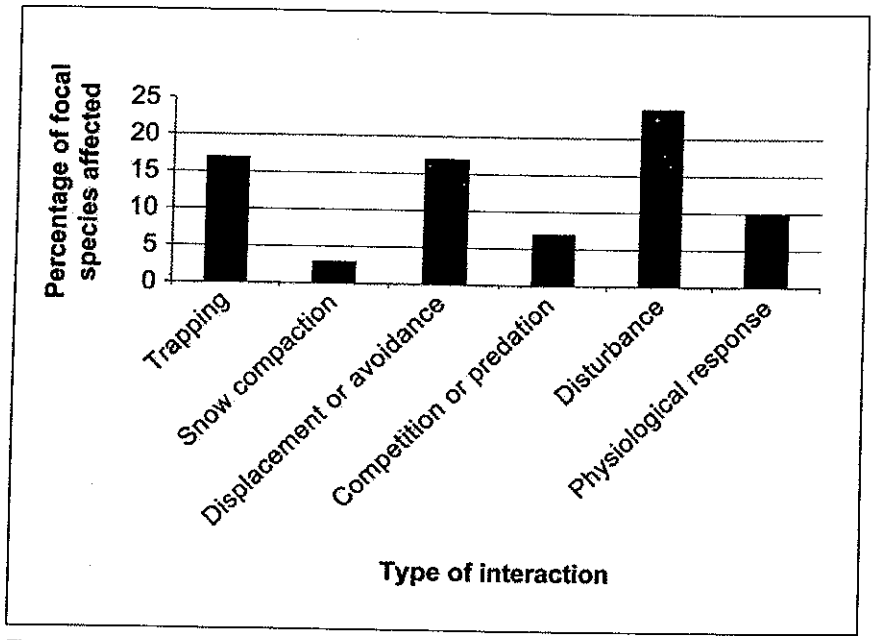


Figure 6—Interactions between the 29 focal wildlife species and ski trails documented from the literature review.

specific site, such as wintering areas (Canfield et al. 1999, Freddy et al. 1986) (fig. 6). As with snowmobile routes, ski trails also included the interactions of snow compaction and competitor/predator community alterations (Buskirk 1999, Koehler and Aubry 1994, Ruediger et al. 2000).

## Information Gaps

Over the course of this review, we kept track of information gaps that hindered our understanding of wildlife, road, and recreation trail interactions. Further research in the following suggested areas of study, which can be accomplished through the use of an adaptive management approach and well-designed monitoring and research (Gaines et al. 1999; Gutzwiller 1991, 1993), would help improve our understanding of wildlife, road, and recreation trail interactions.

- The interactions between wildlife, nonmotorized trails, snowmobile routes, and ski trails for many wildlife species, especially those with small home ranges and limited mobility.
- The interactions between wildlife and the intensity of human use on recreation trails (such as trail density or number of hikers per unit time).
- The interactions between wildlife habitat use and the spatial extent (such as the proportion of a home range or watershed) of recreational activity.
- The relation of recreation trail and wildlife interactions to the demography of particular species of management interest.

Adaptive management and monitoring designed to lead to greater understanding of any of these areas would greatly facilitate our management goals of conserving ecosystem processes and functions while providing recreation opportunities (see "Monitoring and Adaptive Management" on page 51).

The following sections of this document are designed to provide managers with some tools that can be used to evaluate wildlife habitats for various focal wildlife species. In addition, a framework for how to approach adaptive management and monitoring is provided. This information will help address the mutual goals of conserving wildlife species while providing recreation opportunities. These goals have many commonalities, not the least of which is the desire of people to experience "wildlife" during their recreational outings.

## Wide-Ranging Carnivore Habitat Assessment

### Introduction and Focal Species Selection

There were nine wildlife species that were included in the wide-ranging carnivore group (see app.). The species that met the criteria of a focal species for this group included the grizzly bear (*Ursus arctos*), Canada lynx (*Lynx canadensis*), gray wolf (*Canis lupus*) and wolverine (*Gulo gulo*). These four species were representative of the habitat requirements of the other species in the group and were sensitive to an array of road- and trail-associated factors. In addition, three of these species are federally listed, and the other, wolverine, has been petitioned (Biodiversity Legal Foundation 2000) for listing and is under review.

### Summary of Recreation Route-Associated Factors for Focal Species

Mammalian carnivores have responded variously to human recreation. Some species, such as coyotes, have adapted to the presence of humans and to human activities (Crabtree and Sheldon 1999). For others, human recreational activities are documented or suspected to have significant adverse impacts (Claar et al. 1999). Because they are listed under the Endangered Species Act and have been the subjects of considerable research, evidence of such impacts is most compelling for grizzly bears and gray wolves (Claar et al. 1999). For several other carnivore species, such as black bear (*Ursus americanus*), mountain lion or cougar (*Felis concolor,* now *Puma concolor*), lynx, bobcat (*Lynx rufus*), wolverine, fisher (*Martes pennanti*), and marten (*Martes americana*), research has been focused on the demographic effects of hunting or trapping and not on the effects of other recreational activities on their habitats.

Several studies have documented displacement of grizzly bears from trails (motorized and nonmotorized) and roads (Archibald et al. 1987; Kasworm and Manley 1990; Mace and Waller 1996, 1998; Mace et al. 1996, 1999; Mattson et al. 1987; McLellan and Shackleton 1988, 1989) (table 4). Factors related to human access include increased potential for poaching, collisions with vehicles, and chronic negative human interactions at campgrounds and campsites that are accessed by roads and trails (Claar et al. 1999, Wisdom et al. 2000) (table 4). Winter recreational activities have been documented to disturb bears in winter dens (Jonkel 1980, Linnell et al. 2000, Reynolds et al. 1986) and are of special concern if they occur within 200 m of a den site (Linnell et al. 2000). However, because we could not model grizzly bear denning habitat at this broad scale, project-level analyses should consider the direct and indirect effects of winter recreational activities in areas where grizzly bear denning is an issue. Finally, grizzly bear mortalities as a result of collisions with vehicles have been documented (Gibeau and Heuer 1996) (table 4).

Few studies have been conducted on the effects of recreational activities on lynx (Ruediger et al. 2000). Other focal carnivores appear to be more sensitive to the effects of roads and trails (McKelvey et al. 2000); therefore, lynx was selected as a focal species because of concerns about the potential effects of winter recreational activities (Buskirk 1999, Koehler and Aubry 1994, Ruediger et al. 2000). Specifically, snow compaction associated with grooming for snowmobiling and cross-country skiing may provide travel routes for competitors and predators such as coyotes (*Canis latrans*), bobcats, and mountain lions (Buskirk 1999, Koehler and Aubry 1994,

**Table 4—Road- and recreation trail-associated factors for wide-ranging carnivores**

| Focal species | Road-associated factors | Motorized trail-associated factors | Nonmotorized trail-associated factors | Snowmobile route-associated factors | Ski trail-associated factors |
|---|---|---|---|---|---|
| Grizzly bear[a] | Poaching<br>Collisions<br>Negative human interactions<br>Displacement or avoidance | Poaching<br>Negative human interactions<br>Displacement or avoidance | Poaching<br>Negative human interactions<br>Displacement or avoidance | Disturbance at a specific site | Disturbance at a specific site |
| Lynx[b] | Down log reduction<br>Trapping<br>Collisions<br>Disturbance at a specfic site | Disturbance at a specific site<br>Trapping | Disturbance at a specific site | Route for competitors or predators<br>Trapping<br>Disturbance at a specific site | Route for competitors or predators<br>Disturbance at a specific site |
| Gray wolf[c] | Trapping<br>Poaching<br>Collisions<br>Negative human interactions<br>Disturbance at a specific site<br>Displacement or avoidance | Trapping<br>Disturbance at a specific site | Trapping<br>Disturbance at a specific site | Trapping<br>Physiological response | |
| Wolverine[d] | Down log reduction<br>Trapping<br>Disturbance at a specific site<br>Collisions | Trapping<br>Disturbance at a specfic site | Trapping<br>Disturbance at a specific site | Trapping<br>Disturbance at a specific site | Trapping<br>Disturbance at a specific site |

[a]Sources: Archibald et al. 1987; Claar et al. 1999; Hood and Parker 2001; Jonkel 1980; Kasworm and Manley 1990; Linnell et al. 2000; Mace and Waller 1996, 1998; Mace et al. 1996, 1999; Mattson et al. 1987; McLellan and Shackleton 1988, 1989; Puchlerz and Servheen 1998; Weaver et al. 1987; Wisdom et al. 2000.
[b]Sources: Banci 1994, Buskirk 1999, Claar et al. 1999, Koehler and Aubry 1994, McKelvey et al. 2000, Ruediger et al. 2000.
[c]Sources: Boyd and Pletscher 1999; Claar et al. 1999; Creel et al. 2002; De Vos 1948; Harrison and Chapin 1998; Jensen et al. 1986; Mech et al. 1988, 1991; Mladenoff and Sickley 1998; Mladenoff et al. 1995, 1997; Thiel 1985; Thurber et al. 1994.
[d]Sources: Banci 1994, Claar et al. 1999, Copeland 1996, Hornocker and Hash 1981, Koehler and Aubry 1994.

Ruediger et al. 2000) (table 4). Other associated factors include disturbance of den sites during the period of rearing young (Claar et al. 1999) (table 4), which is a site-specific issue that should be addressed during project-level analysis and planning. Lynx mortalities associated with collisions with vehicles have been documented on other areas (Gibeau and Heuer 1996).

Gray wolves and wolverines are sensitive to road-associated factors but are not particularly affected by summer recreation trails (Banci 1994, Boyd and Pletscher 1999, de Vos 1948, Mech et al. 1988, Paquet and Callahan 1996, Thurber et al. 1994) (table 4). For gray wolves, both Mech et al. (1988) and Thiel (1985) found that when road densities exceed about 1.6 km/0.9-km-radius circle (1 mi/mi$^2$), wolves avoided or were displaced from areas. Mladenoff et al. (1995) found road density to be the major

predictor of wolf pack location. Jensen et al. (1986) reported that road densities >0.6 km/km$^2$ were apparent barriers to wolf dispersal. In Yellowstone, Voyageurs, and Isle Royale National Parks, Creel et al. (2002) found levels of stress hormones in wolves to be higher in areas with snowmobiles than in areas without snowmobiles. The implications of these elevated levels of stress hormones to gray wolf population dynamics are not currently well understood. Gray wolves have been documented to abandon den sites if disturbed by humans (Mech et al. 1991) (table 4). However, it was not possible to identify potential wolf denning habitat at the broad scale for this assessment, although it should be addressed at the project level. Both wolves and wolverines have been documented to be killed by collisions with vehicles (Gibeau and Heuer 1996, Paquet and Callahan 1996) (table 4).

Winter recreational activities may displace wolverines from important natal dens in subalpine cirques (Copeland 1996, Hornocker and Hash 1981) (table 4). The effects of recreation trails on potential wolverine denning habitat will be addressed in this assessment process because of the ability to model potential denning habitat by using GIS (Copeland 1996).

**Assessment Processes for Focal Species**

**Grizzly bear assessment model**—Cumulative effects models have been developed for grizzly bears (Gibeau 1998, Hood and Parker 2001, Puchlerz and Servheen 1998, Weaver et al. 1987). The model we recommend for use on the Wenatchee and Okanogan National Forests (Puchlerz and Servheen 1998) identifies areas of relatively low human use, called core areas, which provide refugia for grizzly bears, within bear management units (BMUs). The BMUs have been identified for the portion of the Okanogan and Wenatchee National Forests within the grizzly bear recovery zone (USFWS 1997). These areas are generally large enough to provide a variety of seasonal habitats, making them appropriately sized to address cumulative effects.

Core areas are identified by buffering high-use trails and open roads by 500 m on each side. The 500-m buffer was based on a considerable body of research that shows displacement of grizzly bears from habitats adjacent to roads and high-use trails (Kasworm and Manley 1990, Mace and Waller 1996, Mace et al. 1996, Mattson et al. 1987, McLellan and Shackelton 1988) (table 5) and has been used in other cumulative effects models (Hood and Parker 2001, Puchlerz and Servheen 1998). Definitions of high-use trails and open roads are provided in table 6. To use this model, roads and trails must be assigned attributes by using these definitions and linked to GIS for spatial analysis.

This model should be applied to assess the effects of roads and recreation trails on grizzly bear habitat on a seasonal basis. Seasons appropriate to the Okanogan and Wenatchee National Forests are early-season—15 March or den emergence to 31 May; middle season—1 June to 15 July; and late season—July 16 to 31 October or den entrance (NCETT 1999). Outputs of this model include (1) the amount of core area within the analysis area, (2) the vegetation types that are represented within the core areas, (3) the effects of trails on the amount of core area, and (4) the effects of roads on the amount of core area.

Once the amount of core area has been determined for the BMU or subbasin influenced by the proposed project, then a relative rating of the level of influence of human activities on grizzly bear habitat can be made. The relative scale is as follows: <55 percent core area = high level of human influence on the habitat, 55 to 70 percent core area = moderate level of human influence on the habitat, and >70 percent core area = low level of human influence on the habitat. These levels of core area are similar to

**Table 5—Effects of roads and trails on grizzly bears and gray wolves**

| Human activity | Focal species | Distance at which use is less than expected [a] | Road density at which use is less than expected [b] | References |
|---|---|---|---|---|
| | | *Meters* | *Kilometers per square kilometer* | |
| Roads | Grizzly bear | 500 | | Mattson et al. 1987 |
| Roads | Grizzly bear | 100 | | McLellan and Shackleton 1988 |
| Roads | Grizzly bear | 200 through spring<br>100 through summer<br>400 through autumn | | Aune and Kasworm 1989 |
| Roads | Grizzly bear | 914 | | Kasworm and Manley 1990 |
| Roads | Grizzly bear | 500 | | Mace et al. 1996 |
| Roads and trails | Grizzly bear | 500 | | Hood and Parker 2001 |
| Trails | Grizzly bear | 813 through spring<br>878 through summer<br>1,129 through autumn | | Mace and Waller 1996 |
| Trails | Grizzly bear | 122 through spring and fall | | Kasworm and Manley 1990 |
| Roads | Gray wolf | | 0.7 | Harrison and Chapin 1998 |
| Roads | Gray wolf | | .4 | Mladenoff et al. 1995 |
| Roads | Gray wolf | | .6 | Mech et al. 1988 |
| Roads | Gray wolf | | .7 | Thiel 1985 |
| Roads | Gray wolf | | .6 | Jensen et al. 1986 |

[a] Distance from a linear recreation route in which use by an animal was statistically significantly less than expected.
[b] Density of roads at which use by an animal was statistically significantly less than expected.

what has been prescribed in other areas where grizzly bears and human access are being managed, and provide reasonable estimates of cumulative effects thresholds (Gibeau 1998, Hood and Parker 2001, Puchlerz and Servheen 1998, USFWS 1993).

**Canada lynx assessment model**—We have a rudimentary understanding of the effects of recreational activities on Canada lynx (Ruediger et al. 2000). Canada lynx were selected as a focal species to address the potential for snowmobiling and ski trails to provide routes for competitors such as coyotes, bobcats, and cougars to access lynx habitat (Buskirk 1999, Koehler and Aubry 1994). For lynx, which have relatively narrow habitat preferences (Koehler 1990, McKelvey et al. 2000), lynx analysis units (LAUs) have been identified. These areas have been identified with adequate suitable habitat to support resident lynx (Ruediger et al. 2000) and are an appropriate spatial scale for addressing cumulative effects.

To assess the effects of recreational activities on lynx habitat, the density of groomed or commonly used snowmobile routes and ski trails should be determined by using LAUs as the area of analysis. Determine the density of groomed ski and snowmobile routes in an LAU by using current GIS data layers for spatial analysis. The outputs of this analysis include the proportion of the LAU with route density <1.6 km/0.9-km-radius circle (<1 mi/mi$^2$), 1.6 to 3.2 km/0.9-km-radius circle (1 to 2 mi/mi$^2$), and >3.2 km/0.9-km-radius circle (>2 mi/mi$^2$).

**Table 6—Definitions of roads and trails used in the core area analysis to determine the level of influence of road and recreation trails on grizzly bear habitat**

| Road or trail type | Definition | Effect to core area |
|---|---|---|
| Impassable roads | Roads not reasonably or prudently passable by conventional four-wheeled passenger vehicles, motorcycles, or all-terrain vehicles | Any road classified as impassable during a bear analysis season would be included as core area for that season. |
| Restricted roads | Roads that are restricted with gates or berms but receive occasional administrative use | Any road classified as restricted during a bear analysis season would be included as core area for that season. |
| Open roads | Roads open to motorized use during any portion of an active bear season, or information is not available to verify the effectiveness of a gate or berm | Any road classified as open during a bear analysis season would not be included as core area for that season. |
| Open motorized trail | Trails that are passable by motorcycles or all-terrain vehicles and are not legally restricted | Any trail classified as open motorized during a bear analysis season would not be included as core area for that season. |
| Open nonmotorized rail | Trails that are not reasonably or prudently passable by motorcycles or all-terrain vehicles, but are not legally restricted, or any trail that is legally restricted to allow only nonmotorized use | Any trail classified as open nonmotorized during a bear analysis season would be included as core area for that season unless it is a high-use trail. |
| High-use trail | Any nonmotorized trail that receives an average of 20 or more parties per week during the grizzly bear season being assessed | Any trail categorized as high use during a season would not be included as core area for that season. |

Based on the above information, the relative level of human influence on lynx habitat can then be rated. The rating scheme is as follows: <25 percent of the LAU with ski and snowmobile route densities of <1.6 km/0.9-km-radius circle (<1 mi/mi$^2$) = low level of human influence on lynx habitat, >25 percent with route densities 1.6 km/0.9-km-radius circle (>1 mi/mi$^2$) to 3.2 km/0.9-km-radius circle (2 mi/mi$^2$) = a moderate level of human influence on lynx habitat, and >25 percent with route densities >3.2 km/0.9-km-radius circle (>2 mi/mi$^2$) = a high level of human influence on lynx habitat. This rating scheme is intended to provide a means of making comparisons among the relative levels of human influence within LAUs. Additional research is needed to determine how increases in groomed ski and snowmobile route density affect lynx habitat use and to define cumulative effects thresholds.

**Gray wolf and wolverine assessment model**—An assessment of the effects of roads and trails on gray wolves and wolverines should be based on an area that approximates their extensive home ranges (Banci 1994, Boyd et al. 1995, Mech 1970). Therefore, to address cumulative effects, BMUs should be used for assessments within the grizzly bear recovery zone and 4$^{th}$-field subbasins for areas outside of the grizzly bear recovery zone.

To address the road- and trail-associated factors identified for gray wolves and wolverines (table 4), three analyses should be conducted to assess the cumulative effects. These include an assessment of the current level of road and motorized trail access within available habitat, the effects of snowmobile routes and ski trails that occur on deer and elk winter ranges (see "Ungulate Winter and Summer Habitat Assessment"),

and the effects of snowmobile routes and ski trails on potential wolverine denning habitat. No model is currently available to predict wolf denning habitat on the Okanogan and Wenatchee National Forests.

A moving windows road and motorized trail density analysis using a 0.9-km-radius circular window should be used to classify areas as follows: areas with no open roads or motorized trails, areas with densities from >0 to 1.6 km/0.9-km-radius circle (>0 to 1.0 mi/mi$^2$), and areas with densities that are >1.6 km/0.9-km-radius circle (>1 mi/mi$^2$) within a 4$^{th}$-field subbasin or a BMU. Outputs of this model for each BMU or subbasin include (1) the amount and location of areas with no open roads or motorized trails, (2) the amount and location of areas with open road and motorized trail densities >0 to 1.6 km/0.9-km-radius circle (>0 to 1.0 mi/mi$^2$), and (3) the amount and location of areas with open road and motorized trail densities >1.6 km/0.9-km-radius circle (>1 mi/mi$^2$). Areas with open road densities <1.6 km/0.9 km (<1 mi/mi$^2$) are referred to as security habitats.

Based on the above information, the relative level of human influence on gray wolf and wolverine habitat can then be rated. The rating scheme we used was <50 percent of a BMU or subbasin in security habitat = a high level of human influence on wolf and wolverine habitat, 50 to 70 percent security habitat = a moderate level of human influence on wolf and wolverine habitat, >70 percent security habitat = a low level of human influence on wolf and wolverine habitat.

**Potential wolverine denning habitat**—The effects of snowmobile routes and ski trails on potential wolverine denning habitat could be assessed by using the following model. Current GIS data layers with snowmobile routes and ski trails would be overlaid onto the land type associations (LTAs) (USDA FS 2000a) that correspond to alpine cirques with the type of structure typically used by wolverines for natal dens (Copeland 1996). These include LTAs Ha7, Ha8, Hb9, and Hi9. The density of snowmobile and ski trails would then be calculated for the potential denning habitat located within a BMU or subbasin. The outputs of this model include potential wolverine denning habitat with groomed winter route densities >1.6 km/0.9-km-radius circle (>1 mi/mi$^2$), and areas with densities >3.2 km/0.9-km-radius circle (>2 mi/mi$^2$).

A relative rating of the level of influence of winter recreation routes on potential wolverine denning habitat can then be made by using the following scale. A high level of human influence on potential wolverine denning habitat = >25 percent of the potential habitat within a BMU or subbasin with winter route densities >3.2 km/0.9-km-radius circle (>2 mi/mi$^2$), a moderate level of human influence = >25 percent of the potential habitat within a BMU or subbasin with winter route densities >1.6 km/0.9-km-radius circle (>1 mi/mi$^2$) and <3.2 km/0.9-km-radius circle (<2 mi/mi$^2$), and a low level of human influence = <25 percent of the potential denning habitat within a BMU or subbasin with winter route densities >1.6 km/0.9-km-radius circle (>1 mi/mi$^2$).

**Information Gaps and Research Needs**

Research is needed to validate the applicability of the bear and wolf models for use on the Okanogan and Wenatchee National Forests as they are based on research conducted in other ecosystems. Specifically, the response of grizzly bears and gray wolves to different levels of human use on trails and roads needs further study (Claar et al. 1999). Research needs to be conducted to determine the direct and indirect effects of recreation on wolverines (Banci 1994) and lynx (Koehler and Aubry 1994,

Ruediger et al. 2000), including how snow compaction alters interference competition among lynx, bobcats, and coyotes (Koehler and Aubry 1994). The results of this research could then be used to adapt the assessment models.

### Monitoring and Adaptive Management

**Habitat-effectiveness monitoring**—Periodic application of the assessment models for wide-ranging carnivores across the Okanogan and Wenatchee National Forests would establish baseline conditions and allow comparisons of habitat effectiveness over time. Information on road and trail status and use levels should be updated at the project level and fed into a forest-wide GIS for landscape-scale assessment. Monitoring information can then be used to guide adaptive ecosystem management as new science becomes available about the interactions between wide-ranging carnivores and recreation.

**Population-level monitoring**—Presently, the numbers of grizzly bears, gray wolves, and wolverines may be too low (Almack et al. 1993; Gaines et al. 1995, 2000a, 2000b) to effectively monitor their populations. Lynx on the Okanogan National Forest could provide a situation where numbers are high enough for population monitoring. Population monitoring methods for lynx are currently being developed and implemented (McKelvey et al. 1999).

## Ungulate Winter and Summer Habitat Assessment

### Introduction and Focal Species Selection

There are six wildlife species included in the ungulate group: mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), elk (*Cervus elaphus*), moose (*Alces alces*), bighorn sheep (*Ovis canadensis*), and mountain goats (*Oreamnos americanus*). The focal species selected to represent the effects of roads and recreational activities on ungulates include mule deer, elk, bighorn sheep, and mountain goats. These species were selected because their habitat needs and response to recreation trails and roads were representative of the group, and because habitat effects are possible to monitor. Additionally, the bighorn sheep is listed as a "sensitive" species.

### Summary of Recreation Route-Associated Factors for Focal Species

In general, ungulates respond to recreational activities by avoiding areas near roads, recreation trails, and other types of human activities (tables 7 and 8) (Cassier et al. 1992, Ferguson and Keith 1982, Freddy et al. 1986, Leslie and Douglas 1980, MacArthur et al. 1982, Papouchis et al. 2001, Rowland et al. 2000). Human activities are of particular concern for ungulates when they occur on their winter ranges or where young are reared (Canfield et al. 1999). The direct and indirect effects of recreation on rearing areas may be best evaluated at the site-specific project level owing to the difficulty in identifying them at the broad scale of this assessment.

Several studies have been conducted on the effects of linear recreation routes on mule deer. For example, ski trails seem to displace mule deer to greater distances than occurs along snowmobile routes (table 8) (Cassier et al. 1992, Freddy et al. 1986). Freddy et al. (1986) reported that mule deer displacement by skiers was independent of skier numbers or group size. Perry and Overly (1977) showed that deer were displaced up to 800 m from roads.

Elk responded to persons on foot by moving away from trails, and the distance of this displacement was quite variable among study areas (Cassier et al. 1992, Ferguson and Keith 1982, Schultz and Bailey 1978) (table 8). Elk moved away from ski trails only when use was >8 persons per day (Ferguson and Keith 1982). Creel et al. (2002) reported elevated levels of stress hormones in elk in Yellowstone National Park when they were exposed to snowmobile activity. In addition, Millspaugh et al. (2001) reported that increased levels of stress hormones were associated with vehicle use on

**Table 7—Road- and recreation trail-associated factors for ungulate focal species**

| Focal species | Road-associated factors | Motorized trail-associated factors | Nonmotorized trail-associated factors | Snowmobile route-associated factors | Ski trail-associated factors |
|---|---|---|---|---|---|
| Mule deer[a] | Hunting<br>Poaching<br>Collisions<br>Displacement or avoidance<br>Disturbance at a specific site | Hunting<br>Poaching<br>Displacement or avoidance<br>Disturbance at a specific site | Hunting<br>Poaching<br>Displacement or avoidance<br>Disturbance at a specific site | Displacement or avoidance<br>Disturbance at a specific site | Displacement or avoidance<br>Disturbance at a specific site |
| Elk[b] | Hunting<br>Poaching<br>Collisions<br>Displacement or avoidance<br>Disturbance at a specific site | Hunting<br>Poaching<br>Displacement or avoidance<br>Disturbance at a specific site | Hunting<br>Poaching<br>Displacement or avoidance<br>Disturbance at a specific site | Displacement or avoidance<br>Disturbance at a specific site<br>Physiological response | Displacement or avoidance<br>Disturbance at a specific site |
| Bighorn sheep[c] | Hunting<br>Poaching<br>Collisions<br>Displacement or avoidance<br>Disturbance at a specific site<br>Physiological response | Hunting<br>Poaching<br>Displacement or avoidance<br>Disturbance at a specific site | Hunting<br>Poaching<br>Displacement or avoidance<br>Disturbance at a specific site | Displacement or avoidance<br>Disturbance at a specific site<br>Physiological response | Displacement or avoidance<br>Disturbance at a specific site |
| Mountain goat[d] | Hunting<br>Poaching<br>Collisions<br>Displacement or avoidance<br>Disturbance at a specific site<br>Movement barrier or filter | Hunting<br>Poaching | Hunting<br>Poaching | | |

[a]Sources: Canfield et al. 1999, Cassier et al. 1992, Freddy et al. 1986, Johnson et al. 2000, Ward et al. 1980.
[b]Sources: Canfield et al. 1999, Cassier et al. 1992, Cole et al. 1997, Creel et al. 2002, Ferguson and Keith 1982, Johnson et al. 2000, Lyon 1983, Millspaugh et al. 2001, Phillips and Alldredge 2000, Roloff 1998, Roloff et al. 2001, Rowland et al. 2000, Schultz and Bailey 1978, Ward 1976, Ward et al. 1980.
[c]Sources: Canfield et al. 1999; Hicks and Elder 1979; King and Workman 1986; Leslie and Douglas 1980; MacArthur et al. 1979, 1982; Papouchis et al. 2001; Smith et al. 1991.
[d]Sources: Joslin 1986, Pedevillano and Wright 1987, Singer 1978, Singer and Doherty 1985.

**Table 8—Displacement distances and mean distance from roads reported for ungulate focal species**

| Human activity | Focal species | Distance displaced[a] | Mean distance[b] | References |
|---|---|---|---|---|
| | | *Meters* | | |
| Hiking | Mule deer | 191 | | Freddy et al. 1986 |
| Snowmobiling | Mule deer | 133 | | Freddy et al. 1986 |
| Hiking | Mule deer | 200 | | Ward et al. 1980 |
| Hiking | Elk | 86 | | Schultz and Bailey 1978 |
| Skiing | Elk | 650 | | Cassier et al. 1992 |
| Skiing | Elk | Moved away from high-use (>8 persons per day) trail | | Ferguson and Keith 1982 |
| Hiking | Bighorn sheep | 50 | | MacArthur et al. 1982 |
| Hiking | Bighorn sheep | Did not affect sheep movements | | Hicks and Elder 1979 |
| Hiking | Bighorn sheep | | 200 at which sheep first responded | Papouchis et al. 2001 |
| Roads and trails <500 visitors per year | Bighorn sheep | 100 | | Smith et al. 1991 |
| Roads and trails >500 visitors per year | Bighorn sheep | 150 | | Smith et al. 1991 |
| Road driving ≤1 vehicle per day | Bighorn sheep | | 354 | Papouchis et al. 2001 |
| Road driving 5 to 13 vehicles per day | Bighorn sheep | | 490 | Papouchis et al. 2001 |
| Road driving | Elk | 400 | | Ward 1976 |
| Road driving | Mule deer | 800 | | Perry and Overly 1977 |
| Road driving (closed to vehicles but open to all-terrain vehicles) | | | 268 to 280 | Johnson et al. 2000 |
| Road driving (low traffic 0 to 1 vehicle per 12 hours) | Elk | | 869 to 890 | Johnson et al. 2000 |
| Road driving (medium traffic 2 to 4 vehicles per 12 hours) | Elk | | 909 to 1032 | Johnson et al. 2000 |
| Road driving (high traffic >4 vehicles per 12 hours) | Elk | | 1103 to 1560 | Johnson et al. 2000 |

[a] Average distance at which animals reacted to human activities and were displaced from the area.

[b] Distance that radio-collared animals were located from roads.

primary roads and the density of primary roads. Presently, the relationship between stress hormones and population dynamics of elk is not well understood, and these results should be interpreted with caution (Millspaugh et al. 2001). Johnson et al. (2000) showed that as the volume of traffic increased on roads, the mean distance that elk were located from roads also increased (table 8). Hayes et al. (2002) reported that mortality of elk during hunting season increased when total road density increased. In addition, elk reproductive success has been shown to decrease following human



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disturbance to calving areas (Phillips and Alldredge 2000). Cole et al. (1997) showed that road closures are successful in reducing the effects of habitat displacement and increasing elk survivorship.

Bighorn sheep also have been reported to respond to human disturbance (Hicks and Elder 1979; King and Workman 1986; Leslie and Douglas 1980; MacArthur et al. 1979, 1982; Papouchis et al. 2001; Smith et al. 1991) (table 8). MacArthur et al. (1979) showed that the heart rate of bighorn sheep varies inversely with distance from a road. MacArthur et al. (1982) reported that sheep are affected by a human approaching within 50 m, and Papouchis et al. (2001) found that bighorn sheep respond to hikers at an average distance of 200 m. They also showed that avoidance of roads is greater for high-use (5 to 13 vehicles per hour) versus low-use (1 vehicle per hour) roads. On average, radio-collared sheep were 490 m from high-use roads compared to 354 m from low-use roads (Papouchis et al. 2001). Smith et al. (1991) developed a habitat suitability model for bighorn sheep and considered areas within 100 m of low to moderate human use (<500 visitors per year) trails and roads as unsuitable, and areas within 150 m of high human use (>500 visitors per year) trails and roads as unsuitable.

Limited research has been conducted on the effects of recreational activities on mountain goats, although concern has been expressed about the interactions between recreation and goats (Sachet 1988). Highways have been documented to cause difficulty for crossing goats, resulting in avoidance or temporary displacement (Singer 1978, Singer and Doherty 1985). People walking on the highway to observe goats increased goat crossing time and altered crossing routes (Pedevillano and Wright 1987). In Montana's Rocky Mountain front, mountain goat reproduction was lower in a herd exposed to human activity (ski area, energy exploration, developed recreation), compared to a herd in a more remote area (Joslin 1986). No studies on the effects of forest roads or recreation trails were found in this review. Rodrick and Milner (1991) recommended that recreational activities (roads and hiking trails) that occur within 1.6 km of winter ranges from 1 November to 30 June be evaluated.

**Assessment Processes for Focal Species**

**Mule deer and elk winter habitat disturbance index**—The cumulative effects of roads and recreation trails on mule deer and elk should be assessed during winter when disturbance has the potential to be the most detrimental (Canfield et al. 1999). This means evaluating the effects of roads, ski trails, and snowmobile routes on the winter ranges for these species. Winter ranges for mule deer and elk on the Okanogan and Wenatchee National Forests generally occur at lower elevations and are usually distinct units separated by private lands and higher elevation nonwinter habitats. To address cumulative effects, the entire unit of winter range habitat should be evaluated, and the area should be at least 800 to 1200 ha (Lyon 1983).

An index of habitat effectiveness applied to the winter range habitat unit can be calculated by using GIS with current data layers showing plowed roads, ski trails, and snowmobile routes. Because of the differing effects of these activities, different buffers would be applied to each to evaluate the amount of affected habitat. For roads, the zone of influence would be 800 m on each side of a plowed road; for ski trails that receive use >8 persons per day, the zone of influence would be 200 m on each side; and for snowmobile routes, the zone would be 150 m on each side of the route. The zone of influence may be modified based on the topography adjacent to the linear recreation route. The proportion of the winter range that is influenced by winter recreation is determined. Model outputs include the proportion of winter range influenced by roads, ski trails, and snowmobile routes.

**Table 9—The zone of influence applied to each side of a trail or road based on road type and use level for the bighorn sheep summer and winter habitat influence indices**

| Trail or road type and status | Zone of influence[a] |
|---|---|
| | *Meters* |
| Nonmotorized trail (ski or hiking) | 200 |
| Motorized trail | 350 |
| Road ≤1 vehicle per day | 350 |
| Road >1 vehicle per day | 500 |

[a] Zone of influence distance may be modified by topographic features.

The summed relative effects of these activities are then rated by using the following scale: >70 percent of the winter range outside of a zone of influence rates as a low level of human influence on deer and elk winter range, 50 to 70 percent of the winter range outside of a zone of influence is classified as a moderate level of human influence, and <50 percent outside of the zone of influence rates as a high level of human influence.

**Bighorn sheep summer or winter habitat disturbance index**—To assess the effects of road- and recreational trail-associated factors on bighorn sheep, a summer and winter range habitat-effectiveness index is calculated. To calculate this index, GIS maps of bighorn sheep winter and summer ranges are needed. For the winter index, GIS layers of current roads and their use levels, ski trails, and snowmobile routes are used. For the summer index, GIS layers of roads and their use levels, motorized trails, and nonmotorized trails are used. Roads that receive <1 vehicle per day and other motorized routes are buffered by a 350-m zone of influence and those with >1 vehicle per day a 500-m zone of influence (table 9). Groomed ski trails and hiking trails are buffered by 200 m on each side (table 9). The zone of influence may be modified based on the topography adjacent to the linear recreation route. The proportions of the summer and winter ranges that are influenced by road and trail recreation activities are then determined. Model outputs include the proportion of summer or winter range influenced by roads, the proportion of summer or winter range influenced by trails, and the proportion of summer or winter range influenced by motorized trail routes.

The relative effects of these activities are then rated by using the following scale: >70 percent of the range outside of a zone of influence rates as a low level of human influence on bighorn sheep summer or winter range, 50 to 70 percent of the summer or winter range outside of a zone of influence is classified as a moderate level of human influence, and <50 percent outside of the zone of influence rates as a high level of human influence.

**Mule deer and elk summer habitat disturbance index**—Previous generations of deer and elk habitat-effectiveness models have used road density as an index for summer ranges. However, Roloff (1998) and Rowland et al. (2000) suggested that a spatially explicit roads variable, based on distance to open roads, may be more appropriate. In addition, Johnson et al. (2000) showed that different levels of traffic can have different degrees of influence on deer and elk habitat use. Therefore, to evaluate the



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**Table 10—The zone of influence applied to each side of a motorized trail or road based on road type and use level for the deer and elk summer habitat influence index**

| Trail or road type and status | Zone of influence[a] |
|---|---|
| | *Meters* |
| Motorized trails | 300 |
| Closed road (no vehicular traffic but open to all-terrain vehicles) | 300 |
| Low traffic open road (>0 to 1 vehicle per 12 hours) | 900 |
| Moderate traffic open road (>2 to ≤4 vehicles per 12 hours) | 1000 |
| High traffic open road (>4 vehicles per 12 hours) | 1300 |

[a]Zone of influence distance may be modified by topographic features.

cumulative effects of road and motorized trails on deer and elk summer ranges, roads and motorized trails would be buffered by the distances shown in table 10. These buffers would be applied to all the roads in a 5th-field watershed, and the proportion of the habitat in the watershed would be determined. The zone of influence may be modified based on the topography adjacent to the linear recreation route. This becomes the portion of the watershed that is influenced by roads. This number is then divided by the total area in the watershed to estimate the percentage within a zone of influence.

A relative ranking of the level of road and trail influences on deer and elk summer range is then applied as follows: >70 percent of the summer range outside of a zone of influence is ranked as a low level of human influence on deer and elk summer range, 50 to 70 percent of the summer range outside of a zone of influence is ranked as a moderate level of human influence, and <50 percent outside of the zone of influence is ranked as a high level of human influence.

**Mountain goat winter habitat disturbance index**—To assess the influence of recreation routes on mountain goats, two sources of information are needed for each 5th-field watershed in which a project or related projects may occur. A map of mountain goat winter range is overlaid with roads, trails, snowmobile routes, and ski trails, and each is buffered by a 500-m zone of influence. The zone of influence may be modified based on the topography adjacent to the linear recreation route. The proportion of winter range outside a zone of influence is then determined for each watershed. A relative index is then applied: >70 percent of the range outside of a zone of influence is ranked as a low level of human influence on mountain goat winter range, 50 to 70 percent of the winter range outside of a zone of influence is classified as a moderate level of human influence, and <50 percent outside of the zone of influence is ranked as a high level of human influence.

### Information Gaps and Research Needs

Additional research is needed on the effects of roads and snowmobiles on bighorn sheep and mountain goats during winter. The most efficient method to accomplish this would be through the use of telemetry or observational studies conducted during winter. All ungulate focal species could benefit from research that links the effects of recreation trails and roads to the demography of the focal species. Research on this subject has been most intensively focused on elk, and other species would benefit from similar efforts.

### Monitoring and Adaptive Management

**Habitat monitoring**—Periodic application of the assessment models would allow trends of habitat effectiveness to be tracked over time. In addition, monitoring could be used to validate the zone of influence estimates with site-specific conditions (Roloff et al. 2001). This could be done by using radio-telemetry (White and Garrott 1990), snow tracking, or pellet group indices (Wemmer et al. 1996).

**Population monitoring**—Population monitoring of ungulates is generally carried out by state agencies relying on aerial counts conducted during winter when animals are concentrated on their winter ranges. These data provide information on general trends of ungulate populations.

## Late-Successional Forest Habitat Assessment

### Introduction and Focal Species Selection

A total of 71 species was included in the late-successional forest habitat species group (see app.). The focal species that were selected for this group include species associated with mixed-conifer late-successional forests such as the northern spotted owl (*Strix occidentalis caurina*), northern goshawk (*Accipiter gentilis*), brown creeper (*Certhia americana*), American marten, fisher, and the northern flying squirrel (*Glaucomys sabrinus*). Additional species were selected that are associated with old ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.) forests and they include the pygmy nuthatch (*Sitta pygmaea*), white-breasted nuthatch (*Sitta carolinensis*), and white-headed woodpecker (*Picoides albolarvatus*). These species were selected because they represent an array of road- and recreation trail-associated factors, and late-successional habitats (table 11).

### Summary of Recreation Route-Associated Factors for Focal Species

There is limited information available concerning the effects of winter recreation routes on many of the wildlife species associated with late-successional habitats. More studies have documented the effects that roads and nonwinter recreation routes can have on these species.

Northern spotted owls could be affected by the edge effects that roads can have when they fragment suitable habitat, or mortality as a result of collisions with vehicles (USDA FS 1997). In addition, linear recreation routes can result in physiological stress responses in owls and may result in displacement of owls by certain types of recreational activities. For example, Wasser et al. (1997) found that stress hormone levels were significantly higher in male northern spotted owls (but not females) when they were located <0.41 km from a major logging road compared to spotted owls in areas >0.41 km from a major logging road. The potential effects of elevated stress hormones on spotted owl population dynamics are not well understood. However, chronic high levels of stress hormones (corticosterone) may have negative consequences on reproduction or physical condition in birds (Marra and Holberton 1998). Additional evidence of recreation effects on spotted owls was reported by Swarthout and Steidl (2001) who found that the closely related Mexican spotted owl (*Strix occidentalis lucida*) was affected by hikers. They reported that juveniles and adults were unlikely to flush at distances ≥12 m and ≥24 m from hikers, respectively. Finally, although not a study of

**Table 11—Road- and trail-associated factors for late-successional habitat-associated focal species**

| Focal species | Road-associated factors | Motorized trail-associated factors | Nonmotorized trail-associated factors | Snowmobile route-associated factors | Ski trail-associated factors |
|---|---|---|---|---|---|
| Northern goshawk[a] | Edge effects<br>Habitat loss or fragmentation<br>Disturbance at specific site<br>Collection | Disturbance at a specific site<br>Collection | Disturbance at a specific site<br>Collection | | |
| Northern spotted owl[b] | Edge effects<br>Snag reduction<br>Disturbance at a specific site<br>Collisions<br>Physiological response | Disturbance at a specific site | Disturbance at a specific site | | |
| Brown creeper[c] | Snag reduction<br>Edge effects<br>Displacement or avoidance<br>Habitat loss or fragmentation<br>Route for competitors or predators | Route for competitors or predators<br>Displacement or avoidance | Route for competitors or predators<br>Displacement or avoidance | Route for competitors or predators | Route for competitors or predators |
| American marten[d] | Snag reduction<br>Down log reduction<br>Edge effects<br>Trapping<br>Collisions<br>Habitat loss or fragmentation<br>Movement barrier or filter | Trapping | Trapping | Trapping | Trapping |
| Fisher[e] | Snag reduction<br>Down log reduction<br>Edge effects<br>Trapping<br>Collisions<br>Habitat loss or fragmentation<br>Movement barrier or filter<br>Displacement or avoidance | Trapping | Trapping | Trapping<br>Displacement or avoidance | Trapping |

**Table 11—Road- and trail-associated factors for late-successional habitat-associated focal species (continued)**

| Focal species | Road-associated factors | Motorized trail-associated factors | Nonmotorized trail-associated factors | Snowmobile route-associated factors | Ski trail-associated factors |
|---|---|---|---|---|---|
| Northern flying squirrel[f] | Snag reduction<br>Down log reduction<br>Edge effects<br>Habitat loss or fragmentation<br>Movement barrier or filter | | | | |
| Pygmy nuthatch[g] | Snag reduction<br>Edge effects<br>Displacement or avoidance | Displacement or avoidance | Displacement or avoidance | | |
| White-breasted nuthatch[h] | Snag reduction<br>Edge effects<br>Displacement or avoidance | Displacement or avoidance | Displacement or avoidance | | |
| White-headed woodpecker[i] | Snag reduction<br>Edge effects | | | | |

[a]Sources: Beier and Drennan 1997, Daw and DeStefano 2001, Erdman et al. 1998, Grubb et al. 1998, Hamann et al. 1999, Jones 1979, Reynolds et al. 1992, Wisdom et al. 2000.
[b]Sources: Delaney et al. 1999, Swarthout and Steidl 2001, USDA FS 1997, Wasser et al. 1997.
[c]Sources: Brand and George 2001, Foppen and Reijnen 1994, Gutzwiller et al. 2002, Hickman 1990, Hutto 1995, Keller and Anderson 1992, Miller et al. 1998.
[d]Sources: Buskirk and Ruggiero 1994; Claar et al. 1999; Powell 1979, 1982; Weaver 1993; Wisdom et al. 2000.
[e]Sources: Claar et al. 1999; Heinenmeyer and Jones 1994; Powell 1979, 1982; Rosenburg and Raphael 1986; Weaver 1993; Wisdom et al. 2000.
[f]Sources: Carey 1991, 1995, 2000; Carey et al. 1997, 2002; Wisdom et al. 2000.
[g]Sources: Foppen and Reijnen 1994, Gutzwiller et al. 2002, Miller et al. 1998, Wisdom et al. 2000.
[h]Sources: Foppen and Reijnen 1994, Gutzwiller et al. 2002, Miller et al. 1998, Wisdom et al. 2000.
[i]Sources: Hamann et al.1999, Miller et al. 1998, Wisdom et al. 2000.

recreational effects, Delaney et al. (1999), studied the effects of chainsaw and helicopter noise on Mexican spotted owls. They found that no spotted owls flushed when noise stimuli were >105 m away. This study further shows that spotted owls may be sensitive to some types of noise disturbance.

Some types of human disturbances to goshawk nests have been a suspected cause of nest abandonment (Reynolds et al. 1992). In addition, roads and trails may facilitate access for falconers to remove young from nests (Erdman et al. 1998). Grubb et al. (1998) reported that vehicle traffic from roads caused no discernable behavioral response by goshawks at distances >400 m from nest sites in forested habitats with noise levels <54 decibels. Critical times for human disturbance to be evaluated include the nesting period and postfledgling periods for goshawks. The postfledgling area is

an area of concentrated use from the time the young leave the nest until they are no longer dependent on the adults for food. Jones (1979) recommended a 400- to 500-m radius buffer around goshawk nest sites to protect them from disturbance during 1 March to 30 September. Forest road-associated factors include the fragmentation or loss of goshawk habitat as a result of roads, or more likely, road networks (Wisdom et al. 2000). Goshawks have been shown to be sensitive to changes in canopy closure and habitat fragmentation (Beier and Drennan 1997, Daw and DeStefano 2001) such as could result from a road network.

Recreation routes have been shown to affect forest birds. For example, roads may result in the loss or fragmentation of habitat for brown creepers (table 11). Hutto (1995) found that brown creepers were twice as likely to occur in habitats that were more than 100 m from a road, and both Keller and Anderson (1992) and Brand and George (2001) found that brown creepers were associated with larger forest patches. Foppen and Reijnen (1994) found that roads and motorized trails reduced forest bird reproduction up to a distance of 200 m. In addition, roads and recreation trails may break up forest patches and increase nest predation and parasitism rates by species such as cowbirds (*Molothrus* spp.) (Hickman 1990, Miller et al. 1998). Gutzwiller et al. (2002) found that human intrusion, in the form of hiking, increased the probability of gray jay (*Perisoreus canadensis*) recurrence, which may increase nest predation on other bird species. Trails used for hiking also can influence forest bird habitat use. Miller et al. (1998) reported a zone of influence of 100 m for some forest bird species.

Fisher and marten are known for their vulnerability to trapping and susceptibility to overharvest (Heinenmeyer and Jones 1994; Powell 1979, 1982; Weaver 1993). Roads and trails, especially snowmobile trails, developed for recreation also are used by trappers and, therefore, increase vulnerability of these species to trapping mortality (Claar et al. 1999). Other road- and trail-associated factors included snag and downed log reduction, edge effects, collisions, and habitat loss or fragmentation (table 11) (Buskirk and Ruggiero 1994, Claar et al. 1999, Rosenberg and Raphael 1986, Wisdom et al. 2000).

Northern flying squirrels play important ecological roles in late-successional forests (Carey 1991, 1995) and are therefore included as a focal species. The road-associated factors for the northern flying squirrel included snag and downed log reduction, edge effects, and habitat loss or fragmentation (table 11) (Wisdom et al. 2000). Several studies have shown that forest management can influence den site availability (Carey et al. 1997), food abundance (Carey et al. 2002), and northern flying squirrel densities (Carey 2000). Presumably, roads, and especially road networks, could have similar influences. No trail-associated factors were identified in the literature we reviewed.

Pygmy nuthatch, white-breasted nuthatch, and white-headed woodpecker are affected by the removal of snags along roads for firewood and safety, and the edge effects of roads to their habitats (table 11) (Wisdom et al. 2000). No recreation trail-associated factors were identified for white-headed woodpeckers (Hamann et al. 1999). Roads and recreation trails may influence pygmy nuthatch and white-breasted nuthatch habitat use (Miller et al. 1998). For example, Foppen and Reijnen (1994) found that roads and motorized trails influenced forest bird reproduction to a distance of 200 m. Miller et al. (1998) reported a zone of influence of 75 to 100 m along trails used for hiking for some forest bird species

**Assessment Processes for Focal Species**

Habitat for late-successional-associated species within the range of the northern spotted owl is managed within a network of reserves (USDA FS 1994). On the Wenatchee and Okanogan National Forests, these reserves are called late-successional reserves (LSRs) and managed late-successional areas (MLSAs). This network of reserves was designed to provide for the viability of late-successional species (Thomas et al. 1993). When projects are proposed within one of these reserves, the cumulative effects of roads and trails on habitat effectiveness within the reserve should be assessed (USDA FS 1997). Reserves should be at least 4000 ha to adequately address cumulative effects. Reserves smaller than this can be grouped by including adjacent reserves until an adequately sized area is reached. Projects that are not located in a reserve but could affect late-successional habitats and species should be addressed by using late-successional habitat within a 5th-field watershed as the analysis area.

In the Wenatchee National Forest LSR assessment (WNFLSRA), two indices to assess habitat effectiveness within LSRs and MLSAs were identified (USDA FS 1997). These included the overall open road density within the LSR and the amount of security habitat. Security habitat was defined as areas that were greater than 500 m from an open road. The WNFLSRA did not consider the effects of recreation trails within LSRs and MLSAs on habitat effectiveness for late-successional species. However, as a result of this review, the assessment model that is described below includes recreation trails, both winter and nonwinter, and should be viewed as an update to the security habitat model originally developed in the WNFLSRA (USDA FS 1997).

**Late-successional nonwinter habitat influence index**—The assessment process to evaluate roads and recreational trails on habitat effectiveness for late-successional species should be divided into winter and nonwinter periods. For the nonwinter period, a habitat influence index and security habitat index should be calculated for the late-successional habitat in an LSR, MLSA, or 5th-field watershed in which the project is located. The habitat influence index is designed to address edge effects, snag and downed log reduction, and habitat loss and fragmentation resulting from road-associated factors. This index is calculated by using GIS with a current open roads data layer and late-successional habitat layer. Open roads are buffered by 50 m on both sides, and the area within this buffer is determined for the entire LSR, MLSA, or late-successional habitat in a 5th-field watershed. This number is then divided by the total amount of late-successional habitat in the LSR, MLSA, or in a 5th-field watershed to determine the proportion of late-successional habitats that could be influenced by open roads.

Once the habitat influence index has been calculated, then the relative level of influence of road-associated factors on late-successional habitat can be determined. The scale used to determine the level of influence is as follows: <30 percent within habitat influence buffer is ranked as a low level of human influence on late-successional habitats, 30 to 50 percent is ranked as a moderate level of influence on late-successional habitats, and >50 percent is ranked as a high level of influence on late-successional habitats.

**Late-successional nonwinter security habitat**—The second nonwinter index is a modification of the security habitat index described in the WNFLSRA (USDA FS 1997). This index is used to evaluate the effects of displacement and avoidance, disturbance, and human access that can lead to trapping. This index is calculated by using GIS and current trail and open road data layers. Open roads and motorized trails are buffered by 200 m (Foppen and Reijnen 1994, Hamann et al. 1999, Hutto 1995), and nonmotorized trails are buffered by 100 m (Hamann et al. 1999, Miller et al. 1998).

The area outside this buffer, referred to as security habitat, is determined for late-successional habitat in an LSR, MLSA, or in a 5th-field watershed. This number is then divided by the total area in late-successional habitat in an LSR, MLSA, or 5th-field watershed to determine the proportion that is in security habitat and may provide refugia for some late-successional-associated species.

Once the amount of late-successional security habitat has been determined for the LSR, MLSA, or 5th-field watershed, then a relative rating of the level of influence of human activities on late-successional habitat can be made. This scale is as follows: <50 percent security habitat is ranked as high level of human influence on the late-successional habitat, 50 to 70 percent security habitat is ranked as moderate level of human influence on late-successional habitat, and >70 percent security habitat is ranked as low level of human influence on late-successional habitat.

**Late-successional winter security habitat**—To evaluate the effects of winter recreation trails, a winter security habitat index should be calculated. This index is calculated by using GIS and a current data layer attributed with plowed roads, ski trails, and snowmobile routes within the late-successional habitat in an LSR, MLSA or 5th-field watershed. Plowed roads, ski trails, and snowmobile routes are buffered by 200 m on each side, and the area outside of this buffer is referred to as winter security habitat. This number is then divided by the total area of late-successional habitat in the LSR, MLSA, or 5th-field watershed to determine the proportion of the late-successional habitat in the LSR, MLSA, or 5th-field watershed that is late-successional winter security habitat.

Once the amount of late-successional winter security habitat has been determined for the LSR, MLSA, or 5th-field watershed, then a relative rating of the level of influence of human activities on late-successional habitat can be made. This scale is as follows: <50 percent winter security habitat is ranked as high level of human influence on late-successional habitat, 50 to 70 percent winter security habitat is ranked as moderate level of human influence on late-successional habitat, and >70 percent winter security habitat is ranked as low level of human influence on late-successional habitat

**Information Gaps and Research**

There is currently a lack of information on the effects of recreational trails on many of the wildlife species associated with late-successional habitats. This makes it difficult to develop good management strategies or to assess the effects of projects on these species. Specifically, the influence of recreation trails on space-use patterns of late-successional species at different levels of recreation use and for different types of uses needs to be studied. Research that links the effects of recreational activities to the demography of late-successional species would be especially valuable.

**Monitoring and Adaptive Management**

Until additional research becomes available, the assessment processes identified should be considered as working hypotheses on which monitoring could be designed to test their validity. For example, the influence that roads have on the availability of late-successional habitat structure adjacent to roads as a result of snag cutting and tree felling for firewood or traffic safety could be monitored to determine the validity of the habitat loss index. In addition, the concept of security habitat could be evaluated by monitoring the demography of focal late-successional species in areas identified as security habitat compared to those in areas that are not security habitat.

**Habitat effectiveness monitoring**—The habitat influence index and the security habitat indices could be used to establish baseline levels of habitat effectiveness within LSR, MLSAs, and late-successional habitat in a 5th-field watershed. Periodic application of these models could show trends in habitat effectiveness over time.

**Population monitoring**—Monitoring within LSRs and MLSAs could be used to track habitat effectiveness in relation to species abundance. For example, protocols have been developed to survey and locate goshawk nest sites and monitor their productivity (Watson et al. 1999). Brown creepers, pygmy nuthatches, white-breasted nuthatches, and white-headed woodpeckers can be monitored by using point counts (Ralph et al. 1993), or nest searches could be conducted to evaluate productivity (Ralph et al. 1993). American marten and fisher populations can be indexed by using track plate surveys (Zielinski and Kucera 1995). These protocols could be used to monitor focal late-successional species populations within different late-successional habitats.

Northern spotted owl population monitoring has been ongoing on the Wenatchee and Okanogan National Forests for the past 10 years (Forsman et al. 1996, Van Deusen et al. 1998). These monitoring efforts have indicated a stable to declining population but have not been able to reveal any causal factors at this time. An additional research proposal is being developed that may provide additional insights into causes of the population decline and address how some types of recreational activities may influence spotted owl habitat use and reproduction.

## Riparian Habitat Assessment

### Introduction and Focal Species Selection

There were 144 wildlife species in the riparian habitat species group (see app.). The focal species identified for this group includes the Cascades frog (*Rana cascadae*), tailed frog (*Ascaphus truei*), harlequin duck (*Histrionicus histrionicus*), bald eagle (*Haliaeetus leucocephalus*), water shrew (*Sorex palustris*), and black-capped chickadee (*Parus atricapillus*). These species were selected because they represent a diversity of riparian habitats and were sensitive to a variety of road- and trail-associated factors (table 12).

### Summary of Recreation Route-Associated Factors for Focal Species

Wildlife species associated with riparian habitats are particularly vulnerable to the effects of recreational activities on their habitats because of the concentration of these activities in riparian areas. Riparian habitats occur in a linear configuration within watersheds and are often traversed by roads and trails. In addition, riparian habitats are used by a variety of wildlife species and are used disproportionately more than they are available (Thomas et al. 1979).

The road- and trail-associated factors for the Cascades frog and tailed frog were derived from studies of a variety of amphibian species and included collisions, habitat loss or fragmentation, and movement barriers and filters (table 12) (Ashley and Robinson 1996, DeMaynadier and Hunter 2000, Fahrig et al. 1995, Gibbs 1998, Rei and Seitz 1990, Welsh and Ollivier 1998, Wisdom et al. 2000, Yanes et al. 1995).

Studies have shown that harlequin ducks are sensitive to human disturbances during the breeding season (Cassier and Groves 1989, Hamann et al. 1999, Wallen and Groves 1989). Ashley (1994) found that Harlequin ducks use stream habitats inaccessible to humans more than expected. Wallen (1987) reported that fishing along trails seems more disruptive than hiking. Harlequins avoided humans on the bank or in the streambed and would typically swim or dive downstream past people, remaining partially submerged and watchful while moving out of the area. Fishing also has a direct effect on harlequin ducks as birds have been found entangled in fishing line

**Table 12—Road- and trail-associated factors for riparian associated focal species**

| Focal species | Road-associated factors | Motorized trail-associated factors | Nonmotorized trail-associated factors | Snowmobile route-associated factors | Ski trail-associated factors |
|---|---|---|---|---|---|
| Cascades frog[a] | Collisions<br>Habitat loss or fragmentation<br>Movement barrier or filter | Collisions<br>Habitat loss or fragmentation | | | |
| Tailed frog[b] | Collisions<br>Habitat loss or fragmentation<br>Edge effects<br>Movement barrier or filter | Collisions<br>Habitat loss or fragmentation | | | |
| Harlequin duck[c] | Downed log reduction<br>Disturbance at a specific site<br>Displacement or avoidance<br>Habitat loss or fragmentation<br>Negative human interactions | Disturbance at a specific site<br>Displacement or avoidance<br>Negative human interactions | Disturbance at a specific site<br>Displacement or avoidance<br>Negative human interactions | | |
| Bald eagle[d] | Poaching<br>Disturbance at a specific site<br>Displacement or avoidance | Disturbance at a specific site | Disturbance at a specific site<br>Displacement or avoidance | Disturbance at a specific site | Disturbance at a specific site |
| Water shrew[e] | Collisions<br>Movement barrier or filter<br>Habitat loss or fragmentation<br>Downed log reduction | Collisions | | Snow compaction<br>Displacement or avoidance | Snow compaction |
| Black-capped chickadee[f] | Displacement or avoidance<br>Habitat loss or fragmentation | Displacement or avoidance<br>Habitat loss or fragmentation | Displacement or avoidance<br>Habitat loss or fragmentation | | |

[a]Sources: Ashley and Robinson 1996, DeMaynadier and Hunter 2000, Fahrig et al. 1995, Gibbs 1998, Rei and Seitz 1990, Welsh and Ollivier 1998, Wisdom et al. 2000, Yanes et al. 1995.
[b]Sources: Ashley and Robinson 1996, DeMaynadier and Hunter 2000, Fahrig et al. 1995, Gibbs 1998, Rei and Seitz 1990, Welsh and Ollivier 1998, Wisdom et al. 2000, Yanes et al. 1995.
[c]Sources: Ashley 1994, Clarkson 1992, Hamann et al. 1999, Wallen 1987, Wisdom et al. 2000.
[d]Sources: Fletcher et al. 1999, Hamann et al. 1999, Harmata and Oakleaf 1992, Skagen et al. 1991, Stalmaster and Newman 1978.
[e]Sources: Baldwin and Stoddard 1973, Cole and Landres 1995, Hickman 1990, Knight and Cole 1991, Randgaard 1998, Schmid 1972.
[f]Sources: Belisle et al. 2001, Blakesley and Reese 1988, Garton et al. 1977.



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(Ashley 1994, Clarkson 1992). The road- and recreation-trail associated factors that were identified for the harlequin duck include snag reduction, disturbance at a specific site (nest site), displacement and avoidance, and habitat loss and fragmentation from roads (table 12) (Hamann et al. 1999, Wisdom et al. 2000). Cassier and Groves (1990) recommended that trails and roads be located at least 50 m from streams used by harlequin ducks.

The response of bald eagles to human activities is variable. Reported responses have included spatial avoidance of activity and reproductive failure (Anthony et al. 1995, Buehler et al. 1991, Hamann et al. 1999, McGarigal et al. 1991, Watson 1993), although in some cases, eagles tolerate human disturbances (Harmata and Oakleaf 1992). The road- and recreation-trail associated factors that were identified in this review included poaching, disturbance at a specific site, and avoidance and displacement (table 12) (Skagen et al. 1991, Stalmaster and Newman 1978). Bald eagles seem to be more sensitive to humans afoot than to vehicular traffic (Grubb and King 1991, Hamann et al. 1999, Skagen et al. 1991, Stalmaster and Newman 1978). Fletcher et al. (1999) reported that the abundance of bald eagles was lower in riparian habitats with nonmotorized trails compared to riparian habitats without trails. Montopoli and Anderson (1991) developed a cumulative-effects model for bald eagles that included human disturbances associated with recreational boating. No model has been developed for assessing the cumulative effects of linear recreation routes on bald eagle habitats. Recommended buffer distances to reduce the potential for disturbance to eagles during the nesting period have ranged from 300 to 800 m (Anthony and Isaacs 1989, Fraser et al. 1985, McGarigal 1988, Stalmaster 1987). Grubb and King (1991) evaluated the influence of pedestrian traffic and vehicle traffic on bald eagle nesting activities and recommended buffers of 550 m for pedestrians and 450 m for vehicles.

The water shrew is known to be associated with riparian habitats and occurs at high enough densities to make it a good candidate for monitoring (Peffer 2001). The road- and recreation-trail associated factors for the water shrew include collisions, movement barriers and filters, habitat loss and fragmentation, downed log reduction, displacement and avoidance, and snow compaction (table 12), based on effects documented for other small mammal species as well (Baldwin and Stoddard 1973, Cole and Landres 1995, Knight and Cole 1991, Randgaard 1998, Schmid 1972). Snow compaction from snowmobiling and ski trail grooming has been cited to cause mortality and to present barriers to small mammal movements in subnivean spaces (Schmid 1972).

Some forest birds, such as American robins (*Turdus migratorius*), that are associated with riparian habitats are attracted to campgrounds that occur within riparian areas along roads and trails (Blakesley and Reese 1988, Marzluff 1997). Others, such as the black-capped chickadee, fox sparrow (*Passerella iliaca*) and song sparrow (*Melospiza melodia*) are negatively associated with campgrounds (Blakesley and Reese 1988, Garton et al. 1977, Marzluff 1997). In addition, Odell and Knight (2001) showed that black-capped chickadee densities increased with increasing distance from exurban housing developments. Belisle et al. (2001) found that the movement patterns of black-capped chickadees were influenced by forest cover removal. We included the black-capped chickadee as a focal species to address the displacement or avoidance factor that occurs when roads or trails provide access to campgrounds (table 12) and to address the removal of forest cover for roads and campgrounds.

**Assessment Processes for Focal Species**

To evaluate the cumulative effects of roads and recreation trails on riparian-associated species, the evaluation area should be the 5th-field watershed in which the proposed project is located. Riparian reserves (RR) or riparian habitat conservation areas (RHCAs) are management allocations designed to provide a variety of functions for aquatic and terrestrial species (USDA FS 1994). For terrestrial species, these include providing habitat and connectivity between habitat patches (USDA FS 1994). The assessment processes to evaluate the effects of roads and recreational trails on riparian habitats should be divided into winter and nonwinter periods. We created five GIS models to evaluate the influences of winter recreation routes; three models provide a general index to the overall level of human influence on riparian habitats, and two models are species specific. Any or all of these models can be applied depending on the species being addressed and the issues identified for a project.

**Riparian nonwinter habitat influence index**—For the nonwinter period, a habitat influence index should be calculated for all the RRs or the RHCAs within the watershed. The habitat influence index is designed to address edge effects, and snag and downed log reduction road-associated factors. This index is calculated by using GIS and a current open-roads data layer. Open roads are buffered by 60 m on both sides, and the area within this buffer is determined for the entire area that is within RRs or RHCAs in a watershed. The 60-m buffer is based on information presented in Hamann et al. (1999) on the degree of habitat affected by woodcutting along roads. The area within the buffer is then divided by the total area within RR or RHCA in the watershed to determine the proportion of the riparian habitat influenced by open roads.

We calculated a relative rating to determine the extent that recreation activities influence riparian habitats. The relative rating is as follows: <30 percent of the RR or RHCA in an open road buffer is ranked as a low level of human influence on riparian habitats, 30 to 50 percent is ranked as a moderate level, and >50 percent is ranked as a high level of human influence on riparian habitats.

**Riparian habitat nonwinter route density index**—In addition to the habitat influence index, the density of open roads within RRs or RHCAs should be calculated for the watershed by using a moving window analysis with a 0.9-km-radius circular window. This index is used to evaluate the potential for collisions, habitat loss and fragmentation, and edge-effect road-associated factors to influence wildlife habitats. A high level of human influence on riparian habitat = >25 percent of the riparian habitat within a watershed has route densities >3.2 km/0.9-km-radius circle (>2 mi/mi$^2$), a moderate level of human influence = >25 percent of the riparian habitat within watershed with route densities >1.6 km/0.9-km-radius circle (>1 mi/mi$^2$) and <3.2 km/0.9 km-radius circle (<2 mi/mi$^2$), and a low level of human influence = <25 percent of the riparian habitat within a watershed with route densities >1.6 km/0.9-km-radius circle (>1 mi/mi$^2$).

**Riparian habitat winter recreation route density index**—For the winter period, the density of plowed roads, groomed ski trails, and snowmobile routes within RRs or RHCAs in the watershed should be calculated by using a moving window analysis with a 0.9-km-radius circular window. This provides an index of the effects of winter recreation routes on riparian habitats. A high level of human influence on riparian habitat = >25 percent of the riparian habitat within a watershed that has route densities >3.2 km/0.9-km-radius circle (>2 mi/mi$^2$), a moderate level of human influence = >25 percent of the riparian habitat within a watershed with route densities >1.6 km/

0.9-km-radius circle (>1 mi/mi$^2$), and a low level of human influence = <25 percent of the riparian habitat within a watershed with route densities >1.6 km/0.9-km-radius circle (>1 mi/mi$^2$).

**Bald eagle nesting habitat disturbance index**—To evaluate the potential influences of human activities on bald eagle nesting habitat, the bald eagle nesting habitat disturbance index should be applied. This index should be applied to potential nesting habitat within a 5$^{th}$-field watershed for activities that occur during the nesting period, which is February through August (Rodrick and Milner 1991). A 550-m zone of influence is applied to each side of nonmotorized trails and 450 m to motorized trails and roads. The zone of influence may be modified based on the topography adjacent to the linear recreation route. The proportion of potential nesting habitat within a zone of influence is then calculated and the following relative ranking is applied: <30 percent of the potential nesting habitat in a watershed in a zone of influence is ranked as a low level of human influence, 30 to 50 percent is ranked as a moderate level, and >50 percent is ranked as a high level of human influence on bald eagle nesting habitats.

**Harlequin duck nesting habitat disturbance index**—This index can be used to evaluate the level of human influence on harlequin duck nesting habitats during their nesting period. The nesting period on the Okanogan and Wenatchee National Forests is from February through August. This index is based on the amount of potential nesting habitat within a 5$^{th}$-field watershed. A 50-m zone of influence is then applied to each side of roads, motorized trails, and nonmotorized trails. The proportion of the potential nesting habitats that occurs within a zone of influence is then determined for each watershed. A relative ranking can then be applied to compare the relative levels of human influence among watersheds. The relative rankings are <30 percent of the potential nesting habitat in a watershed in a zone of influence is ranked as a low level of human influence, 30 to 50 percent is ranked as a moderate level, and >50 percent is ranked as a high level of human influence on harlequin duck nesting habitats.

**Information Gaps and Research**

Research is needed to develop a thorough understanding of the influences of road- and trail-associated factors on riparian species, particularly research that links human uses to effects on animal population demographics. Specifically, research needs to be conducted to determine the extent to which roads and recreation trails serve as dispersal barriers or filters for amphibians and small mammals. A more complete understanding of the influences that road and recreation trails have on harlequin duck reproduction and survival is needed. For example, a better understanding of the relationship between the intensity of human use and its effects on harlequin duck reproduction would be helpful to design effective management strategies.

**Monitoring and Adaptive Management**

**Habitat monitoring**—Application of the assessment models for riparian-associated species could be applied periodically to assess trends in the influence of roads and recreation trails on riparian habitats. Validation monitoring needs to be implemented to determine the validity of the assessment models and link them to population demographics of the focal riparian species.

**Population monitoring**—Populations of Cascades frogs and small mammals (such as water shrews) could be monitored by using pitfalls traps (Jones et al. 1996) within riparian habitats that are influenced by road- and trail-associated factors, and compared to areas not influenced (to serve as controls). Specific locations where frogs disperse across roads should be monitored for road-specific mortality and to determine if

management changes are needed. Populations of harlequin ducks could be surveyed following the Forest Service survey protocol and a comparison made between areas with roads and recreation trails compared to those without. A few bald eagle nest sites have been located on the Okanogan and Wenatchee National Forests, and they are being monitored as part of forest plan monitoring. Monitoring of black-capped chickadees in campground and noncampground sites could be accomplished by using point counts (Ralph et al. 1993) and following the methods of Blakesley and Reese (1988).

## Waterfowl and Colonial Nesting Bird Habitat Assessment

### Introduction and Focal Species Selection

A total of 97 wildlife species is in this group (see app.). Focal species that were selected included the common loon (*Gavia immer*), great blue heron (*Ardea herodias*), eared grebe (*Podiceps nigricolis*), and wood duck (*Aix sponsa*). Loons use large rivers and lakes as nesting habitat and are listed as a "sensitive" species. The eared grebe uses ponds and lakes up to the ponderosa pine zone and also is listed as a "sensitive" species. Great blue herons use lowland rivers, and wood ducks nest in cavities adjacent to small ponds and lakes. Together, these species represent a variety of habitats, and road- and trail-associated factors (table 13).

### Summary of Recreation Route-Associated Factors for Focal Species

Human disturbance is known to negatively affect waterfowl and colonial waterbirds (Anderson 1988; Belanger and Bedard 1989, 1990; Boellstorff et al. 1988; Gotmark and Ahlund 1984; Havera et al. 1992; Henson and Grant 1991; Madsen 1985; Owens 1977; Pierce and Simons 1986; Tremblay and Ellison 1979). These studies have shown that human disturbances associated with recreational activities can affect productivity in many ways including nest abandonment, egg mortality owing to exposure, increased predation of eggs and hatchlings, depressed feeding rates on wintering and staging grounds, and avoidance of otherwise suitable habitat.

The common loon, great blue heron, eared grebe, and wood duck were selected as focal species and can be influenced by several forms of human activities (Hamann et al. 1999, Klein 1993, Titus and VanDruff 1981). The road and recreation trail factors associated with these species included disturbance during nesting, and displacement from habitat (table 13) (Ashley 1994, Hamann et al. 1999, Kelly 1992, Klein 1993, Markham and Brechtel 1979, McEneaney 1994, Rodgers and Smith 1995, Titus and VanDruff 1981, Vos et al. 1985, Wallen 1987, Werschkul et al. 1976). No ski- or snowmobile route-associated factors were identified for these species as winter recreation generally occurs outside of the nesting and rearing periods when they are the most susceptible.

Titus and VanDruff (1981) reported that population characteristics, nest and egg production, nest and egg losses, flushing distances, and hatching and brood rearing success for common loons was influenced by human activities such as hiking and boating, but there were no significant differences between areas of high and low human use. Vermeer (1973) showed an inverse relationship between numbers of breeding pairs of loons and the level of human disturbance. Ream (1976) reported that campers and canoeists displaced loons from their nests.

Klein (1993) reported that great blue heron responses to humans in vehicles and afoot varied from no response to flying away, and that they reacted more to humans on foot than in vehicles. Rodgers and Smith (1995) reported that great blue herons flushed at a mean distance of 32.0 ± 12.3 m in response to persons approaching on foot. They recommended a 100-m setback to limit disturbance to nesting colonies. Skagen et al. (2001) found a reduction in the number of great blue heron nests when they were

**Table 13—Road- and recreation trail-associated factors for waterfowl and colonial nesting focal species**

| Focal species | Road-associated factors | Motorized trail-associated factors | Nonmotorized trail-associated factors | Snowmobile route-associated factors | Ski trail-associated factors |
|---|---|---|---|---|---|
| Common loon[a] | Disturbance at a specific site<br>Displacement or avoidance | Disturbance at a specific site<br>Displacement or avoidance | Disturbance at a specific site<br>Displacement or avoidance | | |
| Great blue heron[b] | Disturbance at a specific site<br>Displacement or avoidance | Disturbance at a specific site<br>Displacement or avoidance | Disturbance at a specific site<br>Displacement or avoidance<br>Route for competitors | | |
| Eared grebe[c] | Disturbance at a specific site<br>Displacement or avoidance | Disturbance at a specific site<br>Displacement or avoidance | Disturbance at a specific site<br>Displacement or avoidance | | |
| Wood duck[d] | Snag reduction<br>Disturbance at a specific site<br>Displacement or avoidance | Disturbance at a specific site<br>Displacement or avoidance<br>Snag reduction | Disturbance at a specific site<br>Displacement or avoidance<br>Snag reduction | | |

[a]Sources: Hamann et al. 1999, Ream 1976, Titus and VanDruff 1981, Vermeer 1973.
[b]Sources: Klein 1993, Rodgers and Smith 1995, Skagen et al. 2001.
[c]Source: Hamann et al. 1999.
[d]Source: Hamann et al. 1999.

exposed to humans on foot. In addition, she reported an increase in competition between great blue herons and cormorants, as cormorants were more tolerant of human activities.

Wood ducks nest in cavities and can be affected by the loss of snag habitat associated with firewood gathering and felling of snags for safety when roads are near nesting habitat (Hamann et al. 1999).

## Assessment Processes for Focal Species

**Waterfowl and colonial nester habitat disturbance index**—To evaluate the cumulative effects of roads and recreation trails on nesting and habitat use, the assessment model described below would be applied at the 5th-field watershed scale. Potential nesting habitats such as lakes, rivers, and ponds should be identified within a watershed and put into GIS. A 250-m habitat zone is then placed around each of the identified habitats, and the area within this zone is summed for the watershed. These habitats are overlaid with roads, motorized trails, and nonmotorized trails. Roads and recreation trails are then buffered by a 250-m zone of influence on each side. The proportion of the habitat zone that lies outside of a zone of influence of a road or trail is then determined. The 250-m zone of influence is based on distances at which birds have been observed to be affected by human disturbances (Hamann et al. 1999, Kelly 1992, Markham and Brechtel 1978, Rodgers and Smith 1995, Vos et al. 1985).

Outputs of this model include the proportion of potential habitat in a watershed affected by road-associated factors, motorized trails and nonmotorized trails, and the overall influence of roads and trails.

Hamann et al. (1999) reported that when over half of the available habitat around a lake was disturbed by human activities, loons did not nest. This estimate was used to establish a preliminary cumulative effects threshold and to rank the level of human influence on these habitats within a watershed. The relative ranking is as follows: <50 percent of the potential habitat outside of the zone of influence of a road or trail is ranked as high level of human influence, 50 to 70 percent of the potential habitat in a zone of influence is ranked as moderate level of human influence, and >70 percent is ranked as a low level of human influence.

### Information Gaps and Research Needs

Additional research is needed to relate road- and trail-associated factors to demographic responses of the focal species. In addition, research that explores how different types and intensities of road and trail uses affect focal waterfowl and colonial nester species would allow for the refinement of the cumulative effects models.

### Monitoring and Adaptive Management

**Habitat-effectiveness monitoring**—The cumulative effects model described for these focal species could be used to establish baseline conditions for their habitats within watersheds. These models could then be periodically applied to monitor trends in human influences on habitat over time.

**Population monitoring**—The numbers and productivity of the focal species in this group could be monitored by selecting representative lakes, ponds, and rivers that have different levels of human activities adjacent to them. In this manner, population trends could be monitored, and these trends could be correlated to different levels of human activity.

## Primary Cavity Excavator Habitat Assessment

### Introduction and Focal Species Selection

A total of 11 species was included in the primary cavity excavator (PCE) group (see app.). The species selected as focal species included the white-headed woodpecker, three-toed woodpecker (*Picoides tridactylus*), and pileated woodpecker (*Dryocopus pileatus*) (table 14). The white-headed woodpecker was selected because of its association with old ponderosa pine forests, three-toed woodpeckers with subalpine fir forests, and pileated with mixed-conifer forests.

### Summary of Recreation Route-Associated Factors for Focal Species

Only road-associated factors were identified for these species as the available literature did not suggest that recreation trail-associated disturbances presented a problem for primary cavity excavators (Hamann et al. 1999). Recreational activity is unlikely to be focused around the nest sites of these species and, by design, woodpeckers and other cavity users are relatively more secure from nest predation than any other group of forest birds (Hamann et al. 1999). Therefore, at present, recreational disturbance is not known to be a major limiting factor.

The road-associated factors included the negative edge effects of roads on PCE habitat and snag and down log reduction resulting from wood cutting and safety practices along roads (table 14) (Bull and Holthausen 1993, Hitchcox 1996, Hutto 1995, Milne and Hejl 1989, Raphael and White 1976). The distances in which woodcutters can harvest snags from roads differ according to terrain. Distances reported by Hamann et al. (1999) ranged from 65 to 200 m.

**Table 14—Road- and trail-associated factors for primary cavity excavator focal species**

| Focal species | Road-associated factors | Motorized trail-associated factors | Nonmotorized trail-associated factors | Snowmobile route-associated factors | Ski trail-associated factors |
|---|---|---|---|---|---|
| White-headed woodpecker[a] | Snag reduction<br>Edge effects | | | | |
| Three-toed woodpecker[a] | Snag reduction<br>Edge effects | | | | |
| Pileated woodpecker[a] | Snag reduction<br>Down log reduction<br>Edge effects | | | | |

[a]Sources: Bull and Holthausen 1993, Hamann et al. 1999, Hitchcox 1996, Hutto 1995, Milne and Hejl 1989, Raphael and White 1976.

## Assessment Processes for Focal Species

**Primary cavity excavator habitat influence index**—The assessment processes to evaluate the cumulative effects of road-associated factors on primary cavity excavators would be applied to the 5th-field watershed. Open roads that occur within forested habitats (>10 percent tree cover) are buffered by 60 m on each side to determine the potential influence on cavity excavator habitat. The amount of forested habitat within this buffer is then determined and divided by the total amount of forested habitat within the watershed. In this manner, an index to the proportion of primary cavity excavator habitat influenced by roads within a watershed is derived. A relative ranking is then determined based on the following scale: <30 percent of forested habitat in an open road buffer is ranked as a low level of human influence on primary cavity excavator habitat, 30 to 50 percent is ranked as a moderate level of influence, and >50 percent is ranked as a high level of influence.

## Information Gaps and Research

Research is needed to link road-associated factors to the demography of the focal species for this wildlife group. Additional research is needed to validate the assumption that recreation trails are not a limiting factor for primary cavity excavator populations.

## Monitoring and Adaptive Management

**Habitat monitoring**—The habitat influence index for primary cavity excavators could be applied periodically to determine baseline conditions and track the changes to habitat over time. Monitoring needs to be completed to validate the zone of influence along roads in primary cavity excavator habitat. This could be done by sampling habitat structure at varying distances from roads in a variety of forested habitat types.

**Population monitoring**—Populations of primary cavity excavators could be monitored by using point counts (Bull et al. 1990, Huff et al. 2001) established in a variety of habitats and in areas with and without road- and recreation trail-associated factors.



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## Application of the Recreation Route Cumulative Effects Models: A Case Study

This section illustrates how cumulative effects of linear recreation routes on wildlife habitats can be assessed by using the GIS models developed in the previous sections. This section is intended to display current conditions relative to the influences that linear recreation routes have on various wildlife habitats, which in turn provides a baseline of information for planning efforts. Finally, this section discusses the results and management implications of applying the proposed cumulative effects models.

### Assessment Area

The assessment area includes all of the lands that lie to the east of the crest of the North Cascade Range between Lake Chelan and the Interstate 90 Highway corridor, extending east to the Columbia River. This area provides a diversity of winter and nonwinter recreation opportunities and a diversity of wildlife habitats making it an excellent area to "test drive" the proposed cumulative effects process. The area includes 11 BMUs, 22 LAUs, 9 ungulate winter range units, 15 LSRs (including MLSAs), and 19 5$^{th}$-field watersheds.

### Assessment Models Applied

We applied 15 of the 18 GIS cumulative effects assessment models to evaluate wildlife habitats within the case study area (table 15). Four of the models were used to evaluate winter recreational activities on wildlife habitats; 10 models were for the nonwinter periods, and one model, the wolverine denning model, included winter and spring periods. The three models that were not applied included the deer and elk summer habitat effectiveness model, bald eagle nesting habitat disturbance model, and Harlequin duck nesting habitat disturbance model. These models were not run at this time because of either limited computing power or a lack of information about the habitat of a focal species.

### Results and Discussion

**Wide-ranging carnivore habitats**—During the early season, 36 percent of the BMUs were rated as a high level of human influence, 27 percent as moderate, and 36 percent as low (table 16). During the mid and late seasons, trails became snow free and received enough use to be classified as high-use trails resulting in a higher proportion of BMUs with a high level of human influence. Sixty-four percent of the BMUs were ranked as high level of human influence, 18 percent as moderate, and 18 percent as low during the mid and late seasons (table 16).

This analysis suggests that cumulative effects are more of an issue for grizzly bear habitats during the mid and late seasons within the assessment area. Cumulative effects could be reduced through access management, and these opportunities could be identified during roads analysis (USDA FS 2000c). Seasonally important habitats to be considered for inclusion in core areas have been identified for each of these BMUs in the North Cascades ecosystem grizzly bear habitat assessment (NCETT 2001).

During the nonwinter period, 36 percent of the analysis areas for gray wolf and wolverine habitats were ranked as having a high level of human influence, 36 percent as moderate, and 27 percent as low (table 17). Cumulative effects were more of an issue during the nonwinter season based on this analysis. Habitat effectiveness could be restored through road access management, and opportunities could be identified during roads analysis (USDA FS 2000c). During winter, all the assessment areas were ranked as having a low level of human influence from groomed and designated winter recreation routes (table 18). This assessment did not include winter routes that are not groomed or officially designated, such as snowmobile routes or snow-play areas. These have the potential to result in additional cumulative effects.

**Table 15—Species groups, focal species, cumulative effects indices, and assessment areas used in the cumulative effects of roads and recreation trails on wildlife habitats case study**

| Species group | Focal species | Index | Analysis unit |
|---|---|---|---|
| Wide-ranging carnivores | Grizzly bear | Grizzly bear assessment model | Bear management unit |
| Wide-ranging carnivores | Gray wolf and wolverine | Gray wolf and wolverine assessment model | Bear management unit |
| Wide-ranging carnivores | Wolverine | Potential denning habitat model | Potential denning habitat within bear management units |
| Wide-ranging carnivores | Lynx | Lynx assessment model | Lynx analysis unit |
| Ungulates | Deer and elk | Winter habitat disturbance index | Winter range unit |
| Ungulates | Bighorn sheep | Summer or winter habitat disturbance index | Summer or winter range unit |
| Ungulates | Deer and elk | Summer habitat disturbance index | Fifth-field watersheds |
| Ungulates | Mountain goat | Winter habitat disturbance index | Fifth-field watersheds |
| Late successional | Northern spotted owl, goshawk, brown creeper, American marten, fisher, flying squirrel, pygmy nuthatch, white-breasted nuthatch, white-headed woodpecker | Nonwinter habitat influence index | Late-successional habitat in reserves or fifth-field watersheds |
| Late successional | Northern spotted owl, goshawk, brown creeper, American marten, fisher, flying squirrel, pygmy nuthatch, white-breasted nuthatch, white-headed woodpecker | Nonwinter security habitat | Late-successional habitat in reserves or fifth-field watersheds |
| Late successional | Northern spotted owl, goshawk, brown creeper, American marten, fisher, flying squirrel, pygmy nuthatch, white-breasted nuthatch, white-headed woodpecker | Winter security habitat | Late-successional habitat in reserves or fifth-field watersheds |
| Riparian | Cascades frog, tailed frog, harlequin duck, bald eagle, water shrew | Nonwinter habitat influence index | Riparian reserves within fifth-field watersheds |
| Riparian | Cascades frog, tailed frog, harlequin duck, bald eagle, water shrew | Nonwinter road density index | Riparian reserves within fifth-field watersheds |
| Riparian | Cascades frog, tailed frog, harlequin duck, bald eagle, water shrew | Winter recreation route density index | Riparian reserves within fifth-field watersheds |
| Riparian | Bald eagle | Nesting habitat disturbance index | Nesting habitat within fifth-field watersheds |
| Riparian | Harlequin duck | Nesting habitat disturbance index | Nesting habitat within fifth-field watersheds |
| Waterfowl and colonial nesters | Common loon, great blue heron, eared grebe, wood duck | Habitat disturbance index | Habitats within fifth-field watersheds |
| Primary cavity excavators | White-headed woodpecker | Habitat influence index | Forested habitats within fifth-field watersheds |



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**Table 16—Cumulative effects of roads and trails on grizzly bear habitat within bear management units (BMUs) in the case study area**

| BMU | Early season core | Relative ranking[a] | Mid and late season core | Relative ranking[a] |
|---|---|---|---|---|
| | *Percent* | | *Percent* | |
| Upper Chelan | 87 | Low | 82 | Low |
| Lower Chelan | 62 | Moderate | 53 | High |
| Upper Entiat | 40 | High | 47 | High |
| Lower Entiat | 19 | High | 18 | High |
| Chiwawa | 60 | Moderate | 55 | Moderate |
| Upper Wenatchee | 73 | Low | 61 | Moderate |
| Lower Wenatchee | 38 | High | 39 | High |
| Icicle | 82 | Low | 73 | Low |
| Peshastin | 35 | High | 36 | High |
| Swauk | 63 | Moderate | 20 | High |
| Cle Elum | 81 | Low | 33 | High |

[a]High level of human influence = <55 percent core area per BMU, moderate level of human influence = 55 to 70 percent core area per BMU, and low level of human influence = >70 percent core area per BMU.

**Table 17—Cumulative effects of roads and motorized trails on gray wolf and wolverine habitat within bear management units (BMUs) in the case study area**

| BMU | Areas with no roads | Areas with road densities >0 and <1.6 km/ 0.9-km-radius circle | Areas with road densities >1.6 km/0.9-km-radius circle | Relative ranking[a] |
|---|---|---|---|---|
| | | *Percent* | | |
| Upper Chelan | 100 | 0 | 0 | Low |
| Lower Chelan | 57.3 | 9.9 | 32.8 | Moderate |
| Upper Entiat | 50.2 | 8.6 | 41.2 | Moderate |
| Lower Entiat | 6.7 | 9.1 | 84.2 | High |
| Chiwawa | 58.2 | 5.2 | 36.6 | Moderate |
| Upper Wenatchee | 67.1 | 6.8 | 26.1 | Low |
| Lower Wenatchee | 31.1 | 9.5 | 59.4 | High |
| Icicle | 84.3 | 4.0 | 11.7 | Low |
| Peshastin | 28.6 | 10.0 | 61.3 | High |
| Swauk | 13.9 | 8.7 | 77.3 | High |
| Cle Elum | 46.5 | 7.9 | 45.6 | Moderate |

[a]High level of human influence = <50 percent of a BMU with an open road/trail density of 3.2 km/0.9-km radius circle (<1 mi/mi$^2$), moderate level of human influence = 50 to 70 percent of a BMU with an open road/trail density of between 1.6 and <3.2 km/0.9-km radius circle (<1 mi/mi$^2$ and <2), and low level of human influence = >70 percent of a BMU with an open road/trail density of >1.6 km/0.9-km radius circle (<1 mi/mi$^2$).

The assessment of cumulative effects of groomed and designated winter recreation routes on lynx habitats showed that 4 percent of the LAUs had a high level of human influence, 20 percent had a moderate level, and 76 percent had a low level (table 19). Based on this analysis, cumulative effects are a significant issue within the Cascade crest LAU in the assessment area. This assessment did not include winter routes that are not groomed or officially designated, such as snowmobile routes or snow play areas. These have the potential to result in additional cumulative effects.

**Table 18—Cumulative effects of groomed and designated winter recreation routes on potential wolverine denning habitat within bear analysis units (BMUs) in the case study area**

| BMU | Denning habitat | Proportion of denning habitat with road densities >1.6 km/0.9-km-radius circle | Proportion of denning habitat with road densities >3.2 km/0.9-km-radius circle | Relative ranking[a] |
|---|---|---|---|---|
| | *Hectares* | *Percent* | | |
| Upper Chelan | 283 | 0 | 0 | Low |
| Lower Chelan | 1124 | 0 | 0 | Low |
| Upper Entiat | 1761 | 0 | 0 | Low |
| Lower Entiat | 162 | 0 | 0 | Low |
| Chiwawa | 332 | 0 | 0 | Low |
| Upper Wenatchee | 1014 | 0 | 0 | Low |
| Lower Wenatchee | 1500 | 0.1 | 0 | Low |
| Icicle | 3119 | 0 | 0 | Low |
| Peshastin | 143 | 0 | 0 | Low |
| Swauk | 793 | 0 | 0 | Low |
| Cle Elum | 793 | 0 | 0 | Low |

[a]High level of human influence = >25 percent of the BMU with route densities 3.2 km/0.9-km radius circle (>2 mi/mi$^2$), moderate level of human influence = >25 percent of the BMU with route densities between 1.6 and <3.2 km/0.9-km radius circle (>1 mi/mi$^2$ and >2), and low level of human influence = <25 percent of the BMU with route densities >1.6 km/0.9-km radius circle (>1 mi/mi$^2$).

**Table 19—Cumulative effects of groomed winter recreation routes within lynx analysis units (LAUs) in the case study area**

| LAU | Proportion of the LAU with groomed route densities <1.6 km/ 0.9-km-radius circle | Proportion of the LAU with groomed route densities 1.6 to 3.2 km/ 0.9-km-radius circle | Proportion of the LAU with groomed route densities >3.2 km/ 0.9-km-radius circle | Relative ranking[a] |
|---|---|---|---|---|
| Cascade Crest | 19.5 | 23 | 57.5 | High |
| Cooper Mountain | 100 | 0 | 0 | Low |
| Ferry Basin | 100 | 0 | 0 | Low |
| Hungry Ridge | 100 | 0 | 0 | Low |
| Indian Head Basin | 100 | 0 | 0 | Low |
| Copper Peak | 100 | 0 | 0 | Low |
| Upper Entiat | 100 | 0 | 0 | Low |
| Pyramid | 99.9 | .1 | 0 | Low |
| Lake Basin | 82.9 | 13.9 | 3.2 | Low |
| Chiwawa | 93.2 | 6.8 | 0 | Low |
| Garland | 92.7 | 7.2 | .1 | Low |
| Cougar | 86.6 | 8.7 | 4.7 | Low |
| Chumstick Mountain | 70.7 | 10.8 | 18.5 | Moderate |
| White River | 99.4 | .4 | .2 | Low |
| Little Wenatchee | 100 | 0 | 0 | Low |
| Nason | 85.1 | 8.3 | 6.6 | Low |
| Icicle Ridge | 99.9 | .1 | 0 | Low |
| Upper Icicle | 98.6 | 1.0 | 0.4 | Low |
| Enchantment | 99.8 | .2 | 0 | Low |
| Table Mountain | 72.2 | 14 | 13.8 | Moderate |
| Teanaway | 83.6 | 11.1 | 5.3 | Low |
| Waptus | 92.6 | 6.2 | 1.2 | Low |
| Sasse Ridge | 73.1 | 10.8 | 16.1 | Moderate |
| Silver | 77.1 | 14 | 8.9 | Moderate |
| Keechelus Ridge | 63.9 | 13.1 | 23 | Moderate |

[a]High level of human influence = >25 percent of the LAU with route densities 3.2 km/0.9 km (>2 mi/mi$^2$), moderate level of human influence = >25 percent of the LAU with route densities between 1.6 and <3.2 km/0.9-km radius circle (>1 mi/mi$^2$), and low level of human influence = <25 percent of the LAU with route densities >1.6 km/0.9 km-radius circle (>1 mi/mi$^2$).

**Table 20—Cumulative effects of groomed and designated winter recreation routes on deer and elk winter ranges within watersheds in the case study area**

| Watershed | Hectares of winter range | Percentage outside of a zone of influence | Relative ranking[a] |
|---|---|---|---|
| Chelan | 3584 | 92.4 | Low |
| Entiat | 5893 | 95.9 | Low |
| Columbia River-Antoine | 2466 | 63.6 | Moderate |
| Wenatchee | 9358 | 92.9 | Low |
| Columbia River-Navarre | 2142 | 87.9 | Low |
| Columbia River-Swakane | 5360 | 98.7 | Low |
| Mission | 5216 | 87.7 | Low |
| Columbia River-Stemilt | 1158 | 97.8 | Low |
| Swauk-Naneum | 2134 | 95.4 | Low |

[a]Low = >70 percent outside a zone of influence, moderate = 50 to 70 percent outside a zone of influence, and high = <50 percent outside a zone of influence.

**Table 21—Cumulative effects of nonwinter recreation routes on bighorn sheep summer ranges in the case study area**

| Bighorn sheep summer range | Percentage outside zone of influence | Relative ranking[a] |
|---|---|---|
| Lake Chelan | 55.4 | Moderate |
| Swakane | 33.8 | High |

[a]Low = >70 percent outside a zone of influence, moderate = 50 to 70 percent outside a zone of influence, and high = <50 percent outside a zone of influence.

**Table 22—Cumulative effects of groomed and designated winter recreation routes on bighorn sheep winter ranges in the case study area**

| Bighorn sheep winter range | Hectares | Percentage outside zone of influence | Relative ranking[a] |
|---|---|---|---|
| Lake Chelan | 15 461 | 93.7 | Low |
| Swakane | 3 352 | 95.0 | Low |

[a]Low = >70 percent outside a zone of influence, moderate = 50 to 70 percent outside a zone of influence, and high = <50 percent outside a zone of influence.

**Ungulate winter habitats and bighorn sheep nonwinter habitats**—During winter, groomed and designated winter recreation routes had lower levels of cumulative effects. None of the winter ranges had a high level of human influence on deer and elk, 10 percent had a moderate level, and 90 percent had a low level (table 20). This same trend occurred for bighorn sheep. Assessment units for nonwinter bighorn sheep habitats showed one with a high level and one with a moderate level of human influence (table 21), whereas during winter, both ranked as low levels (table 22).



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The cumulative effects of nonwinter recreation routes on deer and elk habitat could be reduced through management of roads. Opportunities to enhance deer and elk habitat effectiveness through road management could be addressed during roads analysis (USDA FS 2000c). Only groomed and designated routes were considered in this assessment. Other routes may occur and could contribute to additional cumulative effects.

**Late-successional forest habitats**—The results of applying the cumulative effects models to late-successional habitats within LSRs and MLSAs showed that nonwinter recreation routes currently ranked as a low level of direct habitat loss (table 23). However, nonwinter recreation routes had a high level of human influence on habitat effectiveness within 31 percent of the LSRs and MLSAs, a moderate level in 56 percent, and a low level in 13 percent (table 24). Habitat effectiveness could be improved through human access management, and opportunities could be identified during roads analysis (USDA FS 2000c) and project-level analyses. Groomed and designated winter recreation routes had a low level of human influence on winter habitat effectiveness of late-successional habitats (table 25). Other winter routes that are not groomed or designated were not considered in this assessment and may result in additional cumulative effects.

**Riparian habitats**—The analysis of cumulative effects of nonwinter recreation routes on riparian habitat effectiveness showed that 95 percent of the assessment units had a high level of human influence, and 5 percent had a low level (table 26). This analysis showed that roads have the greatest cumulative effect on riparian habitat effectiveness. Opportunities to restore habitat effectiveness for riparian habitats could be identified during roads analysis (USDA FS 2000c).

The riparian habitat influence index estimates the cumulative effects that roads have on habitat loss within riparian habitats. This assessment showed that 26 percent had a moderate level, and 74 percent had a low level (table 27). Opportunities to restore riparian habitats through road management could be identified through roads analysis (USDA FS 2000c).

The winter route density index provides an estimate of the cumulative effects of winter recreation routes on riparian habitat effectiveness. This assessment showed that 5 percent of the assessment areas ranked as a high level of human influence, 26 percent as a moderate level, and 68 percent as a low level (table 28).

The assessments of riparian habitats showed that cumulative effects of linear recreation routes had the greatest impact from nonwinter recreation routes, reducing habitat effectiveness. Habitat effectiveness of riparian habitats could be restored through route access management and restoration opportunities identified through roads analysis (USDA FS 2000c). Riparian areas provide habitat for a large number of wildlife species (Thomas et al. 1979) and therefore should receive high priority for restoration.

**Waterfowl and colonial nesting bird habitats**—The cumulative effects analysis for waterfowl and colonial nesting bird habitats showed that 68 percent of the assessment areas had a high level of human influence, 21 percent had a moderate level, and 10 percent had a low level (table 29). Based on this assessment, cumulative effects on these habitats are relatively high. These areas provide habitat for a large number of

**Table 23—Habitat influence index for late-successional forest habitats within late-successional reserves (LSRs) and managed late-successional areas (MLSAs) in the case study area**

| LSR/MLSA | Percentage inside zone of influence | Relative ranking[a] |
|---|---|---|
| Slide Peak | 10.1 | Low |
| Icicle | 17.7 | Low |
| Boundary Butte | 24.5 | Low |
| Sawtooth | 0 | Low |
| Shady Pass | 10.8 | Low |
| Chiwawa | 14.0 | Low |
| Lake Wenatchee | 14.2 | Low |
| Deadhorse | 15.3 | Low |
| Teanaway | 6.4 | Low |
| Swauk | 23.9 | Low |
| Eagle | 22.8 | Low |
| Twin Lake | 3.6 | Low |
| Tumwater | 16.3 | Low |
| Camas | 22.0 | Low |
| Sand Creek | 12.4 | Low |
| Natapoc | 24.7 | Low |

[a]Low = <30 percent of the habitat in a zone of influence, moderate = 30 to 50 percent, and high = >50 percent.

**Table 24—Cumulative effects of nonwinter recreation routes on late-successional forest habitat effectiveness for late-successional reserves (LSRs) and managed late-successional areas (MLSAs) in the case study area**

| LSR/MLSA | Percentage outside zone of influence | Relative ranking[a] |
|---|---|---|
| Slide Peak | 41.7 | High |
| Icicle | 56.5 | Moderate |
| Boundary Butte | 46.1 | High |
| Sawtooth | 59.9 | Moderate |
| Shady Pass | 63.6 | Moderate |
| Chiwawa | 56.3 | Moderate |
| Lake Wenatchee | 63.9 | Moderate |
| Deadhorse | 58.9 | Moderate |
| Teanaway | 56.3 | Moderate |
| Swauk | 38.1 | High |
| Eagle | 42.7 | High |
| Twin Lake | 82.8 | Low |
| Tumwater | 58.6 | Moderate |
| Camas | 42.7 | High |
| Sand Creek | 54.4 | Moderate |
| Natapoc | 49.2 | Low |

[a]Low = <30 percent of the habitat in a zone of influence, moderate = 30 to 50 percent, and high = >50 percent.



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**Table 25—Cumulative effects of groomed and designated winter recreation routes on late-successional forest habitat effectiveness for late-successional reserves (LSRs) and managed late-successional areas (MLSAs) in the case study area**

| LSR/MLSA | Percentage outside zone of influence | Relative ranking[a] |
|---|---|---|
| Slide Peak | 66.7 | Low |
| Icicle | 100.0 | Low |
| Boundary Butte | 99.0 | Low |
| Sawtooth | 100.0 | Low |
| Shady Pass | 98.3 | Low |
| Chiwawa | 84.2 | Low |
| Lake Wenatchee | 94.8 | Low |
| Deadhorse | 93.2 | Low |
| Teanaway | 96.0 | Low |
| Swauk | 84.8 | Low |
| Eagle | 10.0 | Low |
| Twin Lake | 100.0 | Low |
| Tumwater | 86.2 | Low |
| Camas | 100.0 | Low |
| Sand Creek | 100.0 | Low |
| Natapoc | 93.9 | Low |

[a]Low = <30 percent of the habitat in a zone of influence, moderate = 30 to 50 percent, and high = >50 percent.

**Table 26—Nonwinter recreation route density index for riparian habitats in the case study area**

| Watershed | Percentage with recreation route densities <1.6 km/ 0.9-km-radius circle | Percentage with recreation route densities 1.6 to 3.2 km/ 0.9-km-radius circle | Percentage with recreation route densities >3.2 km/ 0.9-km-radius circle | Relative ranking[a] |
|---|---|---|---|---|
| Chelan | 48.3 | 22.7 | 29.0 | High |
| Chiwawa | 24.6 | 26.2 | 49.2 | High |
| Entiat | 17.5 | 23.7 | 58.7 | High |
| White-Little Wenatchee | 39.8 | 19.5 | 40.7 | High |
| Columbia River-Antoine | 0 | 70.7 | 29.3 | High |
| Mad | 7.2 | 15.6 | 77.1 | High |
| Columbia River-Navarre | 40.2 | 9.4 | 50.4 | High |
| Wenatchee | 18.6 | 21.5 | 60.0 | High |
| Nason | 17.4 | 21.0 | 61.7 | High |
| Columbia River-Entiat | 84.3 | 8.9 | 6.8 | Low |
| Icicle | 30.4 | 30.0 | 39.5 | High |
| Columbia River-Swakane | 38.0 | 33.2 | 28.8 | High |
| Cle Elum | 25.0 | 20.9 | 54.2 | High |
| Peshastin | 11.1 | 18.1 | 70.9 | High |
| Mission | 33.9 | 19.5 | 46.5 | High |
| Yakima | 14.7 | 24.2 | 61.1 | High |
| Columbia River-Stemilt | 22.9 | 7.8 | 69.3 | High |
| Peshastin | 16.9 | 31.6 | 51.5 | High |
| Swauk-Nanuem | 6.8 | 5.2 | 88.0 | High |

[a]High level of human influence = >25 percent of the watershed with 3.2 km/0.9-km radius circle (>2 mi/mi$^2$), moderate level of human influence = >25 percent of the watershed with between 1.6 and <3.2 km/0.9-km radius circle (>1 mi/mi$^2$ and >2), and low level of human influence = <25 percent of the watershed with 1.6 km/0.9-km radius circle (>1 mi/mi$^2$).



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**Table 27—Nonwinter riparian habitat influence index for watersheds located in the case study area**

| Watershed | Hectares of riparian habitat | Percentage of riparian habitats in a zone of influence | Relative ranking[a] |
|---|---|---|---|
| Chelan | 19 972 | 5.6 | Low |
| Chiwawa | 8 240 | 13.0 | Low |
| Entiat | 11 830 | 21.9 | Low |
| White-Little Wenatchee | 11 428 | 9.9 | Low |
| Columbia River-Antoine | 4 | 0 | Low |
| Mad | 3 803 | 22.7 | Low |
| Columbia River-Navarre | 753 | 35.3 | Moderate |
| Wenatchee | 11 361 | 33.9 | Moderate |
| Nason | 3 932 | 20.9 | Low |
| Columbia River-Entiat | 426 | .9 | Low |
| Icicle | 8 493 | 6.7 | Low |
| Columbia River-Swakane | 1 261 | 23.6 | Low |
| Cle Elum | 11 328 | 11.0 | Low |
| Peshastin | 4 757 | 31.8 | Moderate |
| Mission | 2 768 | 20.1 | Low |
| Yakima | 7 228 | 14.9 | Low |
| Columbia River-Stemilt | 453 | 33.5 | Moderate |
| Peshastin | 4 829 | 14.6 | Low |
| Swauk-Naneum | 5 087 | 39.3 | Moderate |

[a]Low level of human influence = <30 percent of the habitat in the watershed within a zone of influence, moderate level of human influence = 30 to 50 percent of the habitat in the watershed within a zone of influence, and high level of human influence = >50 percent of the habitat in the watershed within a zone of influence.

**Table 28—Winter recreation route density index for riparian habitats in the case study area**

| Watershed | Percentage with recreation route densities <1.6 km/ 0.9-km-radius circle | Percentage with recreation route densities 1.6 to 3.2 km/ 0.9-km-radius circle | Percentage with recreation route densities >3.2 km/ 0.9-km-radius circle | Relative ranking[a] |
|---|---|---|---|---|
| Chelan | 92.9 | 6.3 | 1 | Low |
| Chiwawa | 69.6 | 20 | 11 | Moderate |
| Entiat | 87 | 12 | 1 | Low |
| White-Little Wenatchee | 91.2 | 4 | 4 | Low |
| Columbia River-Antoine | 100 | 0 | 0 | Low |
| Mad | 77.8 | 8.8 | 13.4 | Low |
| Columbia River-Navarre | 87.4 | 12.6 | 0 | Low |
| Wenatchee | 75.5 | 17.3 | 7.3 | Moderate |
| Nason | 63.8 | 20.2 | 16 | Moderate |
| Columbia River-Entiat | 59.4 | 40.6 | 0 | Low |
| Icicle | 98.7 | 1.3 | 0 | Low |
| Columbia River-Swakane | 95.8 | 4.2 | 0 | Low |
| Cle Elum | 73 | 13 | 14 | Moderate |
| Peshastin | 83.1 | 16.8 | 1 | Low |
| Mission | 98.2 | 1.8 | 0 | Low |
| Yakima | 54.8 | 20.5 | 25 | High |
| Columbia River-Stemilt | 83 | 7.8 | 9 | Low |
| Peshastin | 86.3 | 9.3 | 5 | Low |
| Swauk-Naneum | 52.2 | 23.2 | 25 | High |

[a]High level of human influence = >25 percent of the watershed with 3.2 km/0.9-km radius circle (<1 mi/mi$^2$), moderate level of human influence = >25 percent of the watershed with between 1.6 and <3.2 km/0.9-km radius circle (<1 mi/mi$^2$ and <2) and low level of human influence = <25 percent of the watershed with >1.6 km/0.9-km radius circle (<1 mi/mi$^2$).



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**Table 29—Cumulative effects analysis for waterfowl and colonial nesting bird habitats for watersheds in the case study area**

| Watershed | Percentage of habitat within a zone of influence | Relative ranking[a] |
|---|---|---|
| Chelan | 34 | Moderate |
| Chiwawa | 55.1 | High |
| Entiat | 62.9 | High |
| White-Little Wenatchee | 55 | Moderate |
| Columbia River-Antoine | 0 | Low |
| Mad River | 74.4 | High |
| Columbia River-Navarre | 50.5 | High |
| Wenatchee River | 68.3 | High |
| Nason Creek | 65.9 | High |
| Columbia River-Entiat | 4.4 | Low |
| Icicle | 55.9 | High |
| Columbia River-Swakane | 41.9 | Moderate |
| Cle Elum | 55.7 | High |
| Peshastin | 77.8 | High |
| Mission Creek | 46.5 | Moderate |
| Yakima | 58.4 | High |
| Columbia River-Stemilt | 67.8 | High |
| Peshastin | 66.7 | High |
| Swauk-Naneum | 81.4 | High |

[a]High level of human influence = .50 percent of the habitat in the watershed outside a zone of influence, moderate level of human influence = 30 to 50 percent of the habitat in the watershed outside a zone of influence, and low level of human influence = <30 percent of the habitat in the watershed outside a zone of influence.

wildlife species and should be given high restoration priority. Opportunities to restore these habitats could be identified during roads analysis (USDA FS 2000c) and considered in project-level evaluations.

**Primary cavity excavator habitats**—The cumulative effects analysis of roads on habitats for primary cavity excavators showed that 90 percent of the assessment units ranked as a low level of human influence, and 10 percent ranked as a moderate level of human influence (table 30). Relative to other focal species habitats, cumulative effects do not seem to be a significant issue for primary cavity excavators within the assessment area.

## Management Implications

This section provides information on the current condition of wildlife habitat for focal species relative to the cumulative effects of linear recreation routes. This information can be used to determine the significance of cumulative effects as an issue at the project scale. For example, if a project is proposed within an assessment area ranked as currently having a high level of human influence, then cumulative effects would be an important issue to address. This issue could be addressed by using the assessment models described in this document. This section also provides an evaluation of baseline conditions to which project-level assessments can be tiered. Finally, this information can be used to identify priorities for restoration of important habitats. The most notable restoration needs based on this assessment are core areas for grizzly bears, late-successional habitat effectiveness, riparian habitat effectiveness, and wetland habitat effectiveness.



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**Table 30—Cumulative effects analysis for primary cavity excavator habitats for watersheds located in the case study area**

| Watershed | Percentage of habitat within a zone of influence | Relative ranking[a] |
|---|---|---|
| Chelan | 6.7 | Low |
| Chiwawa | 13.6 | Low |
| Entiat | 21.0 | Low |
| White-Little Wenatchee | 7.8 | Low |
| Columbia River-Antoine | 6.5 | Low |
| Mad River | 29.2 | Low |
| Columbia River-Navarre | 45.1 | Moderate |
| Wenatchee River | 26.7 | Low |
| Nason Creek | 17.4 | Low |
| Columbia River-Entiat | 22.6 | Low |
| Icicle | 4.1 | Low |
| Columbia River-Swakane | 24.1 | Low |
| Cle Elum | 13.3 | Low |
| Peshastin | 28.9 | Low |
| Mission Creek | 15.3 | Low |
| Yakima | 23.9 | Low |
| Columbia River-Stemilt | 27.0 | Low |
| Peshastin | 9.2 | Low |
| Swauk-Naneum | 47.5 | Moderate |

[a] Low level of human influence = <30 percent of the habitat in the watershed within a zone of influence, moderate level of human influence = 30 to 50 percent of the habitat in the watershed within a zone of influence, and high level of human influence = >50 percent of the habitat in the watershed within a zone of influence.

Some tools that can be used to restore habitat effectiveness are described in general terms below and are based on Knight and Gutzwiller (1995) and Colorado State Parks (1998).

- Spatial separation of humans and wildlife in key habitats. This approach could be used to address situations where displacement/avoidance interactions have been identified for a wildlife species of management interest.
- Temporal separation of humans and wildlife at critical periods. This tool could be applied where the interaction of displacement at a specific site has been identified for a wildlife species of management interest.
- Human behaviors that reduce the effects of recreation on wildlife can be taught through information and education programs.
- Facilities designed with wildlife habitat values in mind. If wildlife habitat issues are identified in the early stages of projects, they can be addressed proactively through project design. Hopefully, the information provided in this assessment will help accomplish this.

To proactively address wildlife conservation and recreation opportunities, we need to begin addressing these issues through our landscape-scale planning processes, such as forest-level planning. This will help in identifying important habitats for wildlife and recreational opportunities for humans. This process could be accomplished by using the following approach:

- Assess the existing level of influence that recreational activities have on wildlife habitats by applying the GIS models and establishing baseline conditions.
- Set compatible wildlife habitat goals and recreation goals through an interdisciplinary planning process.
- Gain further knowledge about wildlife and recreation interactions through an adaptive-management approach. This will require a high level of collaboration between managers and researchers to jointly develop scientifically credible monitoring.
- Adapt habitat and recreation goals based on new information.

The following section provides a framework for how to approach adaptive management and monitoring. This framework will allow us to address the mutual goals of conserving wildlife species while providing recreation opportunities. These goals have many commonalities, not the least of which is the desire of people to experience wildlife during their recreational outings.

## Monitoring and Adaptive Management

Monitoring has been identified as an integral part of an adaptive-management approach to natural resource conservation (Christensen 1997; Christensen et al. 1996; Everett et al. 1994; Gaines et al. 1999; Gutzwiller 1991, 1993; Noss and Cooperrider 1994). Monitoring is defined as the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective (Elzinga et al. 1998). Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs (Nyberg 1998). Adaptive management blends methods of scientific investigation with deliberate manipulations of managed systems. Adaptive management embodies a simple imperative: **policies are experiments and we must learn from them** (Lee 1993).

Adaptive management shares much of its theoretical basis with similar concepts from other fields. Examples include the continuous improvement process in business (Deming 1986, Walton 1986), adaptive control process theory in engineering, and operations research and management (McLain and Lee 1996). An adaptive management approach is particularly useful when dealing with complex management questions and high levels of uncertainty (Nyberg 1998, Walters 1986), both of which confront natural resource managers. One set of complex issues fraught with uncertainty is the management dilemma of balancing recreational opportunities with the conservation of ecological functions and processes. It would seem that using an adaptive-management approach, coupled with credible monitoring, is critical to address these issues.

Scientists can play an important role in adaptive management (Walters 1986), but it is the local resource professionals who must become "adaptive managers" if the promise of the concept is to be realized through its application to natural resource management issues (Nyberg 1998). As part of their everyday jobs, resource managers must be able to design and implement studies that produce reliable information about complex natural resource issues.

### An Adaptive-Management and Monitoring Process

The process for designing and implementing an adaptive management project involves seven steps (based on Elzinga et al. 1998): (1) complete background tasks, (2) develop objectives, (3) design and implement management, (4) design the monitoring methods, (5) implement monitoring, (6) report and use results, and (7) adapt management in light of monitoring results. These seven steps are described in detail below.

**Step 1. Background tasks**—This step involves compiling and reviewing existing information, including relevant management direction. Important decisions to be made at this step include what the priorities are for monitoring (e.g., focal species habitat or population), what resources are available for monitoring, appropriate temporal and spatial scales, and the intensity of the monitoring efforts.

**Step 2. Develop clear, well-defined objectives**—At this step, general management goals and objectives are defined, and monitoring indicators are selected. The desired direction of change (e.g., a 10-percent increase in habitat effectiveness) is described, and specific timeframes for achieving the desired direction are identified.

**Step 3. Design and implement management**—At this step, the project is implemented. It is important that monitoring be considered an integral part of the initial project design as opposed to an afterthought.

**Step 4. Design the monitoring method**—This critical step involves identifying the sampling objectives and methods, defining sampling units, estimating the number of sampling units required, noting sampling frequency, and identifying the resources needed to carry out the monitoring. Randomization, stratification, and replication are important concepts to integrate into the monitoring methods and have implications for the types of statistical methods that can be used in data analyses. Identifying the likely statistical methods that will be used in analysis is also important at this step. Seeking peer review of the monitoring and statistical methods is very important and should be an integral part of this step. This step must be completed along with project design so that project and monitoring objectives are integrated.

**Step 5. Implement monitoring**—This step includes the collection of field data, analysis of data after each measurement cycle, and evaluation of monitoring results. Periodic analysis after measurement cycles allows for adjustments to be made in the monitoring methods.

**Step 6. Report and use results**—For monitoring and adaptive management to be successful, the results, and their applications, must be displayed to managers, interested parties, and decisionmakers. In addition, it is important to leave tracks for successors, as some monitoring may be long term. Seeking peer review of the analysis methods and results is very important and should be an integral part of this step.

**Step 7. Adapt management approaches given the monitoring results**—If monitoring is irrelevant to how resources are managed, then this step is not useful. However, if monitoring is carried out in a way that views management approaches as experimental, is designed into projects at their inception, and is done in a scientifically rigorous manner, then it can be used to guide management of natural resources.

### A Hypothetical Adaptive-Management Plan

**Step 1. Background**—There is a proposal to build a trail for motorized use in order to separate motorized from nonmotorized trail recreation. The project occurs in a roadless area designated for motorized and nonmotorized trail recreation and in a habitat reserve that emphasizes late-successional habitat for species associated with late-successional forest. The land allocations have two goals: provide recreation trail opportunities and maintain security habitat for late-successional species. The specific security habitat goals were described in the reserve assessment (USDA FS 1997), which called for managing toward a goal of a "high" level of security habitat, which is defined as >70 percent security habitat in the reserve. Application of the late-succes-

sional habitat cumulative effects models (as presented in this document) resulted in a concern by the interdisciplinary team (IDT) in meeting recreation needs and maintaining habitat effectiveness for wildlife. This prompted the IDT to propose an adaptive management approach for this project.

The focal species selected for monitoring include breeding birds associated with late-successional forests (brown creeper, pygmy nuthatch, white-breasted nuthatch; white-headed woodpecker) and the American marten.

**Step 2. Objectives**—The management goal is to maintain or improve security habitat for species associated with late-successional forest while providing for trail recreation opportunities. The objective is to determine (1) if motorized trail use decreases habitat effectiveness for the focal species, and (2) if nonmotorized trail use decreases habitat effectiveness for the focal species. The indicators that will be monitored include (1) population indices for late-successional breeding bird species and American marten along the proposed motorized trail, along a nonmotorized hiking trail, and in an area with no trails; and (2) the zone of influence at which focal species may be affected by motorized and or nonmotorized trails, compared to control (trailess) areas.

Monitoring will be implemented for two field seasons following construction of the trail. Monitoring could lead to several possible management changes. First, monitoring may indicate that cumulative effects models need to be revised. Second, if monitoring results in modifications to the cumulative effects models, then the cumulative effects of the current conditions (baseline conditions) will be reassessed based on the new information. Finally, monitoring results will be applied to the evaluation of any future project to assess habitat effectiveness for late-successional focal species in the habitat reserve.

**Step 3. Project design and implementation**—Because the IDT wants to take an adaptive-management approach, they will craft the decision notice to implement the project in three phases. Phase 1 would construct the trails beginning the first field season following a final decision. Phase 2 will be the monitoring of focal species during two field seasons immediately after completion of the trail construction. Phase 3 would include a final evaluation of the monitoring information and appropriate management adjustments to the cumulative effects model and reevaluation of the trail network within the habitat reserve to assess attainment of security habitat goals. This example shows how management decisions can be crafted to incorporate adaptive management.

**Step 4. Monitoring methods**—Monitoring of birds would take place during two breeding seasons immediately following completion of trail construction. Methods will be based on Hickman (1990) and Miller et al. (1998) and include bird point count stations (Ralph et al. 1993) located on and at various distances from motorized and nonmotorized trails, and areas with no trails. A total of 72 point count stations will be located in similar habitats. A total of nine 150-m segments would be monitored, three each along the motorized, nonmotorized, and no-trail areas. Table 31 summarizes the number of bird point count stations at various distances from the trails that would be monitored.

Monitoring of the American marten would rely on the track plate method from Zielinski and Kucera (1995) as modified by Foresman and Pearson (1998). Track plate monitoring would occur at various distances from the trails (table 31) and would include a total

**Table 31—Monitoring efforts for the hypothetical adaptive management trail project to address the effects of motorized and nonmotorized recreation trails on late-successional focal species**

| | No trail | | | | Nonmotorized trail | | | | Motorized trail | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance from trail (meters) | 0 | 100 | 200 | 300 | 0 | 100 | 200 | 300 | 0 | 100 | 200 | 300 |
| Bird point count stations (number) | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Marten track plate stations (number) | | 6 | 6 | 6 | | 6 | 6 | 6 | | 6 | 6 | 6 |

of 54 monitoring stations conducted during two summer field seasons following trail construction. A total of nine 150-m segments within similar habitats would be monitored; three each along the motorized, nonmotorized, and no-trail areas.

Analysis of variance will be used to compare the detection rates of the focal species at each distance from the trail and for each trail type. Alpha for significance testing would be set at 0.05.

**Step 5. Implement and monitor**—District recreation specialists and wildlife biologists would work cooperatively to implement and monitor the trail projects as described in the adaptive-management plan and decision notice.

**Step 6. Report and use**—The district biologists and recreation specialists would summarize their monitoring results and present them to the district leadership team. The monitoring results and report will be peer reviewed and published to assure accuracy and objectivity, and to make them available for others to use.

**Step 7. Management adjustments**—Based on the monitoring results, the district leadership team will review the cumulative effects model and trail network within the habitat reserve to make adjustments to meet the goals for habitat effectiveness for late-successional wildlife species and to provide recreation opportunities.

## Conclusion

Monitoring that is well thought out can be used to validate the assumptions of the cumulative effects models developed in this assessment, and to gain a better understanding of the interactions between wildlife and recreation. The use of adaptive management allows managers to acknowledge uncertainties and information gaps but still move forward with project design and implementation. To implement an adaptive approach, researchers and managers will have to work closely together. But by learning as we go, through the use of monitoring for adaptive management, we will have a higher probability of accomplishing the mutual objectives of providing a highly effective wildlife habitat and offering recreation opportunities.

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## English Equivalents

| When you know: | Multiply by: | To find: |
|---|---|---|
| Meters (m) | 3.28 | Feet |
| Kilometers (km) | .62 | Miles (mi) |
| Square kilometers ($km^2$) | .38 | Square miles ($mi^2$) |
| Hectares (ha) | 2.47 | Acres |

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# Appendix

| | Wildlife groups | | | | | | | Road-associated factors | | | | | | | | | | | | | | | | Nonmotorized trail-associated factors | | | | | | | | | | | | Motorized trail-associated factors | | | | | | | | | | | | Winter recreation/ snowmobiling | | | | | | | | | | | | Winter rec./ skiing & snowshoeing | | | | | | | | | |
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| | Riparian-associated | Late successional | Primary cavity excavator | Waterfowl (lakes, ponds, etc.) | Ungulates | Wide-ranging carnivores | Snag reduction | Down log reduction | Edge effects | Hunting | Trapping | Poaching | Collection | Disturbance at a specific site | Collisions | Negative human interactions | Movement barrier filter | Displacement/avoidance | Habitat loss/fragmentation | Physiological response | Route for competitors/predators | Hunting | Snag reduction | Trapping | Poaching | Collection | Edge effects | Disturbance at a specific site | Negative human interactions | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Route for competitors/predators | Hunting | Snag reduction | Trapping | Poaching | Collection | Edge effects | Collisions | Disturbance at a specific site | Negative human interactions | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Route for competitors/predators | Trapping | Direct mortality | Route for competitors/predators | Disturbance at a specific site | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Physiological response | Snow compaction | Trapping | Route for competitors/predators | Disturbance at a specific site | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Snow compaction |
| **Amphibians** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northwestern salamander | X | X | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Long-toed salamander | X | | | | | | | X | | | | | | | | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pacific giant salamander | X | X | | | | | | | | | | | | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Larch Mountain salamander | | X | | | | | | | | | | | | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rough-skin newt | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Western toad | X | | | | | | | | | | | | | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pacific treefrog | X | | | | | | | | | | | | | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tailed frog* | X | X | | | | | | | X | | | | | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cascade frog* | X | | | | | | | | | | | | | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spotted frog | X | | | | | | | | | | | | | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Reptiles** | | | | | | | | | | | | | | | | | | |

| Birds (continued) | Wildlife groups | | |

| Birds (continued) | Wildlife groups | | | | | | | Road-associated factors | | | | | | | | | | | | | | | | | | | | Nonmotorized trail-associated factors | | | | | | | | | | | | | | | | Motorized trail-associated factors | | | | | | | | | | | | | | | | Winter recreation/ snowmobiling | | | | | | | | | | | | | | | | Winter rec./ skiing & snowshoeing | | | | | | | | | | | |
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| Birds (continued) | Wildlife groups | | | | | | Road-associated factors | | | | | | | | | | | | | | | | | | | | | | Nonmotorized trail-associated factors | | | | | | | | | | | | Motorized trail-associated factors | | | | | | | | | | | | Winter recreation/ snowmobiling | | | | | | | | | | | | Winter rec./ skiing & snowshoeing | | | | | | | | | |
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| Birds (continued) | Wildlife groups | | |

| Birds (continued) | Wildlife groups | | | | | | | Road-associated factors | | | | | | | | | | | | | | | | Nonmotorized trail-associated factors | | | | | | | | | | | | Motorized trail-associated factors | | | | | | | | | | | | Winter recreation/ snowmobiling | | | | | | | | | | | | Winter rec./ skiing & snowshoeing | | | | | | | | | |
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| | Riparian-associated | Late successional | Primary cavity excavator | Waterfowl (lakes, ponds, etc.) | Ungulates | Wide-ranging carnivores | Snag reduction | Down log reduction | Edge effects | Hunting | Trapping | Poaching | Collection | Disturbance at a specific site | Collisions | Negative human interactions | Movement barrier filter | Displacement/avoidance | Habitat loss/fragmentation | Physiological response | Route for competitors/predators | Hunting | Snag reduction | Trapping | Poaching | Collection | Edge effects | Disturbance at a specific site | Negative human interactions | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Route for competitors/predators | Hunting | Snag reduction | Trapping | Poaching | Collection | Edge effects | Collisions | Disturbance at a specific site | Negative human interactions | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Route for competitors/predators | Trapping | Direct mortality | Route for competitors/predators | Disturbance at a specific site | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Physiological response | Snow compaction | Trapping | Route for competitors/predators | Disturbance at a specific site | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Snow compaction |
| Bewick's wren | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| House wren | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Winter wren | | X | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Marsh wren | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| American dipper | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Golden-crowned kinglet | | | X | | | | | | X | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ruby-crowned kinglet | | | | | | | | | X | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Western bluebird | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mountain bluebird | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Townsend's solitaire | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Veery | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Swainson's thrush | | X | | | | | | | X | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hermit thrush | | | X | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| American robin | | X | | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Varied thrush | | | X | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gray catbird | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern mockingbird | | | | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sage thrasher | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| American pipit | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bohemian waxwing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cedar waxwing | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern shrike | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Loggerhead shrike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| European starling | | X | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Solitary vireo | | X | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Warbling vireo | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Red-eyed vireo | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Orange-crowned warbler | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nashville warbler | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Yellow warbler | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Yellow-rumped warbler | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Black-throated gray warbler | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Townsend's warbler | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hermit warbler | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Palm warbler | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Black-and-white warbler | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| American redstart | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern waterthrush | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Macgillivray's warbler | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Common yellowthroat | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wilson's warbler | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Yellow-breasted chat | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Western tanager | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Black-headed grosbeak | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lazuli bunting | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spotted towhee | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Wildlife groups | | Road-associated factors | | | | | | | | | | | | | | | | | | | | Nonmotorized trail-associated factors | | | | | | | | | | | | Motorized trail-associated factors | | | | | | | | | | | | Winter recreation/ snowmobiling | | | | | | | | | | | | Winter rec./ skiing & snowshoeing | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Birds (continued) | Riparian-associated | Late successional | Primary cavity excavator | Waterfowl (lakes, ponds, etc.) | Ungulates | Wide-ranging carnivores | Snag reduction | Down log reduction | Edge effects | Hunting | Trapping | Poaching | Collection | Disturbance at a specific site | Collisions | Negative human interactions | Movement barrier filter | Displacement/avoidance | Habitat loss/fragmentation | Physiological response | Route for completitors/predators | Hunting | Snag reduction | Trapping | Poaching | Collection | Edge effects | Disturbance at a specific site | Negative human interactions | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Route for completitors/predators | Hunting | Snag reduction | Trapping | Poaching | Collection | Edge effects | Collisions | Disturbance at a specific site | Negative human interactions | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Physiological response | Route for completitors/predators | Trapping | Direct mortality | Route for completitors/predators | Disturbance at a specific site | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Physiological response | Snow compaction | Trapping | Route for completitors/predators | Disturbance at a specific site | Movement barrier | Displacement/avoidance | Habitat loss/fragmentation | Snow compaction |
| American tree sparrow | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chipping sparrow | X | | | | | | | X | X | | | | | | X | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Clay-colored sparrow | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Brewer's sparrow | | | | | | | | | X | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vesper sparrow | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lark sparrow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sage sparrow | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Savannah sparrow | | | | | | | | | | | | | | | X | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Grasshopper sparrow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fox sparrow | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Song sparrow | X | | | | | | | | X | | | | | | | | | X | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lincoln's sparrow | X | | | | | | | | X | | | | | | | | | X | | | | | | | | | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| White-throated sparrow | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Golden-crowned sparrow | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| White-crowned sparrow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Harris's sparrow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dark-eyed junco | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lapland longspur | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Snow bunting | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bobolink | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Red-winged blackbird | X | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Western meadowlark | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Yellow-headed blackbird | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Brewer's blackbird | X | | | | | | | X | | | | | | | X | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Brown-headed cowbird | X | | | | | | | | | | | | | | X | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern oriole (Bullock's) | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosy Finch | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pine grosbeak | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Purple finch | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cassin's finch | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| House finch | X | | | | | | | | | | | | | | X | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Red crossbill | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| White-winged crossbill | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Common redpoll | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pine siskin | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| American goldfinch | | | | | | | | X | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Evening grosbeak | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| House sparrow | X | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Mammals** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Virginia opossum | X | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Masked shrew | X | | | | | | | | | | | | | | | | X | | X | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Merriam shrew | X | | | | | | | | | | | | | | X | | X | | X | | | | | | | | X | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trowbridge shrew | X | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dusky shrew | X | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Montane shrew | X | | | | | | | | | | | | | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Mammals (continued) | Wildlife groups | | | | | | | | Road-associated factors | | | | | | | | | | | | | | | | | | | | Nonmotorized trail-associated factors | | | | | | | | | | | | | | | | Motorized trail-associated factors | | | | | | | | | | | | | | | | Winter recreation/ snowmobiling | | | | | | | | | | | | | | | | Winter rec./ skiing & snowshoeing | | | | | | | | | | | |
|---|---|---

| Wildlife groups | Road-associated factors | | | | | | | | | | | | | | | | | | | Nonmotorized trail-associated factors | | | | | | | | | | | | | | | Motorized trail-associated factors | | | | | | | | | | | | | | | Winter recreation/ snowmobiling | | | | | | | | | | | | | | | Winter rec./ skiing & snowshoeing | | | | | | | | | | | |
|---|---|---

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Part II

# Department of the Interior

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife Plants; Designation of Critical Habitat for the Bull Trout; Final Rule

RECEIVED
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**DEPARTMENT OF THE INTERIOR**

**Fish and Wildlife Service**

**50 CFR Part 17**

**RIN 1018–AJ12; 1018–AU31**

## Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Bull Trout

**AGENCY:** Fish and Wildlife Service, Interior.

**ACTION:** Final rule.

**SUMMARY:** We, the U.S. Fish and Wildlife Service (Service), designate critical habitat for the Klamath River, Columbia River, Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River populations of bull trout (*Salvelinus confluentus*) in the coterminous United States pursuant to the Endangered Species Act of 1973, as amended (Act). This final designation totals approximately 3,828 miles (mi) (6,161 kilometers (km) of streams, 143,218 acres (ac) (57,958 hectares (ha) of lakes in Idaho, Montana, Oregon, and Washington, and 985 mi (1,585 km) of shoreline paralleling marine habitat in Washington. We solicited data and comments from the public on all aspects of the proposed rules, including data on economic and other impacts of the designations.

**DATES:** This rule becomes effective October 26, 2005.

**ADDRESSES:** Comments received, as well as supporting documentation used in the preparation of this final rule, will be available for public inspection, by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Branch of Endangered Species, 911 N.E. 11th Avenue, Portland, OR 97232. The final rule, economic analyses, and maps are also available via the Internet at *http://pacific.fws.gov/bulltrout/*.

**FOR FURTHER INFORMATION CONTACT:** Branch of Endangered Species (see **ADDRESSES** section), telephone, facsimile 503/231–6237.

**SUPPLEMENTARY INFORMATION:**

### Role of Critical Habitat in Actual Practice of Administering and Implementing the Act

Attention to and protection of habitat is paramount to successful conservation actions. The role that designation of critical habitat plays in protecting habitat of listed species, however, is often misunderstood. As discussed in more detail below in the discussion of exclusions under ESA section 4(b)(2), there are significant limitations on the regulatory effect of designation under ESA section 7(a)(2). In brief, (1) designation provides additional protection to habitat only where there is a federal nexus; (2) the protection is relevant only when, in the absence of designation, destruction or adverse modification of the critical habitat would in fact take place (in other words, other statutory or regulatory protections, policies, or other factors relevant to agency decision-making would not prevent the destruction or adverse modification); and (3) designation of critical habitat triggers the prohibition of destruction or adverse modification of that habitat, but it does not require specific actions to restore or improve habitat.

Currently, only 470 species, or 37 percent of the 1,264 listed species in the U.S. under the jurisdiction of the Service, have designated critical habitat. We address the habitat needs of all 1,264 listed species through conservation mechanisms such as listing, section 7 consultations, the Section 4 recovery planning process, the Section 9 protective prohibitions of unauthorized take, Section 6 funding to the States, the Section 10 incidental take permit process, and cooperative, nonregulatory efforts with private landowners. The Service believes that it is these measures that may make the difference between extinction and survival for many species.

In considering exclusions of areas originally proposed for designation, we evaluated the benefits of designation in light of *Gifford Pinchot Task Force* v. *United States Fish and Wildlife Service*. In that case, the Ninth Circuit invalidated the Service's regulation defining "destruction or adverse modification of critical habitat." In response, on December 9, 2004, the Director issued guidance to be considered in making section 7 adverse modification determinations. This critical habitat designation does not use the invalidated regulation in our consideration of the benefits of including areas in this final designation. The Service will carefully manage future consultations that analyze impacts to designated critical habitat, particularly those that appear to be resulting in an adverse modification determination. Such consultations will be reviewed by the Regional Office prior to finalizing to ensure that an adequate analysis has been conducted that is informed by the Director's guidance.

On the other hand, to the extent that designation of critical habitat provides protection, that protection can come at significant social and economic cost. In addition, the mere administrative process of designation of critical habitat is expensive, time-consuming, and controversial. The current statutory framework of critical habitat, combined with past judicial interpretations of the statute, make critical habitat the subject of excessive litigation. As a result, critical habitat designations are driven by litigation and courts rather than biology, and made at a time and under a time frame that limits our ability to obtain and evaluate the scientific and other information required to make the designation most meaningful.

In light of these circumstances, the Service believes that additional agency discretion would allow our focus to return to those actions that provide the greatest benefit to the species most in need of protection.

### Procedural and Resource Difficulties in Designating Critical Habitat

We have been inundated with lawsuits for our failure to designate critical habitat, and we face a growing number of lawsuits challenging critical habitat determinations once they are made. These lawsuits have subjected the Service to an ever-increasing series of court orders and court-approved settlement agreements, compliance with which now consumes nearly the entire listing program budget. This leaves the Service with little ability to prioritize its activities to direct scarce listing resources to the listing program actions with the most biologically urgent species conservation needs. The consequence of the critical habitat litigation activity is that limited listing funds are used to defend active lawsuits, to respond to Notices of Intent (NOIs) to sue relative to critical habitat, and to comply with the growing number of adverse court orders. As a result, listing petition responses, the Service's own proposals to list critically imperiled species, and final listing determinations on existing proposals are all significantly delayed. The accelerated schedules of court-ordered designations have left the Service with limited ability to provide for public participation or to ensure a defect-free rulemaking process before making decisions on listing and critical habitat proposals, due to the risks associated with noncompliance with judicially imposed deadlines. This in turn fosters a second round of litigation in which those who fear adverse impacts from critical habitat designations challenge those designations. The cycle of litigation appears endless, and is very expensive, thus diverting resources from conservation actions that may provide relatively more benefit to imperiled species. The costs resulting from the

designation include legal costs, the cost of preparation and publication of the designation, the analysis of the economic effects and the cost of requesting and responding to public comment, and in some cases the costs of compliance with the National Environmental Policy Act (NEPA). These costs, which are not required for many other conservation actions, directly reduce the funds available for direct and tangible conservation actions.

**Background**

Bull trout (*Salvelinus confluentus*) are members of the char subgroup of the family Salmonidae and are native to waters of western North America. Bull trout range throughout the Columbia River and Snake River basins, extending east to headwater streams in Montana and Idaho, into Canada, and in the Klamath River basin of south-central Oregon. The distribution of populations, however, is scattered and patchy (Goetz 1989; Rieman and McIntyre 1993; Zeller 1992; Light *et al.* 1996; Quigley and Arbelbide 1997).

Bull trout exhibit a number of life-history strategies. Stream-resident bull trout complete their entire life cycle in the tributary streams where they spawn and rear. Most bull trout are migratory, spawning in tributary streams where juvenile fish usually rear from 1 to 4 years before migrating to either a larger river (fluvial) or lake (adfluvial) where they spend their adult life, returning to the tributary stream to spawn (Fraley and Shepard 1989). Resident and migratory forms may be found together, and either form can produce resident or migratory offspring (Rieman and McIntyre 1993).

Bull trout, coastal cutthroat trout (*Oncorhynchus clarki clarki*), Pacific salmon (*Oncorhynchus* spp.), and some other species are commonly referred to as "anadromous" (fish that can migrate from saltwater to freshwater to reproduce). However, bull trout, coastal cutthroat trout, and some other species that enter the marine environment are more properly termed "amphidromous." Unlike strictly anadromous species, such as Pacific salmon, amphidromous species often return seasonally to fresh water as subadults, sometimes for several years, before returning to spawn (Wilson 1997). The amphidromous life history form of bull trout is unique to the Coastal-Puget Sound population. For additional information on the biology of this life form, see our June 25, 2004, proposed critical habitat designation for the Jarbidge River, Coastal-Puget sound, and Saint Mary-Belly River populations of bull trout (69 FR 35767).

For additional information on population ranges, biology, and habitat requirements of the bull trout, please refer to the following published rules: Proposed critical habitat designation for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River populations (69 FR 35767, June 25, 2004; as corrected by 69 FR 43058, July 19, 2004); final critical habitat designation (69 FR 59995, October 6, 2004) and proposed critical habitat designation (67 FR 71235, November 29, 2002) for the Klamath River and Columbia River populations; and listing rules for the Klamath River and Columbia River populations (63 FR 31647, June 10, 1998), Jarbidge River population (64 FR 17110, April 8, 1999), and for all populations (64 FR 58909, November 1, 1999).

**Previous Federal Action**

Please refer to the November 29, 2002, proposed critical habitat designation for the Klamath River and Columbia River bull trout populations (67 FR 71235) for a detailed summary of Federal actions completed prior to publication of that proposal related to all bull trout populations. Please refer to the October 6, 2004, final critical habitat designation for the Klamath River and Columbia River bull trout populations (69 FR 59995) for a detailed summary of Federal actions completed between the proposed and final rules related to the Columbia and Klamath populations. Please refer to the June 25, 2004, proposed critical habitat designation for the Jarbidge, Coastal-Puget, and St. Mary Belly bull trout populations (69 FR 35767) for a detailed summary of previous Federal actions completed prior to publication of that proposal related to those bull trout populations.

On December 14, 2004, Alliance for the Wild Rockies *et al.* filed a complaint challenging the adequacy of the final critical habitat designation for the Klamath River and Columbia River bull trout populations. Our motion for partial voluntary remand was subsequently granted by the court with a final rule due by September 15, 2005. On May 25, 2005, we announced the opening of a public comment period on the proposed and final designations of critical habitat for the Klamath River and Columbia River bull trout populations (70 FR 29998). On June 6, 2005, we published a notice clarifying the reopening of the comment period for the proposed and final designation of critical habitat for the Klamath River and Columbia River bull trout populations (70 FR 32732). The comment period was open until June 24, 2005.

On May 3, 2005, we published a notice of the availability of the draft economic analysis (DEA) and reopening of a 30-day comment period until June 2, 2005 (70 FR 22835), for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-belly River populations of bull trout. On June 27, 2005, Judge Jones extended the deadline for designating critical habitat for the Puget Sound-Coastal, Jarbidge, and St. Mary-Belly River bull trout populations to September 15, 2005. This rule combines all of the listed populations of bull trout into one final critical habitat designation, and, in doing so, replaces the final critical habitat designation for the Klamath River and Columbia River populations of bull trout published in the **Federal Register** on October 6, 2004 (69 FR 59995).

**Summary of Comments and Recommendations**

*Jarbidge River, Coastal-Puget Sound, and Saint Mary-belly River Bull Trout Populations*

We requested written comments from the public on the proposed designation of critical habitat for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-belly River populations of bull trout in the proposed rule published on June 25, 2004 (69 FR 35767). We also contacted and invited the appropriate Federal, State, and local agencies, scientific organizations, and other interested parties to comment on the proposed rule. In addition, we held one public hearing on August 10, 2004, in Tumwater, Washington.

During the comment period that opened on June 25, 2004, and closed on August 24, 2004, we received 34 comment letters directly addressing the proposed critical habitat designation: 8 from peer reviewers, 5 from Federal agencies, 3 from State agencies, 2 from County or city agencies, 6 from tribes, and 10 from organizations or individuals.

During the reopened comment period (May 3, 2005 through June 2, 2005) (70 FR 228350), we received 16 comment letters directly addressing the proposed critical habitat designation and DEA, 7 of which were from organizations or individuals that submitted comments during the first comment period. Of the 16 letters, we received 1 from a peer reviewer, 2 from Federal agencies, 3 from State agencies, 3 from county or city agencies, 1 from a tribe, and 6 from organizations or individuals.

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*Klamath River and Columbia River Bull Trout Populations*

Responses to public and peer review comments on proposed critical habitat for the Klamath River and Columbia River bull trout populations (67 FR 71235, November 29, 2002) and the DEA (69 FR 17634, April 5, 2004) were published in the final designation of critical habitat (69 FR 59995, October 6, 2004). The following summary responds only to those comments received during the reopened comment period period (May 3, 2005 through June 2, 2005) on the proposed and final rules for critical habitat designation for the Klamath River and Columbia River bull trout populations (70 FR 32732).

During the reopened comment period, we received 33 letters addressing the final critical habitat designation and economic analysis (EA). Of these letters, we received 7 from Federal agencies, 4 from State agencies, 10 from local entities, 1 from a tribe, and 11 from organizations or individuals.

All comments of a similar nature were grouped together for all populations of bull trout and are addressed in the following summary. Substantive comments have been incorporated into the final rule as appropriate.

*Peer Review*

In accordance with our peer review policy published on July 1, 1994 (59 FR 34270), we solicit opinions from individuals who have expertise with the species and the geographic region where the species occurs and are familiar with conservation biology principles. The peer review process for the Klamath and Columbia River bull trout populations was discussed in the October 6, 2004, final critical habitat designation for the Klamath River and Columbia River bull trout populations (69 FR 59995).

For the proposed critical habitat designation for Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River bull trout populations, we solicited independent expert review from eight individuals and all responded. The peer reviewers generally concurred with our methods, but also provided additional information, clarifications, and suggestions to improve the final critical habitat rule. Key elements of the reviewers' critical comments related to the proposal's scope and whether existing laws and regulations already protect some areas. Comments also addressed the need for greater prioritization of conservation issues influencing critical habitat designation, emphasis on quality habitat to support the migratory life form of bull trout, and an explanation of why some particular habitat, including areas of degraded habitat, are important to bull trout conservation. Additionally, the reviewers provided many technical comments on the appropriateness and bounds of specific geographic areas proposed as critical habitat. Peer reviewer comments are addressed in the following summary and incorporated into the final rule as appropriate.

*Peer Reviewer Comments for Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River Bull Trout Populations*

When similar comments were also received from other reviewers, they are addressed in the comments here to avoid redundancy.

(1) *Comment:* A peer reviewer requested clarification on the difference between critical habitat subunits (CHSUs) and core areas described in the bull trout draft recovery plans (draft Recovery Plans) (Service 2002, 2004).

*Our Response:* In general, critical habitat subunits (CHSUs) correspond to core areas identified in the draft Recovery Plans (*http://www.fws.gov/pacific/bulltrout/*). However, the Olympic Peninsula and Puget Sound Critical Habitat Units (Coastal-Puget Sound populations) also contain nearshore and freshwater habitats outside of natal river basins that are used by bull trout from more than one CHSU or core area. These habitats outside of core areas contain all the physical elements and features (primary constituent elements) critical to overwintering, migration, and subadult and adult foraging needs essential for the conservation of amphidromous (referring to the migratory behavior of fishes moving from fresh water to the sea and vice versa, not for breeding purposes but occurring regularly at some stage of the life cycle, such as feeding or overwintering) bull trout, which are unique to the Coastal-Puget Sound bull trout population. Within the core areas, certain areas identified by the Service as containing features essential for the conservation of the species, and in need of special management or protection, are designated critical habitat. Although core areas contribute to recovery and share primary constituent elements (PCEs) with critical habitat, only those portions of the core areas that meet the statutory definition of critical habitat and provide defined PCEs are considered for designation.

(2) *Comment:* Since little of the Belly River is within the United States, this core area is not a biologically functioning unit that contains necessary features or PCEs.

*Our Response:* A short reach of the North Fork Belly River, extending across the international border from Canada (downstream) into the United States (upstream), is the only known spawning reach for bull trout in the entire Belly River system. Thus, this portion of the North Fork Belly River in the United States is vital as spawning and rearing habitat for this bull trout population. It contains the PCEs necessary for the spawning and rearing life stages (*i.e.*, permanently flowing, cold, upwelling groundwater with suitable spawning substrate and complex rearing habitat). The foraging, migration, and overwintering (FMO) habitat for this population is found downstream in Alberta, Canada. This downstream habitat includes the PCEs found in a migratory corridor, including deep holding pools and a forage base to support large adult bull trout. Adult fish from Canada travel into the United States portions of the watershed annually to spawn. Because of the important spawning areas in the United States, and the presence of necessary PCEs, we have determined that this area is essential to this important biologically functioning unit and is designated critical habitat.

(3) *Comment:* Although it may be consistent with section 4(b)(2) of the Act to exclude Habitat Conservation Plans (HCPs) and the areas covered by the Washington Forest Practice Rules, there are no provisions in the rule to include these excluded lands within designated critical habitat if land-use practices or ownership changes.

*Our Response:* Although the specific provisions vary for each plan, HCPs typically include language that addresses change in circumstances or ownership. For example the draft Implementing Agreement for the Washington Department of Natural Resources, Forest Practices HCP states that any changes in the permits must be adopted through the procedures specified in the Act, other applicable Federal laws, and applicable regulations and if the Service determines that such changes materially impair the conservation plan contained in the HCP, they will notify the State and, if the matter is not otherwise resolved, may suspend or terminate the HCP, permits and the Implementing Agreement. If land ownership changes and a new landowner does not agree to the terms and conditions of the original permit, the original permittee must work with the Services to determine whether, and under what circumstances, the permit can be terminated. In order to terminate a permit, the Services must determine if the minimization and mitigation

measures that were conducted up to that point were commensurate with the amount of incidental take that occurred during the term of the permit. The Services will always require implementation of any outstanding minimization and mitigation measures before a permit is terminated.

(4) *Comment:* Freshwater foraging, migratory, and overwintering habitats outside core areas are not clearly essential to bull trout nor well documented. Therefore, these areas should not be included in the critical habitat designation.

*Our Response:* Some habitats outside of core areas contain all the physical elements to meet critical overwintering, migration, and subadult and adult foraging needs that are essential for the conservation of amphidromous bull trout. Recent tagging studies on the Olympic Peninsula and in Puget Sound have tracked the complex migrations of amphidromous bull trout from their core areas to marine and freshwater foraging, migratory, and overwintering habitats outside of their natal core areas (Brenkman and Corbett 2003, 2005; Goetz *et al.* 2004). Amphidromous bull trout have shown site fidelity to, and extensive use of, freshwater and marine habitat areas, demonstrating these are necessary in completing their life history and therefore, are included as critical habitat.

(5) *Comment:* Reviewers acknowledged the exclusions the Service had proposed for HCPs and the Washington Forest Practice Rules and recommended considering other types of management plans and actions for possible exclusions. They indicated that designation of critical habitat would be a duplication of effort since Federal actions, such as allotment management plans, already undergo formal consultation. One reviewer wanted to know why waterbodies within some Federal lands, such as wilderness, parks, and forests, were not excluded. Another reviewer asked why multi-species conservation plans under development by local watershed organizations in Washington were not excluded. Several reviewers suggested lands covered by Washington State's watershed planning process (subbasin plans), and lands in Olympic and North Cascades National Parks are currently not in need of special management.

*Our Response:* We believe some existing management plans are appropriate for exclusion because the benefits of exclusion outweigh the benefits of inclusion (see section "Section 3(5)(A) and Exclusions Under Section 4(b)(2)"). Landownership is not a factor in determining which areas contain PCEs and meet the definition of critical habitat. Some waterbodies on Federal lands meet the definition of critical habitat. While we have done so in the past, in this rulemaking we did not consider any pending HCPs for exclusion, primarily because none of the pending HCPs were at a point we could do so without prejudging the outcome of the ongoing HCP process and because we expect further changes to the developing HCPs.

(6) *Comment:* One reviewer suggested that Corps of Engineers 401 and 404 permits should be excluded from critical habitat.

*Our Response:* Corps of Engineers 401 and 404 or other instream permits are issued to ensure that applicants avoid and minimize impacts to streams. Any mitigation that may be required by a permit is to avoid or minimize degradation and to mitigate for unavoidable impacts.

(7) *Comment:* Are small stream habitats in the Saint Mary-Belly River headwaters in the critical habitat designation contributing to rearing and foraging of bull trout and are they adequately considered?

*Our Response:* Because of the steep topography, flashy stream flow and very active erosion and depositional processes of the Saint Mary-Belly River headwaters, very few smaller tributary streams support adequate year-round stream flow to allow bull trout passage; in addition, many have natural barriers. Most of those tributary streams have been surveyed, and all those known to support bull trout were considered and included in the final critical habitat designation.

(8) *Comment:* It would help to understand what the threats to bull trout are and how threats relate to critical habitat designation.

*Our Response:* For details of the threats that were the basis for the bull trout listing, refer to the final listing rules for the Klamath River and Columbia River population (63 FR 31647), Jarbidge River population (64 FR 17110), and Coastal-Puget Sound and Saint Mary-Belly River populations (64 FR 58910). Critical habitat identifies those areas that contain the physical and biological features (PCEs) that are essential to the conservation of the species, and those areas that may require special management considerations or protections.

*Public Comments Related to Bull Trout Biology and Habitat; Process of Designating Critical Habitat for the Bull Trout*

(9) *Comment:* The proposed critical habitat for the bull trout fails to account for the importance of habitat connectivity.

*Our Response:* The draft Recovery Plans, critical habitat proposal, and the listing rules for bull trout, citing relevant scientific literature, describe the species' conservation needs. In fact, migratory corridors with minimal physical, biological, or water quality impediments are identified as a PCE in the critical habitat rule. Our proposed designation connected essential occupied waterbodies having PCEs to one another to maintain connectivity within and among habitat types (spawning and rearing, freshwater and marine foraging, migratory, and overwintering habitats). In the final designation, we exclude some critical habitat segments based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation, and in most cases does not affect the protections available to that habitat through the Act.

(10) *Comment:* The status of bull trout strongly indicates that critical habitat designation is warranted for all waterbodies occupied by bull trout.

*Our Response:* Although all occupied habitats are important to the species, not all meet the definition of critical habitat. Examples of exclusions include reaches where bull trout are sometimes entrained and lost to the population or highly fragmented habitats within core areas. We believe that we have identified habitat that contains features essential to the bull trout's conservation. In the final designation, we exclude some critical habitat segments based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation.

(11) *Comment:* The Service should describe the relationship between the reduced distribution of salmon and steelhead (*Oncorhynchus* sp.) and the reduced distribution and abundance of bull trout.

*Our Response:* Our recovery plan and administrative record for critical habitat designation, including public comment and peer review, includes information about the relationship between bull trout and their prey species, such as salmon and steelhead. Such information was employed to support the biological basis of the proposal, but practical considerations limited the amount of such information that could be presented in the proposed critical habitat rule. Refer to the previously

published bull trout critical habitat designations and listings (63 FR 31647, 64 FR 17109, 64 FR 58910, 68 FR 6863, 69 FR 35767, 69 FR 59995) for additional information.

(12) *Comment:* The Service's position equating adverse modification with jeopardy is not supported by the Act or case law. The Service needs to define adverse modification.

*Our Response:* In response to recent court decisions, we are no longer using the regulatory definition of adverse modification. Instead, we are following guidance from the Director, embodied in a December 9, 2004 memorandum, which uses the statute as the basis for our regulatory standard when conducting section 7 consultations on critical habitat. We do note in this rule that due to the method of analyzing jeopardy specific to bull trout, that jeopardy and adverse modification rarely diverge. However, that circumstance is due to the specifics of our bull trout analyses rather than an interpretation of regulations or law.

(13) *Comment:* The Service proposed to designate streams as critical habitat that do not currently support bull trout or have little evidence of bull trout use, with no justification for such designation as to why these stream reaches are essential to the conservation of the species, as required by the Act.

*Our Response:* All streams proposed for critical habitat designation within the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River bull trout population segments were known to be occupied. We considered streams occupied if bull trout were documented there within the last 20 years (our 2004 critical habitat designation provides a full explanation for the basis of this standard). Areas of unknown occupancy and unoccupied habitats were included in the proposed designation for the Klamath River and Columbia River populations. However, in this final rule no unoccupied habitat is being designated. The bull trout critical habitat designation is based on the best available scientific information. In addition, the proposed designations were peer-reviewed by individuals who have expertise with bull trout, the geographic region where bull trout occur, and the principles of conservation biology. Justifications for all critical habitat units are available for public review (see **ADDRESSES** section above).

(14) *Comment:* Critical habitat needs to be designated in unoccupied areas because these areas are important for re-introduction of extirpated populations or expansion of existing populations and are the most important areas in need of protection.

*Our Response:* We have limited the critical habitat designation to areas of known occupancy that have features essential to the conservation of the species because we did not have sufficient data for the Secretary to make a determination that specific unoccupied areas were essential to the bull trout's conservation. We based this designation on the best scientific and commercial information available. Many streams not included in this designation can and will contribute to bull trout recovery, but do not meet the definition of critical habitat.

(15) *Comment:* The Service neglected or violated a variety of regulatory or other requirements including NEPA, the Data Quality Act, Regulatory Flexibility Act, and other laws, regulations, and orders.

*Our Response:* We are not required to prepare an environmental assessment or an environmental impact statement, as defined under the authority of NEPA, in connection with regulations adopted pursuant to section 4(a) of the Act, and in States under the jurisdiction of the Ninth Circuit Court. A notice outlining our reason for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244). This position has been upheld by the Ninth Circuit Court of Appeals in *Douglas County* v. *Babbitt*, 48 F.3d 1495 (9th Cir. 1995). We have addressed all the relevant required regulatory determinations in this rule (see Required Determinations section below). Our Policy on Information Standards Under the Endangered Species Act, published in the **Federal Register** on July 1, 1994 (59 FR 34271), and Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658) and the associated Information Quality Guidelines issued by the Service, provide criteria, establish procedures, and provide guidance to ensure that our decisions are based on the best scientific and commercial data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific and commercial data available, to use primary and original sources of information as the basis for recommendations to designate critical habitat. All information in this critical habitat rule is used in accordance with the provisions of Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658) and the associated Information Quality Guidelines issued by the Service. Both public and peer review of the proposed rule further ensures that the final designation will meet this standard.

(16) *Comment:* Stream temperature is a limiting factor for some populations, and bankfull designation may not encompass sufficient shading to maintain water temperatures for bull trout.

*Our Response:* We agree that temperature can be a limiting factor for some populations which is why it is considered a PCE. Riparian vegetation influences instream habitat conditions by providing shade, organic matter, root strength, bank stability, and large woody debris inputs to streams. Stream width and depth ratios also influence stream temperatures. Even though riparian vegetation may not be within a stream's bankfull width, and therefore not included in the critical habitat designation, effects to these areas are likely to be evaluated during the consultation process due to the indirect effect riparian and upland actions may have on water temperatures, which is one of the identified PCEs for bull trout critical habitat.

(17) *Comment:* The Service failed to consult with Native American tribes in developing the proposed rule and economic analysis.

*Our Response:* We have been, and will continue, to consult with those tribes affected by the critical habitat designation. We contacted Native American tribes where proposed bull trout critical habitat occurred on, or adjacent to, tribal lands. We discussed the critical habitat proposal with representatives of the tribes that responded. We will continue to work with the tribes on a government-to-government basis for the conservation of bull trout.

(18) *Comment:* A single sighting of a native char (bull trout) in a water body is not sufficient reason to designate the water as critical habitat.

*Our Response:* We have not designated any unoccupied areas as critical habitat. However, we included any area with documented occupancy (even a single sighting) within the last 20 years, if the area has PCEs essential to the species' conservation and will support the essential life history needs of bull trout. The published survey protocol for juvenile and resident bull trout was not developed until 2002, and no similar survey protocol for adult migratory bull trout has been developed. Many bull trout sightings are the incidental result of surveys for other species (salmon). In addition, bull trout are difficult to find, are migratory, and often exhibit a patchy distribution. Therefore, an incidental sighting of one

individual or a few bull trout is often the only available information until a targeted survey for bull trout is conducted. With the increasing availability of radio telemetry data, we are finding that the extent or range of bull trout occupied habitat is often greater than was previously known based on incidental observations.

(19) *Comment:* Specific numerical habitat standards for critical habitat must be included along with critical habitat designations.

*Our Response:* There is no requirement under the Act that PCEs have specific numerical standards, nor would it necessarily promote effective conservation to determine numerical standards for all PCEs given the various life histories expressed by bull trout throughout their range. However, we recognize the value of observable or measurable standards. The PCEs include numerical standards when appropriate (*e.g.*, to bracket a range of acceptable temperatures) and feasible, such as for temperature and substrate embeddedness.

(20) *Comment:* The Service should designate critical habitat for a number of "source water" streams. These are predominantly steep, small streams not occupied by bull trout, but are key sources of cold, clean water that feed bull trout habitat downstream.

*Our Response:* Streams that contribute necessary habitat elements such as cold, clean water downstream to designated streams are not included in this designation unless bull trout presence has been documented. Our determination of bull trout critical habitat is limited to areas that bull trout rely on for some portion of their life cycle. Although not designated as critical habitat, we recognize that these "source waters" or non-fish-bearing streams influence the character of designated stream segments located downstream. Where section 7 consultation is required, impacts to these "source water" streams that may affect bull trout critical habitat will be evaluated (see Critical Habitat Designation section below).

(21) *Comment:* The Service failed to include areas of historical bull trout occupancy and the rules do not provide adequate justification for their exclusion.

*Our Response:* The critical habitat proposals did not reflect all habitat areas bull trout are known to occupy or occupied historically, in the coterminous United States. Rather, it reflects those areas that contain the necessary features that are essential for the conservation of the species and are currently occupied by the species. Historical records of bull trout distribution may be anecdotal and incomplete relative to current bull trout distribution and thus, would not provide a sufficient basis for this critical habitat rule. We believe by defining as occupied those segments with at least one documented sighting in the last 20 years we have used a sufficiently broad measure to ensure the most likely occupied areas are included. This standard takes into account the fact that bull trout are abnormally difficult to find as they are primarily nocturnal feeders.

In our proposed critical habitat designation for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River population segments, we specifically solicited additional information on areas of habitat with evidence of occupancy of which we were unaware. These waterbodies had been identified by the bull trout recovery teams as key recovery habitat in the draft recovery plan, however, at that time they had no specific information documenting bull trout occupancy. Since the proposal, we have received additional information on bull trout occupancy for several tributaries in the Nooksack River (Fossil Creek), South Fork Skykomish River (West Fork Foss River), and Ross Lake (North Fork Canyon Creek) systems, which have been excluded from the final designation (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(22) *Comment:* The contribution of tribal lands to bull trout habitat conservation is unclear and these lands are not essential to bull trout recovery.

*Our Response:* The scientific information cited in the draft Recovery Plans provided the basis for our evaluation of habitats that contain the features essential to bull trout conservation. Many tribal lands include portions of mainstem rivers that provide essential migratory corridors and overwintering habitat for fluvial and amphidromous bull trout. Waterbodies on tribal lands were included in the critical habitat designation only if they were found to be currently occupied, contain PCEs that are essential for bull trout conservation, and were not adequately covered by management plans (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(23) *Comment:* The proposed rule fails to mention water rights.

*Our Response:* The proposed and final rules do not specifically address water rights. However, examples of activities that may potentially affect aquatic bull trout critical habitat by altering the PCEs, such as changes in water use or water rights were provided in the proposed and final rules.

(24) *Comment:* The proposal to designate critical habitat in the Saint Mary-Belly Rivers focuses on potential impacts of irrigation activities instead of potential adverse effects of recreational fishing on bull trout.

*Our Response:* Under the 4(d) rule that was included in the final rule which listed bull trout, take of bull trout in accordance with state, National Park Service, and Native American Tribal permitted fishing activities is allowed (64 FR 58910). Irrigation activities are often linked to Federal agencies, such as Bureau of Reclamation (BOR), for the allocation, delivery or storage of the water. Individual anglers, however, are only required to avoid take of listed bull trout by following fishing regulations.

(25) *Comment:* There is no evidence to specifically identify when marine or estuarine areas are being used by bull trout.

*Our Response:* Recent radio and acoustic telemetry studies in Grays Harbor, Puget Sound, and the Snohomish, Dungeness, and Hoh Rivers have provided new information on bull trout use of marine and estuarine areas and the importance of this habitat for bull trout recovery (Brenkman and Corbett 2003, 2005; Jeanes *et al.* 2003; Goetz *et al.* 2004). These studies documented that marine forage fish such as herring (*Clupea* spp.), surf smelt (*Hypomesus pretiosus*), sand lance (*Ammodytes hexapterus*), and shiner surfperch (*Cymatogaster aggregate*) are bull trout prey. In addition, marine waters provide essential migratory corridors for amphidromous bull trout moving from their natal river basin to other rivers or streams as they seek suitable foraging or overwintering habitat. We now know that large numbers of bull trout overwinter in streams that do not contain spawning and rearing habitat and are only accessible by migration through marine waters. Therefore, we have included these marine nearshore areas that contain features essential to bull trout conservation in this final designation.

(26) *Comment:* Adequate foraging habitat has not been included in the designation.

*Our Response:* We believe this designation is based on the best scientific and commercial information available. It includes only occupied habitat, and contains those features that are essential to the conservation of bull trout populations. We recognize that bull trout may forage in areas where their presence has not been detected and these areas may provide access to

abundant forage. However, because we were unable to identify all areas that are used, we have limited designated critical habitat to areas of known occupancy having the necessary PCEs and which were determined to be essential for recovery. However, because of the relatively broad definition of 'occupied' used in this rule, it is likely that forage habitat is included as well as breeding habitat and migratory corridors.

(27) *Comment:* Floodplains are not mentioned in the proposed designation. Does this mean they are not included?

*Our Response:* We have only included occupied aquatic habitats that contain the features essential to the conservation of bull trout within the designation. Federal activities occurring in floodplains may affect designated critical habitat, and as such would be reviewed in section 7 consultation.

(28) *Comment:* Comments provided in the previous rule for the Klamath River and Columbia River populations were not addressed.

*Our Response:* All substantive issues raised in comments received during public comment period for the proposed rule received a response. The response was to either accept or incorporate the issue raised, or to provide a narrative response as to why we did not do so.

(29) *Comment:* Existing regulatory mechanisms are inadequate and continuing threats to bull trout and its habitat from a variety of land and water management activities warrant the designation of all habitat essential to bull trout survival and recovery.

*Our Response:* We believe this designation is based on the best scientific and commercial information available, includes only occupied habitat, and contains those areas that contain the features essential to the conservation of bull trout. Some areas we identified as essential to the conservation of bull trout are not designated in the final rule. This is due to the areas not meeting the definition of critical habitat under section 3(5)(A) or exclusion under 4(b)(2). Sections 3(5)(A) (definition of critical habitat) and 4(b)(2) (Secretarial weighing of the benefits of inclusion versus the benefits of exclusion) of the Act provide for specifc areas to be excluded from critical habitat if they are otherwise provided needed protection (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(30) *Comment:* The final rule is inadequate to recover bull trout and the status quo is leading to declining populations in spite of section 7 consultations, habitat conservation plans, and state restoration plans.

*Our Response:* Recovery planning for bull trout is complex due, in part, to its wide geographic distribution and multifaceted life history. Recovery of the species will require a variety of efforts and the cooperation of Federal, state, tribal, and other entities. Critical habitat by itself will not recover the species, but does provide an additional regulatory benefit for bull trout habitat where protection and special management are necessary to ensure the habitat contributes to the conservation of the species. While any one effort will not recover bull trout, we believe that through the cooperative efforts of all stakeholders, using a variety of conservation tools, bull trout can reach the point of no longer needing the protections of the Act.

(31) *Comment:* We believe that the current attempt to solicit more information on the critical habitat rule is unlawful.

*Our Response:* We disagree and believe that soliciting public comment is essential to conserving any species.

(32) *Comment:* Why is the entire Columbia River mainstem (especially the upper Columbia River) designated as critical habitat, what data were used, and why did the Service use the draft recovery plan?

*Our Response:* This final rule does not include the entire Columbia River mainstem. The bull trout is a wide ranging migratory species and follows salmon, whitefish, and other prey species in the Columbia River, marine waters and freshwater streams and rivers. Records of bull trout distribution indicate their presence from the mouth of the Columbia River to its uppermost reaches. Past monitoring efforts for salmon rarely recorded bull trout in data collections because bull trout were not the targeted species. In the upper Columbia River data from multiple telemetry studies show the use by bull trout of the area between Priest Rapids pool and the Okanogan River, and back into multiple tributaries. Some bull trout that spawn in the upper Columbia River basin use the mainstem for six months or more. We have excluded some areas of the Columbia mainstem where the benefits of excluding these areas outweigh the benefits of including them in the designation (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below). Sub-adults and adults that spawn in alternate years have been documented using the Columbia River year-round. In reference to the use of the draft recovery plan, the Service acknowledges there are data gaps within the plan. The science used in the draft recovery plan was the best available data for bull trout at that time and provided the basis for proposing and designating critical habitat. In the process of developing the proposed and final critical habitat designation, additional data have become available, have been used in these rules, and are available as part of our administrative record.

(33) *Comment:* All waters behind dams (reservoirs and pools) and areas covered by habitat conservation plans do not require designation due to existing management activities and should be excluded.

*Our Response:* We reviewed reservoir operations and habitat conservation plans and carefully weighed the benefits of inclusion versus the benefits of exclusion. Based on this analysis we are excluding all reservoirs and pools that provide flood protection or water supply benefit and we are also excluding habitat conservation plans that adequately address bull trout conservation (see Section 3(5)(a) and Exclusions under Section 4(b)(2) section below).

(34) *Comment:* The final rule for Klamath River and Columbia River populations needs clarification regarding the exclusion of 0.5 mile segments on private land. The inclusion of these stream segments appears to contradict the statement in the rule that exempts segments of less than 0.5 miles on private land.

*Our Response:* The intent in the previous rule was to exclude those stream segments that were less than 0.5 miles in length and under private landownership. The definition was intended to apply only to unbroken stream segments shorter than 0.5 miles in length, irrespective of underlying landownership patterns. The Service is no longer excluding areas of critical habitat on this basis, and all stream segments regardless of length remain designated critical habitat.

**Exclusion Comments**

(35) *Comment:* Exclusions are arbitrary and benefit special interest groups.

*Our Response:* All areas excluded are covered by management plans that specifically address bull trout PCEs, or are being excluded based on policy considerations. Exclusions were carefully reviewed and the Secretary has made the determination that the benefits of excluding these habitats outweighs the benefits of including them in the designation (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(36) *Comment:* Comments were received to either exclude or to include areas covered by HCPs.

*Our Response:* We determined that waterbodies within lands covered under an existing or pending HCP should be excluded from the designation of critical habitat where the benefits of excluding these habitats covered by these management plans outweighs the benefits of including them in the designation (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(37) *Comment:* Comments were received to either exclude or to include areas covered by the Washington Forest Practice Rules. Reasons cited for including areas covered by the Washington Forest Practice Rules were that the rules are not complete, the rules do not include adequate standards, it has not been fully implemented, and the adaptive management process is incomplete. A primary reason expressed for excluding those lands was that this law protects aquatic habitat on State and private land.

*Our Response:* Washington State law H.B. 2091, which codified the Washington Forest Practice Rules, is a science-based plan that protects water quality and fish habitat on over 8 million acres (3.2 million ha) of non-Federal forestland throughout Washington State. Implementing these regulations is expected to maintain the thermal regimes of streams within the range of normal variation, contribute to the maintenance of complex stream channels, maintain appropriate substrates, natural hydrograph, groundwater sources and subsurface connectivity, migratory corridors, and provide abundant food sources for bull trout. Because the benefits of excluding the streams covered by the Washington Forest Practice Rules outweigh the benefits of including them, we have excluded stream segments protected by these regulations. See Washington State Forest Practices Rules and Regulations, as amended by the Forest and Fish Law (FFR) under the Lands to be Excluded from Critical Habitat under section 4(b)(2) of this final rule for further discussion on FFR.

(38) *Comment:* We believe the current Forest Service Land and Resource Management Plans (LRMP) as amended by the Northwest Forest Plan, PACFISH, and/or INFISH aquatic conservation strategies provide the necessary protection and special management that would eliminate the need to designate these areas as critical habitat. In addition, the designation would provide little additional benefit as described under Section 4(b)(2) of the Act.

*Our Response:* We agree. These areas have been excluded from the final critical habitat designation (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(39) *Comment:* Areas covered by the Oregon Forest Practices Act (OFPA) and the Oregon Plan for Salmon and Watersheds (OR Plan) should be excluded.

*Our Response:* The OFPA includes provisions that generally limit clear cut size, require retention of green trees within harvest units for stream shading and downed wood for recruitment into riparian areas, and require replanting after harvest. However, the OFPA has no provisions that specifically address any of the PCEs for bull trout or for ensuring their conservation or protection. The OR Plan serves as a general salmon conservation planning guide and encourages close coordination among the agencies responsible for salmon conservation. Both the OFPA and OR Plan are well intentioned and provide encouragements and some benefits to aquatic habitats in areas where they apply. However, we were unable to determine that the OFPA or the OR Plan provide adequate conservation or protection of bull trout or their PCEs. Therefore, the areas covered by the OFPA or OR Plan do not warrant exclusion based on special protections or management.

(40) *Comment:* The Montana Bull Trout Plan should not be used as the basis for excluding lands from critical habitat. It is a voluntary plan without tracking, reporting, or funding certainty, and it provides no protections against detrimental groundwater or surface water extraction. Implementation has been slow or nonexistent, the list of recommended immediate conservation actions were not acted upon or incorporated into the Plan.

*Our Response:* We have reviewed the plan and determined it does not provide special management protections to the same extent a critical habitat designation would. Therefore, we are not using the Montana Bull Trout Plan as a basis for excluding lands from critical habitat.

(41) *Comment:* No critical habitat should be designated on military lands for national security concerns or those that have Integrated Natural Resource Plans.

*Our Response:* Pursuant to section 4(a)(3)(B)(i) of the Act, the Service has not included critical habitat on military installations that have an Integrated Natural Resource Plan (INRMP) that provide benefits to the bull trout. Pursuant to section 4(b)(2) of the Act, we have excluded other military lands based on national security concerns (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(42) *Comment:* Reservoirs should be included as critical habitat.

*Our Response:* In many places reservoirs provide important foraging and overwintering habitat for bull trout and contain the features essential to the conservation of the bull trout. However, under 4(b)(2) of the Act, the Secretary has discretion to exclude any area from critical habitat if she determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless she determines, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species. The Secretary carefully weighed the benefits of inclusion versus the benefits of exclusion regarding reservoirs (see Section 3(5)(A) and Exclusions under Section 4(b)(2) section below) and found that, for those reservoirs that provide a flood control or water for human consumption function, the benefits of exclusion outweighed the benefits of inclusion.

(43) *Comment:* All tribal reservation lands should be excluded from critical habitat designation.

*Our Response:* In accordance with the President's memorandum of April 29, 1994, "Government-to-Government Relations with Native American Tribal Governments" (59 FR 22951), Executive Order 13175, and 512 DM 2, we coordinate with federally-recognized tribes on a government-to-government basis. Further, Secretarial Order 3206, "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act" (1997) provides that critical habitat should not be designated in an area that may impact tribal trust resources unless it is determined to be essential to the conservation of a listed species and that Tribes be given deference when evaluating conservation management planning.

Accordingly, we are obligated to consult with tribes based on their unique relationship with the Federal government, and to evaluate the appropriateness of designating tribal lands within the framework of the above mentioned directives. In addition, we evaluate tribes' past and ongoing efforts for species conservation and the benefits of including or excluding tribal lands in the designation under section 4(b)(2). We contacted all tribes potentially affected by the proposed designations and met with a number of these tribes to discuss their ongoing or future management strategies for bull trout. Several tribes subsequently submitted letters requesting exclusions from the designation based on their ongoing

management and conservation efforts, or their commitment to develop an appropriate management plan, on their lands. We excluded those tribal lands where there was a commitment to conserve bull trout habitat and where the benefits of exclusion where found to outweigh the benefits of inclusion (*see* Section 3(5)(A) and Exclusions Under Section 4(b)(2) of the Act section below).

(44) *Comment:* The Service ignores court decisions and required components of the Act when it states that areas can be excluded based on economic impacts, national security, management plans, and the preservation of partnerships (*see Center for Biological Diversity* v. *Norton* (2003)).

*Our Response:* Section 4(b)(2) of the Act allows us to consider the economic impact, national security impact, and any other relevant impact of designating any particular area as critical habitat. An area may be excluded from critical habitat if it is determined that the benefits of exclusion outweigh the benefits of designating a particular area as critical habitat, unless the failure to designate such an area as critical habitat will result in the extinction of the species. In addition, the congressional record is clear that the consideration and weight given to any impact is completely within the Secretary's discretion (*see* Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(45) *Comment:* Does excluding habitat covered by HCPs also exclude covered activities on lands the applicant does not own or manage? For example, studies are occurring on lands not owned by the City of Seattle but required by the terms of the approved HCP.

*Our Response:* Areas excluded due to the existence of an approved HCP only include those areas directly covered by the HCP. Areas outside the HCP *e.g.*, City of Seattle, remain designated critical habitat unless excluded for some other reason.

*Comments Related to the Economic Analysis*

(46) *Comment:* The Service neglected to conduct an economic analysis (EA) for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River bull trout populations, contrary to the Act's requirements.

*Our Response:* The Service did conduct an economic analysis for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River bull trout populations. We informed the public in the proposed rule that we would be conducting an analysis of the economic impacts of designating the proposed areas as critical habitat prior to making a final determination. We announced the availability of the DEA with a notice in the **Federal Register** (May 3, 2005, 70 FR 22835) that reopened the public comment period on the DEA and the proposed rule at that time. Reopening the comment period allowed the public to concurrently review and comment on both the DEA and the proposed critical habitat designation. We subsequently provided this same information when replying to electronic mail (e-mail) messages and telephone calls, and during the public hearing held in Washington.

(47) *Comment:* The costs of critical habitat outweigh the benefits of designation and all costs associated with critical habitat should be included in the analysis.

*Our Response:* This final rule excludes areas where the benefits of excluding critical habitat have been determined to exceed the benefit of including these areas in the designation under provisions of section 4(b)(2). The economic analysis (EA) considers the economic efficiency effects that may result from the designation, including habitat protections that may be coextensive with the listing of the species. It also addresses distribution of impacts, including an assessment of the potential effects on small entities and the energy industry. The analysis focuses on quantifying the direct and indirect costs of the rule although economic impacts to land-use activities may exist in the absence of designating critical habitat. For example, economic impacts may result from local zoning laws, state and natural resource laws, and enforceable management plans and best management practices applied by other state and Federal agencies. The information in the EA can be used by the Secretary when taking into consideration the economic impact, and any other relevant impact of specifying any particular area as critical habitat.

(48) *Comment:* Costs associated with the operations of agencies such as the Bureau of Reclamation (BOR) to deliver water belonging to irrigation districts must be taken into consideration. The impact of attempting to alter pre-existing legal requirements, and the constraints those legal rights have on designating critical habitat, must be considered before a final decision can be made.

*Our Response:* Potential costs associated with the designation of bull trout critical habitat, including those related to BOR water management, are addressed through the economic analysis. We received additional information regarding the possible under-or over-estimate of costs related to regulation of water and power generation due to the designation. Where appropriate, this information was used by the Secretary in making determinations under section 4(b)(2) of the Act.

(49) *Comment:* In the economic analysis, the Service did not account for the many economic benefits that the designation of critical habitat for bull trout provides.

*Our Response:* In the context of a critical habitat designation, the primary purpose of the rulemaking (*i.e.*, the direct benefit) is to designate areas that contain the features essential to the conservation of listed species and that may require special management or protections. While the Act is clear that it is the policy of the Federal government to provide a means whereby the ecosystems upon which endangered and threatened species depend are conserved, it is also clear that Congress provided several methods for achieving this policy and critical habitat designation is just one of the methods. The Act states that this policy is to be achieved through cooperation with states through the resolution of water resource issues in concert with conservation. Finally, the Act provides the flexibility for the Secretary to exclude portions of critical habitat based on the consideration of economics, national security, or any other relevant impact if the Secretary determines that the benefit of exclusion exceeds the benefits of inclusion, as long as that exclusion does not result in the extinction of the species.

The designation of critical habitat may result in two distinct categories of benefits to society: (1) Measurable or economic benefits and (2) intangible benefits. The economic analysis generally captures the measurable benefits (such as increased tourism or recreational expenditures) by quantifying them in terms of dollars. The less tangible social benefits that accrue from the physical existence of a resource are more difficult to capture. Non-use benefits, in contrast, represent benefits that individuals perceive from "just knowing" that a particular listed species" natural habitat is being specially managed for the survival and recovery of that species. This benefit is virtually impossible to quantify as there is no market transaction to use as a measurement for such a benefit.

The economic analysis captures those benefits that can be quantified and provides information regarding the economic costs associated with a proposed critical habitat designation.

The economic analysis is used by the Secretary in making decisions under section 4(b)(2) of the Act based on economic impacts. Economic impacts can be both positive and negative and, by definition, are observable through market transactions.

In our designations we recognize that critical habitat may also generate ancillary benefits which can be both negative and positive. That is, management actions undertaken to conserve a species or habitat as a result of designation may have coincident implications to a place's quality of living. For example, fewer consumptive activities (*e.g.*, timber harvesting or cattle grazing) may affect some individuals' enjoyment of an area. While they are not the primary purpose of critical habitat, these ancillary effects which are perceived as benefits may result in gains in non-economic benefits that may offset the direct, negative impacts to a region's economy resulting from actions to conserve a species or its habitat. Conversely, for those formerly dependent on the timber industry or grazing for their livelihood, they may find that significantly reduced employment opportunities which represent reduction in benefits.

It is often difficult to evaluate the ancillary benefits of a critical habitat designation. Where data are available, this analysis attempts to recognize and measure the net economic impact of the proposed designation. For example, if the fencing of a species' habitat to restrict motor vehicles results in an increase in the number of individuals visiting the site for wildlife viewing, then the analysis would recognize the potential for a positive economic impact and attempt to quantify the effect (*e.g.*, impacts that would be associated with an increase in tourism spending by wildlife viewers). Conversely, if the critical habitat designation will result in increased fishing and hiking opportunities, that benefit would be reflected in economic benefits from tourism and related industries. What is not measurable in other than qualitative terms are such benefits as increased quality-of-life values for some and decreased quality-of-life for others (*e.g.*, lower employment due to family wage jobs supported by industrial timber harvesting being replaced by service jobs in the recreation industry).

While section 4(b)(2) of the Act gives the Secretary discretion to exclude certain areas from the final designation, she is authorized to do so only if an exclusion does not result in the extinction of the species. Thus, we believe that explicit consideration of broader social values for the species and its habitat, beyond economic impacts, is evidenced by the designation itself that protects areas for the conservation of the species despite costs associated with that designation. In other words, the Secretary begins a designation based on an assumption that the benefit of designation outweighs the benefit of exclusion and only excludes where an explicit determination is made that the benefit of exclusion, in fact, does outweigh the benefit of inclusion.

(50) *Comment:* The DEA for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River bull trout populations must evaluate impacts of bull trout critical habitat designation on the tribes' trust resources to be consistent with trust responsibilities.

*Our Response:* The DEA for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River bull trout populations evaluates the impacts of this designation on tribal trust resources. Refer to section 3.1.4 in the DEA for further discussion on impacts of the bull trout critical habitat designation on the tribes' trust resources.

(51) *Comment:* The Service needs to address habitat and economic concerns in Canada, as well since a critical habitat designation may affect waters that flow into Canada.

*Our Response:* We state on page 35771 of the critical habitat proposed rule for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River bull trout populations that, "The inter-jurisdictional nature of the Saint Mary River and Belly River watersheds is unique in the bull trout's range and makes international coordination especially critical." However, we cannot propose to establish critical habitat in other countries or address economic concerns of critical habitat in other countries.

(52) *Comment:* The BOR requires water users to pay for all maintenance and operational and mitigation costs associated with the Milk River irrigation system in Montana, so it is the irrigators not the BOR that must avoid adverse modification.

*Our Response:* Section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Through this consultation, the action agency ensures that its actions do not destroy or adversely modify critical habitat. The Service consults with the Federal agencies (in this case BOR) not private individuals. Private individuals may, however, have an identified role in the consultation if they are "applicants" as defined in section 7.

(53) *Comment:* The BOR indicated that bypass facilities at the Saint Mary Diversion dam should be included among the costs attributable to bull trout (not included in the DEA), at an estimate of $128,000 (in 2002 dollars). In addition, there are costs associated with the Sherburne Dam rehabilitation, and BOR estimates those costs to be $700,000 (in 2004 dollars).

*Our Response:* The DEA acknowledged that elements of the Saint Mary Diversion fish entrainment and bypass costs and modifications to Sherburne Dam, located upriver of the Saint Mary Diversion, may be necessary. However, the specific elements or their costs for these components were not available at the time they were requested from BOR, and only preliminary estimates were provided in the DEA (see page 239). We have incorporated new information on these costs into the final economic analysis and our final critical habitat designation. Based on the costs provided in BOR's comment, updated to current dollars, the inclusion of bypass facility costs on the Saint Mary Diversion and the portion of Sherburne Dam rehabilitation attributable to bull trout would increase the total prospective costs by $830,900 and the total annualized cost by $78,400 in the Saint Mary-Belly River region.

(54) *Comment:* BOR noted that fish screens to reduce entrainment on the Saint Mary Diversion would likely not be installed were it not for the bull trout listing, and that the costs in the DEA were underestimated. BOR estimates the cost to be $4,270,000 for an 850 cubic feet/second (cfs) canal.

*Our Response:* BOR's project modification estimates for the rehabilitation of the Saint Mary Diversion were addressed in the DEA (page 239). However, specific costs for fish screens associated with the modification options were not available when we requested the information from BOR, and other sources of information were instead used in the DEA for estimating those costs. We appreciate receiving the estimate of cost that was provided in the comment. A decision has not yet been made about whether to proceed with the rehabilitation as planned, or when, or the size of the rehabilitated canal. Assuming that the rehabilitation is completed in 5 years, and based on the cost for fish screens provided by BOR

for an 850 cfs canal (updated to current dollars), the prospective cost attributable to bull trout would increase by $3,024,800 in the Saint Mary-Belly River region from that presented in the DEA. The total annualized cost would increase by $285,500.

(55) *Comment:* Monitoring riparian areas will occur in areas where there is no grazing. If grazing is unlikely to affect bull trout, why are costs involved?

*Our Response:* Monitoring livestock grazing that may affect the conservation status of sensitive species is a requirement of INFISH in eastern Oregon and Washington, Idaho, western Montana, and portions of Nevada. INFISH was developed as an amendment to U.S. Forest Service (USFS) land and resource management plans and Bureau of Land Management (BLM) resource management plans. The monitoring responsibility would be in effect even in the absence of the designation of critical habitat for bull trout. Costs were included in the economic analysis as they are related to the conservation of bull trout.

(56) *Comment:* The impacts in the economic analysis are overestimated because it does not differentiate between the impacts of the listing and impacts of critical habitat designation. This method of estimating costs unfairly attributes too large a percentage of costs to critical habitat.

*Our Response:* The economic analysis is intended to assist the Secretary in determining whether the benefits of excluding particular areas from the designation outweigh the biological benefits of including those areas in the designation. Also, this information allows us to comply with direction from the U.S. 10th Circuit Court of Appeals that "co-extensive" effects should be included in the economic analysis to inform decision-makers regarding which areas to designate as critical habitat (*New Mexico Cattle Growers Association* v. *U.S. Fish and Wildlife Service* (248 F.3d 1277)).

This analysis identifies those potential activities believed to be most likely to threaten the bull trout and its habitat and, where possible, quantifies the economic impact to avoid, mitigate, or compensate for such threats within the boundaries of the critical habitat designation. Where critical habitat is being proposed after a species is listed, some future impacts may be unavoidable, regardless of the final designation and exclusions under section 4(b)(2). However, due to the difficulty in making a credible distinction between listing and critical habitat effects within critical habitat boundaries, this analysis considers all future conservation-related impacts to be co-extensive with the designation.

(57) *Comment:* The economic analysis overestimates impacts of critical habitat designation by not differentiating between impacts attributable to bull trout conservation verses salmon conservation.

*Our Response:* There are several salmonid species that are listed as threatened or are candidates for listing under the Act whose ranges overlap the critical habitat designation of bull trout. Conservation activities designed to protect bull trout may provide coincident protection to salmon. Conversely, conservation activities designed specifically for salmon may provide protection for bull trout. In assigning costs for fish-related conservation activities in watersheds supporting previously listed salmon species and bull trout, we assume in the analysis that the economic effect of fish-related conservation measures is attributed co-extensively to both species. Therefore, where a conservation activity provides indivisible benefits to both salmon and bull trout, the cost of the activity is apportioned to both species. In areas where proposed critical habitat for bull trout does not overlap the range of other listed species, the costs are assigned solely to bull trout conservation activities. Co-extensive effects may also include impacts associated with overlapping protective measures of other Federal, State, and local laws that aid habitat conservation in the areas proposed for designation. We note that in past instances, some of these measures have been precipitated by the listing of the species. Because habitat conservation efforts affording protection to a listed species likely contribute to the efficacy of the critical habitat designation efforts, the impacts of these actions are considered relevant for understanding the full effect of the proposed designation. Enforcement actions taken in response to violations of the Act, however, are not included.

(58) *Comment:* Critical habitat creates undue economic hardship on private land owners.

*Our Response:* Private landowners are only required to consult with the Service if their action has a Federal nexus and if the action is likely to affect bull trout or its critical habitat.

(59) *Comment:* By designating less area as critical habitat, the costs are disproportionately high for the areas included in critical habitat.

*Our Response:* Excluding areas does not increase the costs on those areas left within the designation. The costs associated with the designation are the section 7 administrative costs of preparing a biological assessment and the potential costs associated with implementing a Reasonable and Prudent Alternative (RPA) if we find that an action is likely to destroy or adversely modify critical habitat. Given that we are only designating critical habitat in occupied areas, where an action agency would need to consult on any adverse effects to bull trout, and given our framework for conducting section 7 consultations on bull trout and bull trout critical habitat, we anticipate that most projects that would result in destruction or adverse modification of critical habitat would also constitute jeopardy to the species. Thus, any costs associated with conducting consultations or implementing an RPA would be present with or without the critical habitat designation, and would not be correlated with the size of the designation.

(60) *Comment:* The EA does not address impacts/costs to the Klamath Lake BOR project or to Agency Lake Ranch.

*Our Response:* BOR staff were contacted and consulted on the likelihood of projects requiring section 7 consultation, as described in Section 4.2.4 for the final EA. When contacted, BOR staff in Klamath Falls stated that no significant consultation activity concerning bull trout was anticipated. As a result, the analysis assumes impacts are not reasonably foreseeable for a BOR project on Agency Lake Ranch.

(61) *Comment:* Specific cost information related to fencing, well installation, maintenance, grass filter strip installation was not accurate in the EA. The comment letter provided specific costs on a per acre basis.

*Our Response:* The DEA (Section 4.2.2, page 4–9 and Section 4.2.7, page 4–72) estimates the number of grazing-related consultations likely to take place in the future and then multiplies the consultations by per consultation estimates of fencing, monitoring, and water requirement costs. Whether the per acre costs presented in the comment fall within the range of per consultation costs estimated in the DEA is difficult to determine. The estimate in the DEA is drawn from a sample of historical consultations.

(62) *Comment:* The EA underestimated costs in the upper Deschutes River basin because 95 percent of crops depend on irrigation.

*Our Response:* The Upper Deschutes basin is currently unoccupied by the species. For effects to irrigated agriculture to occur, the Service would first have to reintroduce bull trout to this basin, consult with BOR on the

operation of the reservoir, and recommend reasonable and prudent measures that would reduce the available irrigation water. As discussed on page 4–28 of the report, this sequence of events is not reasonably foreseeable.

(63) *Comment:* Comments made on the DEA for the Columbia/Klamath Rivers populations were not incorporated into the final EA.

*Our Response:* We believe that the Final Economic Analysis adequately addresses all the comments provided during the public comment period that are consistent with the framework for the analysis described in Section 1.3 of the report. Specifically, impacts to families and small entities are addressed in Section 4.3; costs to irrigators, cities, industries, and other water users are addressed in Section 4.2; costs to hydropower customers are discussed in Section 4.4.2; potential costs to recreational users are discussed in Section 3.3.6; costs associated with flood damages are addressed in Section 4.2.4; costs associated with water quality changes are addressed in paragraphs 16 and 211; costs due to regulatory uncertainty are captured in Section 4; values of potential lost irrigation water supplies are discussed in paragraphs 494 through 499; and employment and secondary impacts are discussed in paragraph 274.

(64) *Comment:* The EA cited the existence of irrigated agricultural diversions and the need for fish screening of those diversions to prevent bull trout entrainment, however the EA did not extrapolate out screening costs. The EA acknowledged that fish screening costs are substantial, ranging between $2,000 and $5,000 per cfs the structure can divert.

*Our Response:* The Service agrees that irrigators incur costs associated with fish screens. However, as described in footnote 110 of the FEA, "* * * installation of diversion fish screen[s] is a baseline regulation within Idaho, Oregon, and Washington. That is, screens on agricultural diversions are already required under Idaho Code 36–906(b)." Because fish screens are required in Idaho, Oregon and Washington in the absence of the Endangered Species Act (ESA), these costs are not included in this analysis.

(65) *Comment:* The economic impact to Baker County and the Regulatory Flexibility Act was ignored in the DEA and final EA.

*Our Response:* In accordance with the Regulatory Flexibility Act, the Final Economic Analysis includes a quantitative screening analysis (see Section 4.3) that the Service used as the basis for its certification that a substantial number of small agricultural entities will not be significantly impacted by the proposed designation. Impacts to small farmers resulting from curtailed irrigation diversions are discussed specifically in Section 4.3.2.

(66) *Comment:* The costs for fish passage and habitat restoration are associated with compliance of Sections 4(e) and 18 of the FPA. The costs for fish passage and restoration of habitat address the recovery of other native salmonids found in the aquatic system, such as westslope cutthroat trout and mountain whitefish. The cost for total dissolved gas abatement is associated with compliance with the Clean Water Act under the 401 Water Quality Certification and Section 4(e) of the FPA. It is not clear what the final terms of the relicensing of the Box Canyon Project will be. The project modifications and costs are not due to bull trout Section 7 consultation as no biological opinion (BO) has been done. It is unclear why Box Canyon Project was picked for a discussion of detailed project modification costs since this project has no modification costs related to Section 7 consultation or the designation of critical habitat.

*Our Response:* FERC relicensing costs are discussed in Section 4.2.6 in the Final Economic Analysis (paragraphs 416–452). Estimates of project modification costs for the FERC Environmental Impact Statement (EIS) on Box Canyon are summarized in paragraph 452 as an example of the uncertainty surrounding the estimate of FERC-related costs. The discussion is consistent with this view that passage modifications are not attributable to section 7 bull trout consultations.

(67) *Comment:* The EA's estimate of conservation costs of $570 per acre for Dungeness Irrigation District is artificially low. The costs for revision or addition of fish passage facilities at those federal dams would be passed on to irrigation contractors through the United States Bureau of Reclamation.

*Our Response:* Following the framework described in on pages 1–11 and 1–12, the FEA considers the costs of proposed or reasonably foreseeable HCPs. In Section 4.1.2, the FEA identifies two HCPs that were currently under development at the writing of the analysis, and projects the costs of future based on the historical costs of developing these plans. HCPs are not reasonably foreseeable in the irrigation districts providing comment. However, the FEA accounts for HCP costs at unspecified locations for the 10-year time period of the analysis (see paragraph 359).

*Unit Specific Comments*

Unit 1: Klamath River Basin

(68) *Comment:* No critical habitat in Agency Lake was requested because of limited to no occurrences or use by bull trout.

*Our Response:* Historically, bull trout are known to have been distributed in several streams along the west side of Agency Lake (Cherry Creek, Threemile Creek, and Sevenmile Creek) and in the Wood River system (Sun, Annie, and Fort Creeks). Given the proximity of habitat and local populations and the predatory and migratory nature of the species, it is likely that bull trout utilized Agency Lake, at least seasonally, as feeding, migrating, and overwintering habitat, however, we are not able to document bull trout use in the last 20 years and have not included Agency Lake in this designation.

Unit 4: Willamette River Basin

See Comments from States (Oregon) section below.

Unit 6: Deschutes River Basin

(69) *Comment:* The Service properly chose not to designate the Crooked River as critical habitat because it is unoccupied and was not essential to the conservation of the species, that designation could also cause harm to ongoing conservation efforts, and that the benefits of excluding this area outweigh the benefits of including it.

*Our Response:* We have limited the critical habitat designation to areas of known occupancy (defined by documented occurrence within the last 20 years) that have features essential to the conservation of the species because we did not have sufficient data for the Secretary to make a determination that specific unoccupied areas were essential to the bull trout's conservation. We have determined that the approximately 14 mile-long section of the Crooked River downstream of the Highway 97 bridge to the Opal Springs Dam is occupied and contains many of the features essential to the conservation of the bull trout. The volume of cold water spring flows that enter the Crooked River downstream of the Highway 97 bridge crossing decreases stream temperatures enough to make this section of the Crooked River suitable for foraging bull trout even during the summer months. The additional habitat in the Crooked River also allows bull trout in Lake Billy Chinook to forage.

(70) *Comment:* There are many plans in the Deschutes River basin that provide special management and protections for bull trout (list of plans provided).

*Our Response:* The Service has reviewed information regarding numerous plans in the Deschutes River basin including the Middle Deschutes/Lower Crooked River Wild and Scenic Management Plan, the Lower Deschutes River Wild and Scenic River Management plans, the Aquatic Conservation Strategy of the Northwest Forest Plan, PACFISH, INFISH, and the Deschutes River Subbasin Plan. For each plan we assessed the protections of the plan as compared with the protections of critical habitat and weighed the benefits of inclusion versus the benefits of exclusion. For those plans where the benefits of exclusion outweighed the benefits of designating critical habitat we excluded those lands from the final designation (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

Unit 8: John Day River Basin

(71) *Comment:* Critical habitat should be removed on the mainstem John Day River below 4,500 ft elevation because the mainstem John Day River below this elevation does not have the appropriate water temperatures for bull trout.

*Our Response:* The Service acknowledges that the current distribution of bull trout in the John Day River basin is fragmented and that water temperature is a limiting factor in the lower portion of the river outside of peak runoff periods (late winter and spring). Bull trout distribution occurs primarily in the headwaters of the Upper Mainstem, North Fork and Middle Fork John Day River tributaries, with seasonal use of the entire North Fork John Day River. However, in 2000, the Oregon Department of Fish and Wildlife captured eleven subadult bull trout in the mainstem John Day River near the town of Spray, Oregon (1,802 ft elevation), while seining for juvenile Chinook salmon. Two of the fish were implanted with radio-tags and both were subsequently tracked into the North Fork John Day River. This suggests that subadult migrations do seasonally occur within lower river segments of the Upper Mainstem, North Fork, and Middle Fork John Day River. Within the John Day Subbasin, historic bull trout distribution likely included seasonal use of the entire mainstem and larger tributaries. Bull trout from the John Day Subbasin were known to migrate to and from the Columbia River (Buchanan *et al.* 1997). Historical records indicate presence of bull trout in Dads Creek, Dixie Creek, Pine Creek, Canyon Creek, Laycock Creek, and Beech Creek (Buchanan *et al.* 1997) all below 1,800 ft in elevation. The lower segments of the John Day Basin currently have many PCEs, including permanent water with low levels of contaminants, stream temperatures from 36° to 59° F (2° to 15° C), complex stream channels, and an abundant food base. Lower segments of the John Day River are typically suitable for bull trout use during peak runoff periods in late winter and spring when water temperatures range from 36° to 59° F (2° to 15° C). During those periods, these streams contain the necessary features essential to the conservation of the bull trout because they serve as migratory corridors that connect local populations in the basin. Such connections are particularly critical in the John Day River Basin because the existing local populations are small and highly vulnerable to localized extirpation. The most viable way to avoid extinction in these areas is to maintain seasonal habitat connections so that the movement of fish between them can sustain or periodically re-establish these small populations. We recognize the apparent difficulty in designating critical habitat where the presence of the PCEs is sporadic. To avoid future misinterpretations of the effect of this designation where PCEs occur as a result of current ongoing federal management, we have included that management in the baseline for future section 7 consultations.

Unit 9: Umatilla/Walla Walla River Basin

(72) *Comment:* There are many examples of additional special management and protections governing habitat utilized by bull trout on BLM-managed lands including the South Fork of the Walla Walla River ACEC, which is an amendment to the Resource Management Plan (RMP) for the Baker Resource Area of the Vale District. The amended plan was signed in February 1992, creating an ACEC of 1,273 acres within the South Fork of the Walla Walla River watershed. The river provides high quality spawning and rearing habitat for bull trout. The decision included: (1) No surface occupancy stipulation for oil and gas leasing; (2) prohibition against development of mineral resources within the ACEC boundary unless needed on an emergency basis to protect ACEC values; (3) prohibition against issuance of grazing leases; (4) no fire salvage will occur unless it meets the goal of ACEC management; and (5) reduction by 99% of the permitted amount of timber removed on the 120 acres of commercial timberland economically operable within the ACEC.

*Our Response:* We agree that the designation in 1992 of the South Fork Walla Walla River as an Area of Critical Environmental Concern added habitat protections that benefit bull trout. The ACEC management actions in the plan amendment, particularly the livestock grazing restrictions and measures to limit and control recreational motor vehicle traffic along the river, are actions that have improved bull trout habitat along the approximately two miles of river that cross BLM land. As a result we have determined this lads do not meet the definition of "in need of special management or protection" in order to be designated as critical habitat.

Unit 10: Grande Ronde River Basin

(73) *Comment:* Wright Slough (Grande Ronde River Basin) has been designated as critical habitat and should not have been. It now has restrictions on it that are impacting agricultural use of the land.

*Our Response:* Wright Slough, a tributary of the Grande Ronde River, was not designated as critical habitat for bull trout in the previous final rule and is not being designated in this rule. The mainstem Grande Ronde River immediately above and below where Wright Slough enters the river is designated as bull trout critical habitat. The State of Oregon has designated Wright Slough as "essential salmonid habitat", which may have been confused with bull trout critical habitat. Critical habitat does not create a preserve and does not, by itself, place restrictions on agricultural land use. If, through section 7 consultation, a proposed Federal action was found to destroy or adversely modify critical habitat, then a reasonable and prudent alternative may result in restrictions on agricultural use. We have not issued any adverse modification biological opinions on bull trout critical habitat and therefore have not imposed any restrictions on agricultural use of lands in Wright Slough through designation of critical habitat.

(74) *Comment:* It is not appropriate to designate critical habitat in the Powder River Basin in areas located below 4,500 ft elevation to prevent extinction of bull trout because these low elevation streams do not have appropriate water temperatures.

*Our Response:* We acknowledge that temperatures in the lower portions of the Powder River Basin are likely only suitable for bull trout use during peak runoff periods in late winter and spring. During these times, lower elevation areas contain the features that are essential to bull trout conservation. These areas are important because they

serve as migratory corridors that connect local populations in the basin. Such connections are particularly critical in the Powder Basin because the existing local populations are small and highly vulnerable to localized extirpation. The most viable way to avoid extirpation in these areas is to maintain seasonal habitat connections so that the movement of fish between them can sustain or periodically re-establish these small populations. We have also indicated that current federal management is included in the baseline so as to ensure that existing PCEs—in this case migrating corridors are maintained without implying that other PCEs are present or require special management or protections.

(75) *Comment:* The previously designated stream segments in the Powder River Basin below the Wallowa-Whitman National Forest boundary are not essential for conservation of bull trout, because: (1) The presence of brook trout downstream of most known bull trout populations and the large number of existing physical barriers in low-elevation stream sections preclude genetic exchange between local populations and attempts to provide connectivity will result in increased hybridization; (2) given the physical and biological barriers, it would be advisable to keep resident bull trout populations in the upper tributaries to prevent brook trout hybridization; (3) the listed segments lack almost all of the identified PCEs and, in fact, dry up or go subsurface for much of the year; and (4) with the single exception of Big Muddy Creek, all observations of bull trout have been above the National Forest boundary, thus the stream sections below the boundary are unoccupied.

*Our Response:* It is true that many of the Powder River tributaries contain impediments to bull trout movement, particularly those that flow through the Baker Valley, where the stream channels and stream flows have been altered for many years to support agricultural production. We also concur that brook trout hybridization is a problem in this area. Nevertheless, the designated tributary streams are deemed essential for bull trout conservation for the following reasons: (1) These streams are occupied and contain PCEs; (2) given the small size of the local populations, which appear to be currently confined to upper elevation headwaters, it is highly unlikely that they will persist in isolation, thus the long-term viability of this core area is dependent on the ability of bull trout to move between populations; and (3) the impediments to seasonal fish movement in these streams are mostly human-caused and could feasibly be corrected. The lower reaches of these streams can function as effective movement corridors even if only during high runoff periods; their designation as critical habitat does not imply that they need to be maintained as suitable habitat year-round. Therefore, we have designated critical habitat in these areas. In addition our inclusion of present operations in the baseline is designed to recognize the particular contributions of the area to bull trout conservation without overstating them.

(76) *Comment:* We believe that fish survey data from the Powder River Basin has been misused because: (1) No accepted, scientific protocol was used for many of the surveys; (2) some of the fish counts were erroneous and contained inaccurate information; (3) some purported sightings and inferences about habitat use were not supported by scientific data; (4) credible evidence provided by local citizens, indicating that bull trout were introduced in the early 1900s into upper tributaries of the Powder River, was ignored or disregarded.

*Our Response:* It is our intent to use only accurate information about species' occurrences when identifying critical habitat. To address the concerns that were raised about data from the Powder River Basin, we conducted a review of all the survey data and anecdotal information we have received on bull trout locations in this area. The sources and documentation associated with these data have been re-checked and verified to the extent possible. Some of the bull trout sighting information comes from informal surveys that did not follow standardized survey protocols because surveys were done before formal survey protocols existed and in other situations "spot check" type surveys were done because the resource agency lacked sufficient resources to conduct more rigorous surveys. It would not be appropriate to disregard positive sightings just because the survey method was informal. The key credibility factor is the fish identification skills of the person making the observation. Also of major importance is the type of observation (*i.e.*, was the fish in hand or just seen swimming by).

In our review of existing data, we excluded from consideration sightings that did not meet the following two criteria: (1) The sighting was made by a biologist or technician that was trained and experienced in bull trout identification, and (2) the identification was made based on close examination of a fish in hand. We cannot verify the assertion that bull trout were introduced by man to the upper Powder River Basin and thus are not native to the area. We are not ignoring or disregarding the reports that suggest bull trout may have been planted in some streams in the Elkhorn Mountains in the early 1900s. It is just not possible to verify those reports or to conclude from them that bull trout did not exist in the area prior to those introductions. Documented information on the historic distribution of bull trout in other nearby Snake River tributaries is compelling evidence that they are likely native inhabitants of the Powder River.

(77) *Comment:* Data on reported bull trout sightings in Rock Creek and Pine Creek are not scientifically valid.

*Our Response:* A bull trout/brook trout hybrid was reported in surveys of Rock Creek conducted by ODFW in 1994. Tissue samples were not collected so positive identification of this fish as a hybrid or pure bull or brook trout is not possible. Follow-up surveys conducted by the USFS did not detect any bull trout in Rock Creek, but surveyors did not search the upper portions of Rock Creek and North Fork Rock Creek, nor did they search about 0.7 mile of creek below Eilertson Meadow. Reaching the conclusion that bull trout are absent from this creek will require regular, repeated surveys using the same protocol. Bull trout have been observed, by professional fish biologists, in Pine Creek and Salmon Creek. Memoranda from Mark Lacy in 1995 (a BLM Fish Biologist at the time) and Jackie Dougan (then a USFS Fish Biologist) to Jeff Zakel (ODFW) provide information on bull trout sightings in these drainages in 1994–1995. Therefore, we have designated critical habitat in these areas.

(78) *Comment:* Special management considerations are already provided through the Powder Basin Subbasin Plan and the Powder/Brownlee Agricultural Water Quality Management Area Plan.

*Our Response:* We have conducted a thorough analysis of the Powder Basin Subbasin Plan and the Powder/Brownlee Agricultural Water Quality Management Area Plan to determine if the benefits of excluding areas covered by these plans from critical habitat outweigh the benefits of including them. We have determined that this plan does not provide a direct conservation benefit to bull trout or any certainty that it will be implemented. Therefore, we have not used these plans as a basis for exclusion.

Unit 13: Malheur River Basin

(79) *Comment:* Do not exclude the Malheur Basin because the Forest Service has not fully implemented INFISH and has failed to effectively modify and suspend its authorized grazing practices required under INFISH. The matrix of pathways and indicators included in the Forest Service 1999 biological assessment documented ratings of "functioning" and fail to meet standards. The grazing program on the Malheur National Forest is maintaining degraded baseline conditions according to a 2004 Service biological opinion. In addition, grazing effects on the Malheur River are likely to restrict bull trout range expansion or at least slow recovery efforts substantially. Information provided by the U.S. Forest Service did document maintenance of a degraded condition for certain indicators. The Forest Service rated grazing allotments as maintaining the current conditions with the expectation that they would meet the requirement of a near natural rate of recovery if the allotments were grazed according to standards. This and other information provided by the Forest Service helped form the basis for the Service's biological opinions referenced by the commenter. The Service has expressed concerns in the past with grazing effects to bull trout on the Malheur National Forest and is working closely with the Forest Service to help decrease impacts to bull trout and their habitats due to grazing activities.

*Response:* The Malheur National Forest recently completed its 2004 grazing monitoring report which provided information and summaries/explanations of data analyzed, collected, or submitted during the 2004 field season. The Forest Service also provided documentation to satisfy the reasonable and prudent measures contained in the Service's 2004 biological opinions by summarizing information collected in 2004. The Forest Service recommends potential management strategies for the 2005 Annual Operating Instructions that are consistent with PACFISH and INFISH. A critical habitat designation will not result in improvement of the conditions in the areas designated in and of itself. Critical habitat designation can only prevent erosion of the baseline levels of the PCEs. Forest Service management under INFISH actually takes positive steps to improve conditions in the aquatic habitat. The Forest Service expects that these strategies will move riparian and stream conditions towards desired conditions. The Service will continue to work with the Forest Service, and assist them in development and implementation of appropriate and effective monitoring strategies. In addition, we have determined that the Malheur National Forest management plan as currently implemented provides at least the same special management and protection as a critical habitat designation and goes beyond what a critical habitat designation provides by enhancing and restoring habitat. We have determined under Forest Service management that the Malheur National Forest does not meet the definition of critical habitat in 3(5)(a) and we have excluded the Malheur National Forest from critical habitat because the benefits of excluding areas covered under PACFISH and INFISH outweighed the benefits of inclusion (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

Unit 16: Salmon River Basin

(80) *Comment:* Not all bull trout habitat in the Salmon River basin should be critical habitat.

*Our Response:* Not all bull trout habitat in the Salmon River basin has been proposed or designated as critical habitat. Numerous streams were not proposed for designation for any, or a combination of, the following reasons: (1) Bull trout are not known to be present; (2) the habitat has low or no potential for bull trout occupation (low elevation, inherently warm water, not historically occupied, etc.); (3) the habitat does not currently contain, or have the potential to contain, one or more PCEs; and (4) the habitat was deemed not necessary to meet draft recovery plan objectives (i.e., non-essential potential populations).

Of those streams that were proposed as critical habitat, not all were designated. Areas covered under PACFISH, INFISH, and the Snake River Basin Adjudication were excluded (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(81) *Comment:* Salmon River bull trout are very healthy and not at risk.

Our *Response:* While it is true that Salmon River bull trout populations are relatively healthy, they are located in areas that contain the features essential to the conservation of bull trout. Areas that are already adequately protected by other management plans, and where the benefits of excluding areas from critical habitat outweigh the benefits of inclusion, exclusions have been applied (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(82) *Comment:* Bull trout are rare in Jordan Creek of the Upper Salmon River and critical habitat should not be designated there.

Our *Response:* We did not exclude areas based on rarity of bull trout. The 2002 critical habitat proposal included stream segments known to be occupied. In our analyses of the species for the draft recovery plan and proposed critical habitat for bull trout, we determined that it is necessary to maintain as many currently occupied areas as possible to facilitate recovery of the species. Jordan Creek supports a local population of bull trout. It is likely that the local population occurring in Jordan Creek was historically, and is currently, supported by migratory bull trout from the Yankee Fork and larger streams, although monitoring has not yet observed this life history strategy. Lower Jordan Creek is important for providing connectivity between the bull trout local population above the mine and larger area of overwintering habitat below. Local populations not connected by migratory fish are believed to be at a substantially greater risk of extirpation.

Unit 17: Southwest Idaho River Basins

(83) *Comment:* Exclude Boise, Payette, and Weiser river basins for economic and social reasons in addition to exclusions based on the Snake River Basin Adjudication plan.

*Our Response:* In our 2002 proposed critical habitat rule we proposed approximately 2,792 km (1,735 mi) of streams in the Boise, Payette, and Weiser river basins. The economic analysis did not identify costs justifying an economic exclusion with the Snake River basin. Section 4(b)(2) of the Act allows us to consider the economic impact, national security impact, and any other relevant impact of specifying any particular area as critical habitat. Therefore, the Secretary of Interior has excluded the area covered by the Snake River Basin Adjudication plan based on collaborative partnerships that have resulted in a settlement agreement benefiting bull trout conservation and where the benefits of excluding these areas outweigh the benefits of including them in the designation (Exclusions Under Section 4(b)(2) section below). The Secretary received inadequate information to make a determination that the economic and social benefits of exclusion outweighed the benefits of the designation.

(84) *Comment:* Many areas in Southwest Idaho do not have sufficient PCEs.

*Our Response:* The 2002 proposed critical habitat rule was developed based on the best available information at that time. In order for a stream to be proposed as critical habitat, it must have sufficient PCEs to sustain at least one

essential life process of the species. However, a stream did not have to contain all PCEs to be proposed as critical habitat. In fact, many streams in southwest Idaho do not have all of the PCEs, but do have sufficient PCEs for bull trout to meet this standard. Streams that did not contain the necessary habitat for bull trout (e.g., including one or more primary constituent elements), and streams inherently incapable of becoming bull trout habitat were not proposed for designation. Those streams that were included will have existing conditions included in the baseline for future section 7 consultations.

Unit 19: Lower Columbia River Basin

(85) *Comment:* Describe the validity of Cougar Creek, a tributary to Yale Reservoir in the Lewis River critical habitat sub-unit (CHSU), as part of the critical habitat designation.

*Our Response:* The Settlement Agreement Concerning the Relicensing of the Lewis River Lewis River Hydroelectric Projects (Agreement) includes a perpetual conservation easement on PacifiCorp's lands in the Cougar/Panamaker Creek area. The measures included in the conservation easement and the settlement agreement provide a high level of conservation benefit to the bull trout PCEs in Cougar Creek. We have determined that lands covered under conservation easements and the Agreement should be excluded from the designation of critical habitat because the benefits of excluding them outweigh the benefits to the species by including them in the designation. Please refer to our discussion concerning the exclusion of Lewis River Hydroelectric Projects Conservation Easements in the Section 3(5)(a) and Exclusions under Section 4(b)(2) of the Act section below.

(86) *Comment:* Rush Creek in the Lewis River CHSU should be included in critical habitat even though it is covered by the Northwest Forest Plan.

*Our Response:* All National Forest lands covered by the Aquatic Conservation Strategy of the Northwest Forest Plan have been excluded from the final designation because the Secretary determined that the lands did not meet the definition of critical habitat and the benefits of exclusion outweighed the benefits of inclusion (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

Unit 21: Upper Columbia River

(87) *Comment:* Special management activities within Priest Rapids project should be excluded.

*Our Response:* The Service has considered the special management activities within the Priest Rapids project area for this rule. Currently there is no biological opinion for bull trout or a settlement agreement in place addressing the PCEs for bull trout for the Priest Rapids Dam project area, and the PCEs for bull trout are not addressed by any other current management activities. The NOAA Fisheries biological opinion only covers salmon species. Although some habitat characteristics are similar for salmon species and bull trout, the PCEs have several differences. The Service Interim Guidelines for bull trout list some of these differences, which include the following: Fish passage and performance measures for salmon are not the same as they are for bull trout; bull trout exist year round in the area and are more closely associated with stream substrates; and, they also require a prey base year round. However, since the area does contain PCEs under current ongoing management, that management will be considered part of the baseline in future section 7 consultations.

(88) *Comment:* Additional consultation requirements for critical habitat negatively affect Grant County by increasing workload.

*Our Response:* Because all areas in this designation are considered occupied, section 7 consultation for the bull trout would be required in all cases where consultation on bull trout critical habitat would be required. The Service has data documenting bull trout occurrence throughout many areas of the mainstem Columbia River, particularly between Priest Rapids pool and the Okanogan River. Fish from the Upper Columbia River Recovery Unit have been documented using this area to fulfill critical elements of their life cycle. A review of the amount of work associated with the incremental costs of completing consultations on bull trout critical habitat revealed that it was relatively minor.

(89) *Comment:* Wells, Rocky Reach, Rock Island, and Comprehensive Bull Trout Monitoring and Management Plans (WBTMP, RRBTMP, RIBTMP, CBTMP), as well as the Anadromous Fish Agreement, Rocky Reach, Rock Island, and Douglas PUD Wells Hydro Project HCPs provide needed benefits to bull trout and their PCEs and should be excluded from critical habitat.

*Our Response:* The Service has considered these plans in our evaluation of critical habitat. The biological opinion and comprehensive BTMPS do not fully cover all PCEs nor do they address all recovery tasks or issues for bull trout in the upper mid-Columbia area. The BTMPs are limited to the requirements of the biological opinion and it is unclear if other PCEs will be addressed. The specific studies are designed to be implemented with specific timeframes which generally will be implemented every 10 years through the life of the plan (50 years). The goals of the Protection, Mitigation, and Enhancement measures in the BTMPs are to identify, develop, and implement measures to monitor and address ongoing impacts to bull trout resulting from project operations. The BTMPs incorporate "Reasonable and Prudent Measures" which are required by the Service Biological Opinion for the Rock Island, Rocky Reach, and Wells hydroelectric project operation. These measures will address the "complex stream channels (PCE #3) and "migratory corridors" (PCE #7) for bull trout. The Service biological opinion states that other PCE's are expected to be maintained or enhanced, but at this time it is unclear where or when any of the habitat restoration projects for the tributary enhancement provisions will occur. Therefore, we do not believe that these plans are an appropriate basis for exclusion.

Unit 22: Northeast Washington

(90) *Comment:* The critical habitat designation is inconsistent with the inclusion of Box Canyon Reservoir.

*Our Response:* The Service acknowledges that the reservoir exclusion in the previous final rule was not applied consistently. In this final rule we are excluding all reservoirs that provide a flood control, water supply function, or energy generation. Although the Box Canyon Reservoir does not meet this criteria, it is being excluded because it is within the Federal Columbia River Power System (FCRPS) action area (see Section 3(5)(a) and Exclusions under Section 4(b)(2) section below).

(91) *Comment:* The Service needs to add the proposed critical habitat areas of the Northeast Washington Unit back in the designation.

*Our Response:* We have evaluated which areas meet the definition of critical habitat for bull trout and excluded areas where we have determined that the benefits of excluding those areas outweigh the benefits of including them as critical habitat (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

Unit 26: Jarbidge River

(92) *Comment:* Maintaining connectivity is important for the Jarbidge River population and it is not

clear if connectivity is included in the PCEs for this population.

*Our Response:* We agree that migratory corridors are important and provide connectivity among local populations and access between spawning, overwintering, and foraging habitats within the Jarbidge River population area. The Jarbidge River bull trout population has been isolated from other bull trout populations by dams and diversion structures for over 100 years (Gilbert and Evermann 1894). The distance between occupied habitats in the Jarbidge River and Columbia River populations is approximately 150 river miles (rmi) (240 river kilometers (rkm)). Critical habitat was not proposed for these areas of unknown bull trout occupancy.

(93) *Comment:* Salmon Falls Creek, Idaho should be designated as critical habitat for the Jarbidge River bull trout population.

*Our Response:* Salmon Falls Creek is not occupied by bull trout, and therefore under the Act, it cannot be designated as critical habitat unless it is essential for the conservation of the species. Salmon Falls Creek is a tributary to the Snake River in Idaho. It historically provided spawning and rearing habitat for anadromous fish, including Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead. Since Salmon Falls Creek Dam was constructed in 1910, the lower 30 mi (48 km) of the stream have been significantly altered by upstream reservoir storage and water diversions. Migration barriers, water diversions, high water temperatures, sedimentation, and nonnative fish introductions are likely contributing factors to the loss of anadromous fish species in this watershed. This watershed is outside the boundary of the geographical area occupied by the Jarbidge River bull trout population, and bull trout from the listed Jarbidge River population do not have access to Salmon Falls Creek due to a number of intervening dams and diversion structures. Due to poor bull trout habitat quality and inaccessibility it is not essential for the conservation of the Jarbidge River population, and is not included in the designation.

(94) *Comment:* Buck Creek, a tributary to the West Fork of the Jarbidge River, should be added to critical habitat designated for the Jarbidge River population because it is similar to adjacent known occupied bull trout streams and could support multiple life history requirements of bull trout.

*Our Response:* Bull trout have not been documented in Buck Creek or its tributaries during infrequent surveys (G. Johnson, Nevada Department of Wildlife, in litt 1993a, b; G. Johnson, NDOW, pers. comm, 2003). We are currently unable to determine that Buck Creek is essential to the conservation of the species based on its undocumented use by bull trout and potentially disconnected reaches of suitable habitat. Because we cannot be certain that this habitat would ever be occupied by bull trout, the Secretary could not make a determination that is essential to the conservation of the species, and thus did not designate it as critical habitat.

(95) *Comment:* Critical habitat should include the entire hydrologic watershed for the East/West Forks of Jarbidge River, Jarbidge River, and Bruneau River.

*Our Response:* We acknowledged in the proposed rule that upstream habitat, as well as adjacent terrestrial habitat, can influence the quality of aquatic habitat downstream. Although the East and West Forks of the Jarbidge River, as well as the mainstem river, are occupied bull trout habitats containing features essential to the conservation of the species we have excluded these areas from the designation after carefully weighing the benefits of inclusion versus the benefits of exclusion (see Section 3(5)(a) and Exclusions under Section 4(b)(2) section below).

Although the Bruneau River has been identified as bull trout habitat in some publications (Conley 1993; Lee *et al.* 1997), there are no records documenting bull trout use. Bull trout may have migrated from the Snake River through the lower Bruneau River and into the Jarbidge River for spawning, similar to Chinook salmon. Bull trout from the Jarbidge River have access to the Bruneau River, and we support implementing research to detect seasonal use of the Bruneau River by bull trout. Research could clarify the importance of the habitat to potential numbers of large migratory bull trout if the Jarbidge River population expands.

Unit 27: Olympic Peninsula

(96) *Comment:* The Quinault River consists of surface water from Lake Quinault and thus has an unsuitable temperature profile for bull trout. It is also part of the Quinault Indian Nation lands; therefore, it should not be designated as critical habitat.

*Our Response:* Temperatures in the Quinault River are influenced by temperatures in Lake Quinault, and during certain times of the year those temperatures likely exceed optimum temperatures for bull trout. Temperatures are naturally warm in the summer in the Quinault River below Lake Quinault. Bull trout have been documented in tributaries to the lower Quinault River and in the river itself. Water temperatures in the river change in response to the season (colder in winter, warmer in summer). Bull trout seasonally use the river when temperatures are cooler. Also, the river contains a prey base for the bull trout. We do not expect the water temperature profile to change in the future and expect that bull trout will continue to use the river. The nearshore land adjacent to the lake affects water quality in the lake. Only a small portion of the shoreline and habitat that affects the lake is within the Quinault Indian Reservation. The portion of the nearshore that is within the reservation, and included in the Quinault Forest Management Plan, is excluded from critical habitat.

(97) *Comment:* The Quinault River downstream of Lake Quinault does not require special management and therefore should be excluded.

*Our Response:* That area is addressed in the Quinault Indian Reservation's Forest Management Plan and is excluded from the Quinault River downstream of Lake Quinault.

(98) *Comment:* Cook Creek is poor habitat and inappropriate as critical habitat.

*Our Response:* Cook Creek has documented bull trout occurrence. The habitat quality is rated as "fair to good" by an analysis of limiting factors for the Quinault River watershed (WSCC 2001). Monthly temperature data indicate that stream temperatures are within the temperature range given in PCE 1 (see Primary Constituent Elements section below) and are suitable for bull trout most of the year. The summer temperatures in the creek are colder than in the river, and Cook Creek likely provides important cold water refuge during the summer months, as well as forage during certain periods of the year. The portion of Cook Creek, from its mouth to approximately rmi 4.8 (rkm 7.7), is addressed in the Forest Management Plan for the Quinault Indian Reservation and excluded from designated critical habitat.

(99) *Comment:* The Raft River and other coastal streams need further evaluation before being designated as critical habitat.

*Our Response:* The Raft River and other coastal streams have documented foraging and overwintering habitat, features essential for bull trout conservation. Although these streams and rivers do not support spawning bull trout populations, they seasonally do provide foraging and overwintering habitat for bull trout that spawn in other coastal rivers. The portion of the Raft River included in the Quinault Indian Reservation Forest Management Plan is

excluded from designated critical habitat.

(100) *Comment:* The proposed rule states that the Quinault Tribe owns less than 1 percent of proposed critical habitat and this underrepresents actual ownership.

*Our Response:* After further review, our Geographic Information System (GIS) indicates that the Quinault tribal ownership is 2.7 percent of the proposed critical habitat designation for the Coastal-Puget Sound bull trout population.

(101) *Comment:* Certain beach areas should be excluded because they are owned by the Quinault Indian Nation.

*Our Response:* There are areas in nearshore marine waters adjacent to beach areas owned by the Quinault Indian Nation that have features essential to bull trout conservation. However, these beach areas are not addressed in the Quinault Indian Reservation Forest Management Plan. These nearshore marine waters may be affected by activities such as development, bank armoring, bulkheading, or dredging occurring in or near the beach and shoreline areas. Therefore, these areas require special management considerations or protections to ensure any proposed Federal actions do not destroy or adversely modify the critical habitat, and thus are designated as critical habitat.

(102) *Comment:* The Skokomish Tribe's lands, and other tribally owned lands in that vicinity, do not provide important contributions to critical habitat because they are below 500 feet (ft) (152 meters (m)) elevation in areas where there is no spawning and rearing habitat.

*Our Response:* The portion of the Skokomish River within the Skokomish Reservation boundaries is below 500 ft (152 m) elevation. However, this area and other tribal lands below 500 ft (152 m) in elevation provide important foraging, migratory, and overwintering habitat for bull trout. These habitats contain the features essential to the species' conservation, especially the fluvial and amphidromous life history forms. However, this portion of the Skokomish River is excluded from designated critical habitat based on the Skokomish Tribe's conservation program. Portions of waterbodies within or adjacent to Swinomish, Muckleshoot, Jamestown S'Klallam, Hoh, Skokomish and Quinault tribal lands are also excluded (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(103) *Comment:* Additional Hood Canal nearshore habitat should be included in the designation.

*Our Response:* Critical habitat is designated on the south and west shores of Hood Canal based on the presence of PCEs, availability of forage fish, and the proximity to streams known to be occupied by bull trout. We have no information suggesting that bull trout use streams draining into the eastern shore of Hood Canal. Therefore, we have not designated critical habitat along the eastern shore.

(104) *Comment:* The Skokomish Tribe has adequate management in place, or in preparation, that precludes the need to designate critical habitat.

*Our Response:* The Skokomish Tribe has a conservation program that provides aquatic resource protection and restoration through a number of collaborative efforts on the reservation and other trust lands. As a result, we are excluding from this critical habitat designation those portions of the Skokomish River, Nalley Slough, Skobob Creek, and Hood Canal nearshore within the Skokomish Indian Reservation.

(105) *Comment:* The U.S. Navy (Navy) believes that the area proposed for extending the Naval Undersea Warfare Center, Division Keyport (NUWC Keyport) should be excluded based on planned section 7 consultations.

*Our Response:* We do not exclude areas based on future section 7 consultations. However, NUWC Keyport has an approved INRMP that provides a benefit to the species for which critical habitat is proposed for designation. Therefore it has not been included in the final critical habitat designation, per section 4(a)(3) of the Act (see Non-inclusions under Section 4(a)(3) section below).

(106) *Comment:* The Wynoochee, Satsop, and Canyon Rivers are not appropriate critical habitat.

*Our Response:* This designation is based on the best scientific and commercial information available and only includes habitat where bull trout have been documented and which contains features essential to bull trout conservation. Bull trout often migrate long distances from their natal streams to find suitable foraging or overwintering habitat. Streams that are not known to contain spawning bull trout populations were included in critical habitat when they provide documented foraging, migratory, and overwintering habitat for bull trout. Although not known as spawning streams, the Wynoochee, Satsop, and Canyon Rivers contain PCEs of critical habitat and bull trout use these areas for foraging, migrating, and overwintering. Therefore, we have included these areas in the designation.

(107) *Comment:* The Navy believes that training and testing areas, including Crescent Harbor, Hood Canal, and Dabob Bay, should be excluded from critical habitat.

*Our Response:* The area of Hood Canal, outside of Dabob Bay, where the Navy conducts activities, is not within or adjacent to proposed critical habitat and is not included in final critical habitat. The Navy conducts training and testing within the marine waters of Crescent Harbor and Dabob Bay. Because these activities are conducted in open marine waters, they are not included in the military's INRMPs. However, limitations on access to, the use of, or the enhancement of the existing capabilities and capacities of these ranges would limit or curtail both testing and fleet support functions performed by NUWC Keyport for undersea warfare.

These areas have been defined on National Oceanic and Atmospheric Administration (NOAA) charts for over 50 years and operating areas have been further delineated in recent public environmental documentation. NEPA analyses, conducted for these areas within the past 5 years, include biological assessments evaluating effects on endangered species that were reviewed and approved by NOAA-Fisheries and the Service. These biological assessments and associated environmental assessments addressed bull trout and interactions with range operations. Based on the above considerations, the importance of these areas for national security, and consistent with direction provided in section 4(b)(2) of the Act, the Navy training and testing areas of Crescent Harbor and Dabob Bay have been excluded from designated critical habitat (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(108) *Comment:* What are the conservation values of the upper North Fork Skokomish River and Lake Cushman? Designation of habitat in these areas conflicts with the Service's decision not to propose critical habitat in highly fragmented areas.

*Our Response:* Although hydroelectric dams have affected bull trout in the North Fork Skokomish River, and the two dams operated by Tacoma City Light prevent upstream and downstream passage of bull trout, we do not believe that this results in "highly fragmented habitats in highly fragmented areas." The North Fork Skokomish River represents a significant amount of

remaining bull trout habitat along Hood Canal and is essential to the conservation and recovery of bull trout in the Skokomish core area and thus, is not excluded from the critical habitat designation.

(109) *Comment:* The Service erroneously assumes that there is downstream connectivity between bull trout located in the upper North Fork Skokomish River and bull trout located in other parts of the Skokomish River.

*Our Response:* Historic accounts (since the 1920s) indicate bull trout were present in the original Lake Cushman and upper North Fork Skokomish River prior to the river's impoundment. Bull trout in Lake Cushman and the upper North Fork Skokomish River have been continually monitored since 1970, and surveys have counted bull trout there as recently as 2004. This area comprises one of two local populations in the Skokomish River area. Construction of the two dams has largely eliminated downstream migration and interaction with bull trout in the South Fork Skokomish River, although for other hydroelectric projects it is well documented that fish do occasionally escape mortality through turbines or are spilled downstream of a dam.

(110) *Comment:* The Service inappropriately assumes that connectivity for the upper North Fork Skokomish River and Lake Cushman will be enhanced in the future.

*Our Response:* Recovery of bull trout in the Skokomish River core area will require addressing connectivity in the North Fork Skokomish River. Bull trout were documented in Lake Cushman and the North Fork Skokomish River above the lake in 2004. Bull trout have also been recently documented in the North Fork Skokomish River below the dams. Bull trout have not been documented in the section of the river between the two dams (Lake Kokanee), and this section is not being designated based on the Federal Energy Regulatory Commission (FERC) license requiring passage at both dams. Implementation of the FERC license for the Cushman Project is expected to result in the construction of trap-and-haul fish passage facilities that will restore connectivity between the lower and upper North Fork, but will bypass and isolate the inundated 2.3 mile long Lake Kokanee segment. Requiring fish passage at the Cushman dams is part of the 1998 FERC license order and is the best available information at this time (FERC 1998).

(111) *Comment:* The upper North Fork Skokomish River should be excluded from critical habitat designation because it is located almost entirely within Olympic National Park (Park), and the Park should be excluded because of their land use restrictions.

*Our Response:* At present, the Park does not have a general management plan that guides the Park's management and provides for bull trout conservation. A general management plan is currently under internal Park review and is scheduled to go out for public review in the next year or so. It is our understanding that the plan will present several alternatives ranging from increased visitor access and development to more resource protection. We do not know how this plan will address bull trout conservation but will review the Park's plan when it becomes available. Because there is no plan that we can review to determine if the Park will provide the appropriate special management required for the conservation of bull trout PCEs in that area this area was not excluded from the critical habitat designation.

Unit 28: Puget Sound

(112) *Comment:* Quilceda Creek and its tributary Edgecombe Creek in Washington should be designated critical habitat.

*Our Response:* Although it is possible that bull trout foraged in these two creeks in the past and may currently use these streams on occasion to forage, there is no clear documentation of the use by bull trout in this system. This does not mean these streams cannot or will not contribute to bull trout recovery, but rather that they were not determined to be essential to the species' conservation, and thus are not designated as critical habitat.

(113) *Comment:* The U.S. Army (Army) requests that the marine nearshore areas and Nisqually River adjacent to Fort Lewis be excluded from designation of critical habitat because of the existing INRMP. For its installations, the Navy believes that existing INRMPs for Whidbey Island Seaplane Base and Naval Station Everett provide justification for their non-inclusion from critical habitat.

*Response:* Fort Lewis has an approved INRMP that provides a benefit to the species for which critical habitat is proposed for designation. Therefore areas covered by the INRMP have not been included in the final critical habitat designation, per section 4(a)(3) of the Act (see Non-inclusions Under Section 4(a)(3) section below).

(114) *Comment:* The designation is not appropriate for four streams, three pocket estuaries, and the nearshore waters of, and adjacent to, the Swinomish Tribal Reservation.

*Our Response:* We believe that the nearshore areas are essential based on the current use of these areas by amphidromous bull trout for foraging and migration, and because they contain the PCEs. Therefore, only the marine nearshore waters, including the Swinomish Channel, associated with the Swinomish Reservation were proposed and designated as critical habitat. The other four streams were not part of our proposal.

(115) *Comment:* The Swinomish Tribe's habitat management plan provides a sufficient level of protection to bull trout and their habitat, and therefore those portions of waterbodies on or adjacent to Swinomish tribal lands should be excluded from the designation.

*Our Response:* We have excluded those lands covered by the Swinomish Tribe's habitat management plan (see Section 3(5)(A) and Exclusions under Section 4(b)(2) section below).

**Comments From States**

*Nevada*

(116) *Comment:* Those most affected by the designation have not been involved in this designation of critical habitat for the Jarbidge River population of the bull trout.

*Our Response:* Throughout the process of designating critical habitat, we attempted to include those interested in the designation of critical habitat for the Jarbidge River population, as well as the Coastal-Puget Sound and Saint Mary-Belly River populations, of the bull trout in the rule-making process. We solicited public comment through two public comment periods and one public hearing, accepting oral and written comments. We also held four local public meetings in Idaho and Nevada specifically regarding critical habitat proposed for the Jarbidge River population. We diligently tried to be responsive to the concerns raised and to address those concerns during the development of this final critical habitat designation.

(117) *Comment:* No information is presented to suggest that conservation of the Jarbidge River population is necessary to ensure the persistence of bull trout in the coterminous unit.

*Our Response:* We considered all available data on the Jarbidge River bull trout population during the listing process (63 FR 31693, 64 FR 17110, 64 FR 58910), and available data that developed since the listing, to designate critical habitat for the Jarbidge River bull trout population. The Jarbidge River population is located in the southernmost habitat currently

occupied by bull trout. This population is geographically segregated from other bull trout in the Snake River basin by more than 150 rmi (240 rkm) of unsuitable habitat and several impassible dams on the mainstem Snake River and the lower Bruneau River. It is, however, essential to the conservation of bull trout as a whole, as discussed in the draft recovery plans.

(118) *Comment:* Streams within the Jarbidge River population range have not been demonstrated to contain PCEs for bull trout.

*Our Response:* All streams identified as essential and designated as critical habitat for the Jarbidge River population contain one or more of the PCEs. Only those streams with documented bull trout occurrence are designated. Variable types and amounts of habitat data are available for these streams to document the presence of PCEs and are in our administrative record for this final rule.

(119) *Comment:* Many plans already in place for bull trout protection don't need critical habitat (the comment letter listed many plans).

*Our Response:* Although there are many plans currently in place that directly or indirectly benefit bull trout, many are interim measures, they improve water quality only, there is no formal management plan, or they are designed to improve habitat on small scale watersheds. Where we could determine that the plans provided protection or management equal to that of a critical habitat designation, we have not included those lands, or otherwise we have designated critical habitat where appropriate (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

*Washington*

(120) *Comment:* Washington Department of Fish and Wildlife (WDFW) stated that Lake Washington and the Nisqually River are inappropriate as critical habitat because they are little used transient habitats for bull trout from other core areas.

*Our Response:* Recent tagging studies have clearly shown that amphidromous bull trout have complex migratory patterns within marine waters and between watersheds. We believe that current and future use of foraging, migratory, and overwintering habitats outside their natal basins is essential to the survival and conservation of bull trout, especially the amphidromous life history form. We expect that, as bull trout populations increase in abundance, bull trout use of the Nisqually River and Lake Washington will increase due to the abundant foraging opportunities provided by these systems. Historically, bull trout were reported as abundant in the Nisqually River. In addition, spawning may still occur within the basin as suggested by the recent capture of a smolt-sized bull trout in the Nisqually River delta (C. Ellings, in litt. 2004). These areas therefore, remain in the critical habitat designation.

(121) *Comment:* The proposed critical habitat designation falls short of protecting nearshore habitats essential to the conservation of bull trout by not including the shoreline riparian areas, bluffs, and uplands above the mean higher high water (MHHW) mark. These areas provide lateral recruitment of spawning substrates for surf smelt the principal food source for bull trout in the northern Puget Sound area. With the existing development along the Puget Sound shoreline, the source for suitable spawning gravels for surf smelt is very limited and protection of these last few areas is essential to the conservation of bull trout.

*Our Response:* We recognize that similar to the influence that riparian and floodplain areas have on stream habitat in freshwater systems, the quality of the habitat within the marine nearshore is intrinsically related to the character of the shoreline riparian areas, bluffs, and uplands, and the human activities that occur above the MHHW mark. Activities that may destroy or adversely modify critical habitat are identified as those that alter the PCEs to an extent that the value of critical habitat for the conservation of bull trout is appreciably reduced, including alterations to foraging habitat and reductions in forage fish abundance. Therefore, although areas above the MHHW mark are not included as critical habitat, in the designation, we recognized the scientific basis for linking the quality of the nearshore environment with the biological and physical processes that occur outside of that environment (see Critical Habitat Designation section below). During section 7 consultations for projects that could cause changes to such areas adjacent to critical habitat, the effects on the critical habitat would be analyzed and protection from adverse modification ensured.

(122) *Comment:* The old Lewis River channel (bypass reach) should be designated as critical habitat.

*Our Response:* The upper bypass reach was not included in the final critical habitat designation because it does not contain PCEs. Specifically, we do not believe it will support successful bull trout spawning and incubation. The lower segment of the bypass reach from Yale Reservoir to the mouth of Ole Creek is designated as critical habitat, except for that portion of the lower segment covered by the Washington Department of Natural Resources HCP which is excluded under 4(b)(2) (see Exclusions Under Section 4(b)(2) of the Act section below). The remaining lower segment provides foraging, migratory, and overwintering habitat for Yale Reservoir bull trout.

(123) *Comment:* The lower mainstem Lewis River, below Merwin Dam, should not be designated as critical habitat.

*Our Response:* The lower mainstem Lewis River will provide foraging, migration, and overwintering habitat once fish passage at Merwin, Yale, and Swift Dams is restored. We anticipate increased use by bull trout of the mainstem with these passage improvements. Restoring connectivity among local populations and to the Columbia River is necessary to maintain opportunities for genetic exchange, re-establishment of local populations, and provide access to additional habitat. Recent information documents use of the mainstem Columbia River by adult bull trout for foraging, migration, and overwintering.

(124) *Comment:* WDFW stated that until Condit Dam is removed, it is difficult to justify the designation of the White Salmon River above the dam as critical habitat.

*Our Response:* There has been a sighting of bull trout in the White Salmon River upstream from Condit Dam as recently as 1989. The designation provides foraging, migration, and overwintering habitat (necessary PCEs) for a potentially remnant population of bull trout within the White Salmon River system. The White Salmon River below Condit Dam is also used by migratory bull trout from other river systems, such as the Hood River. With the restoration of two-way passage at Condit Dam, this will provide access to habitat in the upper White Salmon River for these populations as well.

*Oregon*

(125) *Comment:* Attributing one third of the consultation costs to bull trout in the economic analysis for the Willamette system is likely too high. Passage modifications at dams in the Willamette would not likely be made solely for bull trout, given the presence of listed salmon and steelhead.

*Response:* As described in section 2.2.2 of the Final Economic Analysis (FEA), "[n]o clear allocation of costs can be made between these species, as most of the project modifications would be

sought under both the NOAA and Service consultations." Furthermore, the FEA acknowledges the concern regarding the Willamette. It states" "one-third of estimated costs are allocated to each [salmon, steelhead, and bull trout] species. This is likely to overstate the cost of bull trout conservation rather than understate it, since the primary driving force behind these project modifications is the salmon" (pg. 2–24). As a result, we are not excluding this area from the critical habitat designation based on economics.

(126) *Comment:* The Economic Analysis for critical habitat designations in the Malheur Basin is too high. Some operational changes at Beulah Reservoir have already been implemented and cost less than the annual estimate for Bureau of Reclamation (BOR) provided, and additional activities can be done for less than estimated.

*Response:* As described in section 4.2.4 of the FEA, BOR submitted a comment on the draft economic analysis stating that its "current average annual cost [associated with bull trout consultation] for the Boise (Anderson Ranch and Arrowrock Reservoirs), Payette (Cascade and Deadwood Reservoirs), Malheur (Buelah and Warm Springs Reservoirs), and Powder (Phillips and Thief Valley Reservoirs) is approximately $250,000 for all projects combined." As five of these reservoirs are currently operating under the terms of section 7 bull trout consultations, including Beulah Reservoir, the finding is that such consultations may result in annual fish passage and research costs of $50,000 per year per reservoir (page 4–25). In addition, we received a letter from Oregon DNR indicating the costs attributed to their basin's designation were too high. The analysis was updated with this new information, as reflected in section 4.2.4 of the Final Economic Analysis. As a result, we are not excluding this area from the critical habitat designation based on economics.

(127) *Comment:* Oregon Department of Fish and Wildlife (ODFW) questioned the exclusion of the John Day Basin based on the subbasin plan and Federal Columbia River Power System (FCRPS) given the uncertainty of the implementation of the management actions on mainstem and tributary streams.

*Our Response:* Programs, plans, and other authorities used to exclude certain areas that were originally proposed, have been re-evaluated to determine their benefit for exclusion versus the benefit of designating as critical habitat. We have revised the rule to now include this area as critical habitat based on this re-evaluation.

(128) *Comment:* ODFW believes that designations of unoccupied habitat are important for the re-introduction of extirpated populations or expansion of existing populations, and are the most important areas in need of protection.

*Our Response:* Because there was insufficient information for the Secretary to make a determination that unoccupied areas were essential to the conservation of the species, we have only designated areas of known occupancy that are known to contain the PCEs essential to the conservation of the species. We did not include areas of unknown occupancy in the final critical habitat designation because we did not have adequate information for the Secretary to determine that specific unoccupied areas were essential to the bull trout's conservation. We based this designation on the best scientific and commercial information available. Many streams not included in this designation can and will contribute to bull trout recovery, but do not meet the definition of critical habitat. We evaluated comments documenting stream segments that are not essential and where appropriate, refined this final critical habitat rule (See Summary of Changes from the Proposed Rule section below).

(129) *Comment:* The Clackamas River should be designated as critical habitat.

*Our Response:* The Clackamas River is not designated as critical habitat because the Service determined it is not essential to the conservation of bull trout in the Willamette River Basin Unit. The Willamette Recovery Unit Team recognized the Clackamas River as core habitat and not a core area based on the lack of data documenting bull trout in the Clackamas River. Bull trout are not known to currently inhabit the Clackamas River, but their presence was documented historically, and the Recovery Unit Team believes that the sub-basin has the necessary habitat elements to support the reintroduction of bull trout. Based on limited historical information, it is unknown whether reproducing bull trout populations existed previously in the Clackamas River.

(130) *Comment:* Critical habitat should be designated as it was in the proposed rule because there is no assurance that within the next 10 years or beyond that funding will be available for implementation. Therefore, the state suggested that critical habitat in Oregon should be re-designated as proposed where these directives have been identified as a reason for excluding.

*Our Response:* We have evaluated the FCRPS, the Northwest Forest Plan and PACFISH/INFISH, as well as other individual Federal and State programs and directives to determine their benefit for exclusion versus the benefit of designating as critical habitat. Many of these plans provide some level of conservation benefit to bull trout and the habitat they are known to currently occupy. The final rule considers the contribution of each individual plan, considers whether the lands meet the definition of critical habitat, and weighs the benefits of inclusion versus the benefits of exclusion when determining the final critical habitat designation.

**Summary of Revisions From the Previous Rules**

(1) Unoccupied lands were removed from the designation. Under the Act the Secretary of the Interior may only include unoccupied lands if she finds that those lands are essential to the conservation of the species. In the case of the bull trout, and based on the best scientific data available, it was not possible for the Secretary to make such a determination at this time.

(2) A variety of areas were found to not meet the definition of critical habitat and lands were excluded under section 4(b)(2) of the Act (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section below).

(3) Lands that did not contain sufficient PCEs to support at least one of the species essential biological activities were removed. For example, the Clark Fork River between Missoula and Butte was proposed for designation. Upon further review, it was determined that this site is a superfund site subject to contamination by leaching from mine wastes. Another example is the middle fork of the Boise River, also proposed for designation and also subject to leaching of mining wastes. Proposed critical habitat that did not contain sufficient PCEs to support the species was removed, as was critical habitat where the presence of PCEs was speculative. The Act does not provide for designation based on speculative or prospective presence of PCEs.

(4) The proposed critical habitat designation included a number of reaches to increase connectivity between populations. We received multiple comments that some of the barrier removal proposed to accomplish the connectivity could be detrimental to bull trout populations by providing access to competitor species such as lake trout, brook trout, and rainbow trout. We are removing those reaches pending a site by site determination as to which are appropriate for barrier removal. If necessary, additional critical habitat can be designated once those determinations are made.

(5) Segments were designated based on the contributions to bull trout life processes. Some segments contained all PCEs and supported multiple life processes. Some segments contained only a portion of the PCEs necessary to support the bull trout's particular use of that habitat. Where a subset of the PCEs were present (*e.g.*, water temperature during migration flows) it has been noted that only PCEs present at designation will be protected. In addition, some of the PCEs were present only at particular times of year, and not present at others. This led to a concern that by designating the area as critical habitat subsequent biological opinions would assume that the PCEs were constantly present, particularly in areas where active management (such as a dam) was present. Two examples of this are temperature and flows. We have designated some streams where appropriate temperatures occur only at specific times of year which coincide with bull trout use; but at other times the stream temperatures are outside the optimal range or may even be fatal to bull trout. We are concerned that our designation may be misinterpreted to require these temperatures be available year round as a result of the designation, particularly when the stream is controlled by upstream structures. Another example is flows. There are streams which are designated as critical habitat that are dry for portions of the year. These streams are designated because they are used by bull trout during portions of the year when the PCEs are present, perhaps for migration or foraging. Again, the assumption that the PCEs are present during the entire year is not appropriate, and could have serious consequences for other parties. Our goal is to ensure that the PCEs are protected when they are present as a result of federal actions but also to avoid inadvertently requiring creation of PCEs where they do not now occur. As a result, we have determined that explicitly placing current ongoing federal actions that create the PCEs in the baseline for the purposes of section 7 consultations under the Act, will protect existing PCEs and require any changes in those federal actions to undergo consultation in order to determine the effect of the changes on critical habitat.

Public comments in general, and particularly technical comments from local, State, and Federal agencies and Native American Tribes, were very useful in focusing the proposal to those areas with the features most essential to the conservation of the species. We held numerous public hearings and public meetings where we received specific technical comments that prompted further internal critical review of the proposal. The peer review process provided constructive criticism from fisheries scientists regarding our approach to developing the critical habitat proposal, as well as technical comments regarding specific proposed critical habitat areas. Through our working relationships with State and Federal agencies, we also received some new information after the proposal was issued, such as new records of bull trout occurrence, evidence of reproduction in some streams, or the lack of such positive survey results, as well as information on conservation actions underway within States.

We revised the stream miles and lake and reservoir acreages for designated critical habitat for those areas not containing features essential to bull trout conservation, based on information supplied by comments received as well as information gained from field visits to some of the sites.

**Critical Habitat**

Critical habitat is defined in section 3 of the Act as—(i) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. Conservation, as defined under section 3 of the Act means to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the prohibition against destruction or adverse modification of critical habitat with regard to actions carried out, funded, or authorized by a Federal agency. Section 7 requires consultation on Federal actions that are likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Such designation does not allow government or public access to private lands. Section 7 is a purely protective measure and does not require implementation of restoration, recovery, or enhancement measures.

To be included in a critical habitat designation, the habitat within the area occupied by the species must first have features that are essential to the conservation of the species. Critical habitat designations identify, to the extent known using the best scientific and commercial data available, habitat areas that provide essential life cycle needs of the species (i.e., areas on which are found the primary constituent elements, as defined at 50 CFR 424.12(b)).

Habitat occupied at the time of listing may be included in critical habitat only if the essential features thereon may require special management or protection. Thus, we do not include areas where existing management is sufficient to conserve the species. (As discussed below, such areas may also be excluded from critical habitat pursuant to section 4(b)(2).) Accordingly, when the best available scientific and commercial data do not demonstrate that the conservation needs of the species so require, we will not designate critical habitat in areas outside the geographical area occupied by the species at the time of listing. An area currently occupied by the species but was not known to be occupied at the time of listing will likely but not always be essential to the conservation of the species and, therefore, included in the critical habitat designation.

The Service's Policy on Information Standards Under the Endangered Species Act, published in the **Federal Register** on July 1, 1994 (59 FR 34271), and Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658) and the associated Information Quality Guidelines issued by the Service, provide criteria, establish procedures, and provide guidance to ensure that decisions made by the Service represent the best scientific and commercial data available. They require Service biologists to the extent consistent with the Act and with the use of the best scientific and commercial data available, to use primary and original sources of information as the basis for

recommendations to designate critical habitat. When determining which areas are critical habitat, a primary source of information is generally the listing package for the species. Additional information sources include the recovery plan for the species, articles in peer-reviewed journals, conservation plans developed by States and counties, scientific status surveys and studies, biological assessments, or other unpublished materials and expert opinion or personal knowledge. All information is used in accordance with the provisions of Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658) and the associated Information Quality Guidelines issued by the Service.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific data available. Habitat is often dynamic, and species may move from one area to another over time. Furthermore, we recognize that designation of critical habitat may not include all of the habitat areas that may eventually be determined to be necessary for the recovery of the species. For these reasons, critical habitat designations do not signal that habitat outside the designation is unimportant or may not be required for recovery.

Areas that support populations, but are outside the critical habitat designation, will continue to be subject to conservation actions implemented under section 7(a)(1) of the Act and to the regulatory protections afforded by the section 7(a)(2) jeopardy standard, as determined on the basis of the best available information at the time of the action. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans, or other species conservation planning efforts if new information available to these planning efforts calls for a different outcome.

**Methods**

As required by section 4(b)(1)(A) of the Act, we use the best scientific and commercial data available in determining areas that are essential to the conservation of the bull trout. In designating critical habitat, we reviewed the approaches to the conservation of the species undertaken by local, State, and Federal agencies; tribal governments; and private individuals and organizations since the species was listed in 1998. We relied on information collected by the bull trout Recovery Unit Teams, which were comprised of Federal, State, tribal, and private biologists, as well as experts from other scientific disciplines such as hydrology and forestry, resource users, and other stakeholders with an interest in bull trout and the habitats they depend on for survival. We reviewed available information concerning bull trout habitat use and preferences, habitat conditions, threats, limiting factors, population demographics, and the known locations, distribution, and abundances of bull trout. We designated no areas outside the geographical area presently occupied by the species.

During our evaluation of information, we also took into account the relatively low probability of detection of bull trout in traditional fish sampling and survey efforts, as well as the limited extent of such efforts across the range of bull trout. Because of their varied life history strategies, nocturnal habits, and low population densities in many areas, the detectability of bull trout in a given area is highly variable (Rieman and McIntyre 1993). In some areas, adult and subadult bull trout make extensive migrations both within and outside their core areas, which makes surveying difficult. Much of the current information on bull trout presence is the product of informal surveys or sampling conducted for other species or other purposes. The primary limitations of informal surveys are that they provide no estimate of certainty (*i.e.*, a measure of the probability of detection), and that they may be inadequate for determining population parameters such as the densities and distribution of the population. The need for a statistically sound bull trout survey protocol has been addressed only recently through the development, by the American Fisheries Society, of a peer-reviewed protocol for determining presence/absence, and potential habitat suitability for juvenile and resident bull trout (Peterson *et al.* 2002). Consequently, we considered all documented occurrences of bull trout in the past 20 years as evidence of occupancy.

We used information gathered during the bull trout recovery planning process, as supplemented by even more recent information developed by State agencies, tribes, U.S. Forest Service, and other entities, in developing this final critical habitat designation. We used data concerning habitat conditions or status of PCEs when available. To address areas where data gaps exist, we solicited expert opinions from knowledgeable fisheries biologists in the local area.

We also reviewed available information pertaining to the habitat requirements of this species. Important considerations in selecting areas for designated critical habitat include factors specific to each river system, such as size (*e.g.*, stream order), gradient, channel morphology, connectivity to other aquatic habitats, and habitat complexity and diversity, as well as rangewide recovery considerations. We took into account that preferred habitat for bull trout ranges from small headwater streams used largely for spawning and rearing, to downstream mainstem portions of river networks used for rearing and FMO habitat.

Our methods included consideration of information regarding habitat essential to maintaining the migratory life history forms of bull trout, in light of the repeated emphasis about the importance of such habitat in the scientific literature (Rieman and McIntryre 1993; Hard 1995; Healey and Prince 1995; Rieman *et al.* 1995; Montana Bull Trout Scientific Group (MBTSG) 1998; Dunham and Rieman 1999; Nelson *et al.* 2002). Material reviewed included data in reports submitted during section 7 consultations and by biologists holding section 10(a)(1)(A) recovery permits; research published in peer-reviewed academic theses and agency reports; and regional GIS overlays. Habitat for movement upstream, downstream and, in some cases, through marine waters is essential for migratory life history forms for spawning, foraging, growth, access to rearing and overwintering areas or thermal refugia (*e.g.*, spring-fed streams in late summer), avoidance of extreme environmental conditions, and other normal behavior. Successful migration requires biologically, physically, and chemically unobstructed routes for movement of individuals. Therefore, our methods included considering information regarding habitat that is essential for movement into and out of larger rivers, because of the importance of such areas to the fluvial form of bull trout. We similarly identified habitat essential for movement between streams and lakes by adfluvial forms and habitat essential for movement into and through marine waters by amphidromous forms.

Migratory corridors also are essential for movement between populations (Fraley and Shepard 1989; Rieman and McIntyre 1993; Rieman *et al.* 1995; Dunham and Rieman 1999). Thus, in addition to considering areas important for migration within populations, our method also included considering

information regarding migration corridors necessary to allow genetic exchange between local populations. Corridors that allow such movements can support eventual recolonization of unoccupied areas or otherwise play a significant role in maintaining genetic diversity and metapopulation viability (see the June 25, 2004 proposed rule; 69 FR 35767). Because these factors are important in identifying the features and areas that are essential to bull trout conservation, our method included consideration of the various roles that migratory corridors have for bull trout.

**Primary Constituent Elements**

In accordance with section 3(5)(A)(i) of the Act and regulations at 50 CFR 424.12, in determining which areas to designate as critical habitat, we consider those physical and biological features (PCEs) that are essential to the conservation of the species, and within areas occupied by the species at the time of listing, that may require special management considerations and protection. These include, but are not limited to space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, and rearing (or development) of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

Pursuant to our regulations, we are required to identify the known physical and biological features (PCEs) essential to the conservation of the bull trout. All areas designated as critical habitat for bull trout are occupied, within the species' historic geographic range, and contain sufficient PCEs to support at least one life history function.

Bull trout exhibit a number of life-history strategies. Stream-resident bull trout complete their entire life cycle in the tributary streams where they spawn and rear. Some bull trout are migratory, spawning in tributary streams where juvenile fish usually rear from 1 to 4 years before migrating to either a larger river (fluvial) or lake (adfluvial) where they spend their adult life, returning to the tributary stream to spawn (Fraley and Shepard 1989). These migratory forms occur in areas where conditions allow for movement from upper watershed spawning streams to larger downstream waters that contain greater foraging opportunities (Dunham and Rieman 1999). Resident and migratory forms may be found together, and either form can produce resident or migratory offspring (Rieman and McIntyre 1993). Bull trout in the Coastal-Puget Sound area are believed to include an anadromous form which migrates to saltwater to mature, returning to streams to spawn (64 FR 58912).

Bull trout are opportunistic feeders, with food habits that primarily are a function of size and life history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro-zooplankton, and small fish (Donald and Alger 1993; McPhail and Baxter 1996). Adult migratory bull trout feed almost exclusively on other fish (Rieman and McIntyre 1993).

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that particularly influence their distribution and abundance include water temperature, cover, channel form and stability, spawning and rearing substrate conditions, and migratory corridors (Fraley and Shepard 1989; Goetz 1989; Watson and Hillman 1997).

Relatively cold water temperatures are characteristic of bull trout habitat. Water temperatures above 15 °Celsius (C) (59 °Fahrenheit (F)) while not lethal are believed to limit their distribution (Fraley and Shepard 1989; Rieman and McIntyre 1996). Although adults have been observed in large rivers throughout the Columbia River basin in water temperatures up to 20 °C (68 °F), Gamett (1999) documented steady and substantial declines in abundance in stream reaches where water temperature ranged from 15 to 20 °C (59 to 68 °F). Thus, water temperature may partially explain the generally patchy distribution of bull trout in a watershed. In large rivers, bull trout are often observed "dipping" into the lower reaches of tributary streams, and it is suspected that cooler waters in these tributary mouths may provide important thermal refugia, allowing them to forage, migrate, and overwinter in waters that would otherwise be, at least seasonally, too warm. Spawning areas often are associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman *et al.* 1997).

Throughout their lives, bull trout require complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989; Watson and Hillman 1997). Juveniles and adults frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). McPhail and Baxter (1996) reported that newly emerged fry are secretive and hide in gravel along stream edges and in side channels. They also reported that juveniles are found mainly in pools but also in riffles and runs that they maintain focal sites near the bottom, and that they are strongly associated with instream cover, particularly overhead cover. Bull trout have been observed overwintering in deep beaver ponds or pools containing large woody debris (Jakober 1995). Adult bull trout migrating to spawning areas have been recorded as staying two to four weeks at the mouths of spawning tributaries in deeper holes or near log or cover debris (Fraley and Shepard (1989)).

The stability of stream channels and stream flows are important habitat characteristics for bull trout populations (Rieman and McIntyre 1993). The side channels, stream margins, and pools with suitable cover for bull trout are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns.

Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the necessary habitat requirements for bull trout spawning and rearing, and that the characteristics are not necessarily ubiquitous throughout the watersheds in which bull trout occur. The preferred spawning habitat of bull trout consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). Bull trout typically spawn from August to November during periods of decreasing water temperatures (Swanberg 1997). However, migratory forms are known to begin spawning migrations as early as April, and to move upstream as much as 250 km (155 mi) to spawning areas (Fraley and Shepard 1989; Swanberg 1997). Fraley and Shepard (1989) reported that initiation of spawning by bull trout in the Flathead River system appeared to be related largely to water temperature, with spawning initiated when water temperatures dropped below 9–10 °C (48 to 50 °F). Goetz (1989) reported a temperature range from 4 to 10 °C (39 to 50 °F) (Goetz 1989). Such areas often are associated with cold-water springs or groundwater upwelling (Rieman *et al.* 1997; Baxter *et al.* 1999). Fraley and Shepard (1989) also found that groundwater influence and proximity to cover are important factors influencing spawning site selection. They reported that the combination of relatively specific requirements resulted in a restricted spawning distribution in relation to available stream habitat.

Depending on water temperature, egg incubation is normally 100 to 145 days (Pratt 1992). Water temperatures of 1.2 to 5.4 °C (34.2 to 41.7 °F) have been

reported for incubation, with an optimum (best embryo survivorship) temperature reported to be from 2 to 4 °C (36 to 39 °F) (Fraley and Shepard 1989; McPhail and Baxter 1996). Juveniles remain in the substrate after hatching, such that the time from egg deposition to emergence of fry can exceed 200 days. During the relatively long incubation period in the gravel, bull trout eggs are especially vulnerable to fine sediments and water quality degradation (Fraley and Shepard 1989). Increases in fine sediment appear to reduce egg survival and emergence (Pratt 1992). Juveniles are likely similarly affected. High juvenile densities have been reported in areas characterized by a diverse cobble substrate and a low percent of fine sediments (Shepard *et al.* 1984).

The ability to migrate is important to the persistence of local bull trout subpopulations (Rieman and McIntyre 1993; Gilpin 1997; Rieman and Clayton 1997; Rieman *et al.* 1997). Bull trout rely on migratory corridors to move from spawning and rearing habitats to foraging and overwintering habitats and back. Migratory bull trout become much larger than resident fish in the more productive waters of larger streams and lakes, leading to increased reproductive potential (McPhail and Baxter 1996). The use of migratory corridors by bull trout also results in increased dispersion, facilitating gene flow among local populations when individuals from different local populations interbreed, stray, or return to nonnatal streams. Also, local populations that have been extirpated by catastrophic events may become reestablished as a result of movements by bull trout through migratory corridors (Rieman and McIntyre 1993, Montana Bull Trout Scientific Group (MBTSG) 1998).

While stream habitats have received more attention, lakes and reservoirs also figure prominently in meeting the life cycle requirements of bull trout. For adfluvial bull trout populations, lakes and reservoirs provide an important component of the core foraging, migrating, and overwintering habitat, and are integral to maintaining the adfluvial life history strategy that is commonly exhibited by bull trout. When juvenile bull trout emigrate downstream to a lake or reservoir from the spawning and rearing streams in the headwaters, they enter a more productive lentic environment that allows them to achieve rapid growth and energy storage. Typically, juvenile bull trout are at least two years old and 100 mm (4 inches) or longer upon entry to the lake environment. For the next 2–4 years they grow rapidly. At a typical age of five years or older, when total length normally exceeds 400 mm (16 inches), they reach sexual maturity. The lake environment provides the necessary attributes of food, space, and shelter for the subadult fish to prepare for the rigors of migratory passage upstream to the natal spawning area, a migration that may last as long as six months and cover distances as much as 250 km (155 mi) upriver.

In comparison to streams, lake and reservoir environments are relatively more secure from catastrophic natural events. They provide a sanctuary for bull trout, allowing them to quickly rebound from temporary adverse conditions in the spawning and rearing habitat. For example, if a major wildfire burns a drainage and eliminates most or all aquatic life (a rare occurrence), bull trout subadults and adults that survive in the lake may return the following year to repopulate the system. In this way, lakes and reservoirs provide an important adaptive element of the adfluvial life history strategy.

The construction of reservoirs may have had adverse effects to bull trout, but some reservoirs also have provided benefits. For example, the basin of Hungry Horse Reservoir has functioned adequately for fifty years as a surrogate home for stranded Flathead Lake bull trout trapped upstream of the dam when it was completed. While this is an artificial impoundment, the habitat the reservoir provides and the presence of an enhanced prey base of native minnows, suckers, and whitefish within the reservoir sustain a large adfluvial bull trout population. Additionally, while barriers to migration are often viewed as a negative consequence of dams, the connectivity barrier at Hungry Horse Dam has also served an important, albeit unintended, function in restricting the proliferation of nonnative *Salvelinus* species (brook trout and lake trout) from downstream areas upstream above the dam. Additional information related to bull trout biology can be found in our administrative record.

Based on our current knowledge of the life history, biology, and ecology of the species and the requirements of the habitat to sustain the essential life history functions of the species, we have determined that the bull trout's PCEs are:

(1) Water temperatures that support bull trout use. Bull trout have been documented in streams with temperatures from 32 to 72 °F (0 to 22 °C) but are found more frequently in temperatures ranging from 36 to 59 °F (2 to 15 °C). These temperature ranges may vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence. Stream reaches with temperatures that preclude any bull trout use are specifically excluded from designation;

(2) Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures;

(3) Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. This should include a minimal amount of fine substrate less than 0.25 inch (0.63 centimeter) in diameter.

(4) A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, currently operate under a biological opinion that addresses bull trout, or a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation;

(5) Springs, seeps, groundwater sources, and subsurface water to contribute to water quality and quantity as a cold water source;

(6) Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows;

(7) An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish;

(8) Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.

This designation protects PCEs necessary to support the life history functions which were the basis for the designation. Because not all life history functions require all the PCEs, not all habitat will contain all the PCEs.

Each of the areas designated in this rule have been determined to contain sufficient PCEs to provide for one or more of the life history functions of the bull trout. In some cases, the PCEs exist as a result of ongoing federal actions. As a result, ongoing federal actions at the time of designation will be included in the baseline in any consultation conducted subsequent to this designation.

**Criteria Used To Identify Critical Habitat**

We are designating critical habitat on lands that we have determined are occupied at the time of listing and contain sufficient primary constituent elements to support life history functions essential for the conservation of the species. We reevaluated the proposed designations based on public comment, peer review of the proposed rules and the draft Recovery Plans, the economic analyses of the proposed rules, and the public comments on those analyses, and other available information, to ensure that the designation accurately reflects habitat with the PCEs that is essential to the conservation of the species.

This critical habitat designation focuses primarily on the maintenance of populations by (1) protecting sufficient amounts of spawning and rearing habitat in upper watershed areas; (2) providing suitable habitat conditions in downstream rivers and lakes to provide foraging and overwintering habitat for fluvial and adfluvial fish; and (3) maintaining migratory routes and the potential for gene flow between populations by maintaining habitat conditions that allow for fish passage.

To be included as critical habitat, a critical habitat unit (CHU) had to be occupied by the species and contain sufficient PCEs to provide for one or more of the following three functions: (1) Spawning, rearing, foraging, or overwintering habitat to support existing bull trout local populations; (2) movement corridors necessary for maintaining migratory life-history forms; and/or (3) suitable occupied habitat that is essential for recovering the species.

A brief discussion of each area designated as critical habitat is provided in the unit descriptions below. Additional detailed documentation concerning the essential nature of these areas is contained in our administrative record for this rulemaking.

*Non-Inclusions Under Section 4(a)(3)*

The Sikes Act Improvement Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete, by November 17, 2001, an Integrated Natural Resource Management Plan (INRMP). An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found on the base. Each INRMP includes an assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species; a statement of goals and priorities; a detailed description of management actions to be implemented to provide for these ecological needs; and a monitoring and adaptive management plan. Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management, fish and wildlife habitat enhancement or modification, wetland protection, enhancement, and restoration where necessary to support fish and wildlife and enforcement of applicable natural resource laws.

The National Defense Authorization Act for Fiscal Year 2004 (Pub. L. 108–136) amended the ESA to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(i) of the ESA (16 U.S.C. 1533(a)(3)(B)(i)) now provides: "The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation."

We consult with the military on the development and implementation of INRMPs for installations with listed species. INRMPs developed by military installations located within the range of critical habitat designated for the Columbia and Coastal-Puget Sound populations of bull trout were analyzed for non-inclusion under the authority of 4(a)(3) of the Act.

The Bayview Acoustic Research Detachment (ARD) Naval Surface Warfare Center, Bayview, ID, has an approved INRMP. This property includes approximately 22 ac (9 ha) of developed land on the shore of Lake Pend Oreille and 16 ac (7 ha) of lake area. There are no tributary streams within this area utilized by bull trout for spawning or early life rearing, but the lake area does contain important FMO habitat for bull trout.

Designating critical habitat on Bayview ARD could impact their role in supporting ongoing U.S. Navy research, development, test, and evaluation programs in underwater acoustics. These efforts include the use of large scale models to simulate the characteristics of current and future Navy submarines in order to develop and evaluate advances in submarine silencing technology. Performing acoustic testing on large scale models provides the same accuracy as testing on actual submarines at a significantly lower cost. Bayview ARD is the only Navy facility capable of testing large scale models for hull-induced flow noise and propulsor noise, and the knowledge gained from these tests are directly applied to reducing the detectability of Navy submarines (Department of the Navy 2003). Bayview ARD's INRMP outlines protection and management strategies for natural resources on the center, including fish species and their habitats.

The plan benefits bull trout through the protection of kokanee salmon spawning habitat, a primary food source for bull trout. The ARD Bayview property in Scenic Bay hosts from 40–70 percent of the kokanee spawning activity in Lake Pend Oreille, depending on the year. The INRMP includes measures to minimize impacts to kokanee habitat by limiting facility boat traffic during spawning periods (November-December), and implementing sediment control measures. Furthermore, interpretive signs have been placed throughout the property to educate employees and the public regarding various aspects of the regions natural resources, threatened or endangered species (including bull trout), and geological history. The INRMP requires the natural resource manager to provide an all hands ARD INRMP awareness training to facilitate INRMP implementation.

Eurasian watermilfoil was identified in the northern part of Lake Pend Oreille during the winter of 2002. Following identification and mapping of invasive species at ARD Bayview, a plan will be developed under the INRMP to control invasive species at the facility and to limit their spread to adjacent lands. Eurasian watermilfoil chokes waterways and near shore environments used by bull trout and their prey species.

Based on the above considerations, and consistent with the direction provided in section 4(a)(3)(B)(i) of the Act, we have determined that conservation efforts identified in the final INRMP will provide benefits to the bull trout occurring in the lake area within or adjacent to the Bayview ARD. Approximately 16 ac (7 ha) of essential habitat is not included in this critical habitat designation. Therefore, we are not including critical habitat for bull trout on this installation pursuant to section 4(a)(3) of the Act.

The Naval Radio Station Jim Creek, Naval Station Everett, Naval Air Station Whidbey Island, and the Army's Fort Lewis Installation (Fort Lewis) are all located in western Washington and all have approved INRMPs. We have

examined the INRMPs for these military installations to determine coverage for the bull trout. The Naval Radio Station Jim Creek INRMP provides for (1) restoration of riparian buffers along Jim Creek, (2) protection to Jim Creek from erosion and sedimentation, and (3) protection to Jim Creek from contaminants and herbicides. The Naval Station Everett's INRMP benefits bull trout by providing (1) protection to bull trout in the marine environment from oil spills around the berthing naval vessels, (2) bioswales to prevent the release of toxins, contaminants and oils from reaching the water column through storm drains, and (3) the restoration of riparian habitat on Navy lands located along the Middle Fork Quilceda Creek. Naval Aviation Station Whidbey Island's INRMP benefits bull trout through (1) monitoring and managing livestock grazing, (2) managing road building and maintenance to prevent erosion and sedimentation of bull trout habitat, (3) assuring proper disposal of hazardous materials, and (4) implementation of the Integrated Pest Management plan's best management practices to protect aquatic environments. The INRMP for the U.S. Army, Fort Lewis, benefits bull trout through (1) the protection and enhancement of wetlands, which include marshes, lakes, rivers and streams; all wetlands are protected with 300 foot-wide riparian buffers to maintain cold water temperatures, prevent sediment from entering the streams and provide for woody debris, (2) control of invasive plant species which often diminishes water quality and impacts native plants and animals, and (3) restoring salmon spawning habitat and access to increase salmon productivity which contributes to and enhances the bull trout prey base. In addition, the Navy conducts essential training and testing within the marine waters of Crescent Harbor and Dabob Bay. These activities are conducted in open marine waters not controlled by the military, and are not included in adjacent military INRMPs. However, because these training and testing activities are essential for national security, they have been excluded from the final designation of critical habitat under section 4(b)(2) of the Act.

These military installations with INRMPs do not have streams that are utilized by bull trout for spawning and rearing. The Naval Radio Station Jim Creek occurs in the Jim Creek watershed. The lower reaches of Jim Creek provide foraging habitat for subadult and adult bull trout. The Naval Station Everett and Naval Air Station Whidbey Island property includes land on or near the shores of Puget Sound that contains important foraging and migration habitat for amphidromous bull trout. Fort Lewis borders the Nisqually River and Puget Sound where the mainstem Nisqually River and Puget Sound nearshore bordering this property contain important foraging and migration habitat for amphidromous bull trout.

Habitat features essential to bull trout conservation exists within or immediately adjacent to these military installations. Designating critical habitat on these military installations may impact their role in supporting ongoing military exercises and operations that occur at these locations. These military installations all have approved INRMPs, and activities occurring on these properties are currently being conducted in a manner that minimizes impacts to bull trout habitat. In addition, these installations already consult with us on their actions (including those occurring in the open water training and testing areas) that may have adverse affects to bull trout and their habitat under section 7 requirements.

Based on the above considerations, and in accordance with section 4(a)(3)(B)(i) of the Act, we have determined that conservation efforts identified in the INRMPs will provide benefits to the bull trout occurring in streams within or adjacent to Naval Radio Station Jim Creek, Naval Air Station Whidbey Island, and Fort Lewis. Approximately 25 mi (40 km) of essential habitat is not included in this critical habitat designation. Therefore, we are not including critical habitat for bull trout on these installations pursuant to section 4(a)(3) of the Act.

*Section 3(5)(A) and Exclusions Under Section 4(b)(2)*

Section 3(5)(A) of the Act defines critical habitat as the specific areas within the geographic area occupied by the species on which are found those physical and biological features (i) essential to the conservation of the species, and (ii) which may require special management considerations or protection. Therefore, areas within the geographic area occupied by the species that do not contain the features essential to the conservation of the species are not, by definition, critical habitat. Similarly, areas within the geographic area occupied by the species that require no special management or protection also are not, by definition, critical habitat.

There are multiple ways to provide management for species habitat. Statutory and regulatory frameworks that exist at a local level can provide such protection and management, as can lack of pressure for change, such as areas too remote for anthropogenic disturbance. Finally, State, local, or private management plans as well as management under Federal agencies jurisdictions can provide protection and management to avoid the need for designation of critical habitat. When we consider a plan to determine its adequacy in protecting habitat, we consider whether the plan, as a whole will provide the same level of protection that designation of critical habitat would provide. The plan need not lead to exactly the same result as a designation in every individual application, as long as the protection it provides is equivalent, overall. In making this determination, we examine whether the plan provides management, protection, or enhancement of the PCEs that is at least equivalent to that provided by a critical habitat designation, and whether there is a reasonable expectation that the management, protection, or enhancement actions will continue into the foreseeable future. Each review is particular to the species and the plan, and some plans may be adequate for some species and inadequate for others.

Section 4(b)(2) of the Act states that critical habitat shall be designated, and revised, on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant impact, of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat if [s]he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless [s]he determines, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species. In making that determination, the Secretary is afforded broad discretion and the Congressional record is clear that in making a determination under the section the Secretary has discretion as to which factors and how much weight will be given to any factor.

Under section 4(b)(2), in considering whether to exclude a particular area from the designation, we must identify the benefits of including the area in the designation, identify the benefits of excluding the area from the designation, determine whether the benefits of exclusion outweigh the benefits of inclusion. If an exclusion is contemplated, then we must determine

whether excluding the area would result in the extinction of the species. In the following sections, we address a number of general issues that are relevant to the exclusions we considered.

**Relationship Between Adverse Modification and Jeopardy in Bull Trout and Bull Trout Critical Habitat Consultations**

In *Gifford Pinchot Task Force* v. *United States Fish and Wildlife Service*, the Ninth Circuit held that the Service's regulatory definition of "destruction or adverse modification" was contrary to the ESA because it required an affect on the survival of the species, in addition to an effect on recovery. In response, on December 9, 2004, the Acting Director of the Service issued guidance on conducting section 7 consultations with respect to critical habitat until a new regulatory definition could be put in place. The analytical framework presented in this memo directs us to consider whether, with implementation of the proposed action, critical habitat would remain functional to serve the intended conservation role for the species.

Although *Gifford Pinchot* provides guidance regarding the interpretation of the statutory phrase "destruction or adverse modification," it does not directly speak to the meaning of "jeopardy." In order to determine the benefits of including or excluding an area as critical habitat, we must consider the application of both of these terms, and how they will be affect the outcomes of future section 7 consultations regarding bull trout.

In its jeopardy determinations under bull trout Section 7 consultations, the Service uses an analytical framework that relies heavily on the importance of core area populations to the survival and recovery of the bull trout. This has been the case for all jeopardy consultations on the bull trout. These analyses have focused not only on the core area populations but also on the habitat conditions necessary to support them; they have addressed the survival and recovery needs of the bull trout in a qualitative fashion without making distinctions between what is necessary for survival and what is necessary for recovery. Generally, if a proposed Federal action is incompatible with the viability of the affected core area population(s), inclusive of associated habitat conditions, a jeopardy finding is considered to be warranted. This approach is predicated on the Service's regulatory definitions of "harm" and "take" which explicitly require a consideration of an agency action's effects on habitat, whether or not it is designated as critical.

Subsequent to the 9th circuit's decision in *Gifford Pinchot* the Service has conducted both a jeopardy and adverse modification analysis for consultations involving critical habitat. In conducting the adverse modification analysis, the Service has applied the analytical framework described in the Director's December 9, 2004, memorandum. The ultimate question in this analysis is whether, with implementation of the proposed Federal action, the primary constituent elements of affected critical habitat would remain functional to serve the intended conservation role for the bull trout. Generally, the conservation role of bull trout critical habitat units is to support viable core area populations, as a result, adverse modification to that habitat would result in both a jeopardy determination or an adverse modification determination. This leads to the conclusion, in the particular case of bull trout that very few examples of adverse modification can occur without also triggering a jeopardy finding.

Some consultations (14 informals, 8 formals) on bull trout critical habitat have been conducted in the 9 months since the original designation. These consultations have not resulted in outcomes for Federal action agencies different than those that would have resulted in consultations purely under the jeopardy standard. As stated earlier, this result is due in particular to the manner in which the Service conducts jeopardy analyses for the bull trout (by focusing on protection of core area populations and their habitats, without making a distinction between effects on survival versus recovery. The approach is consistent with the *Gifford Pinchot* court's guidance with respect to adverse modification, because it is based on a standard that gauges the action's effect on conservation rather than survival which is consistent with the court's direction that the Agency go beyond merely a requirement that the Federal action cause an effect on bull trout survival in order to constitute adverse modification.

We also note that in the 200 or so formal consultations completed since the bull trout was listed, most of the anticipated effects of proposed Federal actions on the species have not been biologically significant from a core-area perspective, and if these actions had been subject to the adverse modification standard described above, they would not likely have violated it. Based on our analysis of 137 formal consultations conducted during the period 1998–2003, the following types of projects were proposed in bull trout-occupied habitat, in order of frequency (most to least): Multiple project actions, grazing, road work, bridge work, habitat restoration, land and resource management plans, mining, hydropower, timber harvest, recreation, water diversion/irrigation, research, land exchange, flood control, erosion control, pipeline construction, predator control, landslide remediation, instream crossings, weed management, dredging, and levee repair.

However, at least one major Federal action involving significant modifications to natural flow patterns in designated critical habitat is currently in formal consultation, and it is likely (based on recent litigation patterns and outcomes) that the number of diversion-related Federal actions consulted on, some of which may occur in critical habitat, will increase in the future. Water quality and quantity are significant factors (and primary constituent elements) influencing the viability of bull trout core areas. Given that context, it seems reasonable to predict that a few Federal actions will be found to adversely modify bull trout critical habitat; most of these actions would probably also constitute jeopardy.

This analysis would be different in the case of critical habitat designated in unoccupied areas or if currently occupied areas subsequently become unoccupied. In such cases, different outcomes/requirements of consultation on critical habitat are much more likely. In the first case, designated unoccupied habitat, there would not necessarily be a requirement for a Section 7 consultation in the absence of a critical habitat designation. This is consistent with the 9th Circuit's decision in *Defenders of Wildlife* v. *Flowers et al. 2005*, 414 F.3d 1066 (2005), which upheld a "no effect" determination by the U.S. Army Corps of Engineers in circumstances in which "no pygmy-owls had been found to live within either project area. This designation only designates critical habitat in areas we have defined to be occupied, and so the benefits attributable to unoccupied habitat designation will not accrue. The second situation identified, whereby current populations disappear, theoretically provides a similar benefit. However, as a practical matter, it is unlikely that such a benefit would accrue in the foreseeable future as this rule defines occupied habitat as habitat that has documented occupancy within the past 20 years (see the previous discussion for the basis of the definition). Based on the FWS definition of occupied habitat, it would be at least

20 years until the protections of a jeopardy consultation, with its appurtenant habitat considerations, were removed. Accordingly, we do have a basis for believing that in the particular case of this bull trout critical habitat, designation in the particular case of the bull trout would not result in significantly different protections to the species.

**Benefits of Designating Critical Habitat in the Absence of Other Conservation Efforts**

The designation of critical habitat provides some benefits all the time and may in certain circumstances provide conservation benefits that would not otherwise be provided. We have identified three types of possible benefits. First, there are educational benefits. Second, there are circumstances where additional protections under other regulatory mechanisms are triggered by a designation. For example PACFISH/INFISH has particular protections triggered by a designation and some states have regulatory regimes that employ the existence of designated critical habitat as a trigger for protection. Third, in the instance that a future Federal action would be likely to adversely modify critical habitat but not likely to jeopardize the continued existence of the species, the designation would provide a benefit.

The benefit of including lands in critical habitat is that the designation of critical habitat serves to educate landowners, State and local governments, and the public regarding the potential conservation value of an area. This helps focus and contribute to conservation efforts by other parties by clearly delineating areas of high conservation value for bull trout. In general the educational benefit of a critical habitat designation always exists although in some cases it may be redundant with other educational effects (for example habitat conservation plans have significant public input and may largely duplicate the educational benefit of a critical habitat designation). This benefit is closely related to a second, more indirect benefit; in that designation of critical habitat would inform State agencies and local governments about areas that could be conserved under State laws or local ordinances, such as the Washington State Growth Management Act or Washington State Shoreline Management Act which encourage the protection of "critical areas" including fish and wildlife habitat conservation areas based on the best available science. Designating critical habitat could lead to additional State or local restrictions for the landowner, on top of conservation measures already in place. The benefit could accrue as a result of an automatic "triggering" based on existing law, or through specific, subsequent actions designed to protect the species. However, to the extent that local and state governments wish to provide additional protection for listed species' habitats, there are numerous alternative approaches to achieve that end. For example, recovery plans or proposed critical habitat can form the basis for such additional protections. State and local agencies have independent authority to adopt such protections and do not require Federal authorization or direction to do so. Because of that, we view this benefit as indirect as it is not required to achieve the additional protection.

The most direct, and potentially largest regulatory benefit of critical habitat is that federally authorized, funded, or carried out activities require consultation pursuant to section 7 of the Act to ensure that they are not likely to destroy or adversely modify critical habitat. There are two limitations to this regulatory effect. First, it only applies where there is a Federal nexus—if there is no Federal nexus, designation itself does not restrict actions that destroy or adversely modify critical habitat. Second, it only limits destruction or adverse modification. By its nature, the prohibition on adverse modification is designed to unsure those areas that contain the physical and biological features essential to the conservation of the species or unoccupied areas that are essential to the conservation are not eroded. Critical habitat designation alone, however, does not require specific steps toward recovery. When consultation does take place, the analysis of whether the Federal action destroys or adversely modifies critical habitat makes a determination regarding the effect of the action on the species conservation, consistent with the holding of *Gifford Pinchot*, discussed above. It is important to note that even though, consistent with *Gifford Pinchot*, the prohibition on adverse modification can be triggered without a showing of an effect on survival (in other words, a negative effect on the conservation of the species can trigger the prohibition), designation of critical habitat does not require actions to recover the species beyond what may be necessary to address potential adverse modification impacts on critical habitat that supports recovery. There are tools (*e.g.*, HCPs) that can encourage or require habitat restoration or improvement and other positive steps to help move species closer to being recovered.

Another significant limitation on the benefits of designating critical habitat is the fact that as long as the area in question is occupied, consultation would in any case be required to ensure that the action was not likely to jeopardize the species. The areas that were proposed for designation are all currently occupied by bull trout. Therefore, designation of these areas could have a substantive regulatory effect in two circumstances: (1) The Service consults on a future Federal action, does both jeopardy and adverse modification analyses, and concludes that the action would likely adversely modify critical habitat but not jeopardize the species, or (2) the range of the bull trout contracts prior consultation, such that the area is no longer subject to jeopardy consultation, but the action would be likely to adversely modify critical habitat.

Regarding the first of these circumstances, and in a discussion specific to bull trout, as discussed above, in analyzing whether Federal actions might jeopardize the continued existence of the bull trout, the Service has focused on the viability of core area populations, without making distinctions between what is necessary for survival versus recovery. Because with respect to the bull trout the Service views the conservation role of critical habitat units as supporting viable core area populations, the Service anticipates that few Federal actions (but not necessarily none) would adversely modify critical habitat but not jeopardize the species.

Regarding the second of these circumstances, for each exclusion, the Service considered the possibility of local bull trout extirpation in the affected stream reaches given the data available. In general, the Service does not anticipate significant extirpations in the areas excluded, although such an event cannot be completely ruled as stochastic events such as a conflagration have in the past completely destroyed populations. If such an event was to occur, and an entire population was extirpated, the designation of critical habitat could provide important protection to the habitat to preserve it for eventual recolonization or reintroduction. However, as noted earlier, as a practical matter, the Service would consider the habitat occupied for 20 years subsequent to the temporal extirpation, providing ample opportunity for restoration of the population.

Notwithstanding the limitations discussed above, in those instances in

which the jeopardy prohibition and other applicable protections would not adequately conserve bull trout habitat from the effects of Federal actions, designation of critical habitat could help ensure the integrity of bull trout habitat is maintained. For example, if a federally funded road project was proposed to go across lands that were designated as critical habitat, a consultation would need to be conducted to ensure the designated critical habitat was not destroyed or adversely modified to the point of appreciably diminishing its habitat features essential to bull trout recovery. The designation could therefore result in modifications to the Federal project to protect bull trout habitat.

To the extent that designation results in changes to actions that have a negative effect on bull trout habitat, minimizing or mitigating that effect, or results in additional actions to benefit bull trout habitat (*e.g.*, as a result of disseminating information), designation could benefit bull trout conservation. If the designation provided additional conservation, it could have direct benefits, such as those typically captured in an economic analysis which include, increased tourism or recreational activity. In addition, there could be intangible benefits that accrue to society in general and individuals in direct proportion to the value that society and individuals place on such intrinsic values as existence values and environmental goods.

**Conservation Partnerships on Non-Federal Lands**

Most federally listed species in the United States will not recover without the cooperation of non-federal landowners. More than 60% of the United States is privately owned (National Wilderness Institute 1995) and at least 80% of endangered or threatened occur either partially or solely on private lands (Crouse *et al.* 2002). Stein *et al.* (1995) found that only about 12% of listed species were found almost exclusively on Federal lands (*i.e.*, 90–100% of their known occurrences restricted to Federal lands) and that 50% of federally listed species are not known to occur on Federal lands at all.

Given the distribution of listed species with respect to land ownership, conservation of listed species in many parts of the United States is dependent upon working partnerships with a wide variety of entities and the voluntary cooperation of many non-federal landowners (Wilcove and Chen 1998, Crouse *et al.* 2002, James 2002). Building partnerships and promoting voluntary cooperation of landowners is essential to understanding the status of species on non-federal lands and is necessary to implement recovery actions such as reintroducing listed species, habitat restoration, and habitat protection.

Many non-Federal landowners derive satisfaction in contributing to endangered species recovery. The Service promotes these private-sector efforts through the Four Cs philosophy—conservation through communication, consultation, and cooperation. This philosophy is evident in Service programs such as HCPs, Safe Harbors, CCAs, CCAAs, and conservation challenge cost-share. Many private landowners, however, are wary of the possible consequences of encouraging endangered species to their property, and there is mounting evidence that some regulatory actions by the Federal government, while well-intentioned and required by law, can under certain circumstances have unintended negative consequences for the conservation of species on private lands (Wilcove *et al.* 1996, Bean 2002, Conner and Mathews 2002, James 2002, Koch 2002, Brook *et al.* 2003). Many landowners fear a decline in their property value due to real or perceived restrictions on land-use options where threatened or endangered species are found. Consequently, harboring endangered species is viewed by many landowners as a liability, resulting in anti-conservation incentives because maintaining habitats that harbor endangered species represents a risk to future economic opportunities (Main *et al.* 1999, Brook *et al.* 2003).

The purpose of designating critical habitat is to contribute to the conservation of threatened and endangered species and the ecosystems upon which they depend. The outcome of the designation, triggering regulatory requirements for actions funded, authorized, or carried out by Federal agencies under section 7 of the Act, can sometimes be counterproductive to its intended purpose on non-Federal lands. According to some researchers, the designation of critical habitat on private lands significantly reduces the likelihood that landowners will support and carry out conservation actions (Main *et al.* 1999, Bean 2002, Brook *et al.* 2003). The magnitude of this negative outcome is greatly amplified in situations where active management measures (*e.g.*, reintroduction, fire management, control of invasive species) are necessary for species conservation (Bean 2002).

The Service believes that the judicious use of excluding specific areas of non-federally owned lands from critical habitat designations can contribute to species recovery and provide a superior level of conservation than critical habitat alone. For example, less than 17% of Hawaii is federally owned, but the state is home to more than 24% of all federally listed species, most of which will not recover without State and private landowner cooperation. On the island of Lanai, Castle and Cooke Resorts, LLC, which owns 99% of the island, entered into a conservation agreement with the Service. The conservation agreement provides conservation benefits to target species through management actions that remove threats (*e.g.* axis deer, mouflon sheep, rats, invasive nonnative plants) from the Lanaihale and East Lanai Regions. Specific management actions include fire control measures, nursery propagation of native flora (including the target species) and planting of such flora. These actions will significantly improve the habitat for all currently occurring species. Due to the low likelihood of a Federal nexus on the island we believe that the benefits of excluding the lands covered by the MOA exceeded the benefits of including them. As stated in the final critical habitat rule for endangered plants on the Island of Lanai:

> On Lanai, simply preventing "harmful activities" will not slow the extinction of listed plant species. Where consistent with the discretion provided by the Act, the Service believes it is necessary to implement policies that provide positive incentives to private landowners to voluntarily conserve natural resources and that remove or reduce disincentives to conservation. While the impact of providing these incentives may be modest in economic terms, they can be significant in terms of conservation benefits that can stem from the cooperation of the landowner. The continued participation of Castle and Cooke Resorts, LLC, in the existing Lanai Forest and Watershed Partnership and other voluntary conservation agreements will greatly enhance the Service's ability to further the recovery of these endangered plants.

Secretary Norton's Four Cs philosophy—conservation through communication, consultation, and cooperation—is the foundation for developing the tools of conservation. These tools include conservation grants, funding for Partners for Fish and Wildlife Program, the Coastal Program, and cooperative-conservation challenge cost-share grants. Our Private Stewardship Grant program and Landowner Incentive Program provide assistance to private land owners in their voluntary efforts to protect threatened, imperiled, and endangered

species, including the development and implementation of HCPs.

Conservation agreements with non-Federal landowners (*e.g.*, Habitat Conservation Plans (HCPs), contractual conservation agreements, easements, and stakeholder-negotiated State regulations) enhance species conservation by extending species protections beyond those available through section 7 consultations. In the past decade we have encouraged non-Federal landowners to enter into conservation agreements, based on a view that we can achieve greater species conservation on non-Federal land through such partnerships than we can through coercive methods (61 FR 63854; December 2, 1996).

**Conservation Efforts for Aquatic Systems in the Pacific Northwest**

As discussed below, much of the area that contains the physical and biological features essential for the conservation of bull trout have not been included within this final critical habitat designation. In large part, this is a result of existing management and conservation regimes that apply to watersheds in the Pacific Northwest. These and other state and local conservation planning efforts provide an exceptional level of cooperative conservation for bull trout and other salmonids.

*Analysis of Particular Plans and Areas Under Sections 3(5)(A) and 4(b)(2)* (For a complete documentation of our 3(5)(a) comparison of the protections of a critical habitat designation and the provisions of the management plans, please refer to the administrative record. For a complete documentation of our and 4(b)(2) analyses, please refer to our supporting document.)

**Nisqually National Wildlife Refuge**

The Comprehensive Conservation Plan (CCP) for the Nisqually National Wildlife Refuge (Refuge) was finalized in August 2004 and the ROD was signed on November 1, 2004. The Refuge encompasses the lower Nisqually River and delta, one of the few undeveloped large estuaries remaining within Puget Sound in Washington, and provides important FMO habitat for amphidromous bull trout. The CCP will guide management of Refuge operations, habitat restoration, and visitor services for the next 15 years. The preferred alternative maximizes estuarine restoration by increasing the current amount of FMO habitat for amphidromous bull trout in south Puget Sound, while still providing freshwater wetlands and riparian habitat on the Refuge. Restoration of the estuary is expected to result in increased primary production and thus increased food availability for nearly all fish species which depend upon estuarine and shallow marine habitats for survival, including prey fish species preferred by bull trout. We believe the CCP provides the appropriate special management required for the conservation of bull trout PCEs in this area and is, therefore, not appropriate for designating as critical habitat.

**Tribal Lands**

The longstanding and distinctive relationship between Federal and tribal governments is defined by treaties, statutes, executive orders, judicial decisions, and agreements, which differentiate tribal governments from the other entities that deal with, or are affected by, the Federal government. This relationship has given rise to a special Federal trust responsibility involving the legal responsibilities and obligations of the United States toward Indian Tribes and the application of fiduciary standards of due care with respect to Indian lands, tribal trust resources, and the exercise of tribal rights.

We identified tribal lands within proposed critical habitat where there was a tribal management or conservation plan, or the commitment to establish such a plan, that provided benefits to bull trout and considered whether or not to exclude these lands from critical habitat under subsection 4(b)(2) of the Act. Tribal lands meeting these criteria are: Confederated Tribes of Warm Springs (CTWS) in the Columbia River population; Blackfeet Nation in the Saint Mary/Belly River population; and Swinomish Tribe, Quinault Indian Nation, Muckleshoot Tribe, Jamestown S'Klallam Tribe, Hoh Tribe, and Skokomish Tribe Reservations and tribal lands within the Puget Sound-Coastal population. These tribes have played a significant role in the development of HCPs, local watershed plans, other habitat plans, or have conducted numerous habitat restoration and research projects designed to protect or improve habitat for listed species.

The CTWS has a long history of carrying out proactive conservation actions on their lands. Our dialog with CTWS has led us to believe that their resource management strategy is largely compatible with bull trout conservation. The CTWS have cooperated with Federal and State agencies, and private organizations to implement voluntary proactive conservation activities on their lands that have resulted in tangible conservation benefits for bull trout. We expect this cooperation, and the fruit that it bears (*i.e.*, bull trout conservation), to continue.

The Blackfeet Nation has demonstrated a commitment to conservation, protection, and enhancement of the fishery resource on the Blackfeet Reservation. The tribe has supported and participated in Service studies to gather data for assessing effects of the Milk River Irrigation System on bull trout within the Saint Mary River drainage. They have changed angling regulations on their reservation to maximize bull trout protection since the species was listed. The tribe has also participated in the bull trout recovery planning process and has recently made a commitment to complete a tribal bull trout management plan (W.A. Talks About, Blackfeet Tribal Business Council, in litt. 2005).

The Swinomish Tribe has a management plan that addresses surface water resources of the Swinomish Reservation, including marine tidelands, an artificial marine channel, estuarine wetlands, small streams, and freshwater wetlands. The management plan is based on existing knowledge and ongoing studies, active conservation practices, ordinances, and current management plans. It will be updated with new information obtained from ongoing surveys, habitat assessments, and other planning processes. The plan consists of regulation and implementation of updated tribal laws to protect habitat, control development, reduce pollution within the boundaries of the Reservation, restore habitat and remove fish passage barriers to contribute proactively to species recovery.

The Quinault Indian Nation and the Bureau of Indian Affairs (BIA) recently developed a forest management plan (FMP) for the entire Quinault Indian Reservation. The FMP covers all forestland (about 173,000 ac (70,011 ha)) under tribal and BIA timber management, including individual Indian-owned trust and tribally owned land. Included in the area of the FMP are the lower Quinault River, the tributaries of the lower Quinault River, the lower Queets River, the Salmon River (including the Middle and South Fork Salmon Rivers), portions of the Raft River, and portions of the Moclips River. The FMP is a 10-year plan covering the period from October 2002 through September 2012. The FMP is being implemented by the Quinault Department of Natural Resources and the BIA Taholah Field Office. Although some adverse effects to the bull trout are expected during implementation of the

plan, it is expected to provide for bull trout conservation needs.

The Skokomish Tribe has provided aquatic resource protection and restoration through a number of collaborative efforts on their reservation and other trust lands. The tribe has been working regularly with landowners, local governments, and others to implement and fund voluntary efforts that provide conservation benefits to salmonids, including bull trout. These cooperative efforts include a variety of investigative assessments, restoration and enhancement projects, property acquisitions, and floodplain/river reach analysis.

The Muckleshoot Tribe has demonstrated a commitment to conservation, protection, and enhancement of fish resources both on and off the Muckleshoot Reservation. For example, the tribe has designated all areas of the White River within its reservation, from "bluff to bluff," as a conservation zone. The tribe has also been a leading participant in gathering data for Lake Washington and preparing a Lake Washington Recovery Plan.

The Jamestown S'Klallam Tribe has a record and reputation as a participant and leader in the planning and implementation of salmonid habitat protection and restoration efforts. The tribe is dedicated to coordinating with NOAA Fisheries, the Service, and with the State of Washington in the spirit of co-management, and is also involved in active consultation and in multiple programs to protect listed salmonid species.

The Hoh Tribe has an FMP that demonstrates a commitment to protect bull trout habitat on or adjacent to its reservation. This forestry plan designates major portions of the floodplain and riparian zones adjacent to streams on the current reservation landscape for conservancy, and is filed with the BIA.

(1) Benefits of Inclusion

The principal benefit of any designated critical habitat is that Federal activities will require section 7 consultations to ensure that adequate protection is provided to avoid adverse modification or destruction of critical habitat. This would provide an additional benefit beyond that provided under the jeopardy standard. In evaluating project effects on critical habitat, the Service must be satisfied that the primary constituent elements (PCEs) of the critical habitat likely will not be altered or destroyed by proposed activities to the extent that the conservation of the affected species would be appreciably reduced. If critical habitat were designated in areas of unoccupied habitat or currently occupied areas subsequently become unoccupied, different outcomes/requirements are also likely since effects to unoccupied areas of critical habitat are not likely to trigger the need for a jeopardy analysis.

In *Sierra Club* v. *Fish and Wildlife Service*, 245 F.3d 434 (5th Cir. 2001), the Fifth Circuit Court of Appeals stated that the identification of habitat essential to the conservation of the species can provide informational benefits to the public, State and local governments, scientific organizations, and Federal agencies. The court also noted that critical habitat designation may focus and heighten public awareness of the plight of listed species and their habitats. Designation of critical habitat may contribute to conservation efforts by other parties by delineating areas of high conservation value for the bull trout.

(2) Benefits of Exclusion

The benefits of excluding Indian lands from designation include: (1) The furtherance of established national policies, our Federal trust obligations, and our deference to the tribes in management of natural resources on their lands; (2) the maintenance of effective long-term working relationships to promote the conservation of bull trout; (3) the allowance for continued meaningful collaboration and cooperation in scientific work to learn more about the conservation needs of the species; (4) continued respect for tribal sovereignty over management of natural resources on Indian lands through established tribal natural resource programs; (5) to the extent designation would provide any additional protection of bull trout habitat, costs associated with that protection would be avoided; (6) exclusion would reduce administrative costs of section 7 consultation (as discussed above, these costs are unlikely to lead to additional actual protection for bull trout habitat).

We believe that excluding these tribal lands from critical habitat will help maintain and improve our partnership relationship by recognizing their positive contribution to bull trout conservation. It will also reduce the cost and logistical burden of regulatory oversight. We believe this recognition will provide other landowners with a positive incentive to undertake voluntary conservation activities on their lands, especially where there is no regulatory requirement to implement such actions.

Tribal cooperation and support is required to prevent extinction and promote the recovery of the bull trout due to the need to implement proactive conservation actions. Future conservation efforts will require the cooperation of these tribes. Exclusion of their lands from this critical habitat designation will help us maintain and improve our partnership with them by formally recognizing the positive contributions these tribes have made to bull trout recovery, and by streamlining or reducing unnecessary regulatory oversight.

These tribes have cooperated with us to implement proactive conservation measures. They have cooperated with Federal and State agencies, and private organizations to implement voluntary conservation activities on their lands that have resulted in tangible conservation benefits.

Where consistent with the discretion provided by the Act, we believe it is necessary to implement policies that provide positive incentives to voluntarily conserve natural resources and remove or reduce disincentives to conservation. Thus, we believe it is essential for the recovery of bull trout to build on continued conservation activities with these tribes, to provide positive incentives implementing voluntary conservation activities, and to respect tribal concerns about incurring incidental regulatory or economic impacts.

(3) Benefits of Exclusion Outweigh the Benefits of Inclusion

It is possible, although unlikely, that Federal actions will be proposed that would be likely to destroy or adversely modify the habitat proposed as critical within the area governed by the above tribes. If such a project was proposed, due to the specific way in which jeopardy and adverse modification are analyzed for bull trout, discussed in detail above, it would likely also jeopardize the continued existence of the species. Few additional benefits are provided by including these tribal lands in this critical habitat designation beyond what will be achieved through the implementation of the existing tribal management/conservation plans. In addition, we expect that the benefit of informing the public of the importance of this area to bull trout conservation would be slight. Therefore, we assign relatively little weight to the benefits of designating this area as critical habitat.

In contrast, although the benefits of encouraging participation in tribal management plans, and, more broadly, helping to foster cooperative conservation are indirect, enthusiastic

tribal participation and an atmosphere of cooperation are crucial to the long-term effectiveness of the endangered species program. Therefore, we assign great weight to these benefits of exclusion. To the extent that there are regulatory benefits of including, there would be associated costs that could be avoided by excluding the area from designation. However, as we expect the regulatory benefits to be slight, we likewise give little weight to avoidance of those associated costs, as well as the additional transaction costs related to section 7 compliance. Finally, we recognize the importance of the trust and sovereignty of the tribes, and therefore assign great weight to these benefits of exclusion.

Therefore, we have determined that the benefits of inclusion for the tribes mentioned above are small, while the benefits of exclusion are more significant. Therefore, the benefits of exclusion outweigh the benefits of inclusion. Because we anticipate that little if any conservation benefit to the bull trout will be foregone as a result of excluding these lands, the exclusion will not result in the extinction of the bull trout. The Secretary exercises her discretion under section 4(b)(2) to exclude these areas from the designation.

**Military Lands**

The Navy conducts essential open water training and testing within the marine waters of Crescent Harbor and Dabob Bay, located within Puget Sound on the eastside of Whidbey Island and within the Hood Canal fiord, respectively. These areas encompass important marine nearshore habitat used by amphidromous bull trout for foraging and migration. NUWC Keyport provides state-of-the-art infrastructure and capabilities in the Pacific Northwest that have been essential to the Navy's comprehensive underwater test and evaluation programs for undersea weapons, unmanned undersea vehicles, and related combat systems, as well as to the training of Fleet personnel at the NUWC Keyport facilities. NUWC Keyport testing and training activities to support military readiness requires precision underwater tracking capabilities, underwater range sites that offer diverse environments, and varied water depths to meet their mission of test and evaluation of underwater systems. Because these activities are conducted in open marine waters, they are not included in the military's INRMP. Limitations on access to, the use of, or the enhancement of, the existing capabilities and capacities of these ranges would limit or curtail both testing and mission critical Fleet Support functions performed by NUWC Keyport for undersea warfare. These areas have been defined on NOAA charts for over 50 years and operating areas have been further delineated in recent public environmental documentation. A NEPA analysis for these areas has been conducted within the past 5 years, and includes biological assessments evaluating effects on endangered species, which were reviewed and approved by NOAA-Fisheries and the Service. These biological assessments, and associated environmental assessments, addressed bull trout and interactions with military range operations.

(1) Benefits of Inclusion

Habitat containing features essential to bull trout conservation exists within or immediately adjacent to these military open water training and testing grounds. The primary benefit of designating critical habitat on, or adjacent to, these open water training and testing grounds would result from the requirement under section 7 of the Act that Federal agencies consult with us to ensure that any proposed action authorized, funded, or carried out by a Federal agency would not destroy or adversely modify critical habitat. In addition, the designation can educate the public regarding the potential conservation value of an area. This may contribute to conservation efforts by other parties by delineating areas that have conservation value for the bull trout.

(2) Benefits of Exclusion

Designating critical habitat on these open water training and testing areas may impact their role in supporting ongoing military exercises and operations that occur at these locations. The military activities occurring at these sites are currently being conducted in a manner that minimizes impacts to bull trout habitat. In addition, the Navy already consults with us on their actions occurring in the open water training and testing areas that may have potential impacts to bull trout and their habitat under section 7 requirements.

(3) Benefits of Exclusion Outweigh the Benefits of Inclusion

Because of the relatively limited benefits arising from the designation of critical habitat, we believe the role played in supporting Navy operations, and the related importance to national security of ensuring their ability to maintain a high level of military readiness, we have determined that the national security benefits of excluding areas within or adjacent to the Crescent Harbor and Dabob Bay open water training and testing areas as critical habitat, outweigh the benefits of including them in the designation. Because these marine waters are occupied by the species, and the Navy has a statutory duty under section 7 to ensure that its activities do not jeopardize the continued existence of the bull trout, we find that the exclusion of these marine waters will not lead to the extinction of the bull trout.

**Habitat Conservation Plans**

Section 10(a)(1)(B) of the ESA authorizes us to issue to non-Federal entities a permit for the incidental take of endangered and threatened species. This permit allows a non-Federal landowner to proceed with an activity that is legal in all other respects, but that results in the incidental taking of a listed species (*i.e.*, take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity). The ESA specifies that an application for an incidental take permit must be accompanied by a conservation plan, and specifies the content of such a plan. The purpose of conservation agreements is to describe and ensure that the effects of the permitted action on covered species are adequately minimized and mitigated, and that the action does not appreciably reduce the survival and recovery of the species.

In our assessment of conservation agreements associated with this final rulemaking the analysis required for these types of exclusions requires careful consideration of the benefits of designation versus the benefits of exclusion to determine whether benefits of exclusion outweigh benefits of designation. The benefits of designation typically arise from additional section 7 protections as well as enhanced public awareness once specific areas are identified as critical habitat. The benefits of exclusion generally relate to relieving regulatory burdens on existing conservation partners, maintaining good working relationships with them, and encouraging the development of new partnerships.

Based on comments received on our proposed rule, we could not conclude that all landowners view designation of critical habitat as imposing a burden, and exclusion from designation as removing that burden and thereby strengthening the ongoing relationship. While no conservation agreement partner affirmatively requested designation, we would have viewed the exclusion as likely to harm rather than benefit the relationship. Where a conservation agreement partner has

remained silent on the benefit of exclusion of its land, we do not believe the record supports a presumption that exclusion will enhance the relationship. Similarly, we do not believe it provides an incentive to other landowners to seek a conservation agreement if our exclusions are not in response to an expressed landowner preference. We anticipate further rulemaking in the future to refine these designations, for example, in response to developments in recovery planning. As part of future revisions, we will consider information we receive from those with approved conservation agreements regarding the effect of designation on our ongoing partnership. While we have done so in the past, in this rulemaking we did not consider any pending HCPs for exclusion, primarily because none of the pending HCPs were at a point we could do so without prejudging the outcome of the ongoing HCP process and because we expect further changes to the developing HCPs. In addition, we expect to have future opportunities to refine this designation to provide credit for future activities on private lands as well as currently ongoing activities for which there was insufficient time to adequately review and make a benefits determination. When we review this designation in the future, we will consider whether any exclusion will outweigh the benefit of designation in any particular case.

During the comment period we received comments from five landowners with current HCPs that they would consider exclusion as a benefit to our ongoing relationship—Washington Department of Natural Resources (WDNR), Green Diamond Resources Company, City of Seattle Cedar River Watershed, Tacoma Water Green River, and Plum Creek/Stimson Lumber Company Native Fish HCPs.

**WDNR**

The Washington Department of Natural Resources HCP covers about 1.6 million acres of State forest trust lands within the range of the northern spotted owl in the state of Washington. The majority of the HCP (approximately 1.3 million acres) occurs west of the Cascade Crest and includes the Olympic Peninsula and Southwest Washington. The remainder of the HCP occurs on the east side of the Cascade Mountains within the range of the northern spotted owl. The HCP covers activities primarily associated with commercial forest management. It is an "all-species" HCP west of the Cascade Crest, which includes bull trout and other salmonids. On the east side of the Cascade Crest, bull trout and other aquatic species are not covered under the HCP and DNR is therefore required to follow State Forest Practice Rules for riparian management and other forestry activities. The DNR HCP lands on the west side of the Olympic Peninsula are managed as the Olympic Experimental State Forest. The multi-species portion of the HCP depends upon several broad-scale conservation approaches: Spotted owl conservation, marbled murrelet conservation, riparian conservation, certain species-specific protection measures, protection of uncommon habitats, and provisions to maintain a range of forest types across the HCP landscape.

**Green Diamond HCP**

In October 2000, an HCP (formerly referred to as the Simpson Timber HCP and currently referred to as the Green Diamond HCP) was completed and an incidental take permit was issued for forestry operations on over 261,000 acres of the company's Washington timberlands located on or adjacent to the Olympic Peninsula in Mason, Thurston, and Grays Harbor Counties. The HCP is designed to conserve riparian forests, improve water quality, prevent management-related hill-slope instability, and address hydrological maturity of small sub-basins. The plan addresses five listed species including bull trout and 46 other species. The HCP covers the land owned by Green Diamond along the lower reaches of the North Fork and South Fork Skokomish Rivers, the upper South Fork Skokomish River, West Fork Satsop River, and Canyon River. The HCP is designed to conserve riparian forests, improve water quality, prevent management-related hill-slope instability, and address hydrological maturity of small sub-basins.

**City of Seattle Cedar River Watershed HCP**

In April 2000, The Cedar River Watershed HCP was completed and an incidental take permit was issued to the City of Seattle for water withdrawal and water supply activities affecting flows in the lower Cedar River and reservoir levels in Chester Morse Lake. In addition, the plan provides for forestry restoration activities including riparian thinning, road abandonment, and timber stand improvement on over 91,000 acres in the upper Cedar River Watershed in King County. The HCP is designed to provide adequate fish flows in the lower Cedar River for the spawning and rearing of several salmonid species, to manage water levels in Chester Morse Lake and Masonry Dam Reservoir to benefit instream flows in the lower river and bull trout spawning access to lake tributaries, and to manage 91,000 acres in the upper Cedar River as an ecological reserve. Several research actions are directed at understanding how all life stages of bull trout use Chester Morse Lake and Masonry Pool and how adult bull trout use tributaries to the lake for spawning. The HCP covers 83 species of fish and wildlife including bull trout and six other listed species.

**Tacoma Water Green River HCP**

The Tacoma Water Green River Water Supply Operations and Watershed Protection HCP was completed in July of 2001 and addresses upstream and downstream fish-passage issues, flows in the middle and lower Green River, and timber- and watershed-management activities on about 15,000 acres of Tacoma-owned land in the upper Green River Watershed. The HCP covers 32 species including bull trout. This HCP required close coordination with the U.S. Army Corps of Engineers (COE) because of their facility at Howard Hanson Dam. Tacoma's HCP includes the following features: An upstream fish-passage facility which will open up 220 square miles of previously blocked fish habitat; sponsorship and funding for a downstream fish-passage facility at the Corps of Engineers Howard Hanson Dam; water-flow improvements; improved riparian forest management on Tacoma's lands; and several major habitat restoration projects.

**Plum Creek/Stimson Lumber Company Native Fish HCPs**

Plum Creek Timber Company initiated an effort in 1997 to develop a conservation strategy for native salmonids (including bull trout), occurring on 1.6 million acres of Plum Creek's Timberlands in Montana, Idaho, and Washington. The stated purpose of the Plum Creek Native Fish Habitat Conservation Plan (NFHCP) was to help conserve native salmonids and their ecosystems while allowing Plum Creek to continue to conduct commercial timber harvest within a framework of long term regulatory certainty and flexibility. The Stimson Lumber NFHCP was created when the Stimson Lumber Company acquired certain lands previously owned by Plum Creek and assumed all of the Plum Creek NFHCP commitments. Because of the commonality, for purposes of this discussion, the Plum Creek and Stimson NFHCP are considered one and the same. The Plum Creek NFHCP covers approximately 1.4 million acres, all within the range of the Columbia River basin. NFHCP actions should maintain

a high-level of water quality. They are expected to maintain the thermal regime of streams within the range of normal variation, and contribute to the maintenance of complex stream channels, appropriate substrates, a natural hydrologic regime, ground-water sources and subsurface connectivity, migratory corridors, and an abundant food base. NFHCP actions are not expected to introduce or favor nonnative competitors or predators. In short, the NFHCP is expected to benefit the aquatic environment by providing a gradual improvement in the cold and clean water as well as complex and connected habitat necessary for protection and restoration of bull trout.

(1) Benefits of Inclusion of the WDNR, Green Diamond, City of Seattle Cedar River Watershed, Tacoma Water Green River, and Plum Creek/Stimson Lumber Company Native Fish HCPs

The principal regulatory benefit of critical habitat is that federally authorized, funded, or carried out activities require consultation pursuant to section 7 of the Act to ensure that they will not destroy or adversely modify critical habitat. In the recent *Gifford Pinchot* decision, the 9th Circuit Court of Appeals has ruled that adverse modification evaluations require consideration of impacts on the recovery of species. Conducting section 7 consultations would provide benefits on HCP lands with a Federal nexus by helping ensure the integrity of these lands is maintained. For example, if a federally funded road project was proposed to go across respective HCP lands that were designated as critical habitat, a consultation would need to be conducted to ensure the designated critical habitat was not destroyed or adversely modified to the point of appreciably diminishing its habitat features essential to bull trout recovery.

Designation of critical habitat facilitates state and local regulatory agencies in taking further protective measures where critical habitat is designated resulting in potential additional changes in operations at the aforementioned hydroelectric projects. In fact, State law requires consideration of additional rules and areas for protection upon designation of critical habitat.

To the extent that critical habitat would result in environmental protection (*e.g.*, changes to Federal projects that otherwise would have resulted in destruction or adverse modification) that would exceed the protection garnered from other environmental regulations (*e.g.*, Clean Water Act), there would be some benefit associated with maintaining fish passage survival standards, fish production through hatcheries to compensate for population losses, and tributary habitat loss compensation that would translate into economic benefits such as those that may result from increased recreational fishing opportunities for other species that would benefit from such management.

Another recognized benefit of including lands or sections of rivers in critical habitat is that the designation of critical habitat serves to educate landowners, hydroelectric operators, state and local governments, and the public regarding the potential conservation value of an area. This helps focus and contribute to conservation efforts by other parties by clearly delineating areas of high conservation value for bull trout. Designation of critical habitat would inform state agencies and local governments about areas that could be conserved under state laws or local ordinances, such as the Washington State Growth Management Act or Washington State Shoreline Management Act which encourage the protection of "critical areas" including fish and wildlife habitat conservation areas based on the best available science.

(2) Benefits of Exclusion of the WDNR, Green Diamond, City of Seattle Cedar River Watershed, Tacoma Water Green River, and Plum Creek/Stimson Lumber Company Native Fish HCPs

We identified a number of possible benefits of excluding the area covered by these HCPs from critical habitat designation. First, to the extent designation would provide any additional protection of bull trout habitat, costs associated with that protection would be avoided. Second, exclusion would reduce largely redundant administrative costs of section 7 consultation; as discussed above, these costs are unlikely to lead to additional actual protection for bull trout habitat. Third, exclusion would provide an incentive for participation in the development of new HCPs. Fourth, exclusion would help to foster an atmosphere of cooperation in the conservation of endangered species.

(3) Benefits of Exclusion Outweigh the Benefits of Inclusion for the WDNR, Green Diamond, City of Seattle Cedar River Watershed, Tacoma Water Green River, and Plum Creek/Stimson Lumber Company Native Fish HCPs

As discussed above, it is possible, although unlikely, that any Federal action will be proposed that would be likely to destroy or adversely modify the habitat proposed as critical within the area governed by these HCPs. If such a project was proposed, due to the specific way in which jeopardy and adverse modification are analyzed for bull trout, discussed in detail in the preamble, it would likely also jeopardize the continued existence of the species. In addition, as discussed above, we expect that the benefit of informing the public of the importance of this area to bull trout conservation would be slight. Therefore, we assign relatively little weight to the benefits of designating this area as critical habitat.

In contrast, although the benefits of encouraging participation in HCPs, particularly large-scale HCPs, and, more broadly, helping to foster cooperative conservation are indirect, enthusiastic HCP participation and an atmosphere of cooperation are crucial to the long-term effectiveness of the endangered species program. Therefore, we assign great weight to these benefits of exclusion. To the extent that there are regulatory benefits of including, there would be associated costs that could be avoided by excluding the area from designation. However, as we expect the regulatory benefits to be slight, we likewise give little weight to avoidance of those associated costs, as well as the additional transaction costs related to section 7 compliance.

Therefore, we have determined that the benefits of inclusion of the areas covered by these HCPs are small, while the benefits of exclusion are more significant. Therefore, the benefits of exclusion outweigh the benefits of inclusion. Because we anticipate that little if any conservation benefit to the bull trout will be foregone as a result of excluding these lands, the exclusion will not result in the extinction of the bull trout. The Secretary exercises her discretion under section 4(b)(2) to exclude these areas from the designation (see comprehensive exclusion language in the preamble).

For those conservation agreements, we analyzed the activities covered by the agreement, the protections afforded by the agreement, and the Federal activities that are likely to occur on the affected lands. We considered the number of stream miles within these lands and the number of expected section 7 consultations in those areas. From this information we determined the benefit of designation, which we then weighed against the benefit of exclusion. We concluded that the benefits of exclusion species outweigh the benefits of designation and therefore have excluded lands covered by these agreements in this final designation.

The analysis is described in further detail in the FWS Administrative Record. We have determined that these exclusions, together with the other exclusions described in this rule, will not result in extinction of the species (for a complete documentation of our 3(5)(a) and 4(b)(2) analyses, please refer to our supporting document, *Bull Trout Critical Habitat 3(5)(a) and 4(b)(2) Analyses).*

**Lewis River Hydroelectric Projects Conservation Easements**

There are four projects and three dams that impound over 30 miles of river habitat on the Lewis River in Washington. They are located in portions of Clark, Cowlitz, and Skamania Counties. Bull trout are present in all of the reservoirs; the upper two reservoirs have the most significant populations and also support spawning populations. A Settlement Agreement (Agreement) for the relicensing of the Yale, Merwin, Swift No. 1, and Swift No. 2 hydroelectric projects was signed on November 30, 2004. Conservation measures are incorporated in the Agreement to minimize or compensate for the effects of the projects on listed species, including bull trout. Conservation measures for bull trout include perpetual conservation covenants on PacifiCorp's lands in the Cougar/Panamaker Creek area and PacifiCorp's and Cowlitz PUD's lands along the Swift Creek arm of Swift Creek Reservoir, upstream and downstream fish passage improvements at all reservoirs, limiting-factors analysis for bull trout to determine additional enhancement measures, public information program to protect bull trout, and monitoring and evaluation efforts for bull trout conservation measures. This agreement will also restore anadromous salmon to the upper Lewis River system, restoring a significant part of the historic forage base for bull trout.

(1) Benefits of Inclusion

Designation of critical habitat for bull trout on lands managed under Lewis River Hydroelectric Projects Conservation Easements would provide protection from "destruction or adverse modification" of designated critical habitat under section 7 of the Act. However, without designation, a certain amount of habitat protection would be provided through the jeopardy standard. As noted earlier, based on our review of previous bull trout consultations under this standard, we have found little to indicate that there would be additional habitat protections generated by the designation beyond those provided through the jeopardy standard.

If critical habitat was designated in areas of unoccupied habitat or currently occupied areas that subsequently become unoccupied, there would not be a jeopardy analysis for the species. The adverse effect to critical habitat would have to rise to the level of destruction/adverse modification to effect changes in the proposed action via a Reasonable and Prudent Alternative. Since the destruction/adverse modification determination is made in the context of an entire critical habitat designation, this would be a rare occurrence.

Designating critical habitat can educate the public and management agencies about the distribution of areas containing features essential to the conservation of a species. In areas lacking a bull trout-specific management plan, designation can guide projects to avoid impacts to listed species and can help focus recovery efforts. However, we believe little additional informational benefit will be gained by including Swift and Cougar Creeks in designated critical habitat for bull trout. PacifiCorp has begun implementing conservation recommendations, provided in our 2002 biological opinion, that include posting interpretive signs to educate anglers on identifying and conserving native char, and techniques for catch and release to minimize incidental hooking mortality of bull trout. While we believe educational benefits are important for the conservation of bull trout, we believe it has already been achieved through PacifiCorp's conservation easement, publication of the proposed critical habitat rule, the many public and interagency meetings that have been held to discuss the proposal, and discussion contained in this final rule.

(2) Benefits of Exclusion

The complex process of negotiating relicensing for the Lewis River hydroelectric projects has been ongoing for 9 years. We have established valuable working relationships with the PacifiCorp, Cowlitz County PUD, and the other participants during these complex negotiations. Through the relicensing negotiations, we have built trust and encouraged open dialogue regarding aquatic and riparian management issues among the participants.

By excluding lands included in the two conservation easements from designated critical habitat we will: (1) Maintain and enhance our ability to continue working with PacifiCorp, Cowlitz County PUD, other relicensing applicants, and FERC; and (2) other jurisdictions, private landowners, and other entities will likely continue to see the benefit of working cooperatively with us. This will provide incentives to develop other conservation agreements, or other conservation actions such as HCPs, to provide the bases for future opportunities to conserve species and their habitats. Negotiating conservation measures under conditions of mutual trust can result in greater conservation benefits to the species than would result from including Swift and Cougar Creeks in designated critical habitat.

Exclusion would also reduce administrative costs of conducting section 7 consultations on bull trout critical habitat (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section above).

(3) Benefits of Exclusion Outweigh the Benefits of Inclusion

It is possible, although unlikely, that any Federal action will be proposed that would be likely to destroy or adversely modify the habitat proposed as critical within the area governed by the Lewis River Conservation Easement. If such a project was proposed, due to the specific way in which jeopardy and adverse modification are analyzed for bull trout, discussed in detail above, it would likely also jeopardize the continued existence of the species. In addition, as discussed above, we expect that the benefit of informing the public of the importance of this area to bull trout conservation would be slight. Therefore, we assign relatively little weight to the benefits of designating this area as critical habitat.

In contrast, although the benefits of encouraging participation in conservation partnerships, particularly large-scale conservation projects, and, more broadly, helping to foster cooperative conservation are indirect, enthusiastic conservation project participation and an atmosphere of cooperation are crucial to the long-term effectiveness of the endangered species program. Therefore, we assign great weight to these benefits of exclusion. To the extent that there are regulatory benefits of including, there would be associated costs that could be avoided by excluding the area from designation. However, as we expect the regulatory benefits to be slight, we likewise give little weight to avoidance of those associated costs, as well as the additional transaction costs related to section 7 compliance.

Therefore, we have determined that the benefits of inclusion of the areas covered by this conservation easement are small, while the benefits of exclusion are more significant.

Therefore, the benefits of exclusion outweigh the benefits of inclusion. Because we anticipate that little if any conservation benefit to the bull trout will be foregone as a result of excluding these lands, the exclusion will not result in the extinction of the bull trout. The Secretary exercises her discretion under section 4(b)(2) to exclude these areas from the designation (see comprehensive exclusion language in the preamble).

**Washington State Forest Practices Rules and Forest Practices Regulations for Bull Trout (FFR)**

Beginning in late 1996, faced with the imminent listing of several salmonid species, including bull trout, under the Endangered Species Act (ESA), a diverse group of stakeholders in Washington State agreed to address emerging riparian habitat issues. After almost 2 years of negotiations, representatives of environmental interests and some Tribes withdrew from negotiations. The remaining participants continued negotiating and eventually agreed to the Forests and Fish Report in April 1999. Later that year the Washington State Legislature passed the Forest Practices Salmon Recovery Act (Engrossed Substitute House Bill 2091), which directed the Washington Forest Practices Board to adopt new rules, encouraging the Forest Practices Board to follow the recommendations of the Forests and Fish Report (FFR). To further the purpose of regulatory stability, the Forest Practices Salmon Recovery Act also limited future changes to the new rules so that outside of a court order or legislative directive, new rules could be adopted by the Forest Practices Board "only if the changes or new rules are consistent with the recommendations resulting from the scientifically based adaptive management process" included in the Forests and Fish Report. The language further solidified the adaptive management process as a key component of the conservation program.

Following the passage in 1999 of emergency forest practices rules based on the Forests and Fish Report, the Washington Forest Practices Board adopted new permanent rules in May 2001. Effective July 2001, these rules cover a wide variety of forest practices and include: (1) A new, more functional, classification of rivers and streams on non-federal and non-tribal forestland; (2) improved plans for properly designing, maintaining, and upgrading existing and new forest roads; (3) additional protections for unstable slopes; and (4) greater protections for riparian areas intended to restore or maintain properly functioning aquatic and riparian habitat conditions. In addition to these substantive provisions, the rules adopted the procedural recommendations of the Forests and Fish Report that address adaptive management, training, and other features. The Washington State Legislature and U.S. Congress continued to support the collaboration with significant funding for the research, monitoring, and adaptive management activities called for in the Forests and Fish Report.

(1) Benefits of Inclusion

Designation of critical habitat for bull trout on lands managed under Washington State Forest Practices Rules would provide protection from "destruction or adverse modification" of designated critical habitat under section 7 of the Act. However, without designation, a certain amount of habitat protection would be provided through the jeopardy standard. As noted earlier, based on our review of previous bull trout consultations under this standard, we have found little to indicate that there would be additional habitat protections generated by the designation beyond those provided through the jeopardy standard.

If critical habitat was designated in areas of unoccupied habitat or currently occupied areas that subsequently become unoccupied, there would not necessarily be a jeopardy analysis for the species. The adverse effect to critical habitat would have to rise to the level of destruction/adverse modification to effect changes in the proposed action via a Reasonable and Prudent Alternative. Since the destruction/adverse modification determination is made in the context of an entire critical habitat designation, this would be a rare occurrence.

In addition to the prescriptions in the Rules for protecting riparian and aquatic habitat that benefits the broad range of aquatic species, the Rules include specific provisions for protecting bull trout habitat in eastern Washington. Beyond this, there is adaptive management research and monitoring required under the Washington Forest Practices Rules that specifically addresses the effectiveness and validity of the Rules in protecting bull trout habitat.

Designating critical habitat can educate the public and management agencies about the distribution of areas containing features essential to the conservation of a species. In areas lacking a bull trout-specific management plan, designation can guide projects to avoid impacts to listed species and can help focus recovery efforts. Many landowners subject to Washington State Forest Practices Rules are likely aware of the concerns for bull trout conservation. We expect that designated critical habitat in these areas would provide some additional context, protection, or benefit that would enhance existing, or future, bull trout conservation efforts.

(2) Benefits of Exclusion

The Washington Forest Practices Rules require a large-scale, comprehensive adaptive management program that is supported by in-kind participation by the stakeholders that authored the Forests and Fish Report. The basis for the Washington Forest Practices Rules is the Forests and Fish Report. The Forests and Fish Report was created in a collaborative effort by multi-stakeholders to identify goals and prescriptions to protect riparian and aquatic-dependent species, including bull trout. This cooperative conservation is crucial to the long-term recovery of listed species.

Exclusion of areas covered by the Washington Forest Practices Rules from critical habitat designation would be viewed as honoring the assurances made during the negotiations of the Forests and Fish Report by most Washington forestland stakeholders. The assurances being that the Rules provide adequate minimization and mitigation measures to address bull trout conservation. Failure to exclude the Rules could be viewed as an attempt to extract additional and "unfair" mitigation in violation of the principles behind the Washington Forest Practices Rules and Forests and Fish Report negotiations. Cooperation between the Service and the State to develop and update the Washington Forest Practices Rules for terrestrial, threatened and endangered species would be enhanced through continued cooperative relationships.

In addition, failure to exclude the Rules could be a disincentive for other entities contemplating collaborative rule-making as it would imply that the Service intends to impose additional regulatory burdens once conservation measures have been agreed upon and could undermine the progress made by generating perceptions that we might erode those assurances.

Exclusion would also reduce administrative costs of conducting section 7 consultations on bull trout critical habitat (see Section 3(5)(A) and Exclusions Under Section 4(b)(2)—Generally section above).

(3) Benefits of Exclusion Outweigh the Benefits of Inclusion

It is possible, although very unlikely, that any Federal action would be proposed that would be likely to destroy or adversely modify the habitat proposed as critical within the lands regulated by the Washington Forest Practices Rules. If such a project was proposed, due to the specific way in which jeopardy and adverse modification are analyzed for bull trout, discussed in detail in the preamble, it would likely also jeopardize the continued existence of the species.

The forest landowners regulated by the Washington Forest Practices Rules, as well as those organizations that are directly or indirectly affected by the Rules, are already aware of the need for protecting and conserving bull trout and their habitat.

Based on the above discussion, we assign relatively little weight to the benefits of designating the lands regulated by the Washington Forest Practices Rules as critical habitat for bull trout. In contrast, because exclusions of these areas from critical habitat will be very beneficial to our relationships with stakeholders in the FFR process, and those relationships area crucial to the long-term recovery of bull trout and other listed species, we assign great weight to the benefits of excluding these lands from designation. Therefore, the benefits of exclusion outweigh the benefits of inclusion. Because we anticipate that little, if any, conservation benefit to bull trout will be foregone as a result of excluding these lands, the exclusion will not result in the extinction of bull trout. The Secretary exercises her discretion under section 4(b)(2) to exclude these areas from the designation (see comprehensive exclusion language in the preamble).

**Jarbidge River Bull Trout Critical Habitat Unit**

During the last decade, the Jarbidge River watershed has been the site of substantial conflicts between Federal officials and local interests concerning the conservation and management of bull trout, the Jarbidge River, and associated uplands (Williams 2001). These conflicts, which involved anti-government protests and demonstrations, have had an overall negative impact on the Federal government's ability to work cooperatively with local officials and private landowners to conserve and recover the bull trout and other listed species on Federal and non-federal lands in northern Nevada (Sonner 2001, Williams 2001, Robert 2002). This cooperative relationship is particularly important in relation to achieving voluntary actions to improve bull trout populations and habitat which are identified in the recovery plan.

During the last year, however, both the Service and the U.S. Forest Service have dedicated significant resources and have made encouraging progress in restoring cooperative relationships with the local community. For example, both agencies have received a "Certificate of Appreciation" from Elko County on September 7, 2005, for providing support for the installation of a temporary bridge over the Jarbidge River. Maintenance and improvement of such relationships is key to recovering listed species and is a cornerstone of the Secretary's "4 C's" policy. The active support of local officials and landowners for the conservation of bull trout increases the species likelihood of recovery. In contrast, local opposition to bull trout conservation efforts could be a significant impediment to the species' recovery, especially on non-federal lands, where the voluntary efforts will achieve actions identified in the recovery plan.

Given this history, we considered whether to exclude non-federal lands in the Jarbidge River Bull Trout Critical Habitat Unit (CHU) from the final critical habitat designation. Pursuant to section 4(b)(2) we analyzed whether the benefits of designating these lands were outweighed by the benefits of excluding these lands from a final designation. In the following section, we evaluate a "without critical habitat" scenario and compare it to a "with critical habitat" scenario. The difference between the two scenarios measured the net negative or positive impacts attributable to the designation of critical habitat. We paid particular attention to the following issues:

- The degree to which a critical habitat designation would confer regulatory conservation benefits on these species (*e.g.*, high, medium, low);
- Whether the designation would educate members of the public such that conservation efforts would be enhanced;
- Whether a critical habitat designation would have a positive, neutral, or negative impact on local support for bull trout conservation, including current cooperative efforts on privately-owned lands; and
- To what extent a critical habitat designation is likely to encourage or discourage future cooperative efforts with local landowners and officials.

If a critical habitat designation results in a quantifiable reduction in the likelihood that existing or future voluntary, cooperative conservation activities will be carried out on non-federal lands, and at the same time fails to confer a counter-balancing positive regulatory or educational benefit to the species, then the benefits of excluding such areas from critical habitat outweigh the benefits of including them.

(1) Benefits of Including the Jarbidge River Bull Trout Critical Habitat Unit

The principal benefit of designating critical habitat on non-federal lands is that Federal activities that may affect such habitat are subject to consultation pursuant to section 7 of the Act. Such consultation requires every Federal agency to ensure that any action it authorizes, funds, or carries out is not likely to result in the destruction or adverse modification of critical habitat. This requirement complements the section 7 provision that Federal agencies ensure that their actions are not likely to jeopardize the continued existence of a listed species.

The Jarbidge River is currently occupied by bull trout. Any Federal activity adversely affecting bull trout will require section 7 consultations with the Service, and any non-federal action that may take a bull trout will require a Section 10 permit. Although there are potentially a small number of federally-funded, authorized, or implemented activities on private and State lands that may trigger section 7 consultation, the subject lands comprise only a minor portion (8 percent) of the total habitat (131 mi, 211 km) under consideration for this CHU. Specifically, there are eight stream reaches crossing private lands and four reaches crossing Idaho State school land sections within occupied bull trout habitat in this CHU. Only three of these isolated reaches are 1 mi (1.6 km) or more in length, and all are surrounded by vast expanses of public lands. One of the private reaches is within the town of Jarbidge, Nevada, and another is within the town of Murphy Hot Springs, Idaho.

In analyzing whether Federal actions might jeopardize the continued existence of the bull trout, the Service has focused on the viability of core area populations without making distinctions between what is necessary for survival versus recovery. Because the Service views the conservation role of critical habitat units as supporting viable bull trout core area populations, the Service anticipates that few Federal actions would adversely modify critical habitat but not jeopardize the species.

The Service considered the possibility of local bull trout extirpation in the Jarbidge River (which might reduce the protection afforded bull trout by the

jeopardy prohibition) given the data available. In general, the Service does not anticipate significant extirpations in this area, although such an event cannot be completely ruled out as stochastic events such as conflagrations have in the past eliminated populations elsewhere within the species' range. If such an event was to occur, and the entire population was extirpated, the designation of critical habitat could provide important protection to the habitat to preserve it for eventual recolonization or reintroduction. However, the Service would consider the habitat occupied for 20 years subsequent to the temporal extirpation, providing ample opportunity for restoration of the population. In addition, the benefit would be moderated to the extent that protections other than the prohibition on jeopardizing bull trout would remain in place. For instance, State angling regulations would remain in place to manage bull trout habitat.

In sum, the designation of critical habitat on non-federal lands in the Jarbidge River CHU would confer a relatively low level of additional regulatory benefits beyond the status quo.

Another potential benefit is that the designation of critical habitat can serve to educate the public regarding the potential conservation value of an area and thereby focus and contribute to conservation efforts by clearly delineating areas of high conservation value for certain species. Such a benefit could be substantial in geographic areas where the presence of bull trout was a relatively new or unknown phenomenon, and there was a need to educate the local community to the species' presence and conservation needs. However, such a situation does not exist anywhere in the Jarbidge River CHU. Due in large part to the extensive media attention applied to the high-profile conflicts that accompanied the listing of the species and previous critical habitat proposals; there is widespread knowledge of the species' local status and conservation needs. State fish and game officials have also worked hard to educate the local populace, publishing information on the species and posting signs at public access points along the river. Therefore, it is unlikely that a final critical habitat designation would provide any significant new or additional educational benefit beyond the status quo.

(2) Benefits of Excluding the Jarbidge River Bull Trout Critical Habitat Unit

The designation of critical habitat on non-federal lands can have both negative and positive impacts on the conservation of listed species (Bean 2002). There is a growing body of documentation that some regulatory actions by the Federal government, while well-intentioned and required by law, can under certain circumstances have unintended negative consequences for the conservation of species on non-federal lands (Brook *et al.* 2003, Bean 2002, James 2002, Koch 2002, Wilcove *et al.* 1996). Some landowners fear a decline in value of their properties because of their belief that the Act may restrict future land-use options where threatened or endangered species are found. Consequently, endangered species are perceived by many landowners as a financial liability, which sometimes results in anti-conservation incentives to these landowners (Brook *et al.* 2003, Main *et al.* 1999).

There are reasonable concerns that a critical habitat designation in the Jarbidge River may negatively affect cooperative relationships between Federal and local officials and discourage voluntary, cooperative conservation efforts. The watershed has been the site of substantial conflicts between Federal government agencies, local government entities (Elko County, Nevada), organized private groups (Jarbidge Shovel Brigade), and private individuals. These conflicts primarily have been over roads and public access issues with the U.S. Forest Service, but they have resulted in activities with adverse environmental impacts to bull trout and their habitat. Substantial damage to stream channel and riparian habitats within bull trout occupied reaches occurred due to local actions while bull trout were proposed for listing. Anti-government demonstrations and on-the-ground activities (road construction, stream diversions, channel alterations, tree cutting, and driving in streams) by other groups and individuals escalated when the Service emergency-listed the Jarbidge River bull trout in 1998. The demonstrations and protests continued for several years.

According to some researchers, the designation of critical habitat on private lands significantly reduces the likelihood that many landowners will support and carry out conservation actions (Bean 2002, Brook *et al.* 2003, Main *et al.* 1999). The magnitude of this negative outcome is greatly amplified in conservation situations, such as on privately-owned lowlands in California and Nevada, where it is insufficient simply to prohibit harmful activities. Instead, it is necessary in most cases to encourage and carry out active management measures to prevent extinctions and promote recovery (Bean 2002). Consideration of this concern is especially important in areas where recovery efforts require access and permission for survey and restoration efforts. Simply preventing "harmful activities" will not slow the extinction of listed species or promote their recovery. Proactive, voluntary conservation efforts are necessary to prevent the extinction and promote the recovery of these species (Wilcove and Lee 2004, Shogren *et al.* 1999).

The Service is working to promote cooperative activities in the Jarbidge area. Federal and local government entities working in the Jarbidge River watershed have spent considerable time improving communications and developing personal working relationships to resolve differences and move forward in a positive manner on watershed issues. In particular, the agencies have come to an agreement resolving future road construction and maintenance issues within bull trout occupied areas on public and private lands in the watershed, as presented in the U.S. Forest Service's Jarbidge Canyon Final Environmental Impact Statement issued in April, 2005.

In addition, the Federal agencies and local county government officials recently collaborated on a project to provide access to the town of Jarbidge on an emergency basis using volunteer labor by the Jarbidge Shovel Brigade and other local individuals to help install a temporary bridge donated by the county on private land after a flood destroyed two U.S. Forest Service bridges. On September 7, 2005, the Elko County Board of County Commissioners presented the Service, U.S. Forest Service, and Jarbidge Shovel Brigade each with a Certificate of Appreciation for assistance in completing this project.

The Service is also currently working with a private landowner (Mr. Bert Brackett) and the Nevada Department of Wildlife to acquire the single largest reach of bull trout habitat on private land in the entire watershed (nearly 4 mi, 6.4 km) through a Service Recovery Lands Acquisition Program grant. The State would then manage this habitat specifically for the purpose of bull trout conservation and recovery. The Service is concerned that acquisition negotiations could be adversely affected by designation of critical habitat at this time due to a resurgence of local anti-federal sentiment following a possible designation on non-federal lands.

The Service is also preparing to finalize the May 2004 draft recovery plan for the Jarbidge River bull trout population and to hold stakeholder meetings in FY06. Public and local government participation at these meetings is vital in obtaining local input during the recovery planning process. Participation at these meetings by private landowners—and support for conservation on their lands—may be adversely affected by designation of critical habitat on their non-federal lands.

In sum, we conclude that the designation of critical habitat on non-federal lands in the Jarbidge River CHU would have significant negative impacts on the improving cooperative relationship between Federal agencies and local officials and landowners. This negative impact would in turn adversely affect bull trout conservation because local support and participation is necessary for bull trout recovery actions, all of which are voluntary on non-federal lands. Avoiding these negative impacts is a benefit of excluding these lands from the final critical habitat designation.

(3) Benefits of Exclusion Outweigh the Benefits of Inclusion for the Jarbidge River Critical Habitat Unit

As discussed above, it is possible although unlikely that a Federal action will be proposed that would be likely to destroy or adversely modify the habitat proposed as critical in the Jarbidge River CHU. If such a project was proposed, due to the specific way in which jeopardy and adverse modification are analyzed for bull trout and as discussed in detail in the preamble, it would likely also jeopardize the continued existence of the species and thus be restricted by the Act. In addition, we expect that the benefit of informing the public of the importance of this area to bull trout conservation would be slight. Therefore, we assign relatively little weight to the benefits of designating this area as critical habitat.

In contrast, the need to maintain and expand recent gains in cooperative conservation efforts in the Jarbidge watershed is crucial to the long-term effectiveness of bull trout recovery. Therefore, we assign great weight to these benefits of exclusion. To the extent that there are regulatory benefits of including, there would be associated costs that could be avoided by excluding the area from designation. However, as we expect the regulatory benefits to be slight, we likewise give little weight to avoidance of those associated costs, as well as the additional transaction costs related to section 7 compliance.

The continuation of cooperative efforts in the watershed, as well as implementation of bull trout recovery actions on non-federal lands, is dependent on maintaining effective working relationships with local entities. We believe that designation of critical habitat on non-federal lands within the Jarbidge River CHU would adversely affect our improved working relationships with landowners and other governmental entities, as well as the benefits to bull trout resulting from these relationships. In addition, we believe that such designation may also impair the long-term working relationships of other Federal agencies with land management responsibilities in the Jarbidge River watershed.

Therefore, we have determined that the benefits of inclusion of the non-federal areas within the Jarbidge River CHU are small, while the benefits of exclusion are more significant. Thus the benefits of exclusion outweigh the benefits of inclusion. Because we anticipate that little if any conservation benefit to the bull trout will be foregone as a result of excluding these lands, and the species and much of its habitat is still protected under section 7 as described above, the exclusion will not result in the extinction of the bull trout. The Secretary exercises her discretion under section 4(b)(2) to exclude these areas from the designation.

*Federal Land Management Plans*

We have determined that PACFISH, INFISH, the Interior Columbia Basin Ecosystem Management Project (ICBMP) strategy, and the Northwest Forest Plan (NWFP) Aquatic Conservation Strategy (ACS) provide a level of conservation and adequate protection and special management for the PCEs essential to the conservation of bull trout at least comparable to that achieved by designating critical habitat. As a result, those lands are not being designated critical habitat as they do not meet the statutory definition. In many specific ways these plans are superior to a designation in that they require enhancement and restoration of habitat, acts not required by the designation.

PACFISH is the Interim Strategy for Managing Anadromous Fish-Producing Watersheds and includes Federal lands in Western Oregon and Washington, Idaho, and Portions of California. INFISH is the Interim Strategy for Managing Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada. Each strategy amended Forest Service Land and Resource Management Plans and BLM Resource Management Plans. Together PACFISH and INFISH cover thousands of miles of waterways within 16 million acres and provide a system for reducing effects from land management activities to aquatic resources through riparian management goals, landscape scale interim riparian management objectives, riparian habitat conservation areas, riparian standards, watershed analysis, and the designation of Key and Priority watersheds. These interim strategies have been in place since 1992 and are part of the management plans for the BLM and USFS lands. In addition to protecting and managing the PCEs associated with critical habitat, the strategies include restoration and enhancement of all existing habitat. The BLM and USFS are currently in the process of updating their management plans, few have been completed, but those that have, are discussed below. The new plans are more protective, more complete, and more outcome based than the former plans. In addition, they are recovery based, as opposed to simply maintaining the status quo.

The ICBMP is the strategy that replaces the PACFISH and INFISH interim strategies. The Southwest Idaho Land and Resource Management Plan (LRMP) is the first LRMP under the strategy and provides measures that protect and restore soil, water, riparian and aquatic resources during project implementation while providing flexibility to address both short- and long-term social and economic goals on 6.6 million acres of National Forest lands. This plan includes a long-term Aquatic Conservation Strategy that focuses restoration dollars in priority subwatersheds identified as important to achieving ESA, Tribal, and CWA goals. The Southwest Idaho LRMP replaces the interim PACFISH/INFISH strategies and adds additional conservation elements, specifically, providing an ecosystem management foundation, a prioritization for restoration integrated across multiple scales, and adaptable active, passive and conservation management strategies that address both protection and restoration of habitat and 303(d) stream segments, all of which are far beyond any protection provided by a critical habitat designation.

The Southeast Oregon Resource Management Plan (SEORMP) and Record of Decision is the second LRMP under the ICBMP strategy which describes the long-term (20+ years) plan for managing the public lands within the Malheur and Jordan Resource Areas of the Vale District. The SEORMP is a general resource management plan for

4.6 million acres of BLM administered public lands primarily in Malheur County with some acreage in Grant and Harney Counties, Oregon. The SEORMP contains resource objectives, land use allocations, management actions and direction needed to achieve program goals. Under the plan riparian areas, floodplains, and wetlands will be managed to restore, protect, or improve their natural functions relating to water storage, groundwater recharge, water quality, and fish and wildlife values.

The Northwest Forest Plan covers 24.5 million acres in Washington, Oregon, and northern California. The ACS is a component of the Northwest Forest Plan. It was developed to restore and maintain the ecological health of watersheds and the aquatic ecosystems. The four main components of the ACS (Riparian Reserves, Watershed Analysis, Key Watersheds, and Watershed Restoration) are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems.

These plans establish watershed and riparian goals to maintain or restore all fish habitat;

- Establish aquatic and riparian habitat management objectives;
- Delineate riparian management areas;
- Provide specific standards and guidelines for management activities (timber harvesting, grazing, fire suppression, and mining) in riparian areas;
- Provide a system of key watersheds to protect and restore important fish habitats;
- Call for watershed analyses and subbasin reviews to set priorities and provide guidance on priorities for watershed restoration; and,
- Provide general guidance on implementation and effectiveness monitoring.

It is the objective of the Forest Service and the Bureau of Land Management to manage and maintain habitat and where feasible, and restore habitats that are degraded. These plans provide for the protection of areas that could contribute to the recovery of fish and, overall, improve riparian habitat and water quality throughout the basin. These objectives are accomplished through such activities as closing and rehabilitating roads, replacing culverts, changing grazing and logging practices, and re-planting native vegetation along streams and rivers.

The Forest Service, Natural Resources Conservation Service, and the Bureau of Land Management also provide funds and technical expertise for restoration projects on private lands. Field offices work with local watershed councils and groups to plan and carry out priority restoration projects on both Federal and non-federal lands.

These and other state and local conservation planning efforts provide an exceptional level of cooperative conservation for bull trout and other salmonids and for this reason we have determined that the PCEs in the areas covered by the plans are not in need of special management or protection. These lands have also been excluded using the Secretary's discretion under section 4(b)(2). The following outlines our 3(5)(a) and 4(b)(2) analyses related to exclusions (for a complete documentation of our 3(5)(a) and 4(b)(2) analyses, please refer to our supporting documentation in the administrative record and the comparison of protections provided by a critical habitat designation and the various management plans.

(1) Benefits of Including Lands Managed Under PACFISH, INFISH, the Southwest Idaho Land and Resource Management Plans, the Southeast Oregon Resource Management Plan, and ACS

Designation of critical habitat for bull trout on lands managed under these Federal plans would provide protection from "destruction or adverse modification" of designated critical habitat under section 7 of the Act. However, without designation, a certain amount of habitat protection would be provided through the jeopardy standard. As noted earlier, based on our review of previous bull trout consultations under this standard, we have found little to indicate that there would be additional habitat protections generated by the designation beyond those provided through the jeopardy standard.

If critical habitat was designated in areas of unoccupied habitat or currently occupied areas that subsequently become unoccupied, there would not necessarily be a jeopardy analysis for the species. The adverse effect to critical habitat would have to rise to the level of destruction/adverse modification to effect changes in the proposed action via a Reasonable and Prudent Alternative. Since the destruction/adverse modification determination is made in the context of an entire critical habitat designation, this would be a rare occurrence.

Designating critical habitat helps educate the public and management agencies about the distribution of areas containing features essential to the conservation of a species. In areas lacking a bull trout-specific management plan designation can guide projects to avoid impacts to listed species and can help focus recovery efforts. Most agencies, applicants, and partners operating under the existing strategies on Federal lands are aware of the concerns for bull trout conservation. We expect that designated critical habitat in these areas would provide relatively little additional context, protection, or benefit that would enhance existing, or future, bull trout conservation efforts.

(2) Benefits of Excluding Lands Managed Under PACFISH, INFISH, the Southwest Idaho Land and Resource Management Plans, the Southeast Oregon Resource Management Plan, and ACS

The primary benefits of excluding these Federal lands from critical habitat are the avoidance of administrative costs associated with reinitiation of section 7 consultations for ongoing actions and the reduced administrative costs of consultation on new actions. Based on a review of consultations on bull trout critical habitat, some incremental consultation costs, all in the form of administrative costs (i.e., more time spent preparing and reviewing language in our biological opinions or concurrence letters), have been documented. Cost estimates for informal consultations (n = 15) ranged from "not measurable" ($0) to a little over one biologist-hour (approx $550). Estimates for formal consultations (n = 9) ranged from one biologist-hour (approx $550) to 10–20 biologist-days ($6,230–$12,460) with a median of 1.5 biologist-days (approx $935). The 10–20 biologist-day estimates represented one forest-wide programmatic formal consultation covering all routine and anticipated activities (potentially hundreds of actions) for a 5-year period.

We expect that the action agencies would also have costs associated with reinitiation of consultation or new consultations because they would need to prepare or revise requests for concurrence or biological assessments. These costs are likely to mirror Service costs because the type and specificity of information required for these documents is comparable to Service documents.

(3) Benefits of Exclusion outweigh the Benefits of Inclusion of the Lands Managed Under PACFISH, INFISH, the Southwest Idaho Land and Resource Management Plans, the Southeast Oregon Resource Management Plan, and ACS

While the administrative costs associated with additional consultation activities which result from designation are not significant, the associated

benefits are also minor. In considering the benefits from a designation related to education the Secretary has determined those benefits are largely redundant with the education that takes place through the NEPA process for developing new management plans, as well as the ongoing management documents used by the BLM and USFS in making decisions on those lands. Because the lands being excluded are Federal lands, no additional state or local protections would be triggered by the critical habitat designation, so in this circumstance, there would be no additional benefit. The remaining benefits, those due to additional protection beyond those provided through the jeopardy consultation are likely very small (see our earlier discussion particular to bull trout jeopardy consultations). The benefit from not designating these Federal lands would be largely in the form of avoided costs (staff time and money). These costs, while not significant are avoidable, create no additional benefit to the species and could be better used to effectuate conservation measures on the ground. As a result, the Secretary has determined that the benefit of excluding these Federal lands exceeds the benefits of including them as critical habitat.

**Federal Columbia River Power System (FCRPS)**

The FCRPS is composed of 14 dams and reservoirs on the Columbia and Snake Rivers. Power production is coordinated under the Pacific Northwest Coordination Agreement. The dams and reservoirs also provide flood protection and irrigation flows.

The U.S. Department of the Army, Corps of Engineers operates and maintains 12 of the 14 projects in the FCRPS. These projects control the lower Snake and Columbia Rivers and provide storage in the upper reaches of both rivers. The Corps has a major role in coordinating multiple uses of the system. It is responsible for managing flood control storage at all major reservoirs in the Columbia River Basin; maintaining navigation locks and channels to accommodate river transportation; and operating fish passage, power plant and recreation facilities.

U.S. Department of the Interior, Bureau of Reclamation operates Grand Coulee and Hungry Horse Dams, the remaining two projects. Because of its size and location, Grand Coulee Dam plays a prominent role in the coordinated operation of the Columbia River system. Storage at Hungry Horse is also valuable because of its headwaters location; water released from Hungry Horse passes through many downstream projects and produces additional energy.

The FCRPS is subject to the operation of federal laws and the authorities of 9 federal agencies. These authorities require every activity from mitigation to recovery. In addition, the Federal government has responsibility to the 13 tribes residing in the Columbia River Basin. There are 13 nationwide laws and 3 basin-specific laws as well as several mission specific laws, treaties and executive orders, all of which speak to requirements for restoring, enhancing, and recovering ecosystems and fish and wildlife in the Columbia River Basin. All of these laws affect the operation of the FCRPS. The myriad federal and state laws result in no less than 33 federal programs, 3 state programs, and 2 tribal programs to manage and recover ecosystems and wildlife in the basin. As a result of efforts to recover salmon populations, there are at least 65 groups formed to coordinate recovery efforts between the federal agencies, states, tribes, local governments and other interested parties.

(1) Benefits of Inclusion

Designation of critical habitat for bull trout on lands covered under FCRPS would provide protection from "destruction or adverse modification" of designated critical habitat under section 7 of the Act. Without designation, a certain amount of habitat protection would be provided through the jeopardy standard. However, as noted earlier, based on our review of previous bull trout consultations under this standard, we have found little to indicate that there would be additional habitat protections generated by the designation beyond those provided through the jeopardy standard.

If critical habitat was designated in areas of unoccupied habitat or currently occupied areas that subsequently become unoccupied, there would not be a jeopardy analysis for the species. The adverse effect to critical habitat would have to rise to the level of destruction/adverse modification to effect changes in the proposed action via a Reasonable and Prudent Alternative. We believe that this will be a rare occurrence.

While one of the benefits of a critical habitat designation can be educating the public, we have determined that there is very little benefit related to educational benefit from a designation for bull trout due to the recent subbasin planning effort completed for the Northwest Power Council, which would largely have duplicated any educational benefit accruing from a critical habitat designation.

(2) Benefits of Exclusion

The major benefit to excluding the FCRPS from critical habitat will be to avoid yet another layer of regulation to a system with a multitude of competing efforts to not only protect but to restore anadromous fish populations as well as enhance and restore terrestrial habitats. The potential inefficiencies are enormous, and have been identified. It is unlikely that a system with so many ongoing efforts to restore habitat and fish populations will knowingly contemplate activities that will reduce populations or habitat values. However, it is very likely that biological opinions related to adverse modification, with their focus on narrow project-by-project effects rather than ecosystem based approaches could force actions contrary to larger efforts, force actions that are redundant or counterproductive, or simply require yet another layer of administrative process without measurably improving the outcome. It is difficult to measure just how much cost such inefficiencies represent. But in a system with 4 states, 13 tribes, 11 federal agencies, and a multiplicity of laws, executive orders, programs, and court orders governing it; yet another process to ensure habitat protection is unlikely to achieve measurable results.

Another benefit of excluding the proposed reaches would be avoiding transactions costs related to reinitiating of consultation for all ongoing projects and the cost of an adverse modification analysis for new projects. The number of circumstances where a bull trout adverse modification finding diverges from a jeopardy opinion are likely to be small and the benefits of requiring all ongoing federal actions to reinitiate consultation will be small when compared to the benefit of avoiding the transactions costs related to the actual completion of the consultation (this assumes that there will be few changes in operations and actions as a result of the reinitiations—consistent with our determinations that the standards will not diverge significantly). While individually these avoided costs are small, the sheer scope of the federal actions outlined in the records that we reviewed indicated that purely ministerial actions associated with the reinitiated consultations would represent significant time and effort.

(3) Benefits of Exclusion Outweigh the Benefits of Inclusion

The Secretary weighed the risk of some federal project from proceeding in a manner that destroyed or adversely

modified critical habitat and considered the potential benefit if a designation prevented the project from proceeding. She considered the risk of a critical habitat designation causing multiple reinitiations of consultation and what costs and delays those consultations might generate. She considered the consequences of delays related to reinitiations and the risk that would occur to the species as well as to local planning processes associated with the subbasin plans.

Finally, the Secretary considered what additional benefit a consultation on the effect of any project on critical habitat would provide beyond the protection provided by a jeopardy determination that would be made whether or not critical habitat was designated.

Based on the information in the record, the Secretary determined that the benefits of including those reaches of the designation that are within the FCRPS and subject to a consultation under section 7 of the ESA are outweighed by the benefits of excluding them and avoiding one increased costs and inefficiency. Because we anticipate that little if any conservation benefit to the bull trout will be foregone as a result of excluding these lands, the exclusion will not result in the extinction of the bull trout. The Secretary exercises her discretion under section 4(b)(2) to exclude these areas from the designation.

**Snake River Basin Adjudication**

The lands subject to this adjudication comprise approximately 46 million acres and approximately 142,000 miles of streams in the Snake River Basin. The stream-flows in the basin have been subject to litigation for 21 years. Litigants are the Federal government, the Nez Perce Tribe, and the State of Idaho. In 2004 a settlement was reached by the parties in the proceeding. A Mediator's Term Sheet was developed to guide the settlement of the case, which identifies the responsibilities of the parties over the 30-year term of the agreement. The settlement was announced on May 15, 2004, by the Secretary of the Interior, the Nez Perce Tribal Executive Committee Chairman, and the Governor of Idaho.

As part of the settlement, the parties agreed to establish a habitat fund under two separate accounts, one for the Tribe and one for the State. The State account would be managed through Section 6 cooperative agreements, and would address off-reservation stream-flow and forestry programs. The funds would be used to conduct habitat protection and restoration projects in the Salmon and Clearwater basins (tributaries to the Snake River), including programs intended to protect and restore listed fish and their habitat. The United States would contribute $38 million to these accounts according to a schedule determined by Congress in the enacting legislation. On December 8, 2004, the Snake River Water Rights Act of 2004 was enacted to resolve outstanding issues; reach a final settlement of Tribal claims; authorize, ratify and confirm the Agreement among the parties; direct Federal agencies to execute and perform necessary actions to carry out the agreement; and, to authorize actions and appropriations under the SRBA and the Act for the United States to meet their obligations. On March 31, 2005, a Memorandum of Agreement was signed between the State of Idaho, Nez Perce Tribe, U.S. Fish and Wildlife Service, and National Marine Fisheries Service to establish a process for using the habitat trust fund accounts for habitat protection and restoration projects in the Salmon and Clearwater basins in Idaho. In a March 2005 letter, in response to a request from the State of Idaho, the FWS and NMFS provided specific information as to the standard that would be the basis for the cooperative agreement under Section 6 to implement the term sheet. In that letter, the two agencies indicated that meeting the express statutory requirements in section 6 of the ESA for an adequate and active program for the conservation of the species, in this case, bull trout and salmon, would be required.

At the time the negotiations on the adjudication were completed, the bull trout was a listed species, but critical habitat had not been designated. The negotiations culminating in the final Term sheet were completed prior to designation of critical habitat.

(1) Benefits of Inclusion

Designation of critical habitat for bull trout in the Snake River Basin Adjudication area would provide for protection from "destruction or adverse modification" of designated critical habitat under section 7 of the Act. Without designation, a certain amount of habitat protection would be provided through the jeopardy standard. However, as noted earlier, based on our review of previous bull trout consultations under this standard, we have found little to indicate that there would be additional habitat protections generated by the designation beyond those provided through the jeopardy standard. There would be some educational benefits that would accrue from the designation. However, because of the conservation standard that will be the basis for the Section 6 agreement and the ensuing special management provisions which will be the result of that agreement, it is likely that any educational benefit would overlap with the incidental education that would occur as a result of the Section 6 agreement negotiation and the associated NEPA process. Finally, the Section 6 agreement, with its basis of conservation would likely require more, not less, protection of bull trout habitat, even including restoration and enhancement, both of which provide benefits in excess of those provide, by a critical habitat designation.

(2) Benefits of Exclusion

The primary benefit of exclusion is it preserves the Federal government's commitments to the parties to the adjudication. The Term sheet addressed many of the issues related to stream-flow and land management that would also be addressed by a critical habitat designation. The Section 6 agreement also provided the standard that the government would adhere to in their development of implementing agreements. Discretionary superimposition of requirements, in addition to those spelled out in the agreement, could be viewed as an act of bad faith, would undermine confidence in the government's commitments, and negatively impact future negotiations.

(3) Benefits of Exclusion Outweigh the Benefits of Inclusion

In considering the benefit of a critical habitat designation, and despite any factual circumstance related to meeting the conditions, the Secretary considered that benefits would accrue from a designation. She did this notwithstanding the general premise that in the case of bull trout, our actual consultation records demonstrated the jeopardy standard provided similar results to protection provided by critical habitat designation under the *Gifford Pinchot* definition. These protected conservation benefits, were weighed against the benefit of the Federal government avoiding even the appearance of bad faith in the Snake River Basin adjudication agreements. The Secretary determined that the consequences of the Federal government appearing to unilaterally add additional terms and conditions to an agreement after it was completed were significant and could negatively affect other ongoing and potential future negotiations. The benefit of avoiding even the appearance of bad faith was determined to greatly outweigh any real or speculative benefit conferred by the

regulatory protections of a critical habitat designation.

**Waters Impounded Behind Dams (Reservoirs and Pools)**

We are excluding those reservoirs, or pools impounded behind dams whose primary purpose is for flood control, energy production, or water supply for human consumption. Disruption of these functions could potentially compromise human health and safety in the case of reservoir where the reservoir provides flood control or drinking water, and in the case of energy production, would be consistent with the President's energy policy.

(1) Benefits of Inclusion

We identified two benefits of including reservoirs in the critical habitat designation: The additional protection afforded by the prohibition against adverse modification and the benefits associated with clearly delineating areas containing features essential to a species' conservation.

The principal benefit of any designated critical habitat is the requirement for consultation under section 7 of the Act for any activities having a Federal nexus that may affect critical habitat. Section 7 of the Act requires action agencies to avoid the destruction or adverse modification of critical habitat. Given the unique analytical framework for conducting section 7 consultations on the bull trout (*i.e.*, an analytical approach whereby the continued survival of the species is dependent upon maintaining functioning core habitat), the likelihood that a Federal action would result in adverse modification, without also jeopardizing the continued existence of the species, is low. Therefore we give this benefit little weight.

Designating critical habitat can educate the public and management agencies about the distribution of areas containing features essential to the conservation of a species. In areas lacking a bull trout-specific management plan (*e.g.*, many reservoirs) this can guide projects to avoid impacts to listed species and can help focus recovery efforts. We assign this benefit moderate weight.

(2) Benefits of Exclusion

We identified a number of possible benefits of excluding reservoirs from the critical habitat designation. First, to the extent designation would provide any additional protection of bull trout habitat, costs associated with that protection would be avoided. Since it is unlikely that a Federal action would result in adverse modification (which we have assumed to be small), without also jeopardizing the continued existence of the species, we believe the benefits of critical habitat are low, so it follows that by excluding these areas the benefits of exclusion are also low. However, those reservoirs that provide flood protection; even where there is a very small probability of flood control operations, increasing the risk of loss of human lives due to flooding is unacceptable. The benefit of avoiding the risk exceeds the benefit of the conservation values generated through reservoir operation changes. Equally, where a reservoir provides drinking water for people, the benefit of avoiding the risk, however small, of losing that water supply in terms of human health and safety is significant. And finally, where a reservoir provides for energy production the benefit of avoiding the risk, however small, of a reduction in energy is inconsistent with the President's energy policies. Therefore, we believe that the benefits of exclusion, given the risk, however small, to human health, safety, and energy are large, as we give this benefit a significant amount of weight.

Second, exclusion would reduce administrative costs of conducting section 7 consultations on bull trout critical habitat (see Section 3(5)(A) and Exclusions Under Section 4(b)(2) section above). We assign this benefit moderate weight.

(3) The Benefits of Exclusion Outweigh the Benefits of Inclusion

The benefits of including reservoirs in the critical habitat designation consist of the prohibition against adverse modification and the educational benefits of wider knowledge among the public and management agencies about the distribution of areas containing features essential to the conservation of a species. Based on our analysis above we assign these benefits little to moderate weight.

The benefits of excluding reservoirs from the critical habitat designation include avoiding project modifications that would change existing flood protection, water delivery services, and energy production, and avoiding costs associated with preparing regulatory documents on critical habitat. Modification of reservoir operations as a result of critical habitat designation may result in an increased risk to the primary purpose of those reservoirs. For example, should a reservoir alter its capacity for floodwater storage due to an adverse modification determination, this may increase the risk of flooding. We have determined even a minor increase in the risk of flooding has consequences to human health and safety which outweigh the minor benefits of critical habitat. We assign an overriding benefit to the avoidance of increased flood risk. Avoiding diminishment or interruptions of a reservoir's ability to deliver drinking water also outweighs the benefit to the species of critical habitat designation, since the benefit to the species is small and the removing even a small risk to the disruption of drinking water drinking water supplies is a significant benefit. Furthermore, avoiding possible modifications to reservoir operations that reduces energy production is also a benefit in that it supports the President's energy policy through which we assign great weight.

Therefore, we have determined that the benefits of inclusion of the areas covered by reservoirs are small to moderate, while the benefits of exclusion are more significant. In short, the benefits of exclusion outweigh the benefits of inclusion. Because we anticipate that little if any conservation benefit to the bull trout will be foregone as a result of excluding these lands, the exclusion will not result in the extinction of the bull trout. Where waters impounded are used for energy production, this exclusion is consistent with the President's energy policy. The Secretary exercises her discretion under section 4(b)(2) to exclude these areas from the designation.

*Summary of Exclusions*

We have reviewed the overall effect of the exclusion of the above-mentioned approved Conservation agreements with non-Federal landowners, Tribal lands, military installations, and the Nisqually National Wildlife Refuge, and other lands that we have excluded as described above, for bull trout and their essential habitat. We have determined that the benefits of excluding these areas outweigh the benefits of including them in this critical habitat designation. Designation of critical habitat in these areas would most likely have a negative effect on the recovery and conservation of bull trout. The removal of these lands from critical habitat designation, as a result of these exclusions, will not lead to the species' extinction.

**Special Management Considerations or Protections**

When designating critical habitat, we assess whether the areas determined to be occupied at the time of listing and contain the PCEs may require special management considerations or protections. As we undertake the process of designating critical habitat for a species, we first evaluate lands

defined by those physical and biological features essential to the conservation of the species for inclusion in the designation pursuant to section 3(5)(A) of the Act. Secondly, we evaluate lands defined by those features to assess whether they may require special management considerations or protection. Within each area designated as critical habitat, the physical and biological features essential for the conservation of the bull trout may require some level of management and/or protection to avoid destruction or adverse modification of habitat essential to its conservation.

**Critical Habitat Designation**

We are designating critical habitat in 20 units. Critical habitat includes bull trout habitat in Idaho, Montana, Oregon, and Washington. Lands adjacent to designated critical habitat are under private, local government, State, Tribal, and Federal ownership. The areas we are designating as critical habitat constitute our best assessment of areas that: (1) Have documented occupancy within the last 20 years, (2) contain features essential to the conservation of the bull trout, and (3) are in need of special management, and (4) were not excluded under section 4(b)(2) of the Act. Military lands with an approved INRMP that provides benefits to the bull trout were not included in the designation per section 4(a)(3) of the Act.

Tables 1–5 summarize the distance (stream miles) and area (acres) of designated critical habitat by critical habitat unit, State, and land ownership.

TABLE 1.—STREAM/SHORELINE DISTANCE (MI/KM) DESIGNATED AS BULL TROUT CRITICAL HABITAT BY CRITICAL HABITAT UNIT

| CH unit | Stream/shoreline miles | Stream/shoreline kilometers |
|---|---|---|
| 1. Klamath River Basin | 50 | 80 |
| 2. Clark Fork River Basin | 1,136 | 1,828 |
| 3. Kootenai River Basin | 56 | 91 |
| 4. Willamette River Basin | 111 | 178 |
| 5. Hood River Basin | 30 | 48 |
| 6. Deschutes River Basin | 78 | 126 |
| 9. Umatilla-Walla Walla River Basins | 218 | 350 |
| 10. Grande Ronde River Basin | 308 | 496 |
| 11. Imnaha-Snake River Basins | 92 | 148 |
| 12. Hells Canyon Complex | 125 | 202 |
| 13. Malheur River Basin | 38 | 60 |
| 14. Coeur d'Alene Lake Basin | 124 | 199 |
| 19. Lower Columbia River Basin | 94 | 152 |
| 20. Middle Columbia River Basin | 188 | 302 |
| 22. Northeast Washington River Basins | 25 | 40 |
| 23. Snake River Basin in Washington | 68 | 109 |
| 25. Snake River | 17 | 27 |
| 27. Olympic Peninsula | 388 | 624 |
| 27. Olympic Peninsula (Marine) | 419 | 674 |
| 28. Puget Sound | 646 | 1,039 |
| 28. Puget Sound (Marine) | 566 | 912 |
| 29. Saint Mary-Belly | 37 | 59 |
| Total | 4,813 | 7,745 |

TABLE 2.—ACRES OF RESERVOIRS OR LAKES DESIGNATED AS BULL TROUT CRITICAL HABITAT BY CRITICAL HABITAT UNIT.

| CH unit | Acres | Hectares |
|---|---|---|
| 1. Klamath River Basin | 24,610 | 9,959 |
| 2. Clark Fork River Basin | 49,755 | 20,135 |
| 3. Kootenai River Basin | 1,384 | 560 |
| 6. Deschutes River Basin | 2,713 | 1,098 |
| 14. Coeur d'Alene Lake Basin | 27,296 | 11,046 |
| 27. Olympic Peninsula | 8,318 | 3,366 |
| 28. Puget Sound | 25,035 | 10,131 |
| 29. Saint Mary-Belly | 4,107 | 1,662 |
| Total | 143,218 | 57,958 |

TABLE 3.—STREAM/SHORELINE DISTANCE (MI/KM) DESIGNATED AS BULL TROUT CRITICAL HABITAT BY STATE

| State | Stream/shoreline miles | Stream/shoreline kilometers |
|---|---|---|
| Idaho | 294 | 474 |
| Montana | 1,058 | 1,703 |
| Oregon | 939 | 1,511 |
| Oregon/Idaho | 17 | 27 |
| Washington | 1,519 | 2,445 |
| Washington (Marine) | 985 | 1,585 |

TABLE 3.—STREAM/SHORELINE DISTANCE (MI/KM) DESIGNATED AS BULL TROUT CRITICAL HABITAT BY STATE—Continued

| State | Stream/shoreline miles | Stream/shoreline kilometers |
|---|---|---|
| Total | 4,812 | 7,745 |

TABLE 4.—ACRES OF RESERVOIRS OR LAKES DESIGNATED AS BULL TROUT CRITICAL HABITAT BY STATE

| State | Acres | Hectares |
|---|---|---|
| Idaho | 50,627 | 20,488 |
| Montana | 31,916 | 12,916 |
| Oregon | 27,322 | 11,057 |
| Washington | 33,353 | 13,497 |
| Total | 143,218 | 57,958 |

TABLE 5.—STREAM/SHORELINE DISTANCE (MI/KM) DESIGNATED AS BULL TROUT CRITICAL HABITAT BY OWNERSHIP

| Land ownership | Stream/shoreline miles | Stream/shoreline kilometers |
|---|---|---|
| Federal | 538 | 865 |
| Federal/Private Mixed | 24 | 38 |
| Federal/State Mixed | 6 | 10 |
| Federal/Tribal Mixed | 1 | 1 |
| Private | 3,587 | 5,773 |
| State/Local Government Mixed | 347 | 559 |
| State/Private Mixed | 69 | 111 |
| Tribal | 209 | 336 |
| Tribal/Private Mixed | 31 | 50 |
| Tribal/State Mixed | 1 | 2 |
| Total | 4,813 | 7,745 |

The lateral extent of critical habitat, for each designated stream reach, is the width of the stream channel as defined by its ordinary high-water line as defined by the U.S. Army Corps of Engineers (COE) in 33 CFR 329.11. This approach is consistent with the specific mapping requirements described in agency regulations at 50 CFR 424.12(c). In areas for which ordinary high-water has not been defined pursuant to 33 CFR 329.11, the width of the stream channel shall be defined by its bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain (Rosgen, 1996) and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series (Leopold *et al.*, 1992). Such an interval is commensurate with nearly all of the juvenile freshwater life phases of most salmon and steelhead ESUs. Therefore, it is reasonable to conclude that for an occupied stream reach this lateral extent is regularly "occupied". Moreover, the bankfull elevation can be readily discerned for a variety of stream reaches and stream types using recognizable water lines (*e.g.*, marks on rocks) or vegetation boundaries (Rosgen, 1996). Critical habitat extends from the ordinary high-water line as defined by the Corps in 33 CFR 329.11 and shall be used to determine the lateral extent of critical habitat. Adjacent floodplains are not designated as critical habitat. However, it should be recognized that the quality of aquatic habitat within stream channels is intrinsically related to the character of the floodplains and associated riparian zones, and human activities that occur outside the river channels can have demonstrable effects on physical and biological features of the aquatic environment (*i.e.*, critical habitat). In addition, human activities that occur within or adjacent to streams or stream reaches that flow into critical habitat can also have demonstrable effects on physical and biological features of designated reaches. The lateral extent of lakes and reservoirs is defined by the perimeter of the water body as mapped on standard 1:24,000 scale maps (comparable to the scale of a 7.5 minute USGS Quadrangle topographic map).

**Effects of Critical Habitat Designation**

*Section 7 Consultation*

Section 7 of the Act requires Federal agencies, including the Service, to ensure that actions they fund, authorize, or carry out are not likely to destroy or adversely modify critical habitat. In our regulations at 50 CFR 402.02, we define destruction or adverse modification as "a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical." However, recent decisions by the 5th and 9th Circuit Court of Appeals have invalidated this definition. Pursuant to current national policy and the statutory provisions of the Act, destruction or adverse modification is determined on the basis of whether, with implementation of the proposed Federal action, the affected critical habitat would remain functional (or retain the current ability for the primary constituent elements to be functionally established) to serve the intended conservation role for the species.

Section 7(a) of the Act requires Federal agencies, including the Service, to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is

proposed or designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402.

Section 7(a)(4) of the Act requires Federal agencies to confer with us on any action that is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat. This is a procedural requirement only. However, once proposed species becomes listed, or proposed critical habitat is designated as final, the full prohibitions of section 7(a)(2) apply to any Federal action. The primary utility of the conference procedures is to maximize the opportunity for a Federal agency to adequately consider proposed species and critical habitat and avoid potential delays in implementing their proposed action as a result of the section 7(a)(2) compliance process, should those species be listed or the critical habitat designated.

Under conference procedures, the Service may provide advisory conservation recommendations to assist the agency in eliminating conflicts that may be caused by the proposed action. The Service may conduct either informal or formal conferences. Informal conferences are typically used if the proposed action is not likely to have any adverse effects to the proposed species or proposed critical habitat. Formal conferences are typically used when the Federal agency or the Service believes the proposed action is likely to cause adverse effects to proposed species or critical habitat, inclusive of those that may cause jeopardy or adverse modification.

The results of an informal conference are typically transmitted in a conference report; while the results of a formal conference are typically transmitted in a conference opinion. Conference opinions on proposed critical habitat are typically prepared according to 50 CFR 402.14, as if the proposed critical habitat were designated. We may adopt the conference opinion as the biological opinion when the critical habitat is designated, if no substantial new information or changes in the action alter the content of the opinion (see 50 CFR 402.10(d)). As noted above, any conservation recommendations in a conference report or opinion are strictly advisory.

If a species is listed or critical habitat is designated, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. As a result of this consultation, compliance with the requirements of section 7(a)(2) will be documented through the Service's issuance of: (1) A concurrence letter for Federal actions that may affect, but are not likely to adversely affect, listed species or critical habitat; or (2) a biological opinion for Federal actions that may affect, but are likely to adversely affect, listed species or critical habitat.

When we issue a biological opinion concluding that a project is likely to result in jeopardy to a listed species or the destruction or adverse modification of critical habitat, we also provide reasonable and prudent alternatives to the project, if any are identifiable. "Reasonable and prudent alternatives" are defined at 50 CFR 402.02 as alternative actions identified during consultation that can be implemented in a manner consistent with the intended purpose of the action, that are consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Director believes would avoid jeopardy to the listed species or destruction or adverse modification of critical habitat. Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where a new species is listed or critical habitat is subsequently designated that may be affected and the Federal agency has retained discretionary involvement or control over the action or such discretionary involvement or control is authorized by law. Consequently, some Federal agencies may request reinitiation of consultation with us on actions for which formal consultation has been completed, if those actions may affect subsequently listed species or designated critical habitat or adversely modify or destroy proposed critical habitat.

Federal activities that may affect the bull trout or its designated critical habitat will require section 7 consultation under the Act. Activities on State, tribal, local or private lands requiring a Federal permit (such as a permit from the Corps under section 404 of the Clean Water Act or a permit under section 10(a)(1)(B) of the Act from the Service) or involving some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency) will also be subject to the section 7 consultation process. Federal actions not affecting listed species or critical habitat, and actions on State, tribal, local or private lands that are not federally-funded, authorized, or permitted, do not require section 7 consultations.

**Application of the Jeopardy and Adverse Modification Standards for Actions Involving Effects to the Bull Trout and Its Critical Habitat**

*Jeopardy Standard*

Prior to and following designation of critical habitat, the Service has applied an analytical framework for bull trout jeopardy analyses that relies heavily on the importance of core area populations to the survival and recovery of the bull trout.[1] The section 7(a)(2) analysis is focused not only on these populations but also on the habitat conditions necessary to support them.

The jeopardy analysis usually expresses the survival and recovery needs of the bull trout at the DPS scale in a qualitative fashion without making distinctions between what is necessary for survival and what is necessary for recovery. Generally, if a proposed Federal action is incompatible with the viability of the affected core area population(s), inclusive of associated habitat conditions, a jeopardy finding is considered to be warranted, because of the relationship of each core area population ot the survival and recovery of the species as a whole.

*Adverse Modification Standard*

The analytical framework described in the Director's December 9, 2004, memorandum is used to complete section 7(a)(2) analyses for Federal actions affecting bull trout critical habitat. The key factor related to the adverse modification determination is whether, with implementation of the

[1] (Core areas form the building blocks that provide for conserving the bull trout's evolutionary legacy as represented by major genetic groups. The draft *Bull Trout Recovery Plan* recognizes core areas as the population units that are necessary to provide for bull trout biological needs in relation to genetic and phenotypic diversity, and spreading the risk of extinction caused by stochastic events. Peer review of the draft *Bull Trout Recovery Plan* did not reveal deficiencies with this approach. A panel of scientists invited to participate in the bull trout 5-year review process concluded that core areas are appropriate units of analysis by which threats to the bull trout and recovery standards should be measured.)

proposed Federal action, the affected critical habitat would remain functional (or retain the current ability for the primary constituent elements to be functionally established) to serve the intended conservation role for the species. Generally, the conservation role of bull trout critical habitat units is to support viable core area populations.

It should be noted that in the 200 or so formal consultations completed since the bull trout was listed, most of the anticipated effects of proposed Federal actions on the species have not been biologically significant from a core area perspective, and if these actions were subject to the adverse modification standard described above, they would not likely violate it. Based on an analysis of 137 formal consultations conducted during the period 1998–2003, the following types of projects were proposed in bull trout-occupied habitat, in order of frequency (most to least): multiple project actions, grazing, road work, bridge work, habitat restoration, land and resource management plans, mining, hydropower, timber harvest, recreation, water diversion/irrigation, research, land exchange, flood control, erosion control, pipeline construction, predator control, landslide remediation, instream crossings, weed management, dredging, and levee repair.

However, at least one major Federal action involving significant modifications to natural flow patterns in designated critical habitat is currently in formal consultation, and it is likely (based on recent litigation patterns and outcomes) that the number of diversion-related Federal actions consulted on, some of which may occur in critical habitat, will increase substantially in the future. Water quality and quantity are significant factors (and primary constituent elements of bull trout critical habitat) influencing the viability of bull trout core areas. Given that context, it seems reasonable to predict that a few Federal actions will be found to adversely modify bull trout critical habitat; most of these actions would also probably constitute jeopardy.

Section 4(b)(8) of the Act requires us to briefly evaluate and describe in any proposed or final regulation that designates critical habitat those activities involving a Federal action that may destroy or adversely modify such habitat, or that may be affected by such designation. Activities that may destroy or adversely modify critical habitat may also jeopardize the continued existence of the species. All areas designated as critical habitat are determined to be essential to the conservation of the bull trout.

Activities that may destroy or adversely modify critical habitat are those that alter the PCEs to an extent that the conservation value of critical habitat for the bull trout is appreciably reduced. Activities that, when carried out, funded, or authorized by a Federal agency, may affect critical habitat and therefore result in consultation for the bull trout include, but are not limited to:

(1) Detrimental altering of the minimum flow or the natural flow regime of any of the designated stream segments. Possible actions would include groundwater pumping, impoundment, water diversion, and hydropower generation. We note that such flow alterations resulting from actions affecting tributaries of the designated stream reaches may also destroy or adversely modify critical habitat;

(2) Alterations to the designated stream segments that could indirectly cause significant and detrimental effects to bull trout habitat. Possible actions include vegetation manipulation, timber harvest, road construction and maintenance, prescribed fire, livestock grazing, off-road vehicle use, powerline or pipeline construction and repair, mining, and development. Riparian vegetation profoundly influences instream habitat conditions by providing shade, organic matter, root strength, bank stability, and large woody debris inputs to streams. These characteristics influence water temperature, structure and physical attributes (useable habitat space, depth, width, channel roughness, cover complexity), and food supply (Gregory *et al.* 1991; Sullivan *et al.* 2000). The importance of riparian vegetation and channel bank condition for providing rearing habitat for salmonids in general is well documented (*e.g.*, Bossu 1954 and Hunt 1969, cited in Beschta and Platts 1987; MBTSG 1998);

(3) Detrimental altering of the channel morphology of any of the designated stream segments. Possible actions would include channelization, impoundment, road and bridge construction, deprivation of substrate source, destruction and alteration of aquatic or riparian vegetation, reduction of available floodplain, removal of gravel or floodplain terrace materials, excessive sedimentation from mining, livestock grazing, road construction, timber harvest, off-road vehicle use, and other watershed and floodplain disturbances. We note that such actions in the upper watershed (beyond the riparian area) may also destroy or adversely modify critical habitat. For example, timber harvest activities and associated road construction in upland areas can lead to changes in channel morphology by altering sediment production, debris loading, and peak flows;

(4) Detrimental alterations to the water chemistry in any of the designated stream segments. Possible actions would include release of chemical or biological pollutants into the surface water or connected groundwater at a point source or by dispersed release (non-point);

(5) Proposed activities that are likely to result in the introduction, spread, or augmentation of nonnative aquatic species in any of the designated stream segments. Possible actions would include fish stocking; use of live bait fish; aquaculture; improper construction and operation of canals; and interbasin water transfers; and

(6) Proposed activities that are likely to create significant instream barriers to bull trout movement. Possible actions would include new water diversions, impoundments, and hydropower generation where effective fish passage facilities, mechanisms, or procedures are not provided.

We consider all of the units designated as critical habitat, as well as those that have been excluded or not included, to contain features essential to the conservation of the bull trout. All units are within the geographic range of the species, all were occupied by the species at the time of listing (based on observations made within the last 20 years), and are likely to be used by the bull trout, whether for foraging, migrating, overwintering, spawning, or rearing. Federal agencies already consult with us on activities in areas currently occupied by the bull trout, or if the species may be affected by the action, to ensure that their actions do not jeopardize the continued existence of the bull trout.

If you have questions regarding whether specific activities will likely constitute destruction or adverse modification of critical habitat, contact the Field Supervisor of the nearest Fish and Wildlife Ecological Services Office. Requests for copies of the regulations on listed wildlife, and inquiries about prohibitions and permits may be addressed to the Division of Endangered Species, U.S. Fish and Wildlife Service, 911 NE 11th Avenue, Portland, OR 97232–4181 (telephone 503/231–6158; facsimile 503/231–6243).

**Economic Analysis**

Section 4(b)(2)of the Act requires us to designate critical habitat on the basis of the best scientific and commercial information available and to consider the economic and other relevant

impacts of designating a particular area as critical habitat. We exclude areas from critical habitat upon a determination that the benefits of such exclusions outweigh the benefits of specifying such areas as critical habitat. We cannot exclude areas from critical habitat when exclusion will result in the extinction of the species concerned.

*Analysis of the Klamath River and Columbia River Populations*

Following the publication of the proposed critical habitat designation, we conducted an economic analysis to estimate the potential economic effect of the designation. The draft analysis was made available for public review on April 5, 2004 (69 FR 17634). We accepted comments on the draft analysis until May 5, 2004.

The primary purpose of the economic analysis is to estimate the potential economic impacts associated with the designation of critical habitat for the bull trout. This information is intended to assist the Secretary in making decisions about whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation. This economic analysis considers the economic efficiency effects that may result from the designation, including habitat protections that may be co-extensive with the listing of the species. It also addresses distribution of impacts, including an assessment of the potential effects on small entities and the energy industry. This information can be used by the Secretary to assess whether the effects of the designation might unduly burden a particular group or economic sector.

This analysis focuses on the direct and indirect costs of the rule. However, economic impacts to land use activities can exist in the absence of critical habitat. These impacts may result from, for example, local zoning laws, State and natural resource laws, and enforceable management plans and best management practices applied by other State and Federal agencies. Economic impacts that result from these types of protections are not included in the analysis as they are considered to be part of the regulatory and policy baseline.

The analysis examines activities taking place both within and adjacent to the designation. It estimates impacts based on activities that are "reasonably foreseeable" including, but not limited to, activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. Accordingly, the analysis bases estimates on activities that are likely to occur within a 10-year time frame, from when the proposed rule became available to the public (November 30, 2002, 67 FR 71235). The 10-year time frame was chosen for the analysis because, as the time horizon for an economic analysis is expanded, the assumptions on which the projected number of projects and cost impacts associated with those projects become increasingly speculative. An exception to the 10-year analysis time horizon used in this analysis is for FERC licenses, which are renewed for up to 50 years. Accordingly, this analysis estimates the annualized costs of the expected impacts associated with section 7 bull trout consultations involving FERC re-licensing over a 50-year time horizon.

Costs can be expressed in terms of unit or river mile; both of these metrics are useful in describing economic impacts. On a cost per unit basis, the largest portion of forecast costs is expected to occur in Unit 4, the Willamette River Basin (18 percent). These costs are attributable to fish passage and temperature control projects and annual operating and maintenance and fish study costs at the Corp's facilities in the Upper Willamette River System (Dexter, Lookout Point, Hills Creek, and Blue River Dams). The next most costly unit is Unit 16, the Salmon River Basin (12 percent). Because this is the largest unit in terms of river miles and proportion of USFS-managed land, and because future USFS activities are expected to generate approximately 70 percent of the consultation activity, this unit bears the greatest number of future bull trout-related consultations. Therefore, the administrative costs account for a large portion of the costs in this unit. Together, these two units account for 30 percent (approximately $8.2 million) of forecast costs. The next three most costly units, Hells Canyon complex (Unit 12), and the Clark Fork River (Unit 2), and Malheur River (Unit 13) Basins, each account for 8 percent (a unit cost range of approximately $2.1 million to $2.3 million) of forecast costs. In total, these five units account for almost 55 percent of forecast costs (approximately $14.8 million).

Based on our analysis, we concluded that the designation of critical habitat for the Klamath River and Columbia River population segments would not result in a significant economic impact, and estimated the potential economic effects over a 10-year period would range from $200 to $260 million ($20 to $26 million per year) for bull trout. It is expected that Federal agencies will bear 70 percent of these costs. The total estimated costs associated with bull trout consultation is expected be $9.8 million annually, and total project modification costs are expected to range from $19.5 to $26.1 million annually. Although we do not find the economic costs to be significant, they were considered in balancing the benefits of including and excluding areas from critical habitat.

*Analysis of the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River Populations*

Following the publication of the proposed critical habitat designation, we conducted an economic analysis to estimate the potential economic effect of the designation. The DEA was made available for public review on May 3, 2005 (70 FR 22835). We accepted comments on the DEA until June 2, 2005.

The primary purpose of the economic analysis is to estimate the potential economic impacts associated with the conservation of bull trout. This information is intended to assist the Secretary in making decisions about whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation. The economic analysis considers the economic efficiency effects that may result from the designation, including habitat protections that may be co-extensive with the listing of the species. It also addresses distribution of impacts, including an assessment of the potential effects on small entities and the energy industry. This information can be used by the Secretary to assess whether the effects of the designation might unduly burden a particular group or economic sector.

This analysis focuses on the direct and indirect costs related to bull trout, and the analysis considers how small entities, including small businesses, organizations, and governments, may be affected by future bull trout conservation activities. In addition, this analysis considers the impacts of conservation activities on the energy industry and its customers. However, economic impacts to land-use activities can exist in the absence of critical habitat. These impacts may result from, for example, local zoning laws, State and natural resource laws, and enforceable management plans and best management practices applied by other State and Federal agencies.

The analysis examines activities taking place both within and adjacent to the designation. It estimates impacts based on activities that are "reasonably foreseeable" including, but not limited

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From the December 1996 issue:

# On the prowl

**In suburban backyards and rural fields, free-roaming cats are pouncing on songbird populations.**

**John S. Coleman and Stanley A. Temple**

[Wild at heart] [Keep cats in check] [How many birds do cats kill?]

Some days, you need a bit of imagination to view a house cat as a predator. Sitting in a sunny window, curled up on a bed or stretched out in front of a fireplace, most tabbies hardly seem to have the energy to attack their food dish. But cats are definitely hunters, and there are plenty of them in town, in barns and free-ranging in fields to put the bite on a variety of birds and other wildlife.

Cat populations are tough to gauge accurately. U.S. Census data track those cats that people claim to own as pets, and the numbers are impressive. From 1970 to 1990, the number of urban and rural cats tabulated in the census rose from 30 million to 60 million. Nationwide, approximately 30 percent of households "own" cats. In rural areas, where free-roaming cats often are not regarded as pets, and not recorded by the census, as many as 60 percent of households keep cats on their property. In Wisconsin alone, with 550,000 rural households, we estimate the number of barn cats and outside cats may be as high as two million. Nationwide, there must be at least 100 million cats, mainly concentrated in the same places we find people.

## Wild at heart

Domestic cats (Felis catus) descend from the European and African Wild Cat (Felis silvestris). Although domestic cats make affectionate pets, their skills and behaviors as predators remain essentially unchanged from those of their ancestors, and they hunt as effectively as their wild forebears.

However, house cats differ from wild predators in several important ways: First, people protect cats from disease, predation and competition. Modern veterinary practices, from vaccination to bone setting, substantially extend a pet cat's lifespan. Second, domestic cats adapt well to human domiciles. Unlike native predators, cat densities are not limited by space or the availability of prey. Even barn cats have significantly better shelter, food and water supplies than bobcats, foxes and coyotes. The cat's range extends every time people build new homes and outside shelters. Third, although most people supply their cats with a dependable supply of food, research shows feeding does not suppress the cat's instinct to hunt and kill.

These factors combine to make free-ranging cats a potent predatory force, especially in rural areas. We've estimated that in some parts of rural Wisconsin, cat densities reach 114 animals per square mile -- much higher than all mid-sized native predators. Given ample food supplies and high reproductive rates, cat densities can exceed nine animals per acre.

Rural cats have access to many animals and undoubtedly take the greatest toll. Small mammals like mice and voles make up about 70 percent of their diets, birds constitute about 20 percent of their kills and a mix of other animals constitute the remaining 10 percent. Our research in Wisconsin suggests that free-ranging rural cats may be killing up to 219 million birds in the state; (see sidebar.) Many are native songbirds whose populations are already stressed by a host of factors including development, habitat destruction and pesticide pollution.

Many of these birds are ground-nesting grassland birds, like meadowlarks and sparrows, or birds that often feed on the ground, like robins. Especially in rural areas, these birds inhabit pastures and hayfields around farms where high densities of cats seriously threaten them.

The cat predation affects wildlife dynamics in other ways. Domestic cats eat many of the same animals that native predators eat. Studies show that large numbers of cats reduce available prey for predators such as hawks and weasels.

Free-ranging cats may also transmit diseases to wild animals. Domestic cats have spread feline leukemia virus to mountain lions and may recently have infected the endangered Florida Panther with feline distemper (feline panleucopenia). Unvaccinated domestic cats can also transmit rabies and toxoplasmosis to people. Pregnant women are now routinely advised to avoid contact with cats and litter boxes to minimize the risk of infection.

## Keeping cats in check

Given these concerns, here are seven sensible suggestions to

prevent growing cat populations from becoming an even greater threat to wild animals:

**1.** If you are going to keep cats and you don't intend to breed them, **get them neutered** at about six months of age. This will slow population growth and may lessen your cat's desire to roam. Only keep as many pet cats as you can feed and care for. On farms, keep the minimum number of cats that you determine can keep rodent pests in check.

**2. Don't dispose of unwanted cats by releasing them in rural areas.** This practice enlarges rural cat populations, is an inhumane way of dealing with unwanted cats, and places more predators in the wild. Contact a local humane society to find out where unwanted cats can be brought, adopted or euthanized.

**3.** If possible and practical, **keep your cat indoors**. This eliminates unwanted reproduction, prevents predation on wild animals, reduces cat fights and injury, and reduces the spread of disease. Keeping your cat indoors helps protect the birds and mammals around your yard and reduces the likelihood of injury to your pet. The two most common causes of death for rural cats are disease and being struck by an automobile.

**4. Don't count on a bell** as a solution. Research shows bells on cat collars are mostly ineffective in preventing predation. Even if the bell rings, it is usually too late for the victim.

**5. Declawing cats may reduce hunting success**, but many declawed cats are still effective predators.

**6.** Locate bird feeders in sites that **don't provide cover for cats waiting to ambush songbirds**. Take the same precautions you use to make feeders squirrel-proof -- place feeders away from overhanging tree limbs, decks and away from shrubbery.

**7.** Support community efforts to **license and neuter domestic cats**. Unlicensed, untagged, free-roaming cats indicate owners are not responsibly controlling their pets.

## How many birds do cats kill?

No one has collected enough data to definitively predict the number of birds killed by rural free-ranging cats. Our four-year study of cat predation in Wisconsin, coupled with data from other studies, predicts a range of values based on the following assumptions.

We estimate 1.4-2 million free-ranging cats in rural Wisconsin. We further estimate 23 percent of their diet consists of birds. This figure is consistent with other studies indicating roughly 20-30 percent of free-ranging cat" kills are birds.

The number of animals killed by an individual cat varies greatly from zero to much more prey than a cat can consume. One rural cat was recorded to have killed 1,690 animals in an 18-month period. On an annual basis, studies record low estimates of 14 animals per free-ranging urban cat to at least one animal per day for rural cats. Other studies reported 28 kills per year for urban cats and 91 kills per year for rural cats.

Here are our best guesses at low, intermediate and high estimates of the number of birds killed annually by rural cats in Wisconsin based on the formula:
(number of rural cats) x (number of kills/cat/year) x (% of kills that are birds).

**Low value:** (lowest population estimate) x (twice kill rate by urban cats) x (low percentage of kills that are birds) **1.4 million cats x 28 x 20% = 7.8 million birds killed by rural cats**

**Intermediate value:** (mean population estimate) x (intermediate kill rate) x (higher percentage of kills that are birds) **1.7 million cats x 91 x 25% = 38.7 million birds killed by rural cats**

**High value:** (highest population estimate) x (highest kill rate) x (highest percentage of kills that are birds) **2 million cats x 365 x 30% = 219 million birds killed by rural cats**

Note, these estimates do not include predation by urban cats.

Also note, in northern states such as Wisconsin, most kills occur in spring and summer, though predation at winter feeders is substantial. Many of the spring kills would include nestlings and fledglings.

The densities of free-roaming cats in rural Wisconsin are several times higher than the typical combined densities of other mid-sized predators like foxes, skunks, opposums and raccoons. Clearly, free-ranging cats are a major predator of birds in rural Wisconsin.

## About the authors

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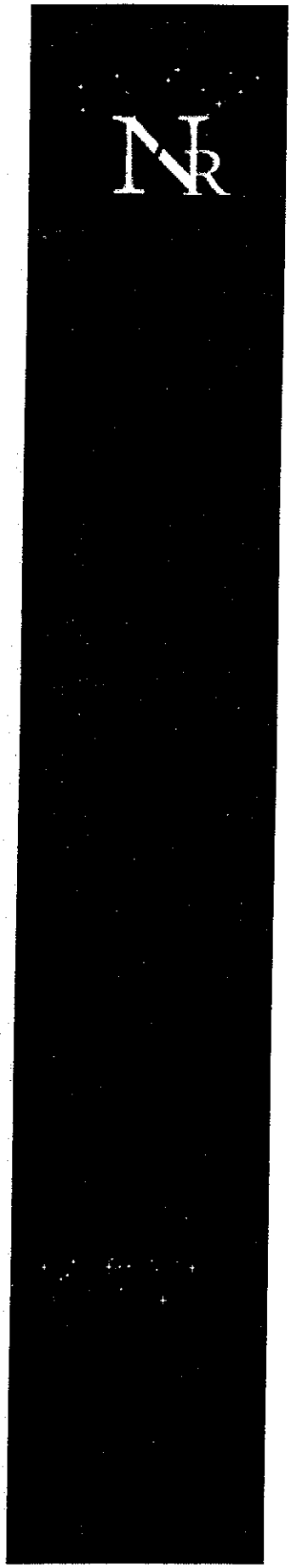



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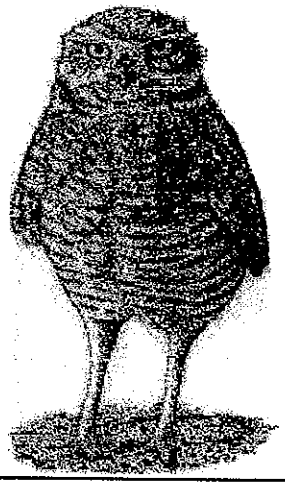

# Burrowing Owl

*Athene cunicularia*

Last updated: 2003

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*Written by Noelle Nordstrom*

## GENERAL RANGE AND WASHINGTON DISTRIBUTION

The breeding range of the burrowing owl includes southern Canada from southern British Columbia eastward to south-central Manitoba, and extends as far south as Mexico (Haug et al. 1993). This species was extirpated from British Columbia but was reintroduced into the province in 1983. In Washington, burrowing owls typically occupy shrub-steppe habitat of the eastern part of the state during the breeding season (see Figure 1; Bryant 1990).

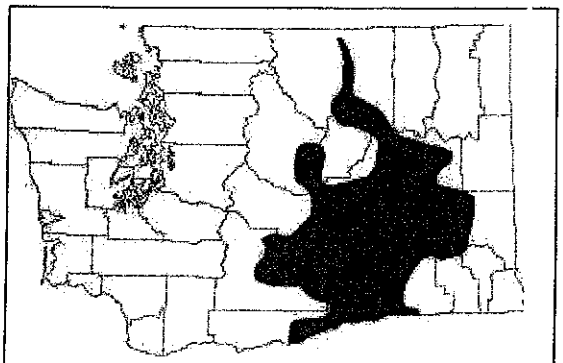

**Figure 1.** General range of the burrowing owl, *Athene cunicularia*, in Washington. Map derived from Washington Department of Fish and Wildlife data files and GAP Analysis of Washington.

Burrowing owls winter mainly in the southern United States, central Mexico and Central America (Zarn 1974). Little information is available on the migration routes and times or wintering areas used by burrowing owls (Haug et al. 1993). Recent banding data have shown that some owls overwinter in eastern Washington (Conway et al. 2002). Additionally, a resident owl was recently found with eggs that were produced in late February (C. Conway, personal communication). Most burrowing owls from Canada and the northern United States are believed to migrate south in September and October. The northern migration to the breeding grounds is thought to occur from March through the first week of May (James and Ethier 1989, James 1992, Haug et al.1993).

## RATIONALE

The burrowing owl is a State Candidate species and a Federal Species of Concern that was once widespread throughout steppe and prairie communities of North America. Currently, the burrowing owl is declining throughout much of its range in the western United States and Canada (Bent 1961, Holroyd and Wellicome 1997, Sheffield 1997). Breeding Bird Survey data for the Columbia Plateau indicate increasing populations, although this estimate is considered imprecise (Sauer et al. 2001).



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## HABITAT REQUIREMENTS

Burrowing owls inhabit open, dry areas in well-drained grasslands, shrub-steppe, prairies and deserts (Martin 1973). They also nest on agricultural lands and suburban areas (Haug et al. 1993). They use burrows for nesting, shelter, protection from predators and to reduce exposure to extreme temperatures (Zarn 1974, Winchell 1994). Although they are capable of digging, burrowing owls usually depend on abandoned burrows excavated by burrowing rodents such as prairie dogs (*Cynomys* spp.) and ground squirrels (*Citellus* spp.), or by larger mammals such as badgers (*Taxidea taxus*), foxes (*Vulpes* spp.) or coyotes (*Canis latrans*) (Mutafov 1992). In the Pacific Northwest, nesting burrowing owls often use unoccupied badger dens (Green and Anthony 1989).

The primary habitat characteristics preferred by burrowing owls include a complex of available burrows, short and/or sparse vegetation that provides good visibility, and adequate populations of prey species (Haug et al. 1993). Soil type affects the life and reusability of nesting burrows (Green and Anthony 1989, Holmes et al., in press). Specifically, the friable nature of sandy soils results in relatively high rates of burrow failure due to erosion and trampling by livestock. Silt-loam soils are more structurally stable and less likely to fail than are soils with a sand component.

Although badgers provide nesting sites for burrowing owls in Washington, they also are one of the owl's main predators (Haug et al. 1993). Burrowing owls line their nests with shredded livestock or ungulate dung, which may reduce nest predation by masking the owl's scent (Martin 1973, Zarn 1974, Green and Anthony 1989). However, several research teams have recently examined the use of dung by owls and found that this conclusion may not be true (C. Conway, personal communication).

Burrowing owls appear at breeding sites in February, and hatchlings emerge in May (C. Conway, personal communication). Recent observations suggest that resident owls initiate nesting earlier than migratory owls (C. Conway, personal communication). Incubation lasts approximately 28 days, and owlets emerge from the burrow about 2 weeks after hatching. At 2 to 3 weeks, the young begin to use other burrows near their nest burrow (C. Conway, personal observation). Paired owls will use up to 10 auxiliary burrows that are within 90 m (300 ft) of their primary nesting burrow (Climpson 1977). These auxiliary burrows are used to provide escape cover from predators, as secondary burrows for fledgling owlets and as alternates if the primary nest becomes heavily infested with parasites (Winchell 1994). Nests may also be located in natural cavities in small rock outcrops (Rich 1986). Nest burrows are often reused in successive years (Haug et al. 1993, Lutz and Plumpton 1999). There are no known records for a second brood during the breeding season in Washington (Haug et al. 1993).

The number of available burrows is not the only factor owls use to select a breeding site. They also look for areas that are open, with short and/or sparse vegetation and good horizontal visibility to see predators and locate prey (Green and Anthony 1989). In areas containing shrubs, they choose nesting burrows located near perches (Martin 1973, Green and Anthony 1989). Burrowing owls hunt by chasing prey items on foot or by catching them in the air (Haug et al. 1993). Their diet changes throughout the day, with insects most often caught during daylight and mammals preyed upon after dark (Martin 1973, Plumpton and Lutz 1993a).

Food availability and quality is likely to affect nesting densities of these owls for a given location (Desmond and Savidge 1996). Burrowing owls are opportunistic feeders, but they consume mostly insects and mammals (Green and Anthony 1989). Other prey species include birds, amphibians and reptiles (Zarn 1974, Gleason and Craig 1979, Mutafov 1992, Haug et al. 1993). Green and Anthony (1989) found a seasonal variation in diets, with rodents making up most of the owl's diet in the spring, and then shifting their diet almost exclusively to insects during the summer.

## LIMITING FACTORS

Human activities that eliminate nesting and foraging habitat are likely the primary cause of this species decline (Haug et al. 1993, Sheffield 1997, Belthoff and King 2002). Intensive cultivation of shrub-steppe, grasslands and native prairies has long been recognized as a primary cause of the declining burrowing owl population (Haug et al. 1993). Agriculture and other development also expose owls to pesticides and increase their vulnerability to predation (Haug et al. 1993, Sheffield 1997). Although some burrowing owls take advantage of crop fields to exploit abundant food sources during the winter, intensive cultivation of native grasslands is a suggested cause of declines in populations of breeding owls (Haug et al. 1993). The burrowing owl is also limited


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by the availability of mammal burrows. Additional mortality has been attributed to collisions with automobiles and shooting (Butts 1973, Haug et al. 1993).

## Habitat Alteration

Although not all nesting burrowing owls use multiple burrows, some nests are associated with multiple burrows in close proximity to one another (Holmes et al., in press). The availability of burrows is reduced directly by destroying them (e.g., trampling of burrows by livestock and diking/tilling) and indirectly by eliminating or reducing the numbers of the animals that excavate the burrows (Haug et al. 1993). Burrow destruction by humans and dogs also occur. Thomsen (1971) estimated that 65% of the damaged burrows at her study site were caused by humans and 20% by domestic dogs. Large-scale efforts to control burrowing mammal populations can harm burrowing owls in areas where they rely on rodent burrows (Butts 1973, Holroyd et al. 2001).

## Pesticides

Pesticides (specifically insecticides and rodenticides) can harm burrowing owls by causing direct mortality or sublethal effects such as decreased body weight and low reproductive success (Haug et al. 1993, Sheffield 1997, Holroyd et al. 2001). Indirect problems such as a decrease in available prey also occurs (James and Fox 1987). Burrowing owls are susceptible to secondary poisoning from insecticides and rodenticides because they feed on carcasses of poisoned prey species (Haug et al. 1993).

Direct exposure to carbofuran, a carbamate insecticide used to control grasshoppers, can significantly impact the survival and reproductive success of burrowing owls (James and Fox 1987, Mutafov 1992). When carbofuran (Furadan 480F) was applied over nest burrows, the number of young was reduced by 83% and nesting success was reduced by 82% (Mutafov 1992). In some instances, sprayed areas were less frequently occupied the following year by burrowing owls.

James et al. (1990) studied the control of ground squirrels with strychnine and its impacts on burrowing owls in southern Saskatchewan. They found, at least in the short term, no direct lethal effects on breeding burrowing owls. Adult survival, breeding success and chick weights were virtually the same in both treated and untreated areas. However, adult owls weighed significantly less in the treated versus the control sites, suggesting a sublethal effect on the species. Winchell (1994) states that nuisance rodent species can be baited or fumigated safely if care is taken not to treat burrows used by owls. However, even if burrowing owls escape inadvertent poisoning, their numbers will likely decrease because fewer burrowing mammals are creating new excavations for owl nesting and because of reduced available prey (C. Conway, personal communication).

## Other Human Disturbances

Burrowing owls seem tolerant of human presence. However, Millsap and Bear (1988) found that reproductive success of burrowing owls in Florida was less at sites where home construction was taking place than at sites adjacent to construction, or where construction was absent.

Burrowing owls can also apparently become accustomed to vehicular traffic. However, nesting near roads may increase burrowing owl road kills. Plumpton and Lutz (1993b) found that vehicular traffic on roads near nesting sites did not create disturbance significant enough to influence the behavior of nesting owls. Unfortunately, owls frequently sit and hunt on roads at night, and collisions with vehicles occur frequently (Mutafov 1992).

## Competition

Green and Anthony (1989) conducted a two-year study of 76 burrowing owl nests in the north-central Oregon and found nesting success to be only 57% the first year and 50% the second. Desertion was the primary reason for nest failure, which may have been related to the proximity of other nesting owls. Nestling mortality was greatest when pairs nested closer than 110 m (360 ft) apart. Green and Anthony (1989) suggested that in the Columbia Basin, nest sites were both clumped and scarce, forcing owls to nest too closely. If food sources are scarce, competition may then be strong enough to force some pairs to abandon their nests. Bryant (1990) found that competition might also limit the nesting success and return rates of burrowing owls reintroduced to areas


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they historically occupied. Owls returning to their breeding grounds selected burrows as far away from neighboring owls as possible.

## MANAGEMENT RECOMMENDATIONS

### Protect Existing Habitat

Important ecological characteristics of areas used by burrowing owls should be maintained (Sheffield 1997). This includes preserving areas of native vegetation (e.g., shrub-steppe) and protecting burrowing mammal species (e.g., ground squirrels, badgers that create nesting habitat) for burrowing owls (Holroyd et al. 2001, Holmes et al., in press). Colonies of burrowing mammals should be preserved in areas where burrowing owls occur.

Nesting and satellite burrows should be protected from disturbance (Winchell 1994). Problems such as agricultural equipment collapsing burrow entrances and the inadvertent application of pesticides to occupied burrows can be reduced by placing markers near the burrows (Zarn 1974). Rangelands with sandy soils are especially prone to destruction of burrows by livestock (Holmes et al., in press). Where damage to burrows is likely or occurring, changes should be made in stocking rates, duration and/or season of grazing.

Activities such as oil and gas exploration and development, or other sources of human disturbance, should be restricted within 0.8 km (0.5 mi) of burrowing owl nests between 15 February and 25 September (T. Lloyd, personal communication; C. Conway personal communication). Direct destruction of burrows through chaining (dragging a heavy chain over an area to remove shrubs), cultivation, and urban, industrial, or agricultural development should be entirely avoided. Irrigation troughs should be regularly maintained because burrows often flood as a result of leaking irrigations systems (C. Conway, personal communication).

Local and regional government programs should be reviewed to ensure they address long-term conservation of burrowing owl habitat (Holroyd et al. 2001). Specifically, critical areas protection that fall under Washington's Growth Management Act could be a useful tool to conserve species, such as the burrowing owl, that are limited by loss of native habitat. Local development regulations could be designed to require mitigation and provide incentives to reduce potential impacts to this species resulting from proposed projects in owl habitat. Many resource agencies, including WDFW, have staff that can provide recommendations to assist in critical areas planning.

### Pesticides

Insecticides and rodenticides are likely to harm burrowing owls directly through poisoning as well as indirectly by reducing populations of burrowing mammals (Holroyd et al. 2001). Therefore, it is recommended that alternatives should be researched thoroughly before resorting to their use. If pesticide use is planned for areas where burrowing owls occur, refer to Appendix A for contacts that can help evaluate pesticides and their alternatives.

Insecticides used in grasshopper control programs, especially carbofuran, have been shown to reduce reproductive productivity in burrowing owls. Carbofuran should not be applied within 250 m (820 ft) of active burrowing owl nests (Haug et al. 1993). Active burrowing owl nests should not be directly sprayed with any pesticide (James and Fox 1987, Lynch 1987).

Fumigation, treated bait or other means of poisoning nuisance animals should not be used in areas where burrowing owls occur. Burrowing owls are likely to scavenge the carcasses of poisoned rodents, making the owls potentially vulnerable to indirect poisoning (Sheffield 1997).

In cases where there are no alternatives to controlling burrowing mammals with poisoned bait or fumigation, thoroughly survey the area for burrowing owls during the nesting season (March through September) (Zarn 1974). Identify and mark nesting and satellite burrows by observing sentry owls, owl droppings and tracks, pellets, and dry, shredded animal dung. The use of treated grain to poison mammals should be restricted to the months of January and February (Butts 1973, Zarn 1974).


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## Mitigation

Artificial nest burrows are useful for expanding the capacity of existing nesting sites, and in transplant operations where burrowing owls are reintroduced into parts of their former range (Thomson 1988). Artificial burrows can also give researchers opportunities to study burrowing owl nesting ecology without destroying existing burrows (Bryant 1990, Olenick 1990, Haug et al. 1993). Dring (2000) and Green and Anthony (1997) have published papers that touch upon the design and use of artificial nesting burrows. State or federal wildlife agencies should be consulted for additional guidance prior to using artificial nesting burrows.

Artificial perches such as fence posts or stakes can be used in areas where vegetation is greater than 5 cm (2 in) tall (Green and Anthony 1989). Several perches scattered throughout the nesting area should benefit this species. Additionally, these and other mitigation measures could be incorporated into local critical areas ordinances where this species exists.

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## PERSONAL COMMUNICATIONS

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## KEY POINTS

### Habitat Requirements

- Burrowing owls inhabit open, dry areas in well-drained grasslands, shrub-steppe, prairies and deserts. They also nest on agricultural lands and suburban areas.
- Preferred characteristics of burrowing owl habitat include a complex of available burrows, short and/or sparse vegetation that provides good visibility, and an adequate availability of prey.

### Management Recommendations

- Preserve areas of native vegetation (e.g., shrub-steppe) used by the burrowing owl.
- Protect populations of badgers and other burrowing mammals that provide nesting habitat for burrowing owls.
- Direct local and regional government programs and policies (e.g., critical areas regulations) to ensure the survival of species, such as the burrowing owl, that are limited by loss of native habitat.
- Refer to Appendix A for contacts that should be used when evaluating pesticides and their alternatives. Insecticides and rodenticides have the potential to harm burrowing owls, and it is recommended that alternatives should be carefully considered before resorting to their use.
- Carbofuran should not be applied within 250 m (820 ft) of active burrowing owl nests. Active burrowing owl nests should not be directly sprayed with any pesticide.
- Fumigation, treated bait or other means of poisoning nuisance animals should not be used in areas where burrowing owls occur. Burrowing owls are likely to scavenge the carcasses of poisoned rodents and are potentially vulnerable to secondary poisoning.
- If there are no alternatives to controlling burrowing mammals with poisoned bait or fumigation, survey for burrowing owls during the nesting season (March through September). Identify and mark burrows used by owls by observing sentry owls, owl droppings and tracks, pellets, prey remains and burrows lined with dried animal feces.
- If all alternatives have been exhausted, poisoning of burrowing mammal colonies with treated grain should be restricted to January and February to minimize harmful effects to burrowing owls.
- Protect both nesting and auxiliary burrows from disturbance. Markers placed at burrows can direct earth moving and other heavy equipment away from burrowing areas and help prevent the collapse of underground passages. In addition, markers can help direct pesticide applications away from occupied burrows.
- Where damage to burrows from livestock trampling is likely or is occurring already, changes should be made in stocking rates, duration and/or season of grazing.
- Restrict activities such as oil and gas exploration and development or other sources of human disturbance within 0.8 km (0.5 mi) of burrowing owl nests between 15 February and 25 September. Direct destruction of burrows by urban, industrial or agricultural development should be avoided entirely.
- Artificial nest burrows can be used to expand the capacity of existing nesting sites and can aid in the reintroduction of owls into parts of their former range.
- Artificial perches, such as fence posts or stakes can be used in areas where vegetation is greater than 5 cm (2 in) tall. Several perches scattered throughout the nesting area might be required to benefit this species.


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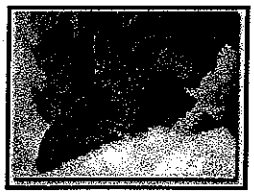
**FOR IMMEDIATE RELEASE**

# Pygmy rabbits win in court! Judge orders further consideration under Endangered Species Act



Pygmy rabbit

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**Oct 02, 2007**

Last week, federal District Judge Edward Lodge of the District of Idaho struck down a decision from the U.S. Fish and Wildlife Service that the agency lacked sufficient scientific information to warrant Endangered Species Act listing consideration. The judge ordered the Fish and Wildlife Service to reconsider this small sagebrush mammal for listing and to issue a new 90-day finding.

"Under this decision, the FWS can no longer ignore the plummeting pygmy rabbit populations", said Todd Tucci, attorney with Advocates for the West. "The Service must put politics aside, and let science dictate the outcome of its review."

The pygmy rabbit weighs about a pound and a half and can fit in the palm of a hand. This unique rabbit climbs high into the branches of sagebrush to browse on the leaves, making it the only arboreal rabbit in North America. Pygmy rabbits require areas of tall, old sagebrush, typically found in valley bottoms.

"The BLM in 2007 is still relentlessly mowing, chopping, burning and herbiciding pygmy rabbit habitats, said Katie Fite of Western Watersheds Project. "Remnant thick and old growth sagebrush is being destroyed in BLM and Forest Service projects dubbed 'hazardous fuels reduction' or wildlife habitat projects. In reality, these are the same as the old livestock forage projects that have already obliterated so much of the Sagebrush Sea."

"Sagebrush dependent wildlife, from pygmy rabbits to sage grouse, are under siege from the dual forces of livestock grazing and cheatgrass-driven fires, turning thousands of acres of the West into a barren moonscape," said Bill Marlett, Executive Director of the Oregon Natural Desert Association.

The welfare of the pygmy rabbit has also become a major issue in massive oil and gas development projects such as Wyoming's Jonah Field and Atlantic Rim. "Pygmy rabbits are especially vulnerable to habitat fragmentation from the building of road networks, because these animals are too shy to

venture out from the cover of sagebrush to cross a road," said Duane Short of Biodiversity Conservation Alliance. "For this reason, the huge level of oil and gas development targeting sagebrush basins in Wyoming is a major threat to the pygmy rabbit."

"The pygmy rabbit's habitat is more threatened than ever before by so-called 'off-site mitigation' projects conducted by oil and gas companies," added Josh Pollock of Center for Native Ecosystems. "We simply cannot afford to lose any more of our Sagebrush Sea environment, especially the stands of tall, mature sagebrush which serve so many wildlife species."

Groups bringing the suit included Western Watersheds Project, Biodiversity Conservation Alliance, Center for Native Ecosystems, Oregon Natural Deserts Association, and the Sagebrush Sea Project. Todd Tucci of the Advocates for the West Boise Office represented the plaintiff groups in the case.

"The pygmy rabbit is one of a suite of sagebrush obligate species that deserve federal protection," said Mark Salvo of the Sagebrush Sea Campaign. "The sage-grouse, white-tailed prairie dog, slickspot peppergrass, Wyoming pocket gopher, and mountain quail are also destined for listing."

"As the pygmy rabbit loses more and more of its sagebrush habitat, the need for the safety net that only the Endangered Species Act can provide becomes all the greater," added Pollock.

###

David S. Dobkin, Ph.D.
Ecological Research and Consultation
Bend, Oregon, USA

TO: Paul D. Dewey, Attorney
FROM: David S. Dobkin, Ph.D.
DATE: 27 July 2008
RE: Response to Materials and Testimony for Thornburgh Resort Wildlife Mitigation Plan (presented before Anne Corcoran Briggs, Hearings Officer, 15 July 2008)

The approach employed by Thornburgh Resort LLC to achieve complete mitigation that would result in no net loss or degradation of the wildlife resource is fundamentally incapable of evaluating the success or failure of the stated goal. The wildlife resource in question is comprised of the native animal species of juniper woodland and sagebrush-shrubsteppe plant communities. The most basic starting point for undertaking mitigation is to have a reasonable quantitative sampling of the components that make up the resource in order to provide a baseline against which changes (both negative and positive) can be measured as a means of assessing failure or success of mitigation efforts.

Applicant contends that the foregoing places an unattainable goal for applicants by requiring a "focus on *all* individual species.[1]" Such a goal would indeed be unreasonable and unrealistic. As previously outlined,[2] there are well-established standard protocols for sampling wildlife populations, and they are designed to provide basic quantitative data necessary for analyses to establish baselines and detect changes through time. Such sampling would provide estimates of numbers of individuals for a reasonable suite of appropriate species with diverse ecological needs that are presently supported on the land to be developed. Similar sampling also must be conducted on the specific lands designated for offsite mitigation to serve as a baseline against which mitigation efforts can be measured to evaluate whether they have succeeded or failed.

How many years of data are needed? As stated previously, "surveys should be conducted for two years prior to the start of significant changes to the habitats *in order to capture at least a minimum of the between-year background variation in numbers driven by variation in precipitation, food resources, etc.* [emphasis added][2]" The goal is not to determine the exact number of each species that is present on the land. The goal is to provide a statistically reasonable estimate of numbers for a suite of ecologically appropriate species so that mitigation success or failure can be evaluated meaningfully. One year of data cannot provide any basis for estimating between-year differences; two years of data provide at least a minimum basis for estimating this critical variation.

In lieu of making the effort to collect actual data to evaluate species composition and numbers present on the Thornburgh property, applicants instead undertook a modified HEP analysis for a handful of species. A HEP analysis is only as good as the data fed into it. The models developed were based on "best-judgment estimates" and "best professional judgment;" as candidly noted by ODFW in a memo to TTECI, "Of course the elephant in the room is how realistic is the model [i.e., HEP] anyway when it is based on professional judgment, rather than quantifiable field measurements.[3]" The data used to populate the model essentially consisted of

guesswork and numbers pulled from the literature for a set of seven species that are ecological generalists, geographically widespread, and occur in many different habitats that bear little to no ecological similarity to juniper woodlands and sagebrush-shrubsteppe. Hence, the numbers culled from the literature for these species are likely to be mostly inappropriate for populations inhabiting juniper woodlands and sagebrush-shrubsteppe. Beyond the foregoing problems, there are additional major problems with the HEP analysis: how the number and identity of species analyzed is determined, and the use of "habitat" as a surrogate for wildlife.

The species selected for analysis in a HEP implicitly are meant to serve as the exemplars for all the species of wildlife of the project area, meaning that the ecological needs for all species are covered by evaluation of the selected species. The sum total of acreage required for mitigation action is based on the numbers of lost "habitat units" (HUs) summed from the HEP analysis of each species modeled. Although Mule Deer is clearly an appropriate exemplar for large hoofed mammals that are hunted, nowhere is there presented any rationale or ecological basis justifying the selection of the other six species analyzed (Northern Flicker, American Kestrel, Red-tailed Hawk, Mountain Bluebird, "small mammals," and Western Fence Lizard) or the sufficiency of these six to ecologically represent all birds, small mammals, and all reptiles. It even appears from the numbers presented (e.g., Table 1)[4] that the more species analyzed in the HEP, the larger the number of acres ultimately required for mitigation (and hence also the amount of money necessary for mitigation).

The "corrected" List of Wildlife Species Potentially Occurring on the Thornburgh Property (Exhibit C submitted 15 July 2008 as part of the Tetra Tech Memorandum) lists 51 bird species, 26 mammal species, and 12 reptiles. Although the new "corrected" list of bird species now omits the several sea ducks and loon species that occur only along the Oregon Coast in saltwater and brackish-water habitats, it still fails to include eight of the species previously noted[2] as common birds of the region's juniper woodlands. A cursory examination of the mammal list (which was not included in the original Exhibit C) reveals omission of pallid bat, black-tailed jackrabbit, and striped skunk, all of which are common inhabitants of the region's juniper woodlands and sagebrush shrubsteppe. The continued inability to identify the species that are likely to be present in the habitats in question raises concerns about attention to detail in formulation and analysis of the Wildlife Mitigation Plan, and indicates a worrisome lack of understanding about which species actually would be expected to occur there.

At a minimum for birds (excluding the two species on the corrected list that occur only as migrants), there are at least 57 bird species that potentially occur on the Thornburgh property during the spring/summer breeding season. The HEP includes four bird species, which are meant implicitly to account for the ecological needs of the other 54 species (Northern Flicker, inexplicably, is not included on the corrected list). One can quibble with the species analyzed, pointing out that two of the four species (kestrels and bluebirds) are the only two of the 57 species that readily nest in artificial nest boxes, thus making for convenient mitigation by providing nest boxes. But more importantly, the four species analyzed comprise an ecologically arbitrary and inordinately small subset of species, omitting exemplars of numerous ecological types by failing to include any ground-foraging species that feed on insects or that feed on seeds, any species that build open-cup nests in shrubs or build nests on the ground, etc. The standard here is no net loss or degradation of the wildlife resource – by what stretch of the imagination is analysis of the habitat needs of Red-tailed Hawk (the only one of the four bird species analyzed

that builds open-type nests in trees) supposed to encompass the ecological needs of all the other bird species that are not large hawks, but build open-cup nests in trees?

If a HEP approach is to be deemed acceptable, then at the very least it should include a sufficient number of species to provide a representative selection of the breadth of ecological needs reflected by the actual species composition of birds, of mammals, and of reptiles that inhabit the region's juniper woodlands and sagebrush-shrubsteppe.

Applicant argues that use of a HEP approach with its focus on habitat, avoids the uncertainties associated with actually surveying for wildlife[5]. They assert, in essence, that it is better to focus on "protecting and enhancing habitat with the well-founded expectation that when the habitat needs of a species are met, the species is likely to be present[5]. Although it is clearly true that a species is not likely to be present if its habitat needs are not met, the opposite conjecture is more wishful thinking than well-founded expectation. When landscapes are fragmented, and inhospitable habitat separates patches of suitable habitat, wildlife populations become discontinuous, and consequently dispersal and colonization are disrupted. It is an axiom of conservation biology that the amount of continuous habitat, its spatial configuration, and its landscape context within a matrix of suitable and unsuitable habitats are the key determinants of whether a species will be found in any given block or patch of "suitable" habitat. As a relevant example, sagebrush habitats are extensive across the western United States, but widespread degradation and fragmentation of these landscapes has led to considerable conservation concern for many of the bird species associated with these habitats[6], which includes 14 of the species on Tetra Tech's corrected list submitted on 15 July 2008. Similarly for small mammals on the corrected species list, analysis of field studies using suitable traps in appropriate habitats found Pygmy Rabbit to be present in only 9% of sites, Merriam's Shrew in only 17% of sites, Preble's Shrew in only 25% of sites, Western Harvest Mouse in 47% of sites, Dark Kangaroo Mouse in 54% of sites, Sagebrush Vole in 60% of sites, and Great Basin Pocket Mouse in 80% of sites[7]. Clearly, habitat as a surrogate for wildlife is not a generally safe assumption.

No response by applicant was provided in the 15 July materials and testimony to address previous concerns detailed[2] about proposed revegetation and restoration with native plant species, or about the complete absence of quantitative vegetation data (including plant species composition and densities) against which the success or failure of vegetation mitigation measures must be evaluated. These concerns remain both for the Thornburgh site and for the specific lands to be designated for offsite mitigation.

The fundamental problem that pervaded the original report still remains: without pre-treatment data for wildlife and vegetation, along with equivalent post-treatment data collection, the approach taken by the Applicant cannot measure the success or failure of mitigation efforts. In the absence of such data, there is no valid basis for evaluating the success or failure of complete mitigation of negative impacts in order to demonstrate no net loss or net degradation of the resource.

[1]Thornburgh Resort Company's Responses to the Hearing Officer's Questions (page 12), 15 July 2008.
[2]Review of Thornburgh Resort Wildlife Mitigation Plan (by David S. Dobkin), 16 June 2008.

[3]Email from Glen Ardt, ODFW Wildlife Habitat Biologist to Lynn Sharp, TTECI biologist, 26 March 2008.
[4]Thornburgh Resort LLC Wildlife Mitigation Plan for Thornburgh Resort (page 6), 15 April 2008.
[5]Tetra Tech Memorandum from Lynn Sharp to Anne Corcoran Briggs, Hearing Officer (page 2), 15 July 2008.
[6]Knick, S.T., D.S. Dobkin, J.T. Rotenberry, M.A. Schroeder, W.M. Vander Haegen, and C. Van Riper, III. 2003. Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. *Condor* 105: 611-634.
[7]Dobkin, D.S. and J.D. Sauder. 2004. Shrubsteppe landscapes in jeopardy. Distributions, abundances, and the uncertain future of birds and small mammals in the Intermountain West. High Desert Ecological Research Institute, Bend, Oregon. 202 pages.

David S. Dobkin, Ph.D.
27 July 2008

Clearwater BioStudies, Inc.

23252 S. Central Point Road Canby, Oregon 97013 (503) 266-8724

## TECHNICAL MEMORANDUM

To: Paul Dewey, Attorney
From: Charles Huntington, Sr. Aquatic Biologist
Subject: Brief comments on four additional Thornburgh-related documents
Date: 25 July 2008

Per your request, I have reviewed the material related to aquatic impacts assessments contained in four additional documents on the Thornburgh Resort that have been submitted to Anne Corcoran Briggs, the Hearings Officer for Deschutes County. These documents include three memoranda from Tetra Tech EC, Inc. (TtEC) as well as a letter report from Newton Consultants, Inc. (NCI):

- *Summary of Thornburgh Mitigation Plan Assuming Yinger's Conclusions* (TtEC 2008a, four pages dated 02 July 2008);
- *Information Regarding the Two Methodologies Used by the Applicant and Opponents* (TtEC 2008b, six pages dated 08 July 2008);
- *Evaluation of Lower Whychus Creek Assuming Yinger's Conclusions* (TtEC 2008c, four pages dated 14 July 2008); and
- *Response to Anne Corcoran Briggs, Hearings Officer, Relative to the Methodology for Determining Impacts to Deschutes River and Whychus Creek* (NCI 2008a, five pages plus attachments, dated 15 July 2008).

My comments on these documents will be brief, so as to maintain a focus on what seem to me to be four important issues and to avoid adding large volumes of material that continue to repeat points already made in written or oral testimony.

**Issue 1.** The amounts of mitigation water associated with the Thornburgh Resort, or at least how the project's proponents or consultants are characterizing them, have again changed. The sequence of changes in documents you have provided me is outlined in Table 1.

***Table 1. Sequential changes in how mitigation water for the Thornburgh Resort that will enter the mainstem Deschutes River above Lake Billy Chinook during summer has been characterized.***

| Average total amount of added surface flow during summer | Average amount of COID water reaching Lower Bridge | Average amount of relatively cold water entering at Deep Canyon Creek | Date/source of information |
|---|---|---|---|
| approximately 7.5-10.4 cfs | approximately 2.0-4.9 cfs | 5.5 cfs | 21 April 2008 (NCI 2008b, pages 9-10) |
| 7.25 cfs | 4.9 cfs | 2.35 cfs | May 2008 (TtEC 2008d, pages 13-14) |
| 3.19 cfs | 1.22 cfs | 1.97 cfs | 02 & 08 July 2008 (TtEC 2008a, page 2; TtEC 2008b, page 3) |

**Issue 2.** TtEC has developed mass-balance estimates of the stream-wide thermal impacts of groundwater pumping by the proposed Thornburgh Resort on summer stream temperatures. Estimates in their original submittal to the Hearings Officer suggested temperature increases of about 0.1°C at selected points along the mainstem Deschutes from near Steelhead Falls downstream to below the Whychus Creek confluence (TtEC 2008a, see Table 4 on page 19). A supplemental mass-balance analysis they have now submitted suggests a smaller stream-wide effect in lower Whychus Creek during summer (TtEC 2008b). The stream-wide thermal impacts estimated for both of these sections of stream are small, but negative, even though the TtEC estimates already account for the resort's proposed mitigation efforts. Contrary to what seem to be suggestions by NCI (2008a, fourth bullet on page 3), the mass-balance analysis does not show that the mitigation water from Deep Canyon Creek offsets these temperature increases.

**Issue 3.** The stream-wide effects on summer water temperatures estimated for the project by TtEC (2008b, 2008c, and 2008d) do not consider the localized consequences of reduced groundwater inputs, specifically the reductions of cool habitat patches and of the coldest water in the affected stream sections at that time of year. This is something about which I gave oral testimony in Bend on 15 July. As was described in that testimony, TtEC's mass-balance analyses are at a coarse spatial scale that obscures these localized effects because the thermal consequences of Thornburgh-related reductions in groundwater inputs are being examined only after the cold groundwater has fully mixed with warmer water. The analyses do not account for the value of the cold groundwater, and the size of associated cool habitat patches, prior to such

mixing. Per page 10 of my memorandum of 15 July (Huntington 2008), logic embedded in mass-balance analyses described by TtEC (2008d) suggests that the Thornburgh Resort's impact on cool habitat patches within affected sections of the mainstem Deschutes would be to reduce existing patches by about 0.6%. The significance of this effect would be expected to increase as additional groundwater pumping within areas contributing to the affected sections of stream accumulated.

**Issue 4.** The mitigation plan for the Thornburgh Resort includes no measures that offset the small reductions of cool habitat patches that seem likely to result along the mainstem Deschutes River below Big Falls and in lower Whychus Creek as a consequence of reduced groundwater inputs. Creation or expansion of a cool habitat patch near Deep Canyon Creek as a result of the Thornburgh mitigation plan can be expected to benefit resident redband trout and mountain whitefish found above Big Falls, but are outside the geographic distributions of some of the species of fish that may be found in the habitat within the mainstem below Big Falls or in lower Whychus Creek: bull trout and reintroduced anadromous redband trout (steelhead) or spring Chinook salmon. These below-falls species will apparently experience incrementally warmer stream-wide temperatures in the mainstem and in lower Whychus Creek, incrementally reduced availability of cool habitat patches in these areas, and no thermally beneficial mitigation.

## References


Huntington, C. 2008. Review of Thornburgh-related documents. Technical Memorandum from Charles Huntington, Clearwater BioStudies, Inc, Canby, Oregon, to Paul Dewey, Attorney. 15 July 2008.

Newton Consultants, Inc. (NCI). 2008a. Response to Anne Corcoran Briggs, Hearings Officer, Relative to the Methodology for Determining Impacts to Deschutes River and Whychus Creek. Letter report to Anne Corcoran Briggs, Hearings Officer, dated 15 July 2008.

NCI. 2008b. Thornburgh Resort fish and wildlife mitigation plan addendum relating to potential impacts of groundwater withdrawals on fish habitat. Consultant report prepared for Thornburgh Resorts, LLC, Redmond, Oregon. Project No. 1007-101-07. April 21, 2008.

Tetra Tech EC, Inc. (TtEC). 2008a. Summary of Thornburgh Mitigation Plan Assuming Yinger's Conclusions. Technical Memorandum to Anne Corcoran Briggs, Hearings Officer, dated 02 July 2008.

TtEC. 2008b. Information Regarding the Two Methodologies used by the Applicant and Opponents. Technical Memorandum to Anne Corcoran Briggs, Hearings Officer, dated 08 July 2008.

TtEC. 2008c. Evaluation of Lower Whychus Creek Assuming Yinger's Conclusions. Technical Memorandum to Anne Corcoran Briggs, Hearings Officer, dated 14 July 2008.

TtEC. 2008d. Evaluation of the proposed Thornburgh Resort project impact on hydrology and fish habitat. Consultant report prepared for Thornburgh Resort Co., LLC, Redmond, Oregon. May 2008.

**Ruth Herzer**

**From:** H. Tom Davis [tomlin2@bendcable.com]
**Sent:** Wednesday, July 23, 2008 2:30 PM
**To:** Fish Ec Centrics
**Subject:** {Spam?} Let's Be Conservative

Let's be conservative, take Nancy's advice and "Just Say No" to the addiction of destination-resort neocrackcocaine before we lose the destinations and have to be committed to the recovery ward for a long stay.

Or is that a destination-resort neofastfood addiction?

OK - maybe both!

Don't miss the good news following the first article.

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# Beware the siren song of the destination resorts

## Blue Oregon - guest column

http://www.blueoregon.com:80/2008/07/beware-the-sire.html

***By Pam Cosmo of La Pine, Oregon.*** *Pat describes herself as a "freedom-loving,agri-business hating, ex-newspaper woman."*

About five years ago, I moved to Deschutes County from South Lake Tahoe. Lake Tahoe is a world class vacation destination, and I am all too familiar with the unintended consequences that resort development entails. I was the special sections editor of the Tahoe Daily Tribune when re-development was just beginning. I used to write about its progress.

I lived in South Lake Tahoe for almost fifteen years. When we got there in 1989, Tahoe was a small town populated for the most part by old hippies from the Bay Area, the offspring of local homesteaders, and Washoe Indians who had been there forever.

It was kind of like here, actually. Lake Tahoe and the mountains and the streams were spectacular and lent themselves to the development of the tourist industry, once the mining of gold and silver in the valley panned out. Family-owned casinos, like Bill Harrah's, and nice hotels, restaurants, and small ski resorts thrived. They employed local people and they did pretty well. The population grew, a hospital and schools were built and tourists were attracted from all over. It was a nice place to live and raise your kids. The schools were fine, the neighbors were friendly, nobody got rich, but you could go skiing in the winter and fishing in the summer and life was good. Local kids grew up to be teachers, auto mechanics, ski instructors, restaurateurs, store owners, car dealers, and the usual assortment of small town staples.

Time passed, though, and it was the nineties. Money had trickled up. The mega-rich had money to burn and needed to put it somewhere. And, they liked to play – hard. To keep up and compete with Aspen and Vail and other resort areas that were the playgrounds of the privileged, Tahoe had to "re-develop." We were convinced by the Chamber of Commerce brain trust that it would behoove all of us to tear down all those "unsightly" dumpy little hotels and gift shops and build a massive new complex combining a ski resort, a convention center, a retail complex, huge fancy hotels, timeshares, and a tram going all the way to the top of the mountain. Spectacular!! All those new jobs! All that money flowing in! Everybody had dollar signs in their eyes.

But, here's what happened: the family owned businesses like Harrah's got bought out by big international tourist and entertainment conglomerates. The first thing they did was to fire most of the local staff and replace them with an independent housekeeping entity that paid lower wages and provided few benefits. They recruited on a large scale with international employment mills, hiring people from Mexico and the Philippines and the former Soviet Union's lesser satellite nations. These people proved to be exceptionally fertile, and soon the schools were swamped with students that required English as a Second Language. Since these people had no insurance, they also had to rely on the small hospital's emergency room for much of their medical care. Now the hospital is perpetually on the brink of bankruptcy. For the first several years, the schools were overwhelmed with all these children. But now families can't afford to live in Tahoe anymore, so schools are closing due to lack of attendance. My son's former cute little middle school on the Nevada side, just closed. Sixth graders will attend the high school next year. So did a middle school on the California side. I just found out that the Montessori School is closing as well. The better paying jobs at the college, the City, and the County all have to be staffed with those who are bi-lingual to deal with the fact that the town is now over a third Spanish speaking.

Huge mansions have been built to cater to the rich retiring from Southern California and second homes for those coming in from the East Coast, Asia and Europe. But, they have no interest in investing in the infra-structure, and so they vote "no" on all projects that would involve increasing taxes to fund schools, roads, fire departments, etc. Keep in mind that each rich person requires about ten poor people to attend to him. "Service" implies "servants," after all. And, they want to keep as much distance from these servants and themselves as possible. A gated community on the North side actually petitioned a Safeway grocery store for their own grocery line so they wouldn't have to stand in line with the riff-raff from town. Here in Deschutes County, that "riff-raff" would be you.

The financing of these mega developments has been somewhat of a nightmare as well. Projects have been started and halted and re-started depending on the ability to secure and match financing. Resorts and hotels have been sold and re-sold, and many now belong to international corporations whose allegiance is to their stockholders, not the local population. Those initial assurances that all would be well and the locals hired first, the community's traditions cherished, and all that, have long since disappeared.

Many of those hard-working service workers, who are paid by how many rooms they can clean in a day, fortify themselves with drugs to keep up the pace. So now, there is also the meth problem to deal with. Their children, having no parents at home to supervise them, have formed gangs to give them a sense of "family" and protection, and now big fights break out regularly between rival groups at bus stops and on the school grounds. And, the crime rate has increased dramatically. It's not the people I blame; it is the corporations that have set up this system of exploitation in both countries that have created this desperate situation. They make money on them from both sides. And, if the workers or their relatives are incarcerated, they make money on that, too, since the prisons have been privatized.

So now, when you go to Tahoe, you'll see a beautiful, up-scale, world-class resort destination. But, the people working these palaces of privilege are living in barrios and taking the bus. The bus schedules are only printed in Spanish, by the way. There isn't enough money to print them in English, too. The former local trades people are moving away in droves because the housing costs have gone up so high. People have to jam into apartment slums to live there. Unless you want your kid to grow up dealing Blackjack or carrying the luggage of a fat cat from Shanghai, you must move. The mom and pop places that gave Tahoe its character are now replaced by big franchise stores just like the ones the tourists have at home. The smaller places can't afford the commercial space. Of course, the fancy new gourmet stores and up-scale theaters are also too expensive for the locals to frequent. They can't even afford to park downtown. Parking used to be free. It is not their town anymore. The locals now live on the edges.

Another disturbing element is that the tourist trade is ever more vulnerable to the vagaries of the climate, the discretionary income of people from other countries as well as our own - and the price of oil. If many of the airlines fold, and the State workers stop driving the hundred miles to vacation, business will come to a standstill. The town will be crushed under the debt load that it took to re-develop. But, when the citizenry is composed of part-time residents, time-share vacationers, and workers who make subsistence wages and barely speak English, who is going to provide the backbone necessary to pull through hard times? We all need to think seriously of these consequences or blow-back from the big-time tourist trade. It could happen here as well. Once the Resorts are in, "Resistance is Futile".

**I recoiled from living under those circumstances and sought a place far from this "development" nightmare. I moved to La Pine in Deschutes County.** And, now, I am hearing

the same pitch all over again. But, now we have the additional threats of the end of cheap oil, the financial/credit debacle, water wars, the inflation of food prices and the falling value of the dollar to contend with. That's in addition to all the inherent damage that resort development accomplishes on its own. I understand that the water level has already dropped 2 feet due to the Thornberg Resort, and it hasn't even opened yet! They are bringing in over a thousand homes and have built a 26,000 acre lake on land that doesn't even have a natural stream? What are they thinking??

Trust me, we are looking at a train wreck in slow motion if large scale destination resorts proliferate. In attempting to make more money and increasing the tax base with rich outsiders, we will be destroying the wealth of the community and of the land. Instead, we should be pulling together to work within the limitations we can afford, utilize the talents of our residents, and take care of the people who live here. Think "Bed and Breakfasts" not big hotels. Think Disc Golf, not 18 hole golf courses. Think artist colony, writers workshops, fishing retreats, permaculture seminars, yurt manufacturing, organic farms and specialty produce, ranching and farmer's markets, pony rides, and trading centers that feature locally made products.

We should be looking to create sustainable communities that localize food production, produce necessities that will no longer be imported due to the rising prices of transportation and manufacture. We should be supporting businesses that create jobs for the families that live here and produce goods and services that are regionally vital in the long term. We should work to make sure that the children who grow up here can find decent jobs and afford homes to live in. We need to focus on quality of life and conservation and preserving the incredible Northwest as we know it. Keep it simple. Keep it wonderful. If we do that, we will continue to be an envy of the world. If we don't, and we succumb to the Destination Resort siren song, it will be lost. And, it may never come back.

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# Colorado Resorts Feel Housing Squeeze

By Courtney Lowery, 7-22-08;
http://www.newwest.net/topic/article/colorado_resorts_feel_housing_squeeze/C559/L559/

Interesting story this week from the *Denver Post's* Jason Blevins on who's feeling what parts of the housing downturn at Colorado's ritziest resorts.

The nut:

> *The number of home sales in Colorado's resort communities has plummeted anywhere from 30 percent to more than 50 percent, a rare downturn in a market that has historically flourished. Resort markets that include Vail, Aspen, Steamboat, Telluride and Breckenridge are enduring record declines, according to Land Title Guarantee, which tracks sales in the high country.*

Prices are still up though, and some are using those stats to maintain optimistic about the high-end Colorado market, and others say the highest of the high-end isn't feeling any pain at all.

A broker quoted in Blevin's story says, "When there are 50 $50 million jets at the Aspen airport over July Fourth, you realize there is a certain level of resident here who is not seriously affected by the ups and downs of the base economy."

But wait just a minute. Those price increases are nothing without context. Byron Koste, at the University of Colorado, says when looking at the average home price, you have to consider that if less homes are sold, that average can be inflated by just a few big sales.

# Beware the siren song of the destination resorts

**Blue Oregon - guest column**

**http://www.blueoregon.com:80/2008/07/beware-the-sire.html**

***By Pam Cosmo of La Pine, Oregon.*** *Pat describes herself as a "freedom-loving, agri-business hating, ex-newspaper woman."*

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So now, when you go to Tahoe, you'll see a beautiful, up-scale, world-class resort destination. But, the people working these palaces of privilege are living in barrios and taking the bus. The bus schedules are only printed in Spanish, by the way. There isn't enough money to print them in English, too. The former local trades people are moving away in droves because the housing costs have gone up so high. People have to jam into apartment slums to live there. Unless you want your kid to grow up dealing Blackjack or carrying the luggage of a fat cat from Shanghai, you must move. The mom and pop places that gave Tahoe its character are now replaced by big franchise stores just like the ones the tourists have at home. The smaller places can't afford the commercial space. Of course, the fancy new gourmet stores and up-scale theaters are also too expensive for the locals to frequent. They can't even afford to park downtown. Parking used to be free. It is not their town anymore. The locals now live on the edges.

Another disturbing element is that the tourist trade is ever more vulnerable to the vagaries of the climate, the discretionary income of people from other countries as well as our own - and the price of oil. If many of the airlines fold, and the State workers stop driving the hundred miles to vacation, business will come to a standstill. The town will be crushed under the debt load that it took to re-develop. But, when the citizenry is composed of part-time residents, time-share vacationers, and workers who make subsistence wages and barely speak English, who is going to provide the backbone necessary to pull through hard times? We all need to think seriously of these consequences or blow-back from the big-time tourist trade. It could happen here as well. Once the Resorts are in, "Resistance isfutile".

**I recoiled from living under those circumstances and sought a place far from this "development" nightmare. I moved to La Pine in Deschutes County.** And, now, I am hearing the same pitch all over again. But, now we have the additional threats of the end of cheap oil, the financial/credit debacle, water wars, the inflation of food prices and the falling value of the dollar to contend with. That's in addition to all the inherent damage that resort development accomplishes on its own. I understand that the water level has already dropped 2 feet due to the Thornberg Resort, and it hasn't even opened yet! They are bringing in over a thousand homes and have built a 26,000 acre lake on land that doesn't even have a natural stream? What are they thinking??

Trust me, we are looking at a train wreck in slow motion if large scale destination resorts proliferate. In attempting to make more money and increasing the tax base with rich outsiders, we will be destroying the wealth of the community and of the land. Instead, we should be pulling together to work within the limitations we can afford, utilize the talents of our residents, and take care of the people who live here. Think "Bed and Breakfasts" not big hotels. Think Disc Golf, not 18 hole golf courses. Think artist colony, writers workshops, fishing retreats, permaculture seminars, yurt manufacturing, organic farms and specialty produce, ranching and farmer's markets, pony rides, and trading centers that feature locally made products.

We should be looking to create sustainable communities that localize food production, produce necessities that will no longer be imported due to the rising prices of

transportation and manufacture. We should be supporting businesses that create jobs for the families that live here and produce goods and services that are regionally vital in the long term. We should work to make sure that the children who grow up here can find decent jobs and afford homes to live in. We need to focus on quality of life and conservation and preserving the incredible Northwest as we know it. Keep it simple. Keep it wonderful. If we do that, we will continue to be an envy of the world. If we don't, and we succumb to the Destination Resort siren song, it will be lost. And, it may never come back

**Paul D. Dewey** · Attorney at Law

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July 18, 2008

Hearings Officer
c/o Ruth Herzer
Deschutes County Planning Dept.
1300 NW Wall Street
Bend, OR 97701

**Re: Submittal of Huntington Report**

Dear Hearings Officer:

Please find enclosed the color version of the document submitted by Mr. Huntington at the hearing on July 15, 2008, plus his C.V. This version of his report includes corrections he mentioned he was going to do. He asked me to point out his reference to the document as a "Technical Memorandum," on page 1, the correction of a few words accidentally left hanging at the end of the first sentence in the last paragraph on page 4, the correction of a typographical error in the third bullet on page 9, the change in the next to last sentence in the last paragraph on page 13 to be geographically clearer and to avoid confusion given the multiple ways in which the upper basin is subdivided into smaller, component sub-basins, and the change "Tetra Tech" to "Ttec" on page 14 for consistency.

Very truly yours,

PAUL DEWEY

PD:ao
Enclosure
cc: Client

**Clearwater BioStudies, Inc.**

23252 S. Central Point Road Canby, Oregon 97013 (503) 266-8724

## TECHNICAL MEMORANDUM

To: Paul Dewey
From: Charles Huntington, Sr. Aquatic Biologist
Subject: Review of Thornburgh-related documents
Date: 15 July 2008

Per request, I reviewed three documents you provided on the Thornburgh Resort Project and its mitigation plan: (1) *A Case Study: Thornburgh Resort Water Resources Impact Evaluation Upper Deschutes Basin, Oregon* by Yinger and Strauss (2008), (2) *Thornburgh Resort Fish and Wildlife Mitigation Plan Addendum Relating to Potential Impacts of Groundwater Withdrawals on Fish Habitat* by NCI (2008), and (3) *Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat* by TtEC (2008).

### A. The Thornburgh Project

All three of the documents reviewed provide a general description of the project, an approximately 1980-acre destination resort to be developed near Redmond, Oregon. Each also discusses proposed groundwater use by the Thornburgh Resort and the need for mitigation measures to offset resultant reductions in groundwater contributions to streamflow in the area. Such contributions are of concern because the area's surface water resources have been heavily developed, the underlying aquifer is known to be well connected to surface waters (Gannett et al. 2001), and native species benefit from groundwater emanating from seeps and springs along the Deschutes River and its tributaries down-gradient from the site of the resort.

The project's strongest effects on groundwater inputs to streamflow are apparently expected in an area of major groundwater discharge upstream from Lake Billy Chinook that begins about 6 miles north from the site of the proposed Resort, near Lower Bridge (Figure 1).

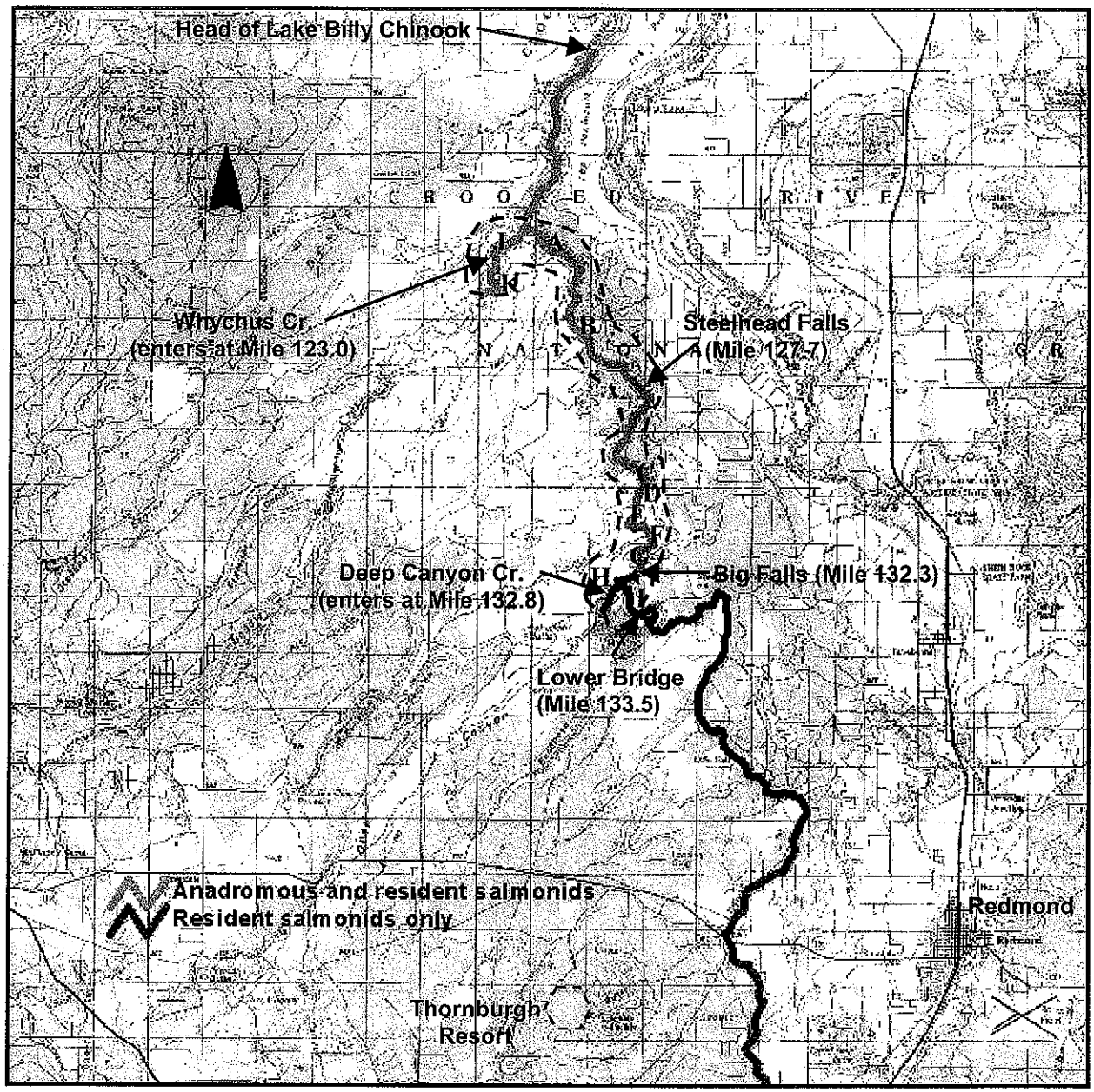


*Figure 1. Segments of the Deschutes River and its tributaries that are a focus of effects analyses for groundwater pumping at Thornburgh Resort and mitigation measures described by NCI (2008) and TtEC (2008). Areas within these segments that provide habitat for resident and anadromous salmonids are as indicated. Locations of primary groundwater inputs to the Deschutes River and Whychus Creek within a project impact zone mapped by NCI (2008) are indicated by capital letters (A-K) shown in dark blue. Modeling by Yinger and Strauss (2008) has indicated a larger potential impact zone.*

## B. Aquatic Habitat and Native Salmonids in the Area

Aquatic habitats across substantial portions of the Upper Deschutes Basin have been degraded by water development and past land-use practices, leaving populations of native salmonids diminished and less connected across the basin than was once the case (Lichatowich 1998; ODFW 2003; many others). Remaining strongholds for these fish are in the least disturbed parts of the basin, including the Metolius subbasin, and in streams where cool water is present during summer. Within the Upper Deschutes subbasin, such relatively cool streams include segments of the Deschutes River from near Steelhead Falls down to Lake Billy Chinook, which are affected by profuse springs that contribute several hundred cubic feet per second (cfs) of groundwater. The lower reach of Whychus (formerly Squaw) Creek, near and below Alder Springs, receives more than 90 cfs of groundwater before it enters the Deschutes River a few miles above the lake and is also considered a salmonid stronghold (NPCC 2005). Streamflows in both the Deschutes River and Whychus Creek above their groundwater-dominated reaches are severely depleted during the irrigation season.

Yinger and Strauss (2008), NCI (2008), and TtEC (2008), all identify salmonids that are of concern with regard to the potential effects of groundwater pumping at the Thornburgh Resort. In aggregate, these include resident redband trout, anadromous redband trout (summer steelhead), spring Chinook salmon, bull trout, and mountain whitefish. All of these fish are temperature sensitive, with bull trout generally preferring the coldest water and being least tolerant of warm water.

TtEC (2008) provides a general overview of the current distributions of native salmonids in the Deschutes subbasin above Lake Billy Chinook. All of the non-anadromous species identified above are present in the Deschutes below Big Falls and in Whychus Creek (with the bull trout restricted to the portion of Whychus below Alder Springs), and efforts are getting underway to reintroduce runs of summer steelhead and spring Chinook to these areas following an ~40 year period of absence above the lake (ODFW 2003). Resident redband trout and mountain whitefish are also present in portions of the system above Big Falls, where anadromous fish are naturally absent. A multitude of unfavorable conditions, including increased water temperatures and altered streamflow regimes, apparently eliminated remnant bull trout populations in the Deschutes River above Big Falls in the 1950s (Stuart et al. 1997).

The TtEC report also provides a reasonable, general summary of habitat limitations that are affecting existing salmonid populations in the area and that are likely to influence the success of recently initiated efforts to reintroduce summer steelhead and spring Chinook to historical

habitats above Lake Billy Chinook. More detailed discussions are available in ODFW (2003) and NPCC (2005). Water temperature criteria for the native salmonids found in the mainstem Deschutes River and Whychus Creek are as outlined in Table 1.

***Table 1. Water temperature criteria for Upper Deschutes Basin salmonids, per Final EPA Water Temperature Guidance (ODEQ 2003).***

| Type of use protected | Criteria[3] (7DADM) | Season(s) of potential concern |
|---|---|---|
| Bull trout rearing | ≤12°C | Spring - summer |
| Salmon/trout "core" rearing[1] | ≤16°C | Spring - fall |
| Salmon/trout "non-core rearing and migration[2] | ≤18°C | Spring - fall |
| Salmon/trout migration | ≤20°C | Spring - fall |
| Bull trout spawning | ≤9°C | Fall |
| Salmon/trout spawning | ≤13°C | Spring or fall (species dependent) |
| Steelhead smoltification | ≤14°C | Spring |

1-- "Core" rearing generally occurs in primary spawning and early rearing areas where temperatures are naturally cool and fish rearing densities high.
2-- "Non-core" rearing generally occurs in areas where temperatures are naturally warmer and fish uses include lower density rearing as well as migration.
3-- The 7DADM is the 7-day rolling average of daily maximum temperatures.

Data available on stream-wide temperatures during summer in the mainstem Deschutes River between Lower Bridge and Lake Billy Chinook, and in lower Whychus Creek are important to setting a context for discussing the potential effects of groundwater pumping by the Thornburgh Resort on salmonid habitat. At present, significant portions of these streams depend on inputs of cold groundwater to provide temperatures that are protective of one or more types of use by salmonids (Figure 2). During summer, only areas of these streams where groundwater influence is strongest provide the kinds of cold water preferred by juvenile bull trout. Multiple segments of the Deschutes above a point midway between Steelhead Falls and Big Falls, and Whychus Creek above Alder Springs, reach temperatures during summer likely to cause even redband trout, which in my experience are the most temperature-tolerant of the basin's native salmonids, to exhibit thermoregulatory behaviors that involve the use of cool habitat patches such as are found at points of groundwater input.

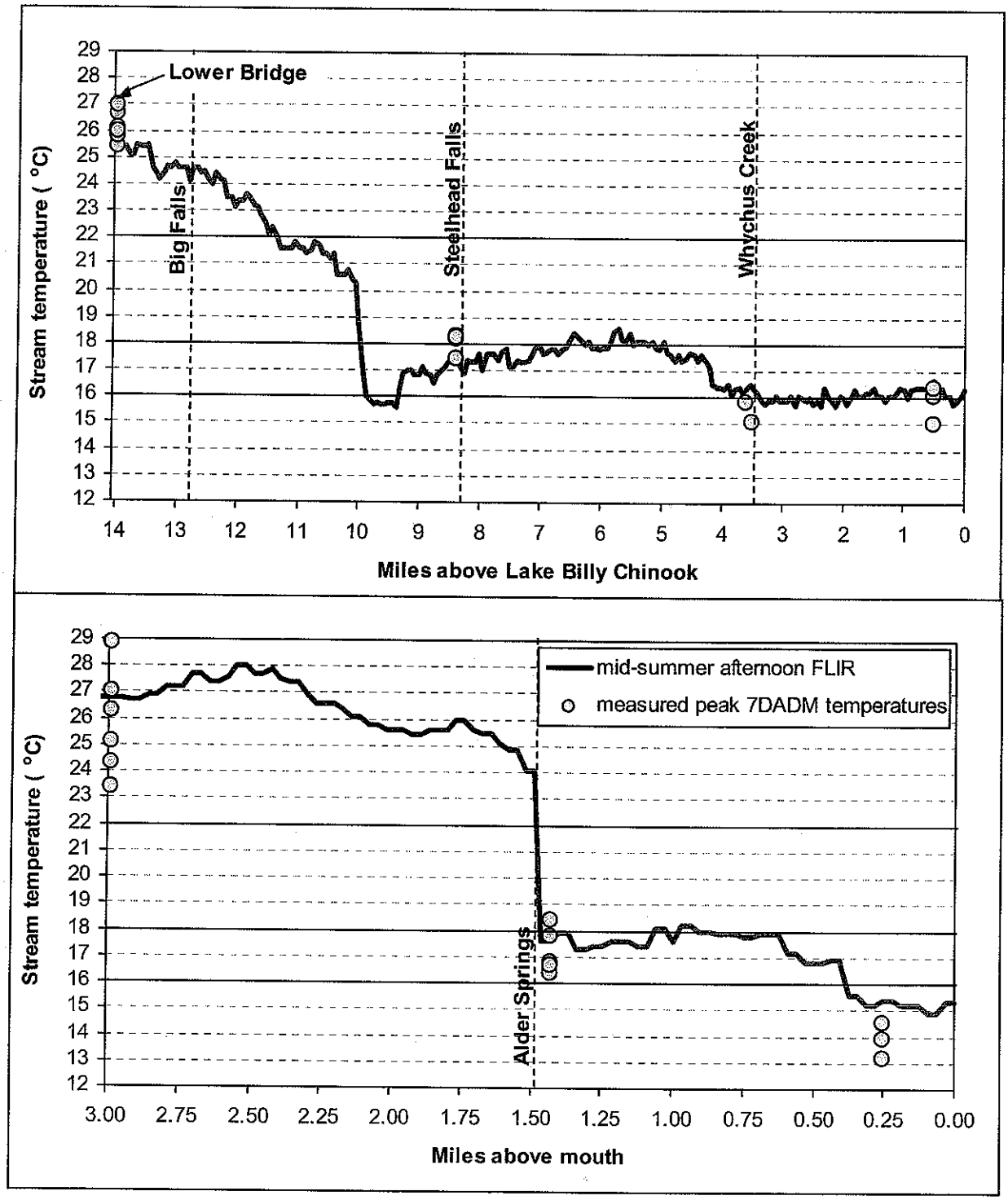


*Figure 2. Data on maximum daily temperatures during summer collected on the mainstem Deschutes River from Lower Bridge downstream to Lake Billy Chinook (top) and on the lower three miles of Whychus Creek, during the period 2000-2007. Peak 7-day averages of daily maximum (7DADM) temperatures measured at specific locations in individual years, per data available from UDWC (2008), are plotted as solid yellow circles. Stream temperatures remotely sensed by Watershed Sciences (2000, 2002) using FLIR technology, which reflect longitudinal differences in thermal conditions, are shown as solid red lines.*

***Potential consequences of reduced groundwater inputs to area streams***. Reductions in groundwater inputs have the potential to diminish streamflows and alter desirable temperature regimes in those stream areas that remain most productive for native salmonids, such as in lower Whychus Creek below Alder Springs and in much of the mainstem Deschutes River between Big Falls and Lake Billy Chinook. Elsewhere, depleted summer streamflows are often already a primary contributor to stressful thermal conditions for salmonids. In streams where water temperatures are particularly high during summer, salmonids are either absent or depend on localized patches of relatively cooler habitat for thermal relief. These patches of cooler habitat, known as thermal refugia, are often fed by groundwater and allow the fish to behave in ways that limit their daily exposures to stressful or potentially lethal conditions elsewhere in the stream. These thermo-regulatory behaviors have been described by Torgerson et al. (1998), Ebersole et al (2003), Sutton et al. (2007), and others. Such behaviors have been reported for juvenile anadromous salmonids as daily maximum stream temperatures reach 22-23°C (Belchick 2003; Sutton et al. 2007). Reduction or removal of thermal refugia along warm sections of stream would clearly be unhelpful to any salmonids that are dependent upon them at present.

Groundwater inputs can also moderate stream temperatures to the benefit of salmonids during winter, contributing water that is warmer and more conducive to fish survival or growth than the stream as a whole at that time of year. They may also provide beneficial thermal moderation during the spawning and incubation period for the basin's native salmonids that spawn during the spring (resident redband trout and summer steelhead) or during the late summer and fall (bull trout, spring Chinook, and mountain whitefish). Reductions in groundwater inputs at these times of year could unfavorably affect the native salmonids, depending on the thermal regime and the volumes of water involved.

## C. Impacts of the Thornburgh Project

The three documents reviewed all agree there will be effects of the groundwater withdrawals. It appears that Yinger and Strauss' model-based predictions of the spatial pattern of impact from the resort's groundwater removals, the "impact area" mapped by NCI (2008; see Figure 5 of that document), and the basic logic described by TtEC (2008) all suggest that groundwater inputs will diminish along the mainstem Deschutes down-gradient from the resort and in lower Whychus Creek. The documents, however, are not all in agreement on how much or where groundwater inputs to area streams will be reduced.

Yinger and Strauss (2008) have used a model of groundwater hydrology in the Upper Deschutes Basin, developed by the USGS (Gannett and Lite 2004), to simulate the pattern of reduced groundwater inputs that might result along streams as a consequence of groundwater pumping at the proposed resort. Their model results suggest spatially dispersed impacts on groundwater contributions to salmonid habitat along multiple stream channels, including the mainstem Deschutes River and lower Whychus Creek. These authors make the valid point that the patches of coldwater habitat provided by direct groundwater inputs to streams can be very important to salmonids in an arid landscape such as the Upper Deschutes Basin, particularly where stream-wide temperatures are high.

TtEC (2008) estimates the potential future effect of Thornburgh groundwater pumping on streamflows based on two simplifying assumptions. The first of these assumptions is that there will be a direct 1:1 connection between groundwater discharge reductions in affected streams and the average annual volume of consumptive groundwater use by the Thornburgh resort. The second assumption is that reductions in groundwater discharge to stream channels north (and down-gradient) of the resort would be in proportion to current groundwater discharges into those streams. The aggregate effect of TtEC's assumptions was to define the project's potential impact as a continuous 1.87 cfs reduction in groundwater discharge to channels within an impact zone narrowed from the geographically dispersed set of channel segments identified by Yinger and Strauss (2008) down to a zone that includes only the mainstem Deschutes River from Lower Bridge to the Whychus confluence. For reasons that are not entirely clear, the impact zone identified and analyzed by TtEC excludes lower Whychus Creek, which was highlighted as being within the zone both by Yinger and Strauss (2008) and by mapping done by NCI (2008; see Figure 5 of that document).

## D. The Thornburgh Mitigation Plan

The two documents by the developer's consultants (i.e., NCI 2008 and TtEC 2008) appear to address project mitigation in a very similar way but give differing amounts of irrigation water to be permanently returned to streams in specified locations to offset groundwater "consumed" by the resort.

### 1. Newton Mitigation Plan (NCI 2008)

This plan describes future groundwater pumping by the Thornburgh Resort and mitigation measures that will include surface flow compensation resulting from transfers of water now used for irrigation. It makes repeated suggestions that the suite of project mitigation

measures identified in the plan are expected to fully mitigate for any negative impacts so that there is no net loss of habitat quantity or quality for fishery resources. Multiple beneficial mitigation measures are described. However, no actual assessment of the probable effectiveness of these measures at mitigating project impacts on habitat for fish native to the area is provided.

The most significant mitigation measures and commitments for the Thornburgh Project, identified on pages 9-10 of the plan, are as follows:

- approximately 7.5 to 10.4 cfs of surface water flow currently diverted for irrigation use will be restored to the Deschutes River based on elimination of irrigation diverstions by Big Falls Ranch on Deep Canyon Creek and elsewhere by the Central Oregon Irrigation District (COID); and
- nearly two-thirds of Thornburgh's total mitigation water will come from a source (Deep Canyon Creek) that will contribute cold spring-fed water to the Deschutes River above but near areas of anticipated project impacts.

The plan's mitigation measures target the mainstem Deschutes River within the Middle Deschutes River subbasin, and indicates on page 10 that "Thornburgh water use is not projected to impact Whychus Creek based on OWRD analysis". However, the only documentation provided of an analysis by OWRD is a copy of a completed surface water impact evaluation form that is attached to the plan as Exhibit 2. The form identifies neither the Middle Deschutes River subbasin nor the Whychus Creek subbasin as a single area of localized project impact.

### 2. Tetra Tech Report (TtEC 2008)

The report by TtEC (2008) gives what is apparently Thornburgh's most recent information on the locations and amounts of irrigation water to be permanently dedicated to instream use and evaluates the project's impact on hydrology and fish habitat. Assuming this information on project mitigation to be correct, and combining it with information NCI (2008) gives on the resort's proposed use of groundwater, other mitigation measures, and supplemental actions, the following summarizes Thornburgh's anticipated water use and offsets:

- 2,129 acre-feet of groundwater per year pumped from on-site wells at full build-out (NCI 2008, pg 4; TtEC. 2008, Pg 9);

- total "consumptive use" of 1,356 acre-feet per year of this pumped groundwater, per Oregon Water Resources Department (OWRD) estimates (NCI 2008, pg 4; TtEC 2008, pg 9);
- an OWRD requirement that 1,356 acre-feet per year of irrigation water, equivalent to the agency's estimate of the resort's total "consumptive use" of groundwater, be permanently returned to the Deschutes River (NCI 2008, page 4; TtEC 2008, pg 9):
    - 4.90 cfs from the Central Oregon Irrigation District diversion at Mile 166.5 to Lake Billy Chinook at about Mile 120.0 (TtEC 2008, pg 13);
    - 2.35 cfs from Big Falls Ranch on lower Deep Canyon Creek will pass down the mainstem Deschutes River from Mile 132.8 to Lake Billy Chinook (TtEC 2008, pg 14), *an amount apparently 3.15 cfs less than that identified by NCI* (2008, section B on pg 9);
- elimination of a small irrigation pond that warms water on lower Deep Canyon Creek (NCI 2008, section C on pg 9);
- terminating use of small "exempt" wells on Thornburgh property that consume an estimated 3.84 of groundwater (NCI 2008, section D on pgs 9-10); and
- $10,000 funding toward water temperature modeling on Whychus Creek (NCI 2008, Section E on pg 10).

The TtEC report goes beyond repeated suggestions by NCI (2008) that the Thornburgh Project will fully mitigate all of the impacts on fish habitat and provides an assessment of the project's potential effects on habitat quantity and quality for salmonids. This assessment, which considered the combined effects of Thornburgh's groundwater pumping and proposed mitigation measures, is summarized below.

***Habitat Quantity***. TtEC has examined the potential effects of the Thornburgh project on salmonid habitat along the Deschutes River within the primary impact area mapped by NCI (2008). Based on their simplifying assumptions (see section C, above) plus recent flow and flow accretion data for the mainstem Deschutes, they conclude that during the irrigation season the project (with mitigation) would yield an increase in streamflow and thus increase overall habitat quantity in reaches extending from above Lower Bridge down to Lake Billy Chinook. Their calculations suggest cumulative flow changes that decline from about +7% at Lower Bridge down to +1% below Whychus Creek, with the smallest changes near Steelhead Falls and downstream. TtEC also estimates that there will be very small decreases in flow at the USGS gauge at Culver, downstream from Whychus Creek, during the non-irrigation season (for

example, -0.1% to – 0.3% during November 2006 through April 2007). All of their estimates of change seem reasonable if TtEC's assumptions about where and to what degree groundwater inputs to the river will be reduced are correct.

One aspect of habitat quantity that TtEC does not address, however, is the amount of coldwater habitat available along the river during summer. Given their assumption that direct groundwater inputs will be reduced by 1.87 cfs along a section of river for which they estimate existing inputs at 326.4 cfs, direct inputs of groundwater would be reduced by about 0.6% (1.87/326.4). Lacking better information, it would seem reasonable to assume that such a reduction would diminish thermal refugia along the river to a similar degree. Such a reduction would incrementally reduce the availability of (1) the cold habitat preferred by bull trout and, (2) refugia that salmonids may use for behavioral thermoregulation in the warmest river segments near and upstream of Big Falls.

***Habitat Quality.*** Water temperatures are a critical component of salmonid habitat quality and are known to influence the pattern of abundance of these fish in the drainage basin above Lake Billy Chinook (e.g., Walks et al. 2000; Torgerson et al. 2006). TtEC used their simplifying assumptions, recent flow and flow accretion data for the mainstem Deschutes, observed groundwater temperatures of ~11°C, actual Deschutes River temperatures recorded by ODEQ, and assumptions on Thornburgh's flow mitigation[1] to construct a mass-balance model[2] of surface flows and water temperatures at specific locations along the river within their suggested impact zone. Their calculations suggest the Thornburgh Project (with mitigation) may have no effect on stream-wide temperatures near Lower Bridge or nearer to Big Falls, but could cause 0.1°C increases in peak 7DADM temperatures near Steelhead Falls, below Whychus Creek, and (I would presume) the section of river between Steelhead Falls and Whychus Creek. This suggests that the project could incrementally increase peak summer temperatures and reduce slightly the quality of thermal conditions along most of the river section used by bull trout and to which steelhead and salmon are being reintroduced. At least portions of this section of river already exceed state water quality criteria intended to protect salmonid rearing and migration during summer (peak 7DADM $\leq$ 18°C), and incremental temperature increases would not be favorable for the salmonids now present or to be reintroduced. With respect to salmon, steelhead, and bull trout, it is unclear from the TtEC report how the project's mitigation measures will offset the slightly negative effects of such temperature increases on these fish. Above Big Falls, additions

[1] The assumed flow mitigation included 2.35 cfs of 13°C water entering the Deschutes River at Deep Canyon Creek and an additional 4.90 cfs passing down the river (undiverted by irrigators) below the COID diversion near Bend, amounts that add to a total that is inconsistent with NCI (2008).

[2] The "mass-balance" model was based primarily on the effects on temperature of adding, subtracting, and mixing water of specific temperatures and volumes thought to match patterns in the system.

of cool water at Deep Canyon Creek would be expected to cause local cooling of the river and might offset the effects of reduced groundwater inputs for resident redband trout in that area.

TtEC (2008) concludes their assessment of the Thornburgh project's effect on the Deschutes River within the impact zone by indicating that the project "will not likely result in a net loss of quality during the irrigation season" and will cause "no change in quality [during the non-irrigation season] because overall changes are very slight and habitat conditions [at that time of year] are not considered to be a primary limiting factor to fish stocks." However, at least with regard to areas currently used by bull trout or into which salmon and steelhead are being reintroduced, the effects the TtEC report suggests for summer water temperatures are slight but negative.

## E. Whychus Creek

The question of whether or not the Thornburgh Project will affect fish habitat in lower Whychus Creek is an important one that does not seem to have been answered clearly (and that may not be possible to answer with certainty). However, several things suggest that there may be impacts. Modeling by Yinger and Strauss (2008, Figs 7-1 and 7-2) shows lower Whychus Creek as one of the areas where the project will reduce groundwater inputs to surface waters and the stream is included in their discussion of the project's primary impact zone. NCI (2008) mapped the section of the stream near and below Alder Springs as being in the project impact area (see Figure 5 of that document) and reports on pages 7-8 that initially ODFW classified coldwater springs and seeps on lower Whychus Creek as "Habitat Category 1" under the ODFW Fish and Wildlife Habitat Mitigation Policy (OAR Chapter 635, Division 414), meaning the habitat is irreplaceable, though this was later revised to a classification of "Habitat Category 2" based on a subsequent determination that temperature impacts to the stream, if present, can be mitigated with appropriate actions. ODFW's attention to, and change of, the habitat classification suggests that concerns expressed about possible impacts on lower Whychus are legitimate, as does Thornburgh's proposed financial support for modeling stream temperatures on Whychus Creek.

Unfortunately, there are no clear indications provided in either NCI (2008) or TtEC (2008) as to how impacts to Whychus Creek might ultimately be determined or mitigated. As noted earlier, NCI (2008) places weight (see also Page 4, paragraph 3 of that document) on the fact that OWRD has not identified the stream as an area of specific localized impact from groundwater pumping at the Thornburgh Resort. TtEC (2008) excluded consideration of reduced groundwater inputs to lower Whychus Creek from its calculations of project impacts without a clear and convincing explanation.

In order to get a better sense of the situation, I mapped out locations of significant groundwater inputs to the Deschutes River between Lower Bridge and the Whychus confluence, as well as to Whychus Creek near and below Alder Springs. This was done based on an accounting of such inputs that underlies water temperature modeling done for ODEQ by Watershed Sciences (2008). The input locations were mapped as CAPITAL LETTERS in Figure 1, and the volumes of groundwater estimated to be entering the stream channel at each letter are given in Table 2. What quickly became apparent when examining the pattern of these groundwater inputs was that (1) they were all a substantial distance down-gradient from the proposed Thornburgh Resort, (2) very large inputs to lower Whychus Creek (areas J and K in the figure and table) and to the Deschutes above the Whychus confluence (areas A and B) are in relatively close geographic proximity to each other, and (3) the inputs to lower Whychus are at elevations that fall *between* those of the large springs on the Deschutes above the confluence. Since TtEC (2008) estimated project-related temperature changes along the mainstem partly on the basis of the distribution and volume of groundwater inputs between Lower Bridge and the Whychus confluence, it is difficult to understand why, if they had seen these data, they would think there would be reductions in groundwater discharges to the mainstem near the confluence but not into Whychus Creek near the confluence.

***Table 2. Locations of key groundwater inputs to the mainstem Deschutes River and Whychus Creek within the project impact zone mapped by NCI (2008). For location map, see Figure 1.***

| Stream | Stream distance above the Whychus Creek confluence (miles) | Map code | Elevation (feet) | Estimated flow accretion (cfs) |
|---|---|---|---|---|
| Deschutes R. | 0.47 - 0.71 | A | 2136 - 2151 | 158.9 |
| | 6.06 - 6.15 | B | 2338 - 2342 | 61.9 |
| | 6.49 | C | 2355 | 73.6 |
| | 6.84 | D | 2378 | 9.4 |
| | 7.77 | E | 2411 | 9.7 |
| | 8.11 | F | 2417 | 8.4 |
| | 8.67 | G | 2448 | 4.6 |
| | 9.79 | H | 2512 | 8.8 |
| | 10.35 | I | 2522 | 4.5 |
| Whychus Cr. | 0.47 | J | 2178 | 74.1 |
| | 0.62 - 1.58 | K | 2191 - 2237 | 26.5 |

***Potential effects of the project on habitat quantity and quality in Whychus Creek***. Monitoring data summarized by Jones (2006) show that for miles above Alder Springs, stream-wide temperatures in Whychus Creek exceed state water quality criteria for salmonid rearing and migration (peak 7DADM $\leq$ 18°C) by substantial margins and for extended periods. Water temperatures in the warmest sections of the stream are high enough that native salmonids within them likely depend on the presence of thermal refugia during hot summer afternoons. Groundwater reductions that diminished or eliminated such refugia would be unfavorable for these fish. Below Alder Springs, temperatures in Whychus Creek during summer are far more moderate, better suited to use by native salmonids, and influenced by inputs of groundwater at multiple locations. Conditions within this lower section appear likely to function as something like a thermal oasis for Whychus Creek salmonids.

Small reductions in groundwater inputs to lower Whychus Creek that might be associated with the Thornburgh Project would cause incremental decreases in the quantity and quality of salmonid rearing and migration habitat found in that area. This could subtly move stream conditions in a direction other than that needed to reestablish productive steelhead and salmon populations. Rearing/foraging habitat for ESA-listed bull trout reported to use Whychus Creek downstream of Alder Springs would also be incrementally diminished.

Logan and Jones (2007) have evaluated thermal conditions in Whychus Creek and report that water quality criteria appropriate for salmon and steelhead spawning (7DADM $\leq$13°C) are sometimes exceeded in the flow-depleted section of stream from Sisters down to Alder Springs. Low flows and elevated water temperatures during the irrigation season help explain why only those segments of Whychus Creek near Alder Springs and downstream were reported to have been used by spawning spring Chinook immediately prior to completion of the Pelton-Round Butte hydroelectric complex. Because this area accounted for most of the documented spring Chinook spawning in the upper mainstem Deschutes and Whychus Creek at that time (Nehlsen 1995), it is likely to play an important role in any efforts to reestablish a run of these fish in these areas. The Thornburgh project will incrementally (slightly) diminish the quantity and quality of salmon and steelhead spawning habitat in Whychus Creek below Alder Springs if it reduces groundwater inputs to this area, and would apparently do so without improving upstream conditions for these fish through some form of active mitigation.

## F. Conclusions

- My sense is that the effects of projects such as this on aquatic habitat and fish really ought to be evaluated from a cumulative effects perspective, but only the Yinger and Strauss (2008) document alludes to the potential consequences of growth in groundwater use in the upper basin.

- The analysis by TtEC (2008) suggests that the Thornburgh Project (including its mitigation measures), may have slight negative effects on the thermal regime and quality of salmonid habitat in the mainstem Deschutes downstream of Big Falls, the only habitat in the Deschutes River above Lake Billy Chinook that is still used by bull trout or that may be used by anadromous salmonids being reintroduced to the Upper Deschutes subbasin after an approximately 40-year absence.

- The TtEC report does not appear to resolve questions about the degree to which the groundwater pumping at Thornburgh would incrementally reduce groundwater inputs, diminish surface flows, and elevate temperatures along lower Whychus Creek, a tributary to the Deschutes River. However, any small impacts there will apparently go unmitigated on that stream. This may be a conservation concern because Whychus Creek was a key producer of anadromous salmonids prior to completion of the Pelton-Round Butte hydroelectric complex, an indication that habitat in the stream will likely be critical to reestablishing runs of these fish in the area. It also provides coldwater habitat used by bull trout.

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**CHARLES W. HUNTINGTON**
**Clearwater BioStudies, Inc.** **Senior Aquatic Biologist**

Mr. Huntington, owner of Clearwater BioStudies, Inc., graduated from Humboldt State University at the top of his class in 1978. He is a senior-level aquatic scientist with 27 years of professional experience on a variety of studies of salmonids and their ecosystems, including 24 years of work as a consulting biologist. His work has included peer-reviewed publications on modeled interactions between wild salmon and conservation hatchery programs on the Oregon Coast, the status of West Coast salmon stocks, and a comparison of salmonid assemblages and aquatic habitats within managed and pristine forestlands. He has been involved in efforts to model the lifecycles of salmon in multiple West Coast basins, including recent work on refining simulations of salmonid-temperature relations in the Klamath and Clackamas rivers. He has also been deeply involved in science-based conservation planning, conducted watershed analyses, designed and implemented aquatic monitoring projects for land managers and watershed councils, and participated in community-based efforts to restore watersheds. His clients include private businesses, landowners, public agencies, Native American groups, conservation organizations, hydroelectric utilities, and others. For four years Mr. Huntington served as Chairman of the Oregon Chapter of the American Fisheries Society's Natural Production Committee, an independent group of professional scientists who address technical issues related to the productivity of Oregon fishes in their native habitat. He recently (from 2002-2007) served on the Oregon and Northern California Coast (ONCC) Technical Recovery Team, a scientific panel established by NOAA Fisheries to assist in recovery planning for ESA-listed coho salmon.

Mr. Huntington's specific areas of expertise include the following:

- Aquatic Ecology
- Regional to Micro-scale Habitat Analysis
- River Studies
- Technical Writing
- Salmonid Biology and Status Assessment
- Watershed Assessment/Monitoring
- Salmonid Modeling
- Conservation Planning

## EDUCATION

B.S., 1978 Fisheries Biology, Humboldt State University, Arcata, California. 4.00 GPA. Primary emphasis on freshwater ecology and salmonid biology.

## PROFESSIONAL EXPERIENCE

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| 1985-present | Senior Aquatic Biologist, Clearwater BioStudies, Inc., Canby, OR |
| 1983-1985 | Aquatic Biologist, Buell & Associates, Inc., Beaverton, OR |
| 1982-1983 | Fisheries Biologist, U.S. Fish & Wildlife Service, Cook, WA |
| 1981 | Fisheries Biologist, Quinault Tribe, Taholah, WA |
| 1980 | Fisheries Biologist, U.S. Fish & Wildlife Service, Vancouver, WA |
| 1978 | Hydrologic Technician, Shasta-Trinity N.F., Redding, CA |

## PROFESSIONAL RECOGNITION

***1997 Annual Award of Merit, American Fisheries Society, Oregon Chapter***

***2008 Robert Borovicka Conservation Achievement Award, American Fisheries Society, Western Division***

## PROFESSIONAL COMMITTEES AND PANELS

Natural Production Committee, Oregon Chapter American Fisheries Society, Chairman, 1994-1998.

Aquatic Habitat Working Group, Environmental Protection Agency -- Region 10, Member, 1998.

Oregon and Northern California Coast (ONCC) Salmon Technical Recovery Team (TRT), Member, 2002-2007.

**PROJECT EXPERIENCE**

**SENIOR AQUATIC BIOLOGIST.** Clearwater BioStudies, Inc., Canby, Oregon. 1985-present.

Manage and participate in all aspects of projects related to evaluating aquatic conditions, assessing the environmental consequences of development activities and/or developing prescriptions for recovering degraded aquatic resources. Coordinate activities with government and non-governmental organizations, review technical reports, identify data needs, supervise field biologists/technicians, oversee QA/QC efforts, analyze data and write various reports.

- Anadromous Fish Reintroduction Plan for the Upper Deschutes Basin (Portland General Electric Co.). 2007.
At the request of multiple parties, Mr. Huntington worked with what had been a dead-locked group of specialists to craft a plan for reintroducing summer steelhead and spring Chinook salmon to formerly occupied habitats above a three-dam hydroelectric complex. The resulting plan is now undergoing final edits, but reflects a major achievement within a 7-8 month period by a group that had been unable to pull a plan together despite several years of effort.

- Peer Review of Lower Deschutes River Instream Flow Studies (Portland General Electric Co.). 2003.
Mr. Huntington reviewed the methods and reported results of an instream flow study of the Lower Deschutes River in north-central Oregon and prepared a technical memorandum discussing the relative strengths and weaknesses of flow recommendations, made by consultants to the Bureau of Indian Affairs, that conflicted with those agreed upon by a diversity of stakeholders involved in the relicensing process for the Pelton-Round Butte Hydroelectric Project.

- Evaluation of Water Temperatures in the Deschutes River, Oregon (Portland General Electric Co.). 1996-98.
As Principal Investigator, compiled historic temperature, flow, and weather data for the Deschutes River, Oregon, and conducted multiple statistical analyses to assess changes which had occurred along the lower 160 km of river since construction of the Pelton/Round Butte hydro-complex in the late 1950s and early 1960s. The SNTEMP model was then used to simulate water temperatures in the river and to corroborate results of the statistical analyses. This was one of multiple relicensing studies for the largest hydro project in central Oregon.

- Technical Advisor on Modeling of Salmonid-Temperature Relations in the Clackamas River (NGOs). 2007.
Mr. Huntington served multiple NGOs (and primarily American Rivers) as a technical advisor responsible for reviewing temperature and salmon lifecycle models, model results, and mitigation plans for reservoir-induced thermal changes in the Clackamas River, Oregon. One of his key responsibilities was assuring that models and/or their outputs were reliable and used appropriately when exploring alternate ways to meet water quality standards. He contributed a variety of accepted suggestions for improving (1) physical models of the thermal benefits of hyporheic flow and (2) lifecycle models intended to simulate thermal impacts on coho, steelhead, and Chinook salmon.

- Assessment of the Coho Supplementation Program in the Upper Cowlitz Basin (Trout Unlimited). 2007.
Mr. Huntington reviewed available information on the hatchery supplementation program for coho in the Upper Cowlitz basin, Washington, developed a model of the consequences of this program, and prepared a technical report summarizing what model simulations suggested about the efficacy of the program. After this report was discussed with fish managers and others, the Washington Department of Fish and Wildlife sought further guidance on its supplementation program from the region's Hatchery Science Review Group. The Review Group made recommendations consistent with Mr. Huntington's report, and the program has since been modified by the agency so as to better encourage development of natural, self-sustaining runs of salmon.

- Anadromous Fish Reintroduction Plan for the Upper Klamath Basin (Klamath Tribes/Yurok Tribe). 2006.
CBI, Mr. Huntington, and a panel of three additional consultants recognized as regional salmon experts, toured the Upper Klamath Basin, reviewed available technical information, and prepared a conceptual plan for strategically reintroducing anadromous fish into the Klamath River system upstream of Iron Gate Dam. Particular emphasis was placed on habitat conditions and reasonable reintroduction opportunities within areas above Upper

Klamath Lake, areas of particular concert to the Klamath Tribes and where the fish have been excluded for nearly 100 years.

• Technical Advisor in Upper Klamath Basin Hydroelectric Relicensing (KRITFC). 2003-2005.
Mr. Huntington represented multiple Native American groups and several non-governmental organizations (NGOs), as a technical advisor in relicensing efforts for PacifiCorp hydroelectric dams on the mainstem Klamath River. His work on this projects was done within a context of environmental regulation, Endangered species of salmon (chinook, coho, and steelhead), Native American interests in recovering lost cultural values and fishing opportunities, and public concerns about poor water quality. In addition to Tribal groups and NGOs, Mr. Huntington's efforts were coordinated with PacifiCorp, the National Marine Fisheries Service, the U.S. Fish & Wildlife Service, Oregon Department of Fish & Wildlife, California Department of Fish and Game, Oregon Department of Environmental Quality, Oregon Department of Water Resources, the Forest Service, Bureau of Land Management, and multiple additional stakeholder groups.

• Abernethy Creek Biological Assessment (PACE Engineering/Clackamas County Public Works). 2007.
Mr. Huntington examined the existing aquatic environment and prepared a biological assessment of the probable effects of a proposed stream channel stabilization project within a semi-urban area on ESA-listed salmon. Key concerns centered on the potential for releases of fine-textured sediments from the streambed and channel margins. Recommendations were made on ways to contain risks associated with such releases.

• Aquatic Monitoring in the Mohawk Watershed (Mohawk Watershed Partnership). 2003-2006.
Mr. Huntington worked with the Mohawk Watershed Partnership to monitor water quality, aquatic/riparian habitat, and fish population conditions along the mainstem Mohawk River and several of the river's tributary streams. The monitoring program, part of a larger Partnership effort to improve watershed stewardship and conditions, followed set protocols to gather information on stream temperatures, a variety of water quality constituents, aquatic invertebrate communities, and fish assemblages. Mr. Huntington collected a substantial portion of this information himself, then works with the Partnership to summarize both his own data as well as that collected by a group of well-trained citizen volunteers. During three consecutive years he presented a summary of annual monitoring results at a public meeting held within the watershed.

• Aquatic Monitoring (Clearwater NF). 1989-2005.
Project Manager/Senior Biologist on more than 30 projects which evaluated aquatic habitat, riparian communities and fish populations along over 3,000 km of salmonid streams in the Lochsa, Lolo, N.Fk. Clearwater, Potlatch and Palouse drainages, Idaho. Field methods included analysis of over 100,000 habitat transects and fish population sampling (electrofishing and snorkeling) at approximately 2,500 representative stations. Personal responsibilities included: agency coordination, project management, training and field supervision of up to thirteen biologists and technicians, QA/QC activities, data collection and analysis, and report writing. Monitored streams (more than 500) ranged from remote wilderness to severely disturbed and provided habitat for spring chinook, summer steelhead, westslope cutthroat, resident rainbow trout, bull trout, brook trout and kokanee salmon.

• Lightning Creek Watershed Assessment (PWA, Inc./Avista Corp.). 2003-2004.
Served as the senior biologist on a multi-disciplinary team that reviewed historic changes in watershed conditions and aquatic habitats within the Lightning Creek drainage, tributary to Lake Pend Oreille, Idaho. Used a GIS and varied statistical analyses to characterize existing habitat and fish population conditions within the watershed. Worked with the team and specialists from the US Forest Service, Idaho Department of Fish and Game, Idaho Division of Lands, and other agencies, to identify a comprehensive set of priority actions for restoring habitats used by bull trout within the watershed.

• Aquatic Monitoring on the Jocko River, Montana (Confederated Shalish & Kootenai Tribes) 2002-2004.
Mr. Huntington designed and implemented an aquatic inventory program on the Jocko River to support the Confederated Salish & Kootenai Tribes' ongoing efforts to settle water rights issues and restore ecological values to the aquatic/riparian system. Mr. Huntington's role on this project was to develop aquatic inventory protocols specific to the Tribes' needs, to manage and actively participate in implementing an aquatic inventory of the river and its largest tributaries, to analyze resultant data for the Tribes, and to complete a final report summarizing results of the inventory.

- Aquatic Restoration Plan for the Nike World Headquarters Campus (Nike, Inc.). 2005-2006.

Mr. Huntington worked with Nike staff and representatives from Salmon-Safe to develop an aquatic restoration plan for the company's campus in Beaverton, Oregon. The resultant plan allowed Nike's campus to become the first corporate campus certified as salmon-friendly by Salmon-Safe.

- South Fork Coquille River Assessment (Coquille Watershed Assessment). 2001-2002.

Conducted a riparian and geomorphic and assessment of the mainstem South Fork Coquille River, Oregon. Key elements of the work included Rosgen (1996) Level II and Level III assessments of the mainstem river, analyses of riparian conditions supplemented with ground-truthing, SHADOW modeling to help support an ongoing evaluation of river temperatures by the Oregon Department of Environmental Quality, and development of a restoration plan that prioritized efforts to increase stream shading and reduce high levels of bank stability.

- Statistical Bull Trout Surveys (Gifford Pinchot NF). 2001.

Designed, implemented, and reported a statistical survey for bull trout presence/absence in 11 watersheds on the Gifford Pinchot National Forest in southwestern Washington. Surveys were based on sampling protocols developed by the Western Division of the American Fisheries Society.

- Salmon Subbasin Summary (Idaho Department of Fish and Game). 2001.

Mr. Huntington coordinated multi-agency efforts to summarize environmental, fish, and wildlife conditions in the Salmon Subbasin, Idaho, as part of the Northwest Power Planning Council's subbasin planning effort. Responsibilities included solicited input from nearly two dozen federal, state, and private entities, synthesizing available information on subbasin conditions, and being the lead writer of an approximately 200 page report prepared in less than 3 months. A primary focus of the summary was on factors limiting salmonid populations within various portions of the subbasin.

- Mohawk Watershed Assessment (Mohawk Watershed Partnership/Bonneville Env. Foundation). 1999-2000.

Funded by the Bonneville Environmental Foundation, Mr. Huntington conducted an independent watershed assessment for a local stakeholder group, the Mohawk Watershed Partnership. He synthesized the results of three previous watershed analyses, filled selected data gaps, and assessed important conservation opportunities available to the Partnership within their 177 square mile watershed. Gaps filled included a systematic survey of stream conditions within the watershed, a review of the life-histories of salmon and trout native to the Mohawk River and its tributaries, and multiple GIS-based analyses of watershed conditions and conservation opportunities. Our final report to the Partnership identified bottomland forests and fluvial cutthroat trout as two of the most significant links to the Mohawk's past and to conservation efforts beyond their watershed's boundaries. We were also able to identify which subwatersheds and restoration actions would provide a good near-term focus for the Partnership's conservation efforts.

- Regional Review of the Restoration Effectiveness of Watershed Councils (TU / PRC). 1998-2000.

Watershed councils are collaborative, multi-stakeholder groups that are becoming an important part of efforts in the Pacific Northwest to improve land stewardship, restore water quality, and recover at-risk populations of native salmon. Mr. Huntington and an expert in collaborative processes conducted independent evaluations of the accomplishments of a random sample of 14 councils active in the region during 1998. He rated the conservation planning and restoration work done by these councils, using a set of standardized evaluation criteria that he developed specifically for the study. The process expert used a different set of criteria for evaluating the effectiveness of each council's processes. The study was the first independent, regional review of the restoration work done by watershed councils in the Pacific Northwest. Results of the study, summarized in a report written for a diverse audience, have been helpful to conservation groups, to policy makers, to agency staff, and to the councils themselves. Elements of the evaluation criteria developed to rate the restoration effectiveness of councils may soon be incorporated into a state monitoring program for the Oregon Plan for Salmon and Watersheds.

- Flood Systems Analysis for the Tillamook Bay Basin (PWA / U.S. Fish & Wildlife Service). 1998-2000.

Worked as part of a multidisciplinary team to identify new approaches to river and flood management in the 582 square mile Tillamook Bay Basin, Oregon. Analyzed salmonid distribution/status, aquatic habitat, and watershed

conditions. Identified relationships between the status of key aquatic resources, past landuse, and historic flood responses. Contributed to development of an analytical approach and strategic plan for riverine management that could serve as a prototype for basins elsewhere in Oregon and the Pacific Northwest.

• Dechutes River Geomorphology and Juvenile Salmonid Studies (Portland Gen. Electric Co.). 1994-95.
Assisted USDA Forest Service and Oregon State University researchers in the development of studies that examined river geomorphic processes and juvenile salmonid life histories in the lower Deschutes River, Oregon.

• Grande Ronde Basin Aquatic Habitat Analysis (Grande Ronde Model Watershed Bd.). 1993-94.
Principal and sole investigator on a study of cumulative habitat degradation and current aquatic conditions in the 8,050 square kilometer Grande Ronde Basin, Oregon. Prepared a widely distributed, objective report summarizing current in-basin conditions, with reference to habitat for threatened, endangered and sensitive salmonid species. Developed a preliminary prioritization model for prioritizing restoration actions for threatened populations of spring chinook salmon and bull trout in the basin. Study was conducted in a highly politicized environment where private landowners, resource users, agency personnel and the public were having great dificulty finding common ground and a basis for coordinated resource management.

• Application of EDT to the Upper Klamath Basin, Oregon (Klamath Tribes) 2003-2005. CBI and Mr. Huntington worked with the Klamath Tribe, PacifiCorp, multiple agencies, and several non-governmental organizations to compile aquatic and riparian data into an Ecosystem Diagnosis and Treatment (EDT) database that drove a model of anadromous fish production potential upstream of hydropower dams on the mainstem Klamath River. Critical data gaps were filled by CBI field crews. Results of the modeling were intended to inform decisions related to providing fish passage at the dams and to restoring at least some of the currently degraded stream/riparian systems above the dams.

• Salmon Monitoring in the Lower Bull Run River (City of Portland Water Bureau). 2005.
Mr. Huntington and CBI staff conducted weekly counts of spawning salmon within the City of Portland's municipal (water supply) watershed during Fall 2005. Analyses of the fish counts and of biological samples collected from fish after they had spawned should help answer questions about the degree to which the river is currently being used by both spring-run and fall-run chinook salmon.

• Technical Advisor for Portland Area Hydroelectric Relicensing (American Rivers). 1999-2006.
Mr. Huntington represented multiple non-governmental organizations (NGOs), as a technical advisor in relicensing efforts at four different hydroelectric projects. Three projects are located in Oregon's western Cascade Range: the North Fork and Oak Grove projects in the Clackamas River Basin, and the Bull Run project in the Sandy River Basin. The fourth project, Willamette Falls, is located on the mainstem Willamette River, just upstream of Portland, Oregon. On each project, he is helping the clients identify key public resource issues, then contributing to the design of studies that address critical questions about how well the projects maintain or protect these resources. He monitors the resource studies, reviews and comments upon written study reports, and assists in negotiations with the hydro-operators. His work on these projects is being done within a context of environmental regulation, Endangered species of salmon (chinook, coho, and steelhead), Native American interests in large runs of Pacific lamprey, and public concerns about poor water quality in the Willamette River. In addition to the NGOs, Mr. Huntington's efforts are coordinated with Portland General Electric Company, the National Marine Fisheries Service, the U.S. Fish & Wildlife Service, Oregon Department of Fish & Wildlife, Oregon Department of Environmental Quality, Oregon Department of Water Resouces, the Forest Service, Bureau of Land Management, multiple Tribes, and others.

• Assessment of Bull Trout Distribution and Habitat in a North-Central Idaho Subbasin (USFWS). 2002.
Assembled available information and developed a carefully documented summary of habitat known or suspected to be used by bull trout in the Clearwater Subbasin, Idaho. Resultant databases and GIS maps were used by the U.S. Fish & Wildlife Service as the agency finalized its ESA-related delineation of Critical Habitat for the species within this geographic area.

• Development of the City of Seattle's Stream Inventory Protocols (Fisheries Consultants/City of Seattle). 2003.

As a subcontractor to another firm, Mr. Huntington worked with City of Seattle hydrologists to develop and refine written stream inventory protocols that will be a key component of efforts to monitor aquatic conditions in the upper Cedar River watershed as part of the City's Habitat Conservation Plan. He then helped train selected City of Seattle staff when the survey protocols were applied to a test stream in the upper watershed.

• Assessing the Benefits of Coho Supplementation on the Oregon Coast (Pac. Rivers Council) 2002-03.
Mr. Huntington assisted in the development and application of a simulation model designed to evaluate the potential benefits to wild Oregon Coast coho of supplementation from a state-of-the-art hatchery. Results of the modeling effort suggested good reason for skepticism that supplementation programs will provide meaningful long-term benefits to the fish. Although not the focus of the modeling study, one clear finding was that effective habitat restoration offered by far the greatest potential benefits to wild coho. A refined version of the final study report was later published in the *Canadian Journal of Fisheries and Aquatic Sciences*, with Mr. Huntington as a co-author.

• Spawning Surveys for Cutthroat Trout in Bull Run Lake, Oregon (City of Portland Water Bureau). 2004.
Mr. Huntington conducted weekly surveys of cutthroat trout spawning activity in six tributaries to Bull Run Lake as part of an ongoing effort by the City of Portland and the US Forest Service to monitor population status. Standardized survey techniques were used to count fish, map spawning sites, and monitor the status of these sites from May through July. A final report summarizing patterns and trends in multi-year monitoring data was prepared for Water Bureau and US Forest Service staff.

• Aquatic Monitoring on the Lochsa and North Fork Clearwater Rivers, Idaho (Clearwater NF). 1998-2004.
Mr. Huntington led a multi-year sediment monitoring programs on the Lochsa and North Fork Clearwater rivers in north-central Idaho. These are big rivers with substantial late-summer flows, and required that CBI use relatively unique sampling procedures. We used kayaks, echo-sounding devices, and electronic positioning devices to obtain bi-annual measurements of residual volumes and/or depths at more than 100 monitored pools. Other sampling included grid-based measurements of fine riverbed sediments in key depositional areas, and benchmarked Wolman pebble counts in riffles. Monitoring results and trends were summarized in reports delivered to the Forest Service every other year. Key issues of interest to Forest land managers were (1) trends in river conditions and (2) potential channel responses to road failures and landslides experienced in highly erodible watersheds during a severe flood in November 1995.

• ESA-related Consultations for the Stafford Bridge Project (Lane County Public Works) 2002-03.
Mr. Huntington helped Lane County meet develop mitigation measures and meet consultation requirements for the construction of a new bridge across the lower Mohawk River, a tributary to the McKenzie River, Oregon.

• Flood Response Monitoring on Streams in the Clearwater National Forest, Idaho (Clearwater NF). 1995-2004.
Mr. Huntington is leading a multi-year monitoring program that is tracking changes in aquatic habitat and riparian conditions as stream channels recover from variable levels of disturbance from road failures and landslides experienced in highly erodible watersheds during a severe flood in November 1995.

• Basinwide Surveys of S. Fk. Red River, Moose Butte Creek, and Whitebird Creek. (Nez Perce NF). 2002.
Project Manager/Senior Biologist on a project that used the Nez Perce NF's standard basinwide methodology survey habitat conditions and fish populations along approximately 43 miles of streams within the upper South Fork Clearwater River and lower Salmon River basins, Idaho.

• Aquatic Inventories in Southwest Washington (Gifford Pinchot NF). 2001.
Mr. Huntington and CBI staff conducted surveys of aquatic and riparian conditions along 119 km of stream channels on National Forest lands, using standard Region 6 protocols (including systematic snorkel surveys of fish). Surveyed streams were situated in the Cispus, Cowlitz, Lewis, E.Fk. Lewis, Wind, White Salmon, and Little White Salmon watersheds. Fish species found in the streams included coastal cutthroat trout, rainbow-steelhead trout, chinook and coho salmon, brook trout, and a variety of non-game species.

- South Fork Clearwater River Monitoring Plan (Nez Perce NF). 1999.

Coordinated efforts with federal and state agencies and a Native American tribe to develop and write an aquatic monitoring plan for the mainstem S. Fk. Clearwater River, Idaho, a sixth-order stream previously identified as having water quality impairment. Pre-existing data were examined and monitoring protocols developed to define current conditions and to track temporal changes in river temperatures, sediments, and channel morphology.

- Statistical Analysis of Historic Forest Plan Monitoring Data (Nez Perce NF). 1997-98.

Examined eight years of fish habitat, salmonid abundance, and instream sediment data for established monitoring stations on the Salmon River Ranger District, Whitebird, Idaho. Identified appropriate statistical approaches and analyzed long-dormant data. Prepared a summary report of findings to the Nez Perce National Forest. This report will serve as a template for continued reporting of aquatic monitoring results for the same stations.

- Large Woody Debris and River Dynamics Assessment. (Willamette NF). 1997.

Principal investigator on study that combined on-site field investigations with air photo interpretation and historic reconstruction techniques to evaluate channel changes and river dynamics in a four mile section of the upper McKenzie River, Oregon. Key issues included historic variability in river conditions, flood-induced changes in river behavior, formations of channel-spanning jams of woody debris, and a USFS desire to provide boater passage around a debris jammed formed during a major flood event in 1996.

- Eastside Ecosystem Management/Interior Columbia Basin Project (USDA Forest Service). 1994-95.

Contracted by the Forest Service to compile and analyze aquatic habitat and fish abundance data for streams in north-central Idaho. My analysis of aquatic habitat included evaluations of the range and frequency of specific instream and riparian conditions across managed, roadless and wilderness-type landscapes. Similar types of analyses were performed on abundance data for salmon and trout. Large datasets were prepared for inclusion in a larger, regional Forest Service analysis of stream conditions in the interior Columbia Basin.

- Meadow Creek Basinwide Survey (Nez Perce NF). 1997-98.

Project Manager and Senior Biologist on a project that evaluated bio-physical conditions along 105 km of streams in a large, unroaded watershed within the Selway River drainage, Idaho. Field methods included basinwide (Hankin-Reeves) habitat and fish population surveys, channel typing, Wolman pebble counts, and riparian classification. Analyses of field data were completed and summarized in a report on stream and riparian conditions within the watershed.

- Crooked River Habitat Enhancement Evaluation (Nez Perce NF/BPA). 1990.

Project Manager/Senior Biologist on project which examined the physical and biological consequences of a large-scale habitat enhancement effort along a 20.2 km study reach of Crooked River, Idaho. Physical and biological changes were assessed using basin-wide survey techniques. Responses of juvenile summer steelhead and spring chinook salmon to habitat structures were evaluated.

- Lolo Creek Habitat Enhancement Evaluation (Clearwater NF/BPA). 1988.

Project Manager/Senior Biologist on project which evaluated the physical and biological effectiveness of a large-scale habitat enhancement effort along a 20.5 km study reach of Lolo Creek, Idaho. Physical habitat changes were assessed using transect survey techniques that include habitat typing, direct measurement of specific habitat parameters, and examination of streambed sedimentation using both ocular and quantitative methods. Responses of juvenile summer steelhead and spring chinook salmon to habitat structures were evaluated using snorkel-census and electrofishing techniques within a treatment/control study design.

- Aquatic Conservation Strategy for State Forests in the North Coast Basin (Oregon Trout). 1996-97.

Principal Investigator on project which evaluated available data, including previous analyses of areas of high conservation priority, to develop a strategy for recovering watersheds, streams, and salmon in the North Coast Basin. Oregon. The strategy was watershed-based and suggested allocating portions of the Tillamook and Clatsop state forests to conservation. These allocations were based on watershed importance to salmon and other sensitive species, current watershed and habitat conditions, erosion hazards, prognosis for recovery, and other factors.

- Review of the Draft Western Oregon State Forests HCP (National Wildlife Federation). 1998.

Performed a technical review of the implications of the April 1998 draft Habitat Conservation Plan for aquatic species, including ESA-listed salmon, inhabiting the Tillamook and Clatsop state forests in northwestern Oregon. Results of this review were summarized in a detailed report submitted to the Oregon Department of Forestry.

- Clark County Fish Passage Project (PWA, Inc. / Clark County Dept. Public Works). 1996-97.

As subconsulting biologist, designed, implemented and reported a county-wide inventory of fish passage problems at culverts beneath county roads and railroads in Clark County, Washington. Identified and analyzed anadromous fish barriers, examined fish habitat above and below barrier sites, and prioritized barriers in need of remediation. Barriers were prioritized in terms of biological benefits per cost of remediation.

- Development of West Coast Salmon Abundance Database (Big Eagle Assoc./NMFS). 1995-96.

Developed a river and basin-specific database which incorporated available time series on abundance of steelhead, coho, chinook, chum, sockeye, and cutthroat trout in Oregon. Data were acquired from a wide variety of agency, tribal, utility, and other sources for use by the National Marine Fisheries Service (NMFS) in species status reviews and associated ESA listing decisions.

- Healthy Stocks of Anadromous Salmonids on the West Coast (Oregon Trout). 1993-94.

Senior investigator on a status evaluation of healthy native stocks of anadromous salmonids along the West Coast. Project included developing a definition of stock health and reviewing available information on various anadromous salmonid populations. The status of native stocks in the Pacific Northwest and California was evaluated on the basis of eight specific criteria. Results of the evaluation were used to construct a GIS database and to map the distribution of healthy stocks. Project concluded with publication of our results in *Fisheries*.

- Bull Run River Smolt Production Estimate (Water Bureau, City of Portland). 1997.

Conducted field studies and developed estimates of actual smolt production in the lower Bull Run River during Fall 1997. Results of this effort, delivered to the Water Bureau within several weeks of contract award, were used to address questions related to steelhead trout in the Lower Columbia River ESU, which has been proposed for listing under the ESA.

- Evaluation of Fish Passage Benefits for Rocky Creek, Oregon (DEA, Inc./Fuller & Morris). 1998.

As subconsulting biologist, evaluated the potential for anadromous fish production in a small coastal Oregon watershed upstream of a total migration barrier beneath Highway 101. Estimates of potential coho and winter steelhead production were developed using multiple methods, for both existing and restored habitat conditions. Production potential for restored conditions was estimated in recognition of opportunities that may become available under the Oregon Plan for salmon restoration. Estimates developed for coho production potential included two made using a simplified version of the latest habitat-based model of coho viability developed by the Oregon Department of Fish & Wildlife.

- Grande Ronde EDT Planning Project (Mobrand Biometrics, Inc.; Bonneville Power Admin.). 1994-95.

Worked as a subconsulting biologist with Mobrand Biometrics on an Ecosystem-Diagnosis-Treatment (EDT) process in the Grande Ronde Basin, Oregon and Washington. Available data were used to produce a temporal/spatial model of habitat quality and survivorship for endangered spring chinook salmon. The model and ecological restoration principles were then used to develop a process that the basin's residents could use to assess watershed restoration priorities and monitor the success of implemented projects.

- Coordination of Discussions Between the Pac. Rivers Cncl. and the Oregon Cattlemen's Assoc. 1994.

Met with members of an environmental group (Pacific Rivers Council) and the Oregon Cattlemen's Association to discuss their disagreements over livestock use of public range and riparian areas. Conducted field tours of specific grazing allotments in the lower Imnaha and Grande Ronde basins in an attempt to find understanding and common ground between opposing sides of a highly contentious issue. Provided an aquatic biologist's perspective on grazing impacts on stream and riparian resources and potential relationships between those impacts and endanged stocks of spring chinook salmon.

- Crooked River Habitat Enhancement Evaluation (Nez Perce NF/BPA). 1990.

Project Manager/Senior Biologist on project which examined the physical and biological consequences of a large-scale habitat enhancement effort along a 20.2 km study reach of Crooked River, Idaho. Physical and biological changes were assessed using basin-wide survey techniques. Responses of juvenile summer steelhead and spring chinook salmon to habitat structures were evaluated.

- Orofino Creek Passage Project (BPA/SJO Engineers). 1987-88.

Assistant Project Manager/Senior Biologist. Biological and engineering feasibility studies for the introduction of summer steelhead and spring chinook salmon to a previously inaccessible watershed. Personally responsible for field, data analysis and reporting activities during all biological studies. Personal activities included: helping to identify and resolve fish passage problems at three barrier falls; collecting/analyzing physical and biological data on streams in a large Idaho watershed; assessment of limiting habitat factors; estimating potential salmonid production; identification of source fish stocks and potential disease problems; consideration of feasible hatchery supplementation strategies; projecting the size of future anadromous fish runs; assessing probable effects of the introduction on resident fish populations; predicting future fishery benefits to result from providing fish passage at the barrier falls; preliminary environmental reporting; benefit-cost analysis; and project coordination with agency and tribal representatives.

- Review of Willamette River Water Quality Criteria (AOSA). 1990-91.

Principal-in-charge of project to examine the biological implications of dissolved oxygen criteria that the Oregon Department of Environmental Quality proposed for the Willamette. Key issues related to the habitat needs of salmonids in the river.

- Habitat Enhancement Plans for Six Utah Streams (USFS; USBOR). 1989-91.

Project to develop comprehensive plans for improving brown, cutthroat, rainbow and brook trout habitat in streams affected by water development. Personally responsible for: project management, hydrologic modeling, benefit-cost analysis, report writing and agency coordination.

- Environmental Field Investigations (National Marine Fisheries Service). 1988-90.

Assessed the environmental consequences of over a dozen specific development projects proposed for navigable waterways or wetlands in Oregon. The projects included several on the lower Columbia River and often were likely to affect juvenile anadromous salmonids. Identified conflicts between development and fishery resources. Proposed methods of minimizing or mitigating adverse environmental impacts.

- Phillips-Ingle Ditch Rehabilitation Study (Wallowa-Whitman NF). 1990-91.

Project Manager/Senior Biologist on project that developed solutions to fish habitat degradation and erosion problems caused by a poorly constructed irrigation ditch. Study activities included evaluation of the severity of ditch-related erosion and habitat degradation, development of feasible erosion control strategies for 11 miles of irrigation ditches, conceptual design, assessment of the environmental consequences of alternative ditch rehabilitation measures and cost-effectiveness analysis.

- Anadromous Salmonid Enhancement in the Klamath Drainage (CDFG). 1986-87, 1990-91.

Project Administrator or Manager on projects to plan and implement improvements to fall chinook and steelhead habitat in four northern California streams: Bogus Creek, Grider Creek, Shasta River and Thompson Creek. Habitat improvement measures included riparian exclosures, boulder weirs, gravel placements, rock deflectors, boulder clusters and organic riprap.

- Hunter Creek Enhancement Project (Del Norte CCC Center). 1988-89.

Administrator/Senior Aquatic Biologist on project to enhance habitat for salmon and steelhead in 26 km of streams within the Hunter Creek Watershed, California. Project activities included: habitat typing along all project streams; identification of specific habitat and erosion problems; a snorkel-census to correlate fish abundance and habitat conditions; limiting factor analyses; enhancement design; and preparation of a design document which allowed the client to construct habitat improvements in streams owned by a private timber company (Simpson Timber).

- Benefit-Cost Analysis of Fish Screening/Rescue Activities (CDFG). 1986-88.

Personally performed a benefit-cost analysis of fish screening and trapping operations in the Klamath River drainage, California. Compiled and analyzed data recorded during 10 years of screening and trapping outmigrant salmon and steelhead juveniles. Modeled fishery benefits attributable to the fish screening and rescue activities. Wrote a technical report on the cost-effectiveness of the program.

- Benefit-Cost Analyses for the Trout Creek Enhancement Project (BPA). 1986-87.

Revised previous benefit-cost projections for stream rehabilitation activities in the Trout Creek watershed, Oregon. Developed and used simulation models of the net economic benefits of future project-related increases in the sport harvest of summer steelhead.

- Moss Creek Rehabilitation Project (Tillamoook Co. SWCD). 1986-87.

Inventoried and assessed degraded habitat for five species of anadromous salmonids inhabiting a small coastal watershed in Oregon. Identified specific habitat problems and overall limiting production factors, then developed a comprehensive stream rehabilitation plan.

- Fishery Benefits Analysis for the Lemhi River Project (Buell Inc./BPA). 1986.

Personally performed supplemental analyses of fishery benefits to result from implementation of fish passage and habitat improvement measures recommended for the Lemhi River, Idaho. Wrote computer programs to model the biological effectiveness of several improvement measures proposed by engineers. Each measure was designed to increase streamflow and/or improve passage conditions for spring chinook salmon and summer steelhead.

- LaLonde Creek Biological Assessment (Clark County Dept. Public Works). 1999.

Prepared a biological assessment of environmental impacts and potential mitigation measures for road improvements and continued urbanization along LaLonde Creek in southwestern Washington. Key issues included ESA-listed salmonids, fish passage, streambed sedimentation, riparian degradation, and increased watershed imperviousness.

- Little Sandy River Instream Flow Study (Hardin-Davis, Inc./Portland General Electric). 1997-98.

Contributed to site selection and other field studies during an instream flow study of the Little Sandy River downstream of Portland General Electric's water diversion at Rkm 3. Suggested potential habitat enhancements for the segment of river below the diversion.

- Clearwater River Litigation (Cramer Associates/Holland & Hart Attorneys). 1993-96.

As subconsulting fisheries specialist, helped counsel for the Nez Perce Tribe develop defensible estimates of anadromous fish losses attributable to a dam constructed on the Clearwater River, Idaho in the 1920's. Responsibilities on the project included: 1) developing estimates of the river system's historic capacity to produce spring chinook and summer steelhead; 2) giving any necessary legal testimony pertaining to the estimates developed; and 3) reviewing technical analyses performed by other specialists on the project team.

- Forest Plan Monitoring (Powell Ranger District). 1992, 1993, 1995, 1996.

Evaluated sediment conditions and salmonid populations at 50 sites in the upper Clearwater River drainage, Idaho. Results of this evaluation contributed to long-term monitoring of compliance with Forest Plan standards.

- Eastside Ecosystem Management/Interior Columbia Basin Project (USDA Forest Service). 1994-95.

Contracted by the Forest Service to compile and analyze aquatic habitat and fish abundance data for streams in north-central Idaho. My analysis of aquatic habitat included evaluations of the range and frequency of specific instream and riparian conditions across managed, roadless and wilderness-type landscapes. Similar types of analyses were performed on abundance data for salmon and trout. Large datasets were prepared for inclusion in a larger, regional Forest Service analysis of stream conditions in the interior Columbia Basin.

- Red Mountain EIS (Montane Resources; USFS). 1991-95.

Personally addressed aquatic and riparian issues during an impact assessment of management alternatives for the Red Mountain Planning Unit of the Wallowa-Whitman NF. Examined the condition of aquatic and semi-aquatic resources within the unit, then evaluated their sensitivity to land management activities. Prepared several sections of a draft EIS. Key issues include riparian conditions, fish habitat, stream sedimentation, water quality and TES salmonids.

- Wild and Scenic River Studies (Montane Resources; USFS). 1991-95.

As the Senior Aquatic Biologist on an interdisciplinary team, contributed to federal wild and scenic river studies on Rock, Killamacue and Dutch Flat creeks in north-east Oregon. Evaluated the relative quality and uniqueness of the three streams with respect to their hydrologic conditions, aquatic habitat and fish populations. Prepared sections of an LEIS related to designating or not designating specific stream segments as part of the Wild and Scenic Rivers system.

- Middle Fork John Day River EA (David Evans & Assoc.; Dept. Transportation). 1994.

Worked as a consulting fisheries specialist on a team of resource scientists evaluating the probable environmental consequences of realigning a section of road along the Middle Fork John Day River and of constructing a new highway bridge across that river. Key issues of concern included project impacts on wetlands and on sensitive populations of spring chinook salmon and bull trout. Helping to prepare project mitigation plan.

- Deadly Moose EIS (Clearwater NF). 1994.

Worked as a consulting fisheries/riparian specialist on a Forest Service ID Team that prepared the environmental documentation for future managent of the Deadly Moose planning unit. Responsible for aquatic environmental analysis of land management alternatives under consideration for a highly fragmented landscape.

- Crooked River Instream Flow Study (Hardin-Davis/ODFW). 1992.

Mapped fish habitat and stream channel types along 15.4 km of Crooked River within a deep canyon near Smith Rocks State Park, Oregon. Contributed to selection of representative transect sites for IFIM analysis.

- Stream Monitoring in Two Idaho Wilderness Areas (Nez Perce NF). 1991-92.

Project Manager/Senior Biologist on project to establish a monitoring baseline on salmonid abundance, fish habitat and riparian conditions along selected streams in the Selway-Bitterroot and River-of-No-Return wilderness areas in Idaho. Baseline data were collected using the Nez Perce NF's basin-wide methodology, a modified Hankin-Reeves survey. Project streams included one which provides pristine habitat for a remnant run of wild spring chinook.

- South Tongue Point EIS (David Evans & Associates; Oregon DSL). 1991-92.

Personally documented existing aquatic conditions and discussed the potential aquatic impacts of proposed development at a site on the Columbia River estuary. Prepared sections of an EIS related to the development. Key issues included wetland alteration, known use of the site by juvenile anadromous salmonids, and potential use of the site by an endangered species of fish (Idaho fall chinook salmon).

- Deschutes River Instream Flow Study (Hardin-Davis/ODFW). 1991.

Contributed to IFIM studies on the Deschutes River below Crane Prairie Reservoir, Oregon.

- McKenzie River Instream Flow Study (EA Engineering; EWEB). 1989-90.

As biological subconsultant, assisted on instream flow (IFIM) studies pertaining to the relicensing of two hydroelectric projects on the lower McKenzie River, Oregon. Direct responsibilities included field logistics, boat handling and data collection at streamflows ranging from approximately 500 to 2,000 cfs.

- Environmental Field Investigations (National Marine Fisheries Service). 1988-90.

Assessed the environmental consequences of over a dozen specific development projects proposed for navigable waterways or wetlands in Oregon. The projects included several on the lower Columbia River and often were likely to affect juvenile anadromous salmonids. Identified conflicts between development and fishery resources. Proposed methods of minimizing or mitigating adverse environmental impacts.

- Habitat Suitability Criteria for McKenzie River Salmonids (Hardin-Davis). 1989.

As subconsulting biologist, helped develop habitat suitability curves (depth, velocity, substrate and cover) for resident and anadromous salmonids in a large Oregon river. River-specific habitat preference data were collected using direct observation (ie. snorkeling) techniques. Resultant suitability curves were subsequently used in a comprehensive instream flow (IFIM) study.

- Delta/Camanche Environmental Assessment (WESCO, Inc.). 1988.

As subconsulting biologist, assessed the effects that an East Bay MUD emergency project to pump mildly-brackish water from the Sacramento-SanJoaquin Delta to a freshwater reservoir would have on aquatic biota. Compiled and reviewed bio-physical data available from state and federal agencies, identified important environmental issues, and discussed areas of critical concern with agency personnel. Key issues included: entrainment losses of Delta fishes; live transfers of undesirable organisms; impacts on biota at the water diversion site (Delta) and the receiving reservoir (Lake Camanche); and adverse effects upon a chinook salmon run in the Mokelumne River, downstream of the receiving reservoir.

- Grider Creek Forest Fire Impact Study (Klamath National Forest). 1988.

Conducted field studies and performed statistical analyses of biophysical data on 17 km of streams in the Grider Creek drainage, California. Study results provided a basis for evaluating habitat and fish responses to influxes of granitic sediments associated with a recent forest fire. Prepared a report on instream conditions that was used to develop several sections of an EIS for proposed management activities in the watershed.

## SELECTED PUBLICATIONS/REPORTS


Dunsmoor, L.K., and C.W. Huntington. 2006. Suitability of environmental conditions within Upper Klamath Lake and the migratory corridor downstream for use by anadromous salmonids. Technical Memorandum to the Klamath Tribes. October 2006.

Foy, M.G., C. Huntington, J. Big Eagle, C.R. Steward and K.K. English. 1995. Coho salmon catch, escapement and historical abundance data. Report to the U.S. Department of Commerce, NOAA, NMFS. Big Eagle & Associates, LGL Limited, Steward Consulting, and Clearwater BioStudies, Inc. May 1995.

Gray, G., G. Sonneville, H. Hansel, C. Huntington, and D. Palmer. 1984. Feeding activity, rate of consumption, daily ration, and prey selection of major predators in John Day Pool. Report to the U.S. Dept. Energy, Bonneville Power Administration, Division of Fish and Wildlife, Portland, Oregon. U.S.D.I., Fish and Wildlife Service, NFRC – Willard Substation, Cook Washington. March 1984.

Huntington, C. 1985. Deschutes River spawning gravel degradation study. Final report to the BonnevillePower Administration from Buell & Assoc., Inc., Contract No. DE-AC79-83BP13102, Portland, Oregon. 241 pp. + appendices.

Huntington, C. 1988. Benefit-cost analysis of fish screening and rescue activities in the Klamath River drainage, California. Final report to the California Department of Fish and Game. Clearwater BioStudies, Inc., Sherwood, Oregon.

Huntington, C. 1994. Stream and riparian conditions within the Grande Ronde Basin. Final report to the Grande Ronde Model Watershed Board. Clearwater BioStudies, Inc., Canby, Oregon.

Huntington, C. 1995. Fish habitat and salmonid abundance within managed and unroaded landscapes on the Clearwater National Forest, Idaho. Final report to the Eastside Ecosystem Management Project, USDA Forest Service. Clearwater BioStudies, Inc.

Huntington, C. 1998. Streams and salmonid assemblages within roaded and unroaded landscapes in the Clearwater River Subbasin, Idaho. Pages 413-428 *in* M.K. Brewin and D.M.A. Monita, tech. coords. Forest-fish conference: land management practices affecting aquatic ecosystems. Proc. Forest-Fish Conf. May 1-4, 1996, Calgary Alberta. Nat. Resour. Can., Can. For. Serv., North. For. Cent., edmontaon, Alberta. Inf. Rep. NOR-X-356.

Huntington, C. 1999. An evaluation of selected watershed councils in the Pacific North west and northern California: how effective have they been at developing and implementing restoration programs. Final Report – Part I. Clearwater BioStudies, Inc. report to Trout Unlimited and Pacific Rivers Council. May 1999.

Huntington, C. 1999. Water temperatures in the lower Deschutes River, Oregon. Final consultant report to Portland General Electric Company, Portland, Oregon. April 1999.

Huntington, C. 2000. A supplemental assessment of the Mohawk watershed. Final consultant report to the Mohawk Watershed Partnership. Clearwater BioStudies, Inc., Canby, Oregon. November 2000.

Huntington, C. 2003. Stream inventory protocols, Confederated Salish and Kootenai Tribes, Version 1.0. Clearwater BioStudies, Inc., Canby, Oregon. August 2003.

Huntington, C. 2004. Klamath River flows within the J.C. Boyle Bypass and below the J.C. Boyle Powerhouse. Technical Memorandum to the Klamath Tribes. Clearwater BioStudies, Inc., Canby, Oregon. 15 April 2004.

Huntington, C. 2006. Aquatic monitoring within the Mohawk watershed, Oregon. Final consultant report to the Mohawk Watershed Partnership (Marcola, Oregon) and to the Bonneville Environmental Foundation (Portland, Oregon). Clearwater BioStudies, Inc., Canby, Oregon. June 2006.

Huntington, C. 2007. Hatchery production and reform in the Columbia Cascade Province: a landscape perspective. Consultant report to the West Coast Conservation Office of Trout Unlimited. Clearwater BioStudies, Inc., Canby, Oregon. 09 February 2007.

Huntington, C. and SJO Engineers. 1988. Orofino Creek passage projectbiological and engineering feasibility report. Final report to the Bonneville Power Administration, Project No. 87-112. SJO Engineers, Portland, Oregon. 129 pp.

Huntington, C., and 16 co-authors. 2001. Salmon Subbasin Summary. Report prepared for the Northwest Power Planning Council, Portland, Oregon.

Huntington, C., and C.A. Frissell. 1997. Aquatic Conservation and Salmon Recovery in the North Coast Basin of Oregon: A crucial role for the Tillamook and Clatsop State Forests. Final report to Oregon Trout from Clearwater BioStudies, Inc.

Huntington, C., and D. Cramer. 2003. Reanalysis of the effects of 1980-1988 spill tests on rates of spring chinook passage through the Faraday Bypass Reach. Technical Memorandum to relicensing participants for the Clackamas Hydroelectric Project. Clearwater BioStudies, Inc., Canby, Oregon. 22 December 2003.

Huntington, C., and L.K. Dunsmoor. 2006. Aquatic habitat conditions related to the reintroduction of anadromous salmonids into the Upper Klamath Basin, with emphasis on areas above Upper Klamath Lake. Technical Memorandum to the Klamath Tribes. 19 September 2006.

Huntington, C., and L.K. Dunsmoor. 2006. Stock selection issues related to the reintroduction of anadromous salmonids into the Upper Klamath Basin, with emphasis on areas above Upper Klamath Lake. Technical Memorandum to the Klamath and Yurok tribes. 27 March 2006.

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Lawson, P., E. Bjorkstedt, C. Huntington, T. Nickelseon, G. Reeves, H. Stout, and T. Wainwright. 2004. Identification of historical populations of coho salmon (Oncorhynchus kisutch) in the Oregon Coast Evolutionarily Significant Unit. Oregon Coast Workgroup, Oregon Coast and Northern California Coast Technical Recovery Team. April 2004.

Mobrand, L., L. Lestelle, L. Gilbertson, D. Bryson, R. Carmichael, E. Claire, B. Hadden, C. Huntington and M. Shaw. 1995. Ecosystem management for the Grande Ronde Model Watershed Project. Final report to the Grande Ronde Model Watershed Board and to the Bonneville Power Administration. Contract No. 94AC10331. Mobrand Biometrics, Inc., Vashon Island, Washington.

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Perry, D.A., B. Anthony, L. Benda, C. Huntington, D. Luoma, R. Noss, and T. Schowalter. 2004. Biodiversity on the Tillamook and Clatsop State Forests: A scientific assessment of the relative merits of the Oregon Department of Forestry's "Structure-Based Management" versus the proposed 50-50 Plan. Expert panel report to the Wild Salmon Center, Portland, Oregon.

Wainwright, T. C., M. W. Chilcote, P. W. Lawson, T. E. Nickelson, C. W. Huntington, J. S. Mills, K. M. S. Moore, G. H. Reeves, H. A. Stout, and L. A. Weitkamp 2006. Biological recovery criteria for the Oregon Coast Coho Salmon Evolutionarily Significant Unit. DRAFT Report, Oregon and Northern California Coast (ONCC) Technical Recovery Team. September 2006.

## Ruth Herzer

**From:** Merry Ann Moore [merryann@bendcable.com]
**Sent:** Wednesday, July 16, 2008 8:28 AM
**To:** Ruth Herzer
**Subject:** Thornburgh hearing comments 7-15-08

Dear Ms. Herzer:

Here are my written comments from last night. They go along with the copy of the memo 3/6/07 from Bob Rindy to LCDC. Thank you for copying Ms. Briggs on these comments, and please confirm receipt with me.

Thank you,

Merry Ann Moore
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July 15, 2008

Ms. Anne Corcoran Briggs
Hearings Officer
c/o Ruth Herzer
Associate Planner
Deschutes County Community Development Department
117 NW Lafayette Ave.
Bend, OR 97701-1925

RE: File Number M-07-2; MA-08-6

Dear Ms. Briggs:

I represent the Juniper Group Sierra Club. I want to address your question about how a resort mitigation plan can meet the requirement of no net loss of wildlife. I will do this in the context of legislative reforms now being proposed.

The Oregon Department of Land Conservation & Development and the Department of Fish & Wildlife have made a recommendation for legislation for the 2009 Legislative Session to reform destination resort requirements.

As you know, DLCD's role is to guide land use policy throughout Oregon. Fish & Wildlife's purpose is to protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations. Together, these agencies have acknowledged that destination resorts are not meeting the goals set out for them in the 1980s.

Here is what these two state authorities acknowledge as problems with resorts that need to be addressed:

- ODFW has experienced problems in getting resorts to follow through with wildlife mitigation plans.
- They've also stated that current plans don't address cumulative impacts.
- "The result has been a net loss of fish and wildlife habitat from all destination resorts in the state."

- DLCD states "The number, size and concentration of resorts in Central Oregon is resulting in types and levels of impacts that were not anticipated at the time Goal 8 and the statute were developed…
- "…the general expectation was that only a few new resorts would be built (mirroring experience in the 1960s and '70s when only three major resort-like developments were built—Sunriver, Salishan and Black Butte. In addition the expectation was that resorts would be spread around the state and in rural areas…
- "…so that the cumulative effect of resort development on the predominantly rural character of the area in which they were located would not be upset."
- "Many resorts have taken on characteristics of large planned developments with a large component of permanent housing that would be better provided for in UGBs."

Here are some of the legislative changes these agencies recommend to address these problems—and they get to the crux of the no net loss standards for mitigation:

1. First, conduct studies on true impacts of resorts, including on critical habitat, and then make reforms to destination resort requirements based on this science.
2. Likely reforms would be:
    - Including cumulative effects in assessments of impacts on wildlife;
    - Putting areas where federally-listed threatened or endangered species live off limits to resort development;
    - Including statutory limits on the concentration of resorts in a region;
    - Stricter requirements for overnight vs. permanent resident housing;
    - Putting areas within 1 ½ miles of winter big game range off limits to resorts;
    - Putting migration corridors off limits to development;
    - Requiring mitigation plans to be completed within 5 years, and failing that, seizure of funds from the developer to restore the public resources that have been damaged.
    - Develop a checklist to standardize environmental assessments of projects, including no net loss.

So all this begs several questions for the hearings officer to consider:

1. If existing resorts haven't been able to meet the requirement of no net loss of wildlife and habitat required in state planning guidelines, what assurance can the public have that this one will? Personally, I don't have confidence that the water scheme proposed will result in no net loss on temperature and flow in the several waterways it will affect.
2. Second, is it right for a county to approve a plan for a highly controversial resort at all, when the state's professional land use and wildlife authorities have acknowledged that current resort policy is not working to protect public resources and should be changed? Is it right to proceed with approval knowing that the experts charged with striking the proper balance between development and conservation are recommending a broad overhaul of resort requirements?

I urge you to postpone a decision on this application until the state legislature has acted on the recommendations of our state land use and wildlife experts in early 2009.

Sincerely,

Merry Ann Moore
Juniper Group Sierra Club
Post Office Box 6376
Bend, Oregon 97708
541.549.6006

**Ruth Herzer**

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**From:** Katy Yoder [ktyoder@coinet.com]
**Sent:** Tuesday, July 15, 2008 5:58 PM
**To:** Ruth Herzer
**Subject:** Thornburgh Resort

Having been involved in trying to protect the Cline Buttes area I am saddened and disappointed to see yet another way that this oasis in the middle of three main areas is being diminished and decimated once again. Historically, this area has always been used to support human concerns in one way or another.

In the beginning it was migratory routes for Native Americans, their spiritual quests and even war. With the onslaught of white settlers, grazing of sheep and cattle, dry land farming, WWII training exercises, Uranium and even gold mining. All of the European uses of the land have taken their toll in varying degrees, but nothing compares to the current attack this area is receiving. The individual building of homes and farms is tapping into the aquifer that lies beneath this area. That is a slow and possibly manageable use; but the Thornburgh Resort is like a bomb being dropped on the area. It will spread and destroy this area by pulling huge amounts of water from the aquifer, not in small manageable amounts but by the lake-full. It will greatly increase and advance the loss of habitat for countless creatures, pushing those that survive at all into areas that are not suitable for their existence. The creatures will either be killed by the guns of frightened or frustrated landowners, cars careening down the ever-expanding roadways, traps, or even a more devastating a slow demise from starvation.

Thornburgh Resort is not worth it! This beautiful piece of land, if it had to be developed, could have been divided in large parcels that minimized its impact on all concerned. But greed and the desire for revenues both private and public has allowed this over-development to go forward. This development is an example of present politicians, developers and other business concerns caring only for the money they can make today with no serious thought for what they are doing for the future of others. For some reason their ability to feel empathy and concern for all living creatures has been shut off as they throw money and well-paid consultants at any logical rebuttal of their desires.

I have seen the Thornburgh Resort marketing machine, under the smiling, shrewd, heartless direction of Linda Swearingen, create pamphlets that made it look as if the original owners of the Thornburgh Ranch desired this development. I know from personal experience there is nothing farther from the truth. A pamphlet was passed out around Tumalo trying to create empathy for a family that worked hard to live off the land in an area that can be less than hospitable. This development is not their dream; but a terrible nightmare they would abhor. They loved this land and wanted to see it as free and wild as possible. I have lived in this area for 15 years; a small amount of time compared with Eva and Ambrose Thornburgh; but even in my short time I've seen the beginning of what they feared; an end to the original contours, wildflowers, Native American signs of the past, habitat for nature and more.

Nothing good will come out of the planned development of this area. It will use more water than we can imagine, regardless of their so-called mitigation of resources. It will be a stomp on the, up until now, slow degradation of a Central Oregon natural resource that should be protected. What ATV's, overgrazing, development and other uses have done to the area will pale in comparison. Let's be brave; let's think ahead and consider the Native American idea of looking ahead and acting now in a way that protects the 7th generation. If we don't our children's children will wonder what on this precious earth we were thinking.

Katy Yoder
541-382-4208
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Bend, OR 97701

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July 15, 2008

Hearings Officer
Deschutes County Planning Department
1300 NW Wall Street
Bend, OR 97701
*Hand-delivered and delivered via email*

**re: Thornburgh Final Master Plan M-07-2, MA-08-6**

**Dear Madame Hearings Officer,**

On behalf of 1000 Friends of Oregon , thank you for the opportunity to comment on the above-referenced Final Master Plan. We urge you to reject the proposed Thornburgh destination resort for the reasons outlined below.

Dr. Marshall Gannett is the foremost expert on the hydrogeology of the Upper Deschutes Basin. He is the principal or associate author of no fewer than 14 publications concerning the ground water of the Deschutes Basin. A partial listing of his publications on the topic is provided in Attachment 1.

Dr. Gannett is the principal author of the definitive description of the flow of groundwater within the Upper Deschutes Basin, which appears in the 2001 "U.S. Geological Survey, Ground-Water Hydrology of the Upper Deschutes Basin, Oregon, USGS Water-Resources Investigation Report 00-4162", which is part of the record for this proceeding.

The title page of this definitive work provides the following statement:

> Prepared in cooperation with Oregon Water Resources Department;
> cities of Bend, Redmond, and Sisters; Deschutes and Jefferson Counties;
> The Confederated Tribes of the Warm Springs Reservation of Oregon;
> and U.S. Environmental Protection Agency

Deschutes County cooperated in the production of this study and approved its results. There is no competing model of groundwater flows in the Upper Deschutes Basin. A search of the recent literature indicates no other model has been published since the USGS published this model of groundwater flow in the Basin.

In other words, there is no model available which can provide a more accurate prediction of the impact that groundwater withdrawals, such as those predicted by the applicant for the proposed Thornburgh Resort, will have on the ground waters and surface waters of Deschutes County.

Dr. Gannett indicated in an email dated June 12, 2008 and provided as Attachment 2, that results of simulations conducted using Thornburgh data and the model of groundwater flow patterns in the Deschutes Basin used by Mark Yinger and Laura Strauss "are very consistent with similar simulations presented in our report (USGS Water Resources Investigations Report 03-4195."

Mark Yinger and Laura Strauss worked for six months to model the impact of Thornburgh's own predicted groundwater withdrawals on the ground waters and surface waters of the Deschutes Basin. They are experts in hydrogeological studies such as the 2008 Case Study submitted into the record for this application. (Thornburgh Resort Water Resources Impact Evaluation Upper Deschutes Basin, Oregon, for Steve Munson and Sandy Lonsdale, Native Restoration Fund, Vulcan Power Co.)

Laura Strauss holds a bachelors degree in Geology/Environmental Studies from UCSB, and a masters in Hydrology from the University of Arizona. Mark Yinger holds a bachelors degree in Geology from the Oregon State University, and a masters in Geology from the University of Idaho. Both have decades of experience in the field of hydrogeological assessment.

Pursuant to Deschutes County Code 18.113.070, in order to approve a destination resort, a hearings officer shall find from substantial evidence in the record that any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource.

> **18.113.070 Approval Criteria.**
> In order to approve a destination resort, the Planning Director or Hearings Body shall find from substantial evidence in the record that:...
>
> D. Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource.

The 2008 Yinger and Associates report indicates that withdrawal of groundwater by the applicant will result in a lowering of water level and increase in water temperature in reaches of Wychus Creek, among other negative impacts. There is no way to mitigate for the loss of fish habitat in Wychus Creek that will result. Native fish currently being re-introduced into the Creek rely on its current temperatures and flow levels for their survival.

The construction currently underway of new fish passage facilities at the Pelton-Round Butte dams on the mainstem Deschutes River is one of the most ambitious fisheries restoration projects ever undertaken in the Pacific Northwest. The operators of the dams, Portland General Electric and the Confederated Tribes of the Warm Springs Reservation of Oregon, began reintroducing steelhead and chinook salmon to Wychus Creek in 2007.

Whychus Creek is instrumental to the success of steelhead reintroduction efforts in the Deschutes Basin. Models developed as part of fish passage studies conducted for the re-licensing agreement indicate Wychus Creek -alone- will provide over 42% of the steelhead production in the Upper Basin. Wychus Creek is widely acknowledged to provide the highest quality riparian and stream habitats for the native fish re-introduction in the Upper Basin.

Deschutes County is a signatory to the relicensing agreement for the dams. After 19 months of negotiations, on July 13, 2004, Deschutes County signed the relicensing agreement with the dam's owners and 22 other government and non-government organizations representing the various stakeholders interested in the fish habitat of the streams and rivers upstream of the Pelton and Round Butte dams, including Wychus Creek. The commitments stated in that multiparty settlement agreement became conditions of the new license for the dams.

The re-licensing agreement signed by Deschutes County obligates the Warm Springs Tribe and PGE to invest more than $121 million in the project license period over the next 50 years for fish-related projects and activities (2003 dollars).

There is no other stream more important than Wychus Creek to the native fish restoration project in the Upper Deschutes Basin that Deschutes County committed to after 19 months of negotiations with 22 other organizations. There is no way to mitigate for the negative impacts of the projected groundwater withdrawals on the surface waters of Deschutes County and on the fish habitats in those waters.

There is no more accurate model of groundwater flow in the Deschutes Basin than that created by Dr. Marshall Gannet and no more accurate estimates of impacts of Thornburgh ground water withdrawals than those produced by Mark Yinger and Laura Strauss in their report, a report characterized by Dr. Gannett himself as very consistent with simulations he produced with the model.

For these reasons, we urge you to find that the destination resort may not be approved because there is substantial evidence in the record that no mitigation is possible for the irreversible and permanent harm to the native fish resources of Deschutes County that is predicted to result from the groundwater withdrawals needed for the resort.

Thank you for your attention to these views. Please add our testimony to the record for this proceeding.

Best regards,

Carol Macbeth
Central Oregon Advocate
1000 Friends of Oregon

**ATTACHMENTS**

1. Partial listing of publications of Dr. Marshall Gannett on the Hydrogeology of the Deschutes Basin

2. Copy of June 12, 2008, 10:33 AM, email from Marshall W. Gannett to H. Tom Davis, Subject "re: Yinger Application", 1 page.

**ATTACHMENT 1**

PARTIAL LISTING PUBLICATIONS
OF
DR.MARSHALL GANNETT
ON THE HYDROGEOLOGY OF THE DESCHUTES BASIN

Gannett, M.W., Manga, Michael, and Lite, K.E., Jr., 2003, Groundwater hydrology of the upper Deschtues Basin and its influence on streamflow: *in* O'Connor, J.E., and Grant, G.E. eds., A Peculiar River -- Geology, geomorphology, and hydrology of the Deschutes River, Oregon: American Geophysical Union Water Science and Application 7, p. 31-49.

Sherrod, D.R., Gannett, M.W., and Lite, K.E., Jr., 2002, Hydrogeology of the upper Deschutes Basin , central Oregon -- A young basin adjacent to the Cascade volcanic arc: *in* Moore , G.E., ed., Field guide to geologic processes in Cascadia: Oregon Department of Geology and Mineral Industries Special Paper 36, p. 109-144.

Gannett, M.W., Lite, K.E., Jr., and La Marche , J.L., 2003, Temporal and spatial variations in ground-water discharge to streams in the Cascade Range in Oregon , and implications for water management in the Klamath Basin [abs]: Geological Society of America Abstracts with Programs, GSA National Meeting, Seattle , November 2003.

Gannett, M. W., and Lite, K.E., 2000, Climate-driven fluctuations in hydraulic head and groundwater discharge to streams in the upper Deschutes Basin , Oregon [abs]: Eos, v. 81, n. 48, p. 531.

Lite, K. E., Gannett, M. W., and Burgel, L.E., 2000, Mitigating the effects of groundwater development on streamflow in the upper Deschutes Basin , Oregon [abs]: Eos, v. 81, n. 48, p. 529.

Gannett, M. W., and Lite, K. E., Jr., 1999, Simulation of regional ground-water flow in a young volcanic terrane using inverse methods [abs]: Geological Society of America Abstracts with Programs, v. 31, n. 7, p. A-86.

Gannett, M. W., and Lite, K. E., Jr., 1999, The use of numerical models in conjunctive use management in the Upper Deschutes Basin, Oregon [abs]: Proceedings of the National Ground Water Association Pacific Northwest Focus Ground Water Conference, Portland , Oregon , February 17-19, 1999.

Lite, K.E. Jr., and Gannett, M.W., 1999, The role of quantitative hydrology in conjunctive water management in the upper Deschutes Basin, Oregon [abs]: Proceedings of the National Ground Water Association Pacific Northwest Focus Ground Water Conference, Portland, Oregon, February 17-19, 1999.

Ferns, M. L., Lite, K. E., Jr., and Clark, M. D., 1996, Lithologic controls on groundwater discharge to the Deschutes River between Lower Bridge and Lake Billy Chinook, central Oregon [abs.]: Geological Society of America Abstracts with Programs, v. 28, n. 5, p. 65.

**ATTACHMENT 1 (cont.)**

Gannett, M.W., and Lite, K.E. Jr., 1996, Hydrogeology of regional ground-water flow in the middle Deschutes Basin, central Oregon [abs]: Geological Society of America Abstracts with Programs v. 28, n. 5, p. 66.

Gannett, M.W., Morgan, D.S., and Lite, K.E. Jr., 1996, Groundwater/surface-water interactions in the upper Deschutes Basin, central Oregon [abs]: EOS, Transactions of the American Geophysical Union, v. 77, n. 46, p. F-265.

Gates, S.M., and Gannett, M.W., 1996, Estimation of aquifer parameters for water-bearing zones in the Deschutes Formation, middle Deschutes basin, Oregon [abs]: Geological Society of America Abstracts with Programs v. 28, n. 5, p. 68.

Lite, K.E. Jr., and Gannett, M.W., 1996, Developing models for quantitative evaluation of ground-water/surface-water interactions in the upper Deschutes Basin, central Oregon [abs]: EOS, Transactions of the American Geophysical Union, v. 77, n. 46, F-248.

Gannett, M.W., and Lite, K.E. Jr. 1995, Effects of climate, stream stage, and irrigation canal seepage on groundwater levels in the middle Deschutes Basin, Oregon [abs]: Oregon Section, American Institute of Hydrology 1995 meeting, Ashland , Oregon .

Lite, K.E. Jr., and Gannett, M.W., 1995, Factors controlling seasonal and long-term ground-water level variations in the middle Deschutes Basin, Oregon [abs]: Proceedings of the Oregon Academy of Science, v. XXXII.

The report *Ground-water and water-chemistry data for the Upper Deschutes Basin, Oregon,* provides much of the raw hydrologic data collected during the study. It includes tabulated information for more than 1,500 field-inventoried water wells, hydrographs showing water-level fluctuations for 102 wells, and water-chemistry data for 26 wells, 7 springs, and 5 surface-water sites.

The geologic factors controlling the occurrence and movement of ground water in the basin are described in the report *Geologic Framework of the Regional Ground-Water Flow System in the Upper Deschutes Basin*. This report describes the geologic history and stratigraphy of the basin, and the resulting regional permeability distribution. It provides the geologic context for the discussion of ground-water flow in other reports.

The regional ground-water hydrology is described in *Ground-Water Hydrology of the Upper Deschutes Basin, Oregon*. This report describes the quantitative understanding of the regional ground-water flow system including the rate and distribution of recharge, flow directions (head distribution), ground-water/surface-water interaction, discharge, and the response to stresses.

The hydrologic understanding of the basin is synthesized and a numerical flow model is described in the report *Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon*. The report describes numerical model construction, steady-state and transient calibration, and example simulations of pumping and canal-lining scenarios.

ATTACHMENT 2

----- Original Message -----
From: "Marshall W Gannett" <mgannett@usgs.gov>
To: "H. Tom Davis" <tomlin2@bendcable.com>
Sent: Thursday, June 12, 2008 10:33 AM
Subject: Re: Yinger Application

The Yinger and Associates report states that the USGS model was used "with a few modifications" (page 35). Without knowing exactly what modifications were made and being able to review the model files, I can't rigorously evaluate their simulation results.There is, however, no indication that the model was improperly modified or incorrectly used. The results in the Yinger and Associated report are very consistent with similar simulations presented in our report (USGS Water Resources Investigations Report
03-4195).

I hope this is helpful.

Sincerely,

Marshall Gannett

# Sign-In Sheet for Hearing

**Date:** 7/15/08

**Meeting Location:**

**Subject:** M-07-2, MA-08-6 Thornburgh

**File No.** M-07-2 MA-08-6

| Name/Names | Mailing Address and Email | Home Phone | Work Phone |
|---|---|---|---|
| Peter Livingston | 1211 SW 5th Ave, Portland, OR. | | 503 796 2892 |
| Martha Pagel | 530 Center St NE, Ste 400, Salem 97301 | | 503 540-4260 |
| Dick Nichols | 521 SW 6th St Redmond, OR | | 541-504-9940 x 225 |
| David Newton | " " " " " " | | " " " " |
| Jennifer Hawkins | TetraTech EC 19803 Northcreek Parkway, Bothell, WA | | 425-482-7678 |
| Lynn Sharp | TetraTech EC 1750 SW Harbor Way, #400, Portland OR | | 503-222-4546 |
| Mark Finger | 69860 Camp Polk Rd Sisters, OR 97759 | | 541-549-3030 |
| Charles Huntington | 23252 S. Central Point Rd. Canby, OR 97013 | | 503-266-8724 |
| DAVID DOBKIN | 19526 MAMMOTH DRIVE BEND, OR 97702 | | 541-382-1117 |
| Bret Michalski | 19325 Kiowa Rd Bend, OR 97702 | | 541-317-9067 |
| Brad Markell | 2900 NW Melville Drive (on behalf of) Bend, OR 97701 Deschutes Land Trust | | 541.382-7557 |
| Nancie Gould | 19845 SW. Brown Rd Bend OR 97701 | | 420-3325. |

EBAY #2008-203 LOT 32

## Sign-In Sheet for Hearing

**Date:** _____ **Meeting Location:** _____

**Subject:** _____ **File No.** _____

| Name/Names | Mailing Address and Email | Home Phone | Work Phone |
|---|---|---|---|
| Rex Barber Jr | 70460 NW Lower Bridge Way Terrebonne OR 97760 | 541-548-8954 | |
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LUBA # 2008-203
01133

## Exhibit Schedule

**File No.** MA-08-6 (M-07-2) **Hearing Date:** 7/15/08

**Subject:** Thornburgh Resort

**Hearings Body:** Hearings Officer Anne Corcoran-Briggs

| Exhibit No. | Description | Submitted By |
|---|---|---|
| A | Letter | Lewis & Bennett |
| B | Letter | Beverly Southern |
| C | Letter | Katy Yoder |
| D | Letter | Patrick Hodge |
| E | Letter | mark Yinger |
| F | Case Study | Yinger & Associates |
| G (together) | Thornburgh's responses to the Hearings Officers Questions | Livingston Paegel |
| H (together) | Applicant's Submission | Livingston |
| I | Supplemental memo of Nunzio Gould in opposition to the proposed develop | Paul Dewey |
| J | A case study: Thornburgh Resort Water Resources Impact Evaluation | mark Yinger |
| K | Clearwater BioStudies | Charles Huntington, Sr. |
| L | Commission Review & Potential Approval of Proposed 2009 Legislative Concepts | Merry Ann Moore |
| M | Oregon Chapter Sierra Club (marylin miller) | Sandy Lonsdale |
| N | Letter | Sandy Lonsdale |
| O | Letter | marilyn miller |
| P | Letter | marianne Fellner |
| Q | Letters | Nunzio Gould |
| R | Letter | Rex Barber |

From: Mail Delivery System <MAILER-DAEMON@c650-2.noc.bendbroadband.com>
Subject: **Delivery Status Notification (Failure)**
Date: July 15, 2008 11:02:05 AM PDT
To: lewlou@bendbroadband.com

The following message to <Ruth-Herzer@co.dechutes.or.us> was undeliverable.
The reason for the problem:
5.1.2 - Bad destination host 'DNS Hard Error looking up co.dechutes.or.us (MX): NXDomain'
Reporting-MTA: dns; c650-2.noc.bendbroadband.com

Final-Recipient: rfc822;Ruth-Herzer@co.dechutes.or.us
Action: failed
Status: 5.0.0 (permanent failure)
Diagnostic-Code: smtp; 5.1.2 - Bad destination host 'DNS Hard Error looking up co.dechutes.or.us (MX): NXDomain' (delivery attempts: 0)

From: Lewis W Bennett <lewlou@bendbroadband.com>
Date: July 15, 2008 11:04:27 AM PDT
To: Ruth-Herzer@co.dechutes.or.us
Subject: **Water wasters at Thornburgh**

The Highland Estates Water District is a 29 member owned supplier of domestic water. It is controlled by a five member board, all volunteers, elected each year by the membership. The State of Oregon requires laboratory tests, check valve tests, and professional help which we provide with diligence.We have an emergency plan to insure water in case of problems. We hope that the STATE will help to keep water wasters from taking our water out from under us for use in sport destinations which are not vital to human life. Open ponds evaporate high amounts of water in dry, high elevation atmospheres.If we lose our well due to carelessness, certainly those who have taken it will have to pay restoration costs and we expect the STATE to be just as diligent in that effort as we have been in living up to our obligations. LEWIS W. BENNETT President of The Highland Estates Water District

**Ruth Herzer**

**From:** Beverly Southern [blackhorseacres@hotmail.com]
**Sent:** Tuesday, July 15, 2008 1:50 PM
**To:** Ruth Herzer
**Subject:** The Thornburgh Resort Hearing on the Final Master Plan-- Comments

Anne Corcoran Briggs
Hearings Officer
File # M07-2, MA08-6

July 15, 2008

Dear Ms Briggs

Thank you in advance for receiving these comments from my husband and myself. We are landowners/residents directly adjacent to the southern edge of the BLM land in which the Thornburg project is proposed. We purchased this property almost 10 years ago for all the reasons others live in this area.

a. small, rural community
b. rural, 2 lane road with far less traffic than living in a city
c. the ability to hear birds, see deer, watch falcons, owls, and hawks, smell clean air, and see the stars at night.
d. live by neighbors that are committed to a way of life on a full time basis so as not to pollute the area, and then leave to go back to their own cities.

In response to your request for additional evidence:

GENERAL:

1. We (the Tumalo community) have for several yearrs, asked ODOT to address the traffic concerns at Cook Ave (downtown Tumalo) and Highway 20 to no avail. We have written, emailed and have had them come to our meetings to hear our concerns. Now, there own documents prove an increase incidence of traffic accidents not just from this intersection, but the other streets in Tumalo that access Highway 20 as vehicles are so frustrated trying to access Highway 20 to get to Bend, that they bypass the main route and use one of the smaller streets.

One does, not have to be an engineer to conclude that the volume of traffic that Thornburgh would put on Cline Falls (2 lane) road, would overwhelm the preveiously mentioned Tumalo access to Highway 20. ODOT has repeated admitted

that there is NO, ABSOLUTELY No thought of re-vamping this intersection until years and years after 2013. They've actually stated that it isn't even in their scope of thinking about till after 2013. In addition, ODOT has stated that the required monies put aside by Eagle Crest years ago, is in no way capable of providing for the upgrades needed in todays dollars.

2. My husband and I have worked for several years with BLM regarding the Cline Butte Rec Plan. We have worked with BLM individuals and with large groups of local residents to help plan for the best use of this precious resource and with the least disruption to wildlife that have used these migration paths long before we took breath. BLM has stated that not only deer migrate, but that a large area has been used by ELK for calving and eagles for breeding/nesting.

BLM has NOT yet finished it proposal or plans to the public with regard to the 3-4 proposed options for recreation use of this area. How can ANYONE state that they are mitigating for fish, wildlife, or even water when, for example, BLM and OWRD have not finished analysis and in BLM's case, their program implementation. OWRD has not given input yet regarding the privately funded analysis of water by the Mark Yinger report given to them several months ago. This report speaks not only to the water tables being lowered in this area, but also its impact on endangered fish.

WILDLIFE MITIGATION PLAN:

1. Local residents don't need a mathematical formula to attest to the fact that many of our wells have had to be lowered in this adjacent area in the recent past. It can hardly be denied that these wells had to be lowered AFTER Eagle Crest developed. Now, Eagle Crest residents are worried that THERE well depth may not hold with the proposed development of Thornburgh.

Can we not learn from other desert areas with regard to a limited supply of water?? Do we not remember 20 years ago when San Francisco watched its water supply being depleted by the aquaduct to LA ?? Is Central Oregon not by definition a desert and therefore, with a limited water supply ??

2. The destruction of an ecosystem, has proven in the long run, to destroy all. We don't believe that the golden eagle is less important than destination resort people enjoying a large man-made lake with water that should be deep in the ground and used for local consumption of farmland, residents and our food supply.

3. How does one ethically quantify loss of a species in an area versus money gained by a small group of people?? How do you quantify quality of life issues for local

residents versus transient populaces ? Is it as important for wildlife to have water and shelter and areas to feed versus a development in an area already perhaps overdeveloped and in a homeowners recession with houses not even being able to be auctioned off in the recent months ??

4. What amount of money IS acceptable to replace the value of the habitat ?? Or the lifestyle ? Or the traffic ? Or the noise and emissions ? Or the value of the farm land ??

5. We cannot comment as we are not aware of the 'Firewise' standards.

TRANSPORTATION:

1. We believe we previously commented fully on the concerns the Tumalo residents have had over the vast many years regarding the traffic at it's current rate and the unacceptability, much less furthered compounded by this large resort proposal. ODOT HAS NO FIX and has stated so, many times in front of hundreds of people.

We appreciate, in advance, your listening to our concerns and are hopeful you may hear our plea when making your assessment.

Most Sincerely

Don and Beverly Southern

**Ruth Herzer**

---

**From:** Katy Yoder [ktyoder@coinet.com]
**Sent:** Tuesday, July 15, 2008 7:59 AM
**To:** Ruth Herzer
**Subject:** Thornburgh Resort Rebuttal

Deschutes County Planning Commission:

Having been involved in trying to protect the Cline Buttes area I am saddened and disappointed to see yet another way that this oasis in the middle of three main areas is being diminished and decimated once again. Historically, this area has always been used to support human concerns in one way or another.

In the beginning it was migratory routes for Native Americans, their spiritual quests and even war. With the onslaught of white settlers, grazing of sheep and cattle, dry land farming, WWII training exercises, Uranium and even gold mining. All of the European uses of the land have taken their toll in varying degrees, but nothing compares to the current attack this area is receiving. The individual building of homes and farms is tapping into the aquifer that lies beneath this area. That is a slow and possibly manageable use; but the Thornburgh Resort is like a bomb being dropped on the area. It will spread and destroy this area by pulling huge amounts of water from the aquifer, not in small manageable amounts but by the lake-full. It will greatly increase and advance the loss of habitat for countless creatures, pushing those that survive at all into areas that are not suitable for their existence. The creatures will either be killed by the guns of frightened or frustrated landowners, cars careening down the ever-expanding roadways, traps, or even a more devastating a slow demise from starvation.

Thornburgh Resort is not worth it! This beautiful piece of land, if it had to be developed, could have been divided in large parcels that minimized its impact on all concerned. But greed and the desire for revenues both private and public has allowed this over-development to go forward. This development is an example of present politicians, developers and other business concerns caring only for the money they can make today with no serious thought for what they are doing for the future of others. For some reason their ability to feel empathy and concern for all living creatures has been shut off as they throw money and well-paid consultants at any logical rebuttal of their desires.

I have seen the Thornburgh Resort marketing machine, under the smiling, shrewd, heartless direction of Linda Swearingen, create pamphlets that made it look as if the original owners of the Thornburgh Ranch desired this development. I know from personal experience there is nothing farther from the truth. A pamphlet was passed out around Tumalo trying to create empathy for a family that worked hard to live off the land in an area that can be less than hospitable. This development is not their dream; but a terrible nightmare they would abhor. They loved this land and wanted to see it as free and wild as possible. I have lived in this area for 15 years; a small amount of time compared with Eva and Everett Thornburgh; but even in my short time I've seen the beginning of what they feared; an end to the original contours, wildflowers, Native American signs of the past, habitat for nature and more.

Nothing good will come out of the planned development of this area. It will use more water than we can imagine, regardless of their so-called mitigation of resources. It will be a stomp on

the, up until now, slow degradation of a Central Oregon natural resource that should be protected. What ATV's, overgrazing, development and other uses have done to the area will pale in comparison. Let's be brave; let's think ahead and consider the Native American idea of looking ahead and acting now in a way that protects the 7th generation. If we don't our children's children will wonder what on this precious earth we were thinking.

Katy Yoder
541-382-4208
18489 Fryrear Ranch Road
Bend, OR 97701

# LONG BUTTE WATER SYSTEM, INC.

P.O. Box 7648
Bend, OR 97708-7648

20354 Empire Ave. Suite D6
Bend, OR 97701

541-383-2863
541-383-6511 (fax)

July 14, 2008

RECEIVED

JUL 14 2008

Deschutes County CDD

Anne Corcoran Briggs
Hearings Officer
c/o Ruth Herzer
County Planner

To Whom It May Concern:

My name is Patrick Hodge and I am the President and owner of Long Butte Water System Inc. (LBWSI). LBWSI is a quasi municipal domestic water system that serves 275 homes in the Whispering Pines Estates subdivision located 3 miles from the proposed Thornburgh destination resort. All the water to serve these homes comes from ground water via 2 wells.

This letter is to express my concern about the pending decision to approve the construction of the Thornburgh destination resort. More specifically, if approved, the resort will drill multiple large volume wells as their water source both for domestic and irrigation needs. These wells would tap into the aquifer that I draw from to serve the 275 homes in my service area. Most all the wells in this area draw from this deep aquifer.

Because no one can accurately predict the effects these multiple large capacity wells will have on the existing water table and existing wells, caution must be taken. I don't believe our precious ground water supply should be put in jeopardy for three new golf courses and man made lakes in the middle of the desert.

If the county does approve this resort I hope you have the foresight to only allow measured development and the drilling of wells as needed, not a blanket approval without any checks and balances.

If a new well proposed by the resort is put on line the existing wells in the surrounding area should be carefully monitored to see if the new large well is impacting the aquifer. Baseline information would need to be gathered before any well construction could begin. If there is an impact to the water table from the new well then how could this new

well continue to be used much less drill more wells. I offer the wells of LBWSI to be some of the wells for monitoring the aquifer level. One well is 885' deep and the other is 960'. Both these wells are drawing water from the aquifer that the resort would tap into.

I have been a builder in Deschutes County for 30 years. I am not against growth or development. However, our resources should be treasured and protected. What has happened at other destination resorts should not be allowed to happen again i. e. Pronghorn not building their mandated rental units etc. The developers of these resorts must be accountable for the long term to the communities they inject themselves into.

As you gather the information for your final decision on Thornburgh please error on the side of caution and measured results. Once the water table is compromised no one knows what it will take to restore it if it can be fixed at all.

Sincerely,

Patrick Hodge

Groundwater & Environmental Consultants

**Mark Yinger Associates**

69860 Camp Polk Road, Sisters, OR 97759 – 541-549-3030

July 14, 2008

Steve Munson
Vulcan Power Company - Native Restoration Fund
345 SW Cyber Drive, Suite 103
Bend, OR 97702

Ref: Response to a question asked by Anne Corcoran Briggs in a Memorandum dated July 7, 2008.

Dear Mr. Munson:

Anne Corcoran Briggs, the hearings officer for the Thornburgh Master Plan proceedings, presented questions in a public memorandum asking for responses from the applicant and opponents. The following is the question I am responding to.

*Wildlife Mitigation Plan*

*1. I understand that the applicant applied a mathematical formula to calculate the likely impact its water use will have on surface waters in the Deschutes Basin based on the assumption that the consumptive use equals the estimated impact on the basin. The opponents have used a methodology developed by the USGS for the entire basin. I would like the parties to provide a little more information regarding the two methodologies to help me better understand the relative advantages/disadvantages of each approach.*

Our evaluation of the impact of the proposed Thornburgh resort's use of groundwater is primarily based on a three dimensional numerical groundwater flow model of the upper Deschutes Basin (Yinger and Strauss, 2008). This numerical groundwater flow model is the product of a multi-year study conducted by the USGS and OWRD in cooperation with the Cities of Bend, Redmond and Sisters, Deschutes and Jefferson Counties and the Confederated Tribes of Warm Springs. The groundwater flow of the upper Deschutes Basin is simulated in the model by the finite-difference method using MODFLOW. The MODFLOW model was developed and is maintained by the USGS. It is one of the most widely accepted and used groundwater flow models in the world.

The upper Deschutes Basin groundwater flow model utilizes a large body of observed data. This data includes: geologic mapping, boring logs, well logs, geophysical logs, groundwater levels from observation wells, private wells and public wells, well and aquifer tests, precipitation, streamflow, groundwater seepage, evapotranspiration and pumpage. The numerical model is the best method to synthesize all of this data and a conceptual model in order to predict the behavior of a complex natural system in response to new stress such as the pumping of wells.



EXHIBIT LUBA # 2008-213 PAGE 01143

It is critical to understand that the upper Deschutes Basin groundwater flow model is a calibrated model. The developers of the numerical groundwater flow model adjusted model parameter values and their spatial distribution to obtain the best fit between simulated and observed hydraulic head and flow. In the area of interest, the groundwater discharge to streams simulated by the model closely matches measured or estimated discharge values, which are based on data from seepage runs, gaging stations and streamflow measurements (Gannett and Lite, 2004). The fit between simulated and measured or estimated discharge of groundwater is close for the Deschutes River between Lower Bridge and the gauge near Culver. It is reasonable to assume that simulated and measured groundwater discharge would also be in close agreement for the lower Whychus Creek from Alder Springs to the Deschutes River. A direct comparison cannot be made for lower Whychus Creek due to the lack of seepage run and flow data.

Our use of the USGS numerical groundwater flow model only involved two modifications. These are 1) the addition of the Thornburgh wells to the well input file and 2) the use of the PCG5 numerical solver rather than of the earlier PCG4 solver. The PCG5 numerical solver is more efficient and reduces model run time. We did not alter the USGS model. We simply added the pumpage of the Thornburgh wells.

The advantage of using the USGS numerical groundwater flow model for evaluating the impact of the pumping of the Thornburgh wells on streams is that the calibrated model is based on a synthesis of all available data and knowledge, and has been peer reviewed and published. The numerical model allows us to simulate impact of the pumping of the proposed Thornburgh wells.

The disadvantage of the method used by the applicant's consultant, Tetra Tech (2008), is that it relies on the use of only one set of flow data, which is seepage run data for the middle Deschutes River. Their analysis simply assumes the impact will occur only on the Deschutes River from Lower Bridge to below the mouth of Whychus Creek. No justification is given for limiting the impact to this reach. The Tetra Tech study simply ignores any impact to lower Whychus Creek. No justification is given for not addressing impact to lower Whychus Creek or other stream reaches. Our groundwater modeling shows reduced groundwater discharge to lower Whychus Creek. Even based on a conceptual hydrogeologic model, it is reasonable to conclude that there will be impact to lower Whychus Creek. Their approach is a gross and arbitrary simplification.

Tetra Tech's attempts to dismiss our use of the USGS groundwater flow model as inappropriate are based on the assertion that the model is too simple relative to the geology. The following statement by Tetra Tech is contradictory and wrong:

> "Treating the formation as a single homogenous unit, or breaking it down into only a few horizontal units (as accomplishing in the USGS model), is not appropriate for use at the small-scale proposed Thornburgh resort project."

The fact is the USGS groundwater flow model does account for complex heterogeneous geology through defining many zones of hydraulic conductivity within each model layer and through the calibration of the model. The eight layers of the model are divided into a total of 171 zones based on hydraulic conductivity. To demonstrate the use of the model the USGS used it to simulate the impact on streamflow for a hypothetical well in the Redmond area (Gannett and Lite, 2004).

***Consumptive Use***

In our modeling of the pumping of the Thornburgh wells we used the rate at which the wells would actually be pumped to withdraw the annual water right volume. We used this pumping rate for several reasons:

1. This is the rate that the wells would be pumped at.

2. There is no technical argument that supports the assumption that a significant quantity of the non-consumed water will actually return to the deep aquifer from which it will be pumped, thereby reducing the impact of pumping on groundwater discharges to distant streams. Mitigation must apply to where the impacts will occur.

3. At the time we did the groundwater modeling runs the applicant proposed a consumptive/non-consumptive ratio of 40%/60% for all uses based on an inappropriate quasi-municipal use descriptor. This was challenged by Oregon WaterWatch and higher consumptive volumes were negotiated. For example, the golf course irrigation consumptive use was increased to 90%.

Thornburgh resort's claimed percentage of water consumed is still too low. We assumed that golf course and landscaping irrigation will be modern efficient sprinkler irrigation, and therefore, there will be no recharge to groundwater and the consumptive use for irrigation is 100%. In the USGS groundwater hydrology report for the upper Deschutes Basin modern sprinkler irrigation is assumed to result in no recharge (Gannett and others, 2001). The following statement is made in the USGS hydrology report:

> "In areas of sprinkler irrigation with efficiencies of 94 percent, only 6 percent of applied water is lost (mostly to evaporation and wind drift), and no water is assumed to be lost to deep percolation [recharge]."

4. As a condition of the Thornburgh resort's Water Pollution Control Facility Permit (WPCF Permit No. 102900) issued by the ODEQ, the resort must stop the subsurface disposal of sewage when the sewage flow reaches 15,000 gallons per day (gpd) and place in operation a sewage treatment plant and land application system (permit attached). At full resort development, the effluent will be 326,000 gpd and the resort will have a waste water treatment plant. The effluent will be surface applied by sprinklers at the agronomic rate during the irrigation season and stored in lagoons during the non-irrigation season. The intent of the DEQ permit is to prevent the effluent from percolating to groundwater and impacting its quality. This is achieved by promoting evaporation of the effluent. At the agronomic application rate, plants will uptake all of the effluent. Therefore, there will be no groundwater recharge resulting from the discharge of effluent.

Thornburgh's WPCF permit was issued by the ODEQ on February 14, 2007, prior to OWRD's final order on the resort's water right application dated March 22, 2007 (final order attached). Given this, the applicant should not have claimed in its water right application a 40%/60% ratio of consumptive versus non-consumptive use for "Other Quasi-Municipal" water use.

It appears that on the one hand the applicant claims no effluent will percolate to groundwater to avoid rigorous groundwater quality monitoring requirements under DEQ rules. But, on the other hand the applicant claims that its effluent will percolate to and recharge groundwater so as to reduce its mitigation obligation under OWRD rules.

Reservoir management should be 100% consumed. This is water that replaces evaporation losses to maintain the water levels in the resort's water features. These water features will be lined to preclude water loss to the subsurface.

I consider the applicant's claimed non-consumptive volume of water use to be inflated. The consequence of this inflation of the non-consumptive volume is that the full impact to streamflow and fisheries will not be completely mitigated.

Thornburgh's Conceptual Master Plan describes a sanitary sewer system that will disperse 625,000 gpd of effluent by using subsurface drip irrigation or sanitary drain fields (CMP Exhibit 18, attached). This will not be the case as required under the WPCF permit, yet this significant change in effluent volume from 625,000 gpd disposed subsurface to 326,000 gpd disposed to the surface is not acknowledged in the Final Master Plan.

***Other Problems with the Tetra Tech Evaluation***

Examples of other problems with the Tetra Tech evaluation include:

1. No reasoning or argument is given to support the Tetra Tech assumption that the impact of the pumping of the Thornburgh wells is proportional to groundwater discharge rates to the Deschutes River between Lower Bridge and below the mouth of Whychus Creek.

2. On page 14 the third bullet item; it is wrong to state that there is a "152.9 cfs" gain in the Deschutes River below the mouth of the Whychus Creek. The fact is that 146 cfs of this gain occurs in the 1.6 mile segment immediately above the mouth of Whychus Creek. This large gain just above the mouth Whychus Creek is good evidence that there is also significant groundwater discharge to lower Whychus Creek. In fact, the last approximately 1.25 miles of Whychus Creek gains approximately 88 cfs (Watershed Sciences, 2008). Using Tetra Tech's approach I could just as arbitrarily say that all of the impact of the pumping of the Thornburgh's wells will be to lower Whychus Creek.

3. There is no basis for Tetra Tech's description of their analysis as "conservative" or "a worst case scenario" just because they assume a direct connection between groundwater beneath the proposed resort area and surface water. It is widely recognized among geologists and hydrogeologists familiar with the area that there is a direct connection. To suggest otherwise is the equivalent of saying that the groundwater beneath the proposed resort discharges to surface water in some other basin.

4. The thermal mass equation used by Tetra Tech assumes instantaneous mixing of water. This is a gross simplification. When COID mitigation water at 26°C, which is lethal for bull trout, mixes with colder water in the Lower Bridge area the mixing will occur over some distance

along the stream and the result will be a mixing zone in which the water temperature increase will be higher than Tetra Tech's calculated temperature.

***Summary***

The USGS numerical groundwater flow model of the upper Deschutes Basin is the best available method for evaluating the impacts to streamflows, and consequently water temperatures, resulting from the pumping of Thornburgh resort's wells.

Tetra Tech's analysis is incorrect because it is based on a groundwater consumptive use volume that is incorrect. The assumption that the impact of the pumping of the Thornburgh wells is limited to the Deschutes River with no impact to Whychus Creek is unfounded.

Given that it will take 20 to 30 years for the impact of the Thornburgh groundwater pumping to be fully realized, it is critical that the impact of this particular groundwater use and future groundwater uses be critically evaluated using the best available methods. Over time, the failure to fully evaluate and mitigate the impact of the Thornburgh groundwater use and future uses will be cumulative and very hard to reverse.

Sincerely,

Mark Yinger, R.G.
Hydrogeologist

Attachments:

WPCF Permit #102900
Thornburgh Resort CMP Exhibit 18 Sanitary Sewer Collection and Disposal

References:

Gannett, Marshall and others, 2001, Ground-Water Hydrology of the Upper Deschutes Basin, Oregon, USGS Water-Resources Investigation Report 00-4162.

Gannett, Marshall and Lite, Kenneth, 2004, Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon, USGS Water Resources Investigation Report 03-4195.

Tetra Tech EC, Inc., 2008, Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat, prepared for Thornburgh Resort Co. LLC.

Yinger, Mark and Strauss, Laura, 2008, A Case Study: Thornburgh Resort Water Resources Impact Evaluation Upper Deschutes Basin, Oregon, for Steve Munson and Sandy Lonsdale, Native Restoration Fund, Vulcan Power Co.

Watershed Sciences and MaxDepth Aquatics, 2008, Deschutes River, Whychus Creek and Tumalo Creek Temperature Modeling, for the Oregon Department of Environmental Quality.

# WATER POLLUTION CONTROL FACILITIES PERMIT

Department of Environmental Quality
2146 NE 4th Street, Suite 104, Bend, OR 97701
Telephone: (541) 388-6146
Issued pursuant to ORS 468B.050

**ISSUED TO:**

Thornburgh Resort Company, LLC
P.O. Box 264
Bend, Oregon 97709

**SOURCES COVERED BY THIS PERMIT:**

| Type of Waste | Method of Disposal |
|---|---|
| Domestic Wastewater | Soil Absorption |
| | Land Application/Reuse |

**SYSTEM TYPE AND LOCATION:**

Septic Tanks, Biological Treatment Plant, Land Irrigation and Soil Absorption Areas
**Thornburgh Resort**
7 Miles West of Redmond, OR

System Operator: Thornburgh Utility Company, LLC

**Treatment System Class: III**
**Collection System Class: II**

**RIVER BASIN INFORMATION:**

Basin: Deschutes
Sub-Basin: Middle Deschutes
LLID - 1209151456389-143.7 -N
County: Deschutes

Nearest surface stream which would receive waste if it were to discharge: Deschutes River

Issued in response to Application No. 977607 received July 27, 2006.

This permit is issued based on the land use findings in the permit record.

Eric Nigg, Manager
Bend Water Quality Section
Eastern Region - Bend

February 14, 2007
Date

## PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:


| | Page |
|---|---|
| Schedule A - Waste Discharge Limitations not to be Exceeded | 2-3 |
| Schedule B - Minimum Monitoring and Reporting Requirements | 4-6 |
| Schedule C - Compliance Conditions and Schedules | 7 |
| Schedule D - Special Conditions | 8-10 |
| Schedule E - Not Applicable | -- |
| Schedule F - General Conditions | 11-14 |


All direct discharges to surface waters or the surfacing of raw or treated sewage are prohibited.

## SCHEDULE A

I. Waste Disposal Limitations before a Sewage Treatment Plant is Constructed and On-line

1. The permittee is authorized to construct, operate, and maintain sewage collection, treatment and disposal systems constructed in accordance with plans and specifications approved by the Department and in accordance with the following conditions:

   a. The community wastewater absorption areas or cells shall not be hydraulically loaded in excess of their respective, Department-approved hydraulic load design capacities. Additional absorption areas or cells shall be constructed in accordance with approved plans and placed in operation as necessary to maintain compliance with the conditions of this permit.

   b. No discharge to state waters is permitted. All wastewater shall be distributed into individual or community on-site sewage soil absorption areas for dissipation by evapotranspiration and subsurface soil absorption so as to prevent:

      (1) Surfacing of wastewater onto the ground surface;

      (2) Surface runoff or subsurface drainage through drainage tile;

      (3) Impairment of existing or future beneficial uses of groundwater.

   c. The monthly average daily combined wastewater flow to the soil absorption areas shall not exceed 15,000 gallons per day in the north area and 15,000 gallons per day in the south area, for a total flow going into absorption areas at 30,000 gallons per day.

II. Waste Disposal Limitations after a Sewage Treatment Plant is Constructed and On-line

1. The permittee is authorized to construct, operate, and maintain sewage collection, treatment, disposal, storage and land application systems constructed in accordance with plans and specifications approved by the Department and in accordance with the following conditions:

   a. If the sewage treatment plant is constructed in phases, as each phase begins operation, the monthly average daily sewage flow to the plant shall not exceed the flow limitation set forth in the Department's approval letter for that phase of the facility. The Department may modify this permit to incorporate limitations and conditions for the system as it is expanded.

   b. After completion of the final phase of the sewage treatment plant the monthly average daily combined wastewater flow to the plant from the entire development at build-out shall not exceed 326,000 gallons per day.

   c. For beneficial reuse purposes requiring Level III treatment as defined in OAR 340-55, prior to land application, the wastewater shall be treated as required for Level III effluent pursuant to OAR 340-55 and the quality of reclaimed water shall not exceed the following effluent limitations:

| Parameter | Limitation |
|---|---|
| Total Coliform | Shall not exceed a 7 day median of 2.2 organisms /100 mls and no single sample shall exceed 23 organisms /100 mls. |

   d. For beneficial reuse purposes requiring Level IV treatment as defined in OAR 340-55, prior to land application, the wastewater shall be treated as required for Level IV effluent pursuant to OAR

340-55 and the quality of reclaimed water shall not exceed the following effluent limitations:

| Parameter | Limitation |
|---|---|
| Total Coliform | Shall not exceed a 7 day median of 2.2 organisms /100 mls and no single sample shall exceed 23 organisms /100 mls. |
| Turbidity | Shall not exceed a 24-hour mean of 2 NTU, and shall not exceed 5 NTU for more than 5% of time during a 24-hour period. |

e. All reclaimed water that is irrigated shall be distributed on land, for dissipation by evapotranspiration and controlled seepage by following sound irrigation practices so as to prevent:

(1) Prolonged ponding of reclaimed water on the ground surface;

(2) Surface runoff or subsurface drainage through drainage tile;

(3) The creation of odors, fly and mosquito breeding or other nuisance conditions;

(4) Overloading of land with nutrients, organics or other pollutants; and,

(5) Impairment of existing or future beneficial uses of groundwater.

f. Reclaimed water use shall comply with all provisions of a Reclaimed Water Use Plan approved by the Department pursuant to OAR 340-55.

g. Unless otherwise approved in writing by the Department, irrigation shall only occur during the period between April 1 and October 31. Unless otherwise approved by the Department, wastewater shall not be applied to land that is frozen, snow covered or saturated, or during precipitation periods.

h. The quantity of reclaimed water irrigated upon land shall not exceed that established in a reclaimed water use plan submitted to and approved by the Department.

i. No reclaimed water shall be applied to food crops destined for human consumption nor otherwise be made available for a use that is inconsistent with the uses provided for in OAR 340-55.

## SCHEDULE B

1. Minimum Monitoring and Reporting Requirements

The permittee shall monitor the operation and efficiency of all treatment, disposal and land application facilities. Unless otherwise agreed to in writing by the Department of Environmental Quality, data collected, and submitted shall include but not necessarily be limited to the following parameters and minimum frequencies:

a. Prior to construction and start-up of a sewage treatment plant.

(1) Influent to community soil absorption areas:

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Total Flow (MGD) | Daily | Measurement |
| $BOD_5$ | Semi-Annually | Composite (See note 1/) |
| TSS | Semi-Annually | Composite (See note 1/) |
| pH | 2/week | Grab |

(2) Other parameters

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Unusual occurrences affecting operation or performance | Each occurrence | Record |
| Tanks pumped (septic, dosing, and grease interceptors | Each occurrence | Record total, no., type, and gallons pumped |
| Test dosing tank pumps and alarms | Quarterly | Visual/Audible |
| Inspect dosing tank pump screens | Quarterly | Visual |
| Inspect and clean hydrasplitters if present | Quarterly | Visual |
| Inspect soil absorption monitoring ports | Weekly | Measurement of effluent depth |

b. After construction and start-up of a sewage treatment plant.

(1) Influent to the sewage treatment plant:

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Total Flow (MGD) | Daily | Measurement |
| Flow meter calibration | Annually | Verification |
| $BOD_5$ | Monthly | Composite (See note 1/) |
| TSS | Monthly | Composite (See note 1/) |
| pH | 2/week | Grab |

(2) Effluent at the discharge from storage lagoon (when irrigating):

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| pH | 2/week | Grab |
| $NO_3$-N | Monthly | Composite (See note 1/) |
| TKN | Monthly | Composite (See note 1/) |
| UV Radiation Intensity | Daily when irradiating | Reading (See note 2/) |
| Chlorine residual | Daily when chlorinating | Grab |

(3) Reclaimed water for storage and/or land application meeting Level III criteria:

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Total coliform | 3/week (See note 3/) | Grab (See note 4/) |

(4) Reclaimed water for storage and/or land application meeting Level IV criteria:

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Total coliform | Daily (See note 3/) | Grab (See note 4/) |
| Turbidity (See note 5/) | Continuous | Measurement (See note 4/) |

(5) Reclaimed water for land application/reuse:

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Acreage irrigated | Daily when irrigating | Measurement |
| Quantity irrigated (gallons) | Daily when irrigating | Measurement |
| Nitrogen application rate (pounds/acre) | Annually | Calculation |
| Quantity for Water Features/Reuse (gallons) | Daily | Measurement |

(6) Biosolids are to be collected and processed by a licensed sewage disposal service business approved to handle biosolids. Biosolids must be managed under a Department approved Biosolids Management Plan.

**NOTES:**

1/ Composite samples shall consist of no less than four (4) samples collected over an 8-hour period, between 6 a.m. and 6 p.m., and apportioned according to the volume of flow at the time of sampling.

2/ The intensity of UV radiation passing through the water column will affect the systems ability to kill organisms. To track the reduction in intensity, the UV disinfection system must include a UV intensity meter with a sensor located in the water column at a specified distance from the UV bulbs. This meter will measure the intensity of UV radiation in mWatts/cm$^2$. The daily UV intensity would be determined by reading the meter each day.

3/ If two consecutive samples exceed 23 Total Coliform per 100 milliliters, then five consecutive re-samples shall be taken at four hour intervals beginning as soon as practicable (preferably within 28 hours) after the original samples were taken.

4/ The sample measurement shall be taken at the discharge from the sewage treatment plant prior to the storage lagoon.

5/ There must be an approved notification system in operation to notify an operator when effluent turbidity exceeds 2 NTU and may possibly exceed a 24-hour mean greater than 2 NTU, or if the effluent approaches 5 NTU for more than 5% of time during a 24-hour period.

2. Reporting Procedures

a. Monitoring results shall be reported on Department approved forms. Monitoring reports shall identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Until the biological treatment plant comes on-line the reporting period is the calendar year. Reports shall be submitted once a year to the Department's Bend office by January 15 of the following year. Once the biological treatment plant is on-line the reporting period is the calendar month. Reports shall be submitted monthly to the Department's Bend office by the 15th day of the following month.

b. By no later than January 15 of each year following completion and start-up of the reclaimed water use system, the permittee shall submit to the Department an annual report describing the effectiveness of the reclaimed water system to comply with the approved reclaimed water use plan, the rules of OAR 340-55, and the limitations and conditions of this permit applicable to reuse of reclaimed water.

## SCHEDULE C

Compliance Conditions and Schedules

1. Prior to exceeding a monthly average sewage flow of 15,000 gallons per day to either of the two subsurface sewage absorption systems, the permittee shall install and commence operation of a Department-approved biological sewage treatment plant.

2. Prior to start-up of the sewage treatment plant, the permittee shall submit a biosolids management plan that complies with all requirements of Section 503 of the federal Clean Water Act regulations and Oregon Administrative Rule (OAR) 340-50.

3. Ninety (90) days prior to start-up of the land application system, the permittee shall submit to the Department for approval a Reclaimed Water Use Plan. The management plan shall be in accordance with Oregon Administrative Rules, Chapter 340, Division 55, "Regulations Pertaining to the Use of Reclaimed Water (Treated Effluent) from Sewage Treatment Plants". Upon approval of the plan by the Department, the plan shall be implemented by the permittee. No substantial changes shall be made in the approved plan without written approval of the Department

4. The permittee is expected to meet the compliance dates which have been established in this schedule. Either prior to or no later than 14 days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director or his/her authorized representative may revise a schedule of compliance if s/he determines good and valid cause resulting from events over which the permittee has little or no control.

## SCHEDULE D

Special Conditions

1. Prior to constructing or modifying any sewage collection, treatment, or disposal facilities, detailed plans and specifications shall be approved in writing by the Department. After approval of the plans, all construction shall be in strict conformance with the plans unless otherwise approved in writing by the Department.

2. Prior to placing the treatment, disposal and land application facilities into operation, the permittee's design consultant shall certify in writing to the Department that all work conforms to the approved plans, specifications, applicable standards and all Department approved changes thereto.

3. Each individual on-site system and all other sewerage facilities covered by this permit shall be under the ownership of the permittee. The permittee shall have authority to access all areas of Lots and Common Areas within the development on which sewerage facilities may be located, for the purpose of constructing, operating, maintaining, inspecting, repairing, or modifying sewerage facilities.

4. Within sewerage facility easements, no structure, planting or other material shall be placed or permitted to remain which may damage or interfere with the installation or maintenance of sewerage utilities.

5. Septic tanks used for the initial development phase will be adapted for hook up to the STEP/STEG collection system. Any septic tanks that are taken completely out of service shall either be removed or decommissioned in accordance with OAR 340-071-0185.

6. The community and individual on-site system soil absorption areas and replacement areas shall be kept vacant and free of vehicular or heavy equipment storage or traffic and shall not be subject to any other activity that would adversely affect the soil or functioning of the system including covering with asphalt or concrete, filling, cutting or other soil modification. The extreme corners of each community soil absorption area unit or cell shall be marked with an iron pipe or monument of durable material.

7. An adequate contingency plan for prevention and handling of spills and unplanned discharges shall be in force at all times. A continuing program of employee orientation and education shall be maintained to ensure awareness of the necessity of good inplant control and quick and proper action in the event of a spill or accident.

8. Unless otherwise provided for in a DEQ-approved biosolids management plan, all septage shall be managed by a sewage disposal service which is licensed in accordance with Oregon Administrative Rule 340-71-600. The permittee shall retain a copy of the contract between the sewage disposal service and the permittee. This contract shall be kept on file by the wastewater treatment system owner and be made available to the Department for inspection.

9. After startup of the sewage treatment plant all biosolids shall be managed in accordance with a current biosolids management plan approved by the Department. No substantial changes shall be made in biosolids management activities which significantly differ from operations specified under the approved plan without prior written approval of the Department.

10. The permittee shall meet the requirements for use of reclaimed water under OAR 340-55, including the following:

    a. All reclaimed water shall be managed in accordance with an approved reclaimed water use plan. No substantial changes shall be made in the approved plan without written approval of the

Department.

b. No reclaimed water shall be made available to a person proposing to use reclaimed water unless that person certifies in writing that they have read and understand the provisions in these rules. This written certification shall be kept on file by the wastewater treatment system owner and be made available to the Department for inspection.

c. No reclaimed water shall be released by the permittee to another person, as defined in ORS 468.005, for use unless there is a valid contract between the permittee and that person that meets the requirements of OAR 340-55-015(9).

d. The permittee shall notify the Department within 24 hours if it is determined that the treated effluent is being used in a manner not in compliance with this permit and associated plans or other requirements of OAR 340-55. When the Department offices are not open, the permittee shall report the incident of non-compliance to the Oregon Emergency Response System (phone 1-800-452-0311).

11. The permittee shall comply with OAR 340-49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

a. When the operation of the biological sewage treatment plant begins as required in Condition 1 of Schedule C of this permit, the permittee shall have its wastewater system supervised by one or more operators who are certified in a classification and grade level (equal to or greater) that corresponds with the classification (collection and/or treatment) of the system to be supervised.

**Note: A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge permit. "Supervise" means responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.**

b. The permittee's wastewater system shall not be without supervision (as required by Special Condition 11.a. above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee shall make available another person who is certified in the proper classification and grade level I or higher.

c. If the wastewater system has more than one daily shift, the permittee shall have the shift supervisor, if any, certified at no less than one grade lower than the system classification.

d. The permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

e. The permittee shall notify the Department of Environmental Quality in writing within thirty (30) days of replacement or redesignation of certified operators responsible for supervising wastewater system operation. The notice shall be filed with the Water Quality Division, Operator Certification Program at 811 S.W. Sixth Avenue, Portland, Oregon 97204. This requirement is in addition to the reporting requirements contained under Schedule B of this permit.

f. Upon written request, the Department may grant the permittee reasonable time, not to exceed 120 days, to obtain the services of a qualified person to supervise the wastewater system. The written request shall include justification for the time needed, a schedule for recruiting and hiring, the date

the system supervisor availability ceased and the name of the alternate system supervisor(s) as required by 11.b. above.

12. The permittee shall immediately notify the DEQ Bend office (phone 388-6146) of any occurrence of surfacing sewage so corrective action can be coordinated between the permittee and the Department. When the Department offices are not open, the permittee shall report the incident to the Oregon Emergency Response System (phone 1-800-452-0311).

13. For the purpose of this permit Soil Absorption Area means a drainfield, a cell of disposal trenches, or a subsurface drip emitter system

# WPCF GENERAL CONDITIONS
# (SCHEDULE F)

## SECTION A. STANDARD CONDITIONS

1. Property Rights

Issuance of this permit does not convey any property rights in either real or personal property or any exclusive privileges, nor does it authorize any injury to private property, any invasion of personal rights, or any infringement of federal, state, or local laws or regulations.

2. Liability

The Department of Environmental Quality or its officers, agents, or employees may not sustain any liability on account of the issuance of this permit or on account of the construction or maintenance of facilities or systems because of this permit.

3. Permit Actions

After notice by the Department, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including but not limited to the following:

a. Violation of any term or condition of this permit, any applicable rule or statute, or any order of the Commission;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts.

4. Transfer of Permit

This permit may not be transferred to a third party without prior written approval from the Department. The Department may approve transfers where the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of this permit and the rules of the Commission. A transfer application and filing fee must be submitted to the Department.

5. Permit Fees

The permittee must pay the fees required with this permit application and annually for permit compliance determination by Oregon Administrative Rules.

## SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

At all times the permittee must maintain in good working order and properly operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to comply with the terms and conditions of this permit.

2. Standard Operation and Maintenance

All waste collection, control, treatment, and disposal facilities or systems must be operated in a manner consistent with the following:

a. At all times, all facilities or systems must be operated as efficiently as possible in a manner that will prevent discharges, health hazards, and nuisance conditions.

b. All screenings, grit, and sludge must be disposed of in a manner approved by the Department to prevent any pollutant from the materials from reaching waters of the state, creating a public health hazard, or causing a nuisance condition.

c. Bypassing untreated waste is generally prohibited. Bypassing may not occur without prior written permission from the Department except where unavoidable to prevent loss of life, personal injury, or severe property damage.

3. Noncompliance and Notification Procedures

If the permittee is unable to comply with conditions of this permit because of surfacing sewage; a breakdown of equipment, facilities or systems; an accident caused by human error or negligence; or any other cause such as an act of nature, the permittee must:

a. Immediately take action to stop, contain, and clean up the unauthorized discharges and correct the problem.

b. Immediately notify the Department's Regional office so that an investigation can be made to evaluate the impact and the corrective actions taken, and to determine any additional action that must be taken.

c. Within 5 days of the time the permittee becomes aware of the circumstances, the permittee must submit to the Department a detailed written report describing the breakdown, the actual quantity and quality of waste discharged, corrective action taken, steps taken to prevent a recurrence, and any other pertinent information.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or liability for failure to comply.

4. Wastewater System Personnel

The permittee must provide an adequate operating staff that is duly qualified to carry out the operation, maintenance, and monitoring requirements to assure continuous compliance with the conditions of this permit.

## SECTION C. MONITORING AND RECORDS

1. Inspection and Entry

The permittee must at all reasonable times allow authorized representatives of the Department of Environmental Quality to:

a. Enter upon the permittee's premises where a waste source or disposal system is located or where any records are required to be kept under the terms and conditions of this permit;

b. Have access to and copy any records required by this permit;

c. Inspect any treatment or disposal system, practices, operations, monitoring equipment, or monitoring method regulated or required by this permit; or

d. Sample or monitor any substances or permit parameters at any location at reasonable times for the purpose of assuring permit compliance or as otherwise authorized by state law.

2. Averaging of Measurements

Calculations of averages of measurements required for all parameters except bacteria must use an arithmetic mean; bacteria must be averaged as specified in the permit.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures specified in the most recent edition of **Standard Methods for the Examination of Water and Wastewater,** unless other test procedures have been approved in writing by the Department and specified in this permit.

4. Retention of Records

The permittee must retain records of all monitoring and maintenance information, including all calibrations, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. The Department may extend this period at any time.

## SECTION D. REPORTING REQUIREMENTS

1. Plan Submittal

Pursuant to Oregon Revised Statute 468B.055, unless specifically exempted by rule, construction, installation, or modification of disposal systems, treatment works, or sewerage systems may not commence until plans and specifications are submitted to and approved in writing by the Department. All construction, installation, or modification shall be in strict conformance with the Department's written approval of the plans.

2. Change in Discharge

Whenever a facility expansion, production increase, or process modification is expected to result in a change in the character of pollutants to be discharged or in a new or increased discharge that will exceed the conditions of this permit, a new application must be submitted together with the necessary reports, plans, and specifications for the proposed changes. A change may not be made until plans have been approved and a new permit or permit modification has been issued.

3. Signatory Requirements

All applications, reports, or information submitted to the Department must be signed and certified by the official applicant of record (owner) or authorized designee.

## SECTION E. DEFINITIONS

1. *$BOD_5$* means five-day biochemical oxygen demand.
2. *TSS* means total suspended solids.
3. *FC* means fecal coliform bacteria.
4. *$NH_3$-N* means Ammonia Nitrogen.
5. *$NO_3$-N* means Nitrate Nitrogen.

d. Sample or monitor any substances or permit parameters at any location at reasonable times for the purpose of assuring permit compliance or as otherwise authorized by state law.

2. Averaging of Measurements

Calculations of averages of measurements required for all parameters except bacteria must use an arithmetic mean; bacteria must be averaged as specified in the permit.

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3. *FC* means fecal coliform bacteria.
4. $NH_3$-*N* means Ammonia Nitrogen.
5. $NO_3$-*N* means Nitrate Nitrogen.

6. *$NO_2$-N* means Nitrite Nitrogen.
7. *TKN* means Total Kjeldahl Nitrogen.
8. *Cl* means Chloride.
9. *TN* means Total Nitrogen.
10. "*Bacteria*" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and E. coli bacteria.
11. *Total residual chlorine* means combined chlorine forms plus free residual chlorine.
12. *mg/l* means milligrams per liter.
13. *ug/l* means micrograms per liter.
14. *kg* means kilograms.
15. *GPD* means gallons per day.
16. *MGD* means million gallons per day.
17. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.
18. *Composite sample* means a combination of samples collected, generally at equal intervals over a 24-hour period, and apportioned according to the volume of flow at the time of sampling.
19. *Week* means a calendar week of Sunday through Saturday.
20. *Month* means a calendar month.
21. *Quarter* means January through March, April through June, July through September, or October through December.

# WATER POLLUTION CONTROL FACILITIES PERMIT EVALUATION

Department of Environmental Quality
2146 NE 4th Street, Suite 104, Bend, OR 97701
Telephone: (541) 388-6146

**FACILITY:**

Thornburgh Resort Company, LLC
P.O. Box 264
Bend, Oregon 97709

**SOURCES COVERED BY THIS PERMIT:**

| Type of Waste | Method of Disposal |
|---|---|
| Domestic Wastewater | Soil Absorption Areas |
| | Land Application/Reuse |

**SYSTEM TYPE AND LOCATION:**

Septic Tanks, Biological Treatment Plant, Land Irrigation and Soil Absorption Areas
**Thornburgh Resort**
7 Miles West of Redmond, OR

System Operator: Thornburgh Utility Company, LLC
**Treatment System Class: III**
**Collection System Class: II**

**RIVER BASIN INFORMATION:**

Basin: Deschutes
Sub-Basin: Middle Deschutes
LLID - 1209151456389-143.7 -N
County: Deschutes

Nearest surface stream which would receive waste if it were to discharge: Deschutes River

## BACKGROUND

Thornburgh Resort Company LLC is proposing to develop a destination resort with 1,000 single family vacation homes, 300 time share/condos and cottages, 200 hotel rooms, three golf courses, two clubhouses, a community center, three restaurants, and 25 units of resort commercial development. The project will be divided by natural topography into two distinct basins, "Pinnacle" to the north and "Tribute" to the south, and comprise about 1,900 acres near the base on the west and southwest sides of Cline Butte. At build-out the projected peak-day design sewage flow for the resort will be 326,000 gallons per day. Initial sewage flows up to 30,000 gallons per day will be handled by up to two subsurface sewage absorption systems, each with a maximum design flow of 15,000 gallons per day and consisting of disposal trench cells or subsurface drip irrigation. One system will be located in the Pinnacle basin and the other in the Tribute basin. A treatment facility using a membrane bioreactor (MBR) technology capable of compliance with OAR 340-55 and producing effluent suitable as reclaimed water for irrigation at agronomic rates on turf or landscape on resort property is proposed before flows reach 15,000 gallons per day to either system. During the winter the treated effluent from the MBR will be stored. This permit does not allow discharge to surface waters at any time.

### Land Use

The applicant has submitted a Land Use Compatibility Statement that was signed by the Deschutes County Planning Department on July 21, 2006.

### Environmental Issues

In the hydrology report prepared by Newton Consultants Inc. approximate static water levels reported on 96 well logs from existing wells in the immediate area within 2 miles of the project site showed depth to groundwater as 300 to 1000 feet. Based on the prioritization screening criteria for groundwater review if the design flow of a soil absorption area is less than 15,000 gallons per day and the depth to groundwater is greater than 300 feet then no

further groundwater information is needed Also, groundwater review is not needed for land application systems that apply at or below agronomic rates.

## PROPOSED PERMIT LIMITS AND CONDITIONS

### Schedule A - Waste Disposal Limitations

Thornburgh Resort Company LLC is being permitted to construct, operate, and maintain wastewater collection, treatment, on-site disposal, storage and land application systems subject to plans, specifications, and conditions of the permit. Unauthorized discharge to state waters and the ground surface is prohibited. Hydraulic loading is limited to Department approved capacities of 15,000 gallons per day in each of the two soil absorption areas for a total flow of 30,000 gallons per day. The monthly average daily flow from the Thornburgh Destination Resort development to the sewage treatment plant at build-out shall not exceed 326,000 gallons per day.

The Total Coliform and turbidity limitations are set for the sewage treatment plant when it is brought on-line. Disinfection limits are based on the requirements for the use of reclaimed water set forth in OAR 340-55.

The permit effluent limitations apply at the point of discharge to the storage lagoon. The proposed effluent limitations are established with OAR 340-55, Regulations Pertaining to the use of Reclaimed Water (treated effluent) from Sewage Treatment Plants. The permit includes both Level III and Level IV reclaimed water effluent limitations.

The Permittee has requested that effluent from the MBR treatment facility be approved as Level IV. Level IV quality effluent must be demonstrated through more frequent bacterial monitoring than required for Level III effluent and the addition of continuous turbidity monitoring. Until approved, this effluent will be considered Level III effluent. The Department cannot guarantee the MBR treatment facilities will be approved for Level IV effluent prior to issuance of this permit. The quality of effluent in the storage lagoon is based on the lowest level of treated effluent as defined in OAR-340-055. The Permittee can perform Level IV monitoring on the effluent to ensure the storage lagoon meets the minimum Total Coliform and Turbidity requirements for Level IV while the Department evaluates MBR technology treatment levels, otherwise the effluent in the storage lagoon will be considered as level III effluent.

The permit will allow irrigation during the period of April 1 to October 31. The Department may approve an extension of this time period provided vegetation being grown requires it. Irrigation is not allowed on land that is frozen, snow covered or saturated, or during precipitation periods.

### Schedule B - Minimum Monitoring and Reporting Requirements

The monitoring frequencies for the soil absorption parameters in Schedule B are consistent with the Department's On-Site Monitoring Matrix. Monitoring requirements for the MBR sewage treatment plant are comparable with the requirements in other permits for similar systems.

The permit includes minimum monitoring requirements for both Level III and Level IV effluent. The Department will recommend that the Permittee monitor at Level IV requirements while the request for Level IV is being evaluated for approval. Level IV effluent will require continuous monitoring for turbidity and daily monitoring of Total Coliform concentrations. The facility will also be required to have an alarm and notification system in place should the effluent turbidity exceed 2 NTU for any length of time.

Reports must be submitted annually until the sewage treatment plant begins operation. Once the MBR sewage treatment plant is on-line the reports must be submitted monthly. Currently, Thornburgh Resort Company, LLC plans to contract with a sewage disposal service to remove biosolids from the facility. The sludge from the MBR sewage treatment plant shall be removed from the facility by a licensed sewage disposal service and processed and disposed of as specified in the Department approved biosolids management plan for the facility. The contract between the permittee and the licensed sewage disposal service must be kept on file and made available to the

Department in the event of an inspection. If, in the future, the permittee plans to conduct final treatment or land application of their biosolids, they must notify the Department prior to renewal of this WPCF permit or apply for a permit modification. The permittee must also submit an updated biosolids management plan.

The Department suggests, but does not require, influent monitoring for $NO_3$-N and TKN during the first year of operation of the sewage treatment plant. This will provide the owner with information on the treatment capabilities of the MBR system.

**Schedule C - Compliance Conditions and Schedules**

No more than 15,000 gallons per day of sewage may be discharged to either of the two subsurface sewage absorption systems. To discharge greater effluent flows, the permittee must install and commence operation of a biological sewage treatment plant. A biosolids management plan must be submitted for Department review and written approval prior to start-up of the sewage treatment plant. A reclaimed water use plan must be submitted for Department review and written approval ninety (90) days prior to start-up of the land application activity.

**Schedule D - Special Conditions**

Once the sewage treatment plant and land application system are in operation all reclaimed water shall be managed in accordance with an approved reclaimed water use plan.

Within sewerage facility easements, no structure, planting or other material shall be placed or permitted to remain which may damage or interfere with the installation or maintenance of sewerage utilities.

Septic tanks used for the initial development phase will be adapted for hook up to the STEP/STEG collection system. Any septic tanks that are completely taken out of service shall either be removed or decommissioned in accordance with OAR 340-071-0185.

Once the sewage treatment plant is in operation the permittee shall comply with OAR 340-49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" for the treatment system as well as the collection system.

THORNBURGH RESORT
CONCEPTUAL MASTER PLAN

18.113.050 - B

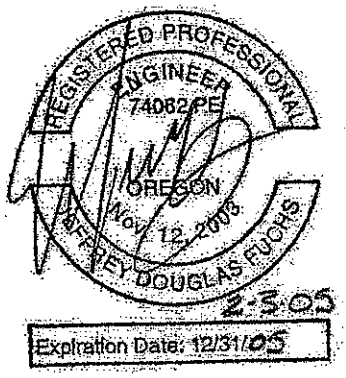
**Exhibit 18 Sanitary Sewer Collection and Disposal**

1. B-14: Sewer Master Plan
2. B-15: Sewer Preliminary Layout

# THORNBURG DESTINATION RESORT

## SEWER SYSTEM MASTER PLAN

FEBRUARY 2005




Prepared for: Thornburgh Resort Company, LLC
Mr. Kameron DeLashmutt
PO Box 2068
Redmond, OR 97756

Prepared by: Hickman Williams & Associates, Inc.
805 SW Industrial Way, Suite 10
Bend, Oregon 97702

EXHIBIT B-14

# THORNBURG DESTINATION RESORT

## SEWER SYSTEM MASTER PLAN

FEBRUARY 2005

Prepared for: Thornburgh Resort Company, LLC
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# THORNBURG DESTINATION RESORT
## SANITARY SEWER COLLECTION AND DISPOSAL
## MASTER PLAN
## FEBRUARY 2005

### I. INTRODUCTION

PROJECT DESCRIPTION AND LOCATION

Thornburg Destination Resort is located in Deschutes County south of Highway 126 between Cline Falls Highway and Barr Road approximately seven miles west of Redmond, Oregon. The project includes approximately 1941 acres of land in Township 15 South, Range 12 East in sections 17, 20, 21, 28, 29, and 30. The project site includes tax lot numbers 5000, 5001, 5002, 7700, 7701, 7800, 7801, and 8000. The project is located on EFU zoned land that is included in the Deschutes County destination resort overlay, which allows for the uses proposed by the project. The project is adjacent to large tract rural residential home sites and is surrounded primarily by US Government or State of Oregon public lands. There are no known waterways on the project property or within ½ mile of the proposed treatment and dispersal facilities.

Exhibit B-13 shows the tax lot boundary for the subject property and the parcel numbers of surrounding parcels. Exhibit B-13 also shows locations, latitudes, and longitudes for all known existing wastewater UICs in the project vicinity.

The project will include approximately 1000 single-family homes, 400 time-share condos or homes, three golf courses, two clubhouses, a community center, two resort hotels, and various resort commercial developments. The project will be divided by natural topography into two distinct basins for development (public side and private side). A significant natural ridge that bisects the property separates the basins.

### II. ON-SITE SEWER SYSTEM DESCRIPTION

Exhibit B-13 in Appendix A shows the master-planned on-site sewer system proposed for Thornburgh Resort. The project is divided into two sewer basins, the north basin and the south basin. The on-site system includes approximately 15 miles of pipe, 1430 septic tanks, an effluent lift station, and at least two treatment and dispersal facilities.

At full build-out, peak daily sewage flows are expected to be 625,000 gallons per day based on DEQ Table 2-OAR 340-71-220, with 249,300-gpd flowing to the north basin treatment facility and 375,700-gpd flowing to the south basin treatment facility. Locations of the on-site treatment /dispersals facilities will be selected based on topography, soil conditions, and proximity to project amenities.

The sewage collection, conveyance, treatment and dispersal system will be entirely owned by one entity in charge of operating and maintaining the system.

The collection and conveyance system will consist of septic tank effluent pressure (STEP) or gravity (STEG) sewers depending on the elevation of the collection system versus the elevation of the treatment and dispersal facilities. In a typical STEP or STEG sewer system, household sewage is pretreated in a septic tank where gross solids and grease are collected. A "clear" effluent from the mid-depth of the tank is conveyed to a common sewer. In a STEP system, the effluent is pumped from the septic tank under pressure to a small-diameter, pressurized collector sewer. In a STEG system, effluent flows by gravity, where terrain allows, to small-diameter gravity collector lines[1].

Each single family home will be connected to a 1000-gallon septic tank, which will discharge into the sewage conveyance system. The septic tank will be located in an easement that will be granted to the homeowners association, private utility, or other party responsible for operating and maintaining the entire sewer collection, conveyance, and dispersal system. Septic tanks connected to STEP sewers will be connected to the sewer system with in-tank submersible pumps. All other septic tanks will flow to the sewer system by gravity flow.

Sewage treatment will occur in the individual septic tanks and at the treatment and dispersal facilities. The septic tanks will collect the solids and pre-treat the sewage. The "clear" effluent that is conveyed to the treatment facilities will be treated by a DEQ approved filtration system. The solids that are collected in the septic tanks will be pumped to trucks and transported to a regional treatment facility. The pumping frequency will be determined based on the observed usage of the septic tanks.

The dispersal system will consist of a community drain field, underground drip irrigation, or above ground irrigation.

This master plan provides anticipated sizing and general guidelines for developing the on-site sewage collection and treatment system. As the project progresses, the sewer collection and treatment design will be submitted to Oregon DEQ for review and approval. Prior to submitting the Final Master Plan, an application will be submitted to Oregon DEQ for a Water Pollution Control Facility (WPCF) permit.

## III. SCHEDULE FOR DEVELOPMENT

Thornburgh Resort will be constructed over 10 years in seven development phases. The on-site sewer system will be expanded to serve each new phase. The proposed modular recirculating filter system is designed to be constructed in modules so it can be expanded as the project builds out. The recirculating tank will be constructed with the first phase. The filters will be added in 5,000 gpd pods as demand requires. Septic tanks can be installed as homes are built on each lot. Common sewer lines will be constructed as each phase is constructed. Drip irrigation system for effluent dispersal can be expanded as demand requires.

The project is currently preparing a Conceptual Master Plan for review and approval by Deschutes County per County Code Chapter 18.113.040A. After approval of the Conceptual Master Plan, the applicant will prepare a Final Master Plan for approval by Deschutes County. The Final Master Plan will serve as a land use permit in accordance with DCC Title 22. Each element or phase of the Final Master Plan will be submitted for site plan approval or subdivision approval in accordance with County Code.

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[1] *Guidelines for Design of Septic Tank Effluent Pump or Gravity (STEP/STEG) Sewer Projects Involving Common Sewers*, Department of Environmental Quality Guidelines, State of Oregon, Rev. VIII.94, p.2.

## IV. REGULATORY JURISDICTION

The proposed facility is not located within the service boundary of a municipal sanitary sewerage system. The on-site wastewater system for this project will be constructed and operated under a renewable water pollution control facility (WPCF) permit, issued pursuant to OAR 340-071-0162. The WPCF will be submitted for approval prior to completion of the Final Master Plan. The WPCF application requires a completed and approved Land Use Compatibility Statement and Underground Injection Control (UIC) Registration.

In preparation for completion of the WPCF permit application, Exhibit B-13 shows the location and anticipated quantities of drinking water sources for this project. In addition, a water resource report has been prepared by Newton Consultants, Inc. that provides ground water information for the project site.

The preliminary engineering report that will be submitted with the WPCF application will include the information included in this master plan, as well as a site evaluation report in accordance with OAR 340-071-0150 and an operation and maintenance plan for the on-site waste water collection, conveyance, and disposal system.

Oregon Revised Statutes (ORS) 454.425 and OAR chapter 340, Division 015, requires any person proposing to construct or operate facilities for the collection, treatment, or disposal of sewage with a design capacity of 5,000 gallons per day or more the owner to file a perpetual surety bond, or approved alternate security, in the amount of $1.00 per gallon per day installed sewage disposal capacity, with the Department.

## V. SCOPE OF MASTER PLAN

This master plan establishes design criteria and guidelines, anticipated sizing, and dispersal alternatives for developing the on-site sewage collection and treatment system. As the project progresses, the sewer collection and treatment design will be submitted to Oregon DEQ for review and approval.

Due to the current limited capacity of the City of Redmond sewerage collection and treatment system, this sewer master plan proposes on-site treatment and dispersal. During the course of the project, it may become feasible to discharge a portion of the sewage generated by this project to the City of Redmond sewer system. The recommendations in this master plan in are in no way intended to preclude alternative sewer disposal methods that may become available as the project progresses.

## VI. WASTE WATER CHARACTERIZATION AND SEWAGE CONTRIBUTION

This project will create a resort community of consisting of approximately 1100 single-family homes and cottages, 315 timeshare condos, three golf courses, two clubhouses, a community center, two resort hotels, 3 restaurants, and 25 units of resort commercial development. Sewage collection and treatment will be designed to accommodate projected daily sewage flows. Projected daily flows sewage flows shown below in Table 1 were estimated from Table 2-OAR 340-71-220.

Wastewater for this project will consist primarily of residential strength wastewater. Approximately 3.5% of the wastewater will be generated from restaurants. To minimize impacts of the treatment system, restaurants will be equipped will grease separators to remove oil and grease before the waste enters the septic tanks.

| Type of Establishment | North Basin | | | South Basin | | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Number of units | Gallons per unit per day | Projected daily sewage flow | Number of units | Gallons per unit per day | Projected daily sewage flow | Number of units | Projected daily sewage flow |
| Single family homes | 385 | 450 | 173,250 | 665 | 450 | 299,250 | 1,050 | 472,500 |
| Cottages | 0 | 300 | 0 | 50 | 300 | 15,000 | 50 | 15,000 |
| Time shares / condos | 165 | 300 | 49,500 | 150 | 300 | 45,000 | 315 | 94,500 |
| Hotel rooms | 100 | 120 | 12,000 | 0 | 120 | 0 | 100 | 12,000 |
| Golf clubhouse (people) | 100 | 25 | 2,500 | 100 | 25 | 2,500 | 200 | 5,000 |
| Sport/community facilities | 130 | 10 | 1,300 | 70 | 10 | 700 | 200 | 2,000 |
| Meeting rooms (seats) | 150 | 5 | 750 | 250 | 5 | 1,250 | 400 | 2,000 |
| Restaurants (seats) | 250 | 40 | 10,000 | 300 | 40 | 12,000 | 550 | 22,000 |
| | | | 249,300 | | | 375,700 | | 625,000 |

**Table 1:** Average Daily Estimated Sewage Flows by Establishment Type

The on-site sewer system will be constructed in phases to accommodate the growing demand as the project is built out. For the initial phase, sewage flows will be based on the projected flows shown in Table 2. As the project progresses, the projected daily flows will be adjusted to reflect actual sewage contributions experienced by the project.

| Project Phase | North Basin | South Basin | Total |
|---|---|---|---|
| | Projected daily sewage flow | Projected daily sewage flow | Projected daily sewage flow |
| PHASE A | 0 | 194,125 | **194,125** |
| PHASE B | 22,500 | 69,825 | **92,325** |
| PHASE C | 19,500 | 56,250 | **75,750** |
| PHASE D | 69,225 | 18,000 | **87,225** |
| PHASE E | 81,700 | 0 | **81,700** |
| PHASE F | 56,375 | 0 | **56,375** |
| PHASE G | 0 | 37,500 | **37,500** |
| **TOTAL PROJECT** | **249,300** | **375,700** | **625,000** |

**Table 2:** Average Daily Estimated Sewage Flows by Phase

## VII.SEWAGE COLLECTION

The sewage collection system is designed to collect sanitary wastewater from the community and convey it to treatment facilities. It is important that the sanitary sewer collection system be odor-free and nearly invisible to the visitors and residents of the community. Sewage collection will be designed in accordance with DEQ standards and *Alternative Sewer Systems, Manual of Practice No. FD-12, Facilities Development*, Water Environment Federation, 1986.

For this project, sewage collection will be divided into two basins separated by an ease-west ridge that bisects the property. The north basin includes an area of approximately 671 AC, which encompasses the area from the top of the ridge to the north property boundary. The remainder of

the project is located in the south basin. The south basin includes an area of approximately 1270 AC. Contributing flows for each basin are described above in Table 1.

Each basin will be divided into collection zones that will be served by either STEP or STEG sewers depending on the elevation of the collection zone versus the elevation of the treatment-dispersal facility. Wherever possible, STEG sewers will be used to reduce the complexity of the sewer system. STEP systems will be used when it is not possible to gravity flow to the treatment facility in each basin. Phase G that is included in the South Basin will be served by an effluent lift station that will pump liquid sewer effluent over the ridge to the collection system that serves the remainder of the South Basin.

GRAVITY SEWER

Gravity sewer is the typical method of collecting municipal sewer. Gravity sewers collect raw sewage that consists of both solids and liquids and convey the sewage to a treatment plant for treatment and disposal. A gravity sewer system consists of sewer services lines that flow downhill from the building plumbing to a sewer main normally located under the street. The sewer main then flows downhill to a treatment facility or a sewage lift-station. The service lines are typically 4" diameter pipe. The main lines are typically 8" in diameter with manholes located every 300 to 500-ft to allow for maintenance access along the sewer main.

The minimum allowable slope of gravity sewer lines is dependent on the pipe diameter. For 8" pipes the min. allowable slope is 0.4%. For service lines, the slope is determined by the building code. The minimum slope of service lines is ¼" drop per foot of pipe.

Due to the topography of this site gravity sewer for collection is a feasible alternative. However, due to the current limited capacity of the City of Redmond sewerage collection and treatment system, this sewer master plan does not propose using gravity sewer. During the course of the project, it may become feasible to discharge a portion of the sewage generated by this project to the City of Redmond sewer system. At that time, gravity sewer may become a viable alternative that can be implemented for remaining phases of the project.

STEG/STEP SEWER

In a typical STEP or STEG sewer system, household sewage is pretreated in a septic tank where gross solids and grease are collected. A "clear" effluent from the mid-depth of the tank is conveyed to a common sewer. In a STEP system, the effluent is pumped from the septic tank under pressure to a small-diameter, pressurized collector sewer. In a STEG system, effluent flows by gravity, where terrain allows, to small-diameter gravity collector lines[2].

A STEP or STEG sewer has the advantage that only "clear" liquid effluent is discharged to the treatment facility and solids are collected in the septic tanks. "Clear" liquid effluent can be treated by several on-site treatment systems, including mechanical filtering, chemical treatment, or underground discharge and treatment. Solids can be periodically collected from septic tanks and discharged to local treatment facilities.

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[2] *Guidelines for Design of Septic Tank Effluent Pump or Gravity (STEP/STEG) Sewer Projects Involving Common Sewers*, Department of Environmental Quality Guidelines, State of Oregon, Rev. VIII.94, p.2.

Because the sewer pipes convey only "clear" liquid, the pipes can be smaller diameter and they can be laid at flatter slopes than traditional gravity sewer systems. In the case of STEP sewers, the pressurized pipes can flow uphill, overcoming a static head of up to 250-ft, so the sewer collection system can be installed to follow the contours of the land. This project proposes to use both STEP and STEG systems depending on the location of the buildings that are being served.

Single tanks serving multiple lots under separate ownership are not normally allowed by DEQ. Each residence or site should have a separate tank. However, systems serving facilities such as planned unit developments are usually under the control of a single customer or responsible association. At the discretion of the engineer, such systems may be designed with shared tanks, subject to requirements of the Oregon State Plumbing Code[3].

This project will include both individual tanks that serve single-family homes and large flow tanks that serve clusters of homes, hotels, restaurants, and other larger facilities. Tanks that serve individual homes will be 1000-gallon tanks. Large flow tanks will be defined as tanks that have design flows greater than that of three dwelling units per day. Large flow tanks will be sized in accordance with *Septic Tank Sizes for Large Flows*, by T.R. Bounds[4].

STEG/STEP SEWER DESIGN CRITERIA

Design criteria for the STEP and STEG sewer system as summarized Table 3 will be based on *Alternative Sewer Systems, Manual of Practice No. FD-12, Facilities Development*, Water Environment Federation, 1986, *Guidelines for Design of Septic Tank Effluent Pump or Gravity (STEP/STEG) Sewer Projects Involving Common Sewers*, by Oregon DEQ and *Alternative Sewer Designs – Effluent Sewer Technology – Septic Tank Effluent Pump (STEP) and Septic tank Effluent Gravity (STEG) Systems*, by Terry R Bounds, PE.[5] The DEQ and Bounds documents are included in the appendix.

Septic tanks will be sized in accordance with OAR 340-17-220(3), which is summarized in Table 2. Minimum tank capacity for single-family homes with four or fewer bedrooms will be 1000-gallons.

(A) Septic tanks for commercial facilities shall have a liquid capacity of at least two (2) times the projected daily sewage flow, unless otherwise authorized by the agent or department; but in no case shall capacity be less than 1,000 gallons;

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[3] *Guidelines for Design of Septic Tank Effluent Pump or Gravity (STEP/STEG) Sewer Projects Involving Common Sewers*, Department of Environmental Quality Guidelines, State of Oregon, Rev. VIII.94, p.4.

[4] *Septic Tank Sizes for Large Flows*, T.R. Bounds, Orenco Systems, Inc. NTP-TNK-TRB-2, 12-1994.

[5] *Alternative Sewer Designs – Effluent Sewer Technology – Septic Tank Effluent Pump (STEP) and Septic tank Effluent Gravity (STEG) Systems*, Terry R Bounds, PE, 1996.

(B) Additional volume may be required by the agent for special or unique waste characteristics, including but not limited to flow patterns, volumes, waste strength, or facility operation;
(C) The quantity of daily sewage flow shall be estimated from table 2. For structures not listed in table 2, the agent shall determine the projected daily sewage flow;
(D) Single family dwelling. a septic tank to serve a single-family dwelling shall be sized on the number of bedrooms in the dwelling. For a dwelling with 4 or fewer bedrooms, the tank capacity shall be at least 1,000 gallons. A 1,500-gallon (or larger) septic tank shall be required when the dwelling has more than 4 bedrooms.
(E) Tank lids will be designed for HS-20 loading in traffic areas.
(F) Tanks will be equipped with plastic effluent screens.

**Table 3:** Summary of Design Criteria for Septic Tanks OAR 340-71-220(3)

Septic Tank Installation requirements:

(A) Septic tanks shall be installed on a level, stable base that will not settle;
(B) Septic tanks located in high groundwater areas shall be weighted or provided with an anti-buoyancy device to prevent flotation;
(C) All septic tanks shall be installed with a watertight manhole riser extending to the ground surface or above. The riser shall have a minimum nominal diameter of 20 inches. a cover shall be provided and securely fastened or weighted to prevent easy removal. Septic tanks with a soil cover depth of more than 36 inches or having a capacity of more than 3,000 gallons shall have at least one manhole riser [that] is 30 inches in diameter or more;
(D) Septic tanks shall be installed in a location that provides access for servicing and pumping;
(E) Where practicable, the sewage flow from any establishment shall be consolidated into one septic tank.
(F) At the discretion of the agent, a removable plug may be placed in the top of the septic tank's inlet sanitary tee if the septic tank discharges directly into a gravity-fed absorption facility;
(G) All tanks shall be tested for water tightness in accordance with oar 340-073-0025.
(H) The outlet of all septic tanks serving commercial facilities shall be equipped with an effluent filter meeting the requirements of rule 073-0056, complete with a service riser for the filter which meets all the requirements of OAR 340-071-0220(3)(b)(c).

**Table 4:** Summary of Design Criteria for Septic Installation OAR 340-71-220(3)

STEP Collection system requirements:

(A) The collection system will be designed for the full build-out volumes shown in Table 1.

(B) Minimum pipe size for pressures sewers will be 2-inches. Pipe will be sized to accommodate anticipated peak flows.
(C) Collection system sewers will be constructed from PVC pressure rated pipe (class 200).
(D) Air relief valves will be installed at high points.
(E) Septic tank pumps will be limited to a maximum discharge flow rate of 10 gpm. Flows will generally be controlled between 5 gpm and 10 gpm. Grinder pumps will not be used.
(F) A shut-off valve and check valves will be installed between the collection main line and each individual septic tank.

**Table 5:** Summary of Design Criteria for STEP Collection System

STEG Collection system requirements:

(A) The collection system will be designed for the full build-out volumes shown in Table 1.
(B) Minimum pipe size for gravity sewer mains will be 4-inches.
(C) Collection system sewers will be constructed from PVC pressure rated pipe.
(D) Service lines will be designed to have a minimum capacity of 10 gpm flowing half-full (Manning's n=0.013)
(E) Each service line will be vented at the upper end with venting continuous through the tank.
(F) Gravity common lines will be designed for 1 gpm per dwelling flowing half-full.
(G) STEG sewers will have cleanouts spaced approximately 300-ft along the common line.
(H) To minimize sulfide formation, pipe will be designed to flow half-full at average daily flows with a minimum velocity of 0.5 fps.
(I) For sulfide control, minimum pipe slope for various pipe sizes will be:
2-in dia @ 0.16%
3-in dia @ 0.08%
4-in dia @ 0.05%
6-in dia @ 0.03%
8-in dia @ 0.02%
(J) For sulfide control, adverse grades and inverted siphons will be avoided.

**Table 6:** Summary of Design Criteria for STEG Collection System

## VIII. TREATMENT AND DISPERSAL

This project proposes on-site wastewater treatment and dispersal. Due to the current limited capacity of the City of Redmond sewerage collection and treatment system, this sewer master plan does not propose using gravity sewer. During the course of the project, it may become feasible to discharge a portion of the sewage generated by this project to the City of Redmond sewer system. At that time, gravity sewer may become a viable alternative that can be implemented for remaining phases of the project.

"The purpose of the treatment component is to transform the raw household wastewater into an effluent suited to the disposal component, such that the wastewater can be disposed of in conformance with public health and environmental regulations."[6]

[6] *Design Manual - Wastewater Treatment And Disposal Systems*, Environmental Protection Agency Office of Water Program, Office o f Research and Municipal Research Laboratory, EPA-625/1-80-012, 1980.

The proposed on-site treatment system for Thornburgh Resort will consist of individual or combined septic tanks, filtration, and dispersal. Dispersal will be underground in a drain field or through drip irrigation, or through above ground irrigation. Each sewer basin will discharge to its own treatment facility located in the basin. Due to site topography, the basins may be divided into smaller sub basins that contain smaller treatment and dispersal facilities.

If above ground irrigation is selected as the preferred alternative, effluent from the filters will be disinfected and discharged into a tank or pond and applied to the ground by sprinklers. If below ground dispersal is selected, the effluent from the filters will be discharged into an underground dispersal field or into a drip irrigation system.

## SEPTIC TANKS

The septic tanks collect solids and greases and provide limited digestion of organic matter. Solids and partially decomposed sludge sink to the bottom of the tank. Lightweight materials including oils and grease float to the top of the tank and form a layer of scum. Partially clarified liquids flow through the tank. In STEG systems the clear effluent flows by gravity into the conveyance system where it is treated and discharged at a centrally located facility. In STEP systems the clear liquid is pumped from the tank into the conveyance system where it is also treated and dispersed at a central facility. In order to reduce the occurrence of clogging in the conveyance system, the discharge from each septic tank is fitted with an effluent filter assemble, which is designed to keep solids in the tanks.

Septic tanks for commercial buildings and hotels will be sized to accommodate anticipated flows from those buildings. Septic tanks for restaurants will be preceded by grease interceptors.

Solids will be removed from the septic tanks at intervals of approximately 7 to 12 years. To determine solids removal frequency, the septic tanks will be monitored on an annual basis.

## TREATMENT FACILITY

At the treatment facility, the clarified liquid effluent from the septic tanks will be treated and disposed of by a DEQ approved method. Treatment will consist of filtration through a modular recirculating filter system. Each filter "pod" will treat up to 5,000 gallons per day at an organic loading rate of 4 lbs BOD per day. Depending on the type of effluent anticipated, the number of pods required will be determined during design to maintain a maximum organic loading rate of 4 lbs. BOD/day.

The filter pods will be added to the treatment system, as system demand requires. The recirculation tank will be constructed in the initial phase to accommodate the entire anticipated full-build flow.

Based on a total hydraulic load of 625,000 gpd, the treatment facility will require approximately 125 filter pods. The recirculation tank will be sized to contain the projected daily flow for each treatment facility. For the north basin, the recirculation tank will be approximately 249,300 gallons. The recirculation tank for the south basin will be approximately 375,700 gallons.

## DISPERSAL FACILITY

Dispersal of the filtered effluent can be accomplished in several ways. At nearby Eagle Crest Resort, dispersal is accomplished by collecting filtered effluent in a pond and using the reused water to irrigate the golf course. Prior to storage in the pond, the effluent is disinfected.

This project proposes to disperse the filtered effluent by using it for underground drip irrigation or sanitary drain fields. Table 6 summarizes approximate land area required to treat and dispose of wastewater at Thornburgh Resort.

Land Area Estimate for Treatment and Disposal

North Basin

- Treatment – 240' x 130' or 23,000 sq. ft (.53 acres)
- Dispersal –22.9 acres

South Basin

- Treatment – 200' x 130' or 34,700 sq. ft (.80 acres)
- Dispersal –34.5 acres

Assumptions

- Disposal area numbers were arrived at using a conservative estimate of .4-gpd/ft$^2$ for the loading rate
- All the treatment and disposal fields are put into single locations for each section of the resort

**Table 7:** Land Area Estimate for Treatment and Dispersal

Several companies in the United States market products for dispersing sanitary effluent through underground drip irrigation. In all cases, the drip irrigation systems are designed to be buried in the root zone of the plants to thoroughly saturate the soil. During the design phase of the project, the use of underground drip irrigation to irrigate landscaping and turf will be evaluated for cost effectiveness.

## IX. EFFLUENT LIFT STATION

Phase G will be served by STEG or STEP sewer that discharges liquid sewage effluent from the individual septic tanks to a central lift-station. The lift station will pump the liquid effluent approximately XXX vertical feet to the STEP sewer located in Phase C. The lift station will be designed in accordance with *Design of Wastewater and Stormwater Pumping Station, Manual of Practice FD-4*, Water Environment Federation, 1993 and *Alternative Sewer Systems, Manual of Practice No. FD-12, Facilities Development*, Water Environment Federation, 1986.

Because large solids and debris are collected in the individual septic tanks, the lift station for a STEG or STEP sewer do not need to have large solid handling capability. In addition, the septic tanks in the system attenuate peak flows significantly so smaller pumps can be used. Due to the corrosive nature of the septic effluent, the wet well and all concrete components of the lift station should be coated with a chemically inert material and non-ferrous materials should be used in wet well construction. Pumps should be kept below the liquid level in the wet well to minimize corrosion of the pump.

Odor control at the lift station can be accomplished by discharging effluent into the wet well through drop inlets that extend below the liquid surface. The lift station should be provided with 24 hours of emergency storage volume to accommodate pump failures or interruptions in electrical service to the site.

| | | |
|---|---|---|
| **Peak Inflow Rate - Peak, ΣQi** | 48 | GPM |
| **Static Head, Hs** | 191 | FT |
| **Design Pumping Rate, Qp** | 60 | GPM |
| **Total Dynamic Head at Qp** | 192 | FT |
| **Brake Horsepower** | 5 | bHP |
| **Working Capacity, Vw** | 480 | gal. |
| **Working Depth, $D_W$** | 1 | FT |
| **Emergency Storage Capacity, $V_e$** | 2880 | gal. |
| **Emergency Storage Depth, $D_e$:** | 6 | FT |

Table 8: Phase G Lift Station Conceptual Design

## X. SUMMARY

This master plan provides anticipated sizing and general guidelines for developing the on-site sewage collection and treatment system. As the project progresses, the sewer collection and treatment design will be submitted to Oregon DEQ for review and approval. Prior to submitting the Final Master Plan, an application will be submitted to Oregon DEQ for a Water Pollution Control Facility (WPCF) permit.

Groundwater & Environmental Consultants

**Mark Yinger Associates**

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June 13, 2008

Steve Munson
Vulcan Power Company - Native Restoration Fund
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Ref: Review of portions of the Thornburgh Final Master Plan Application, Deschutes County file number M-07-2.

Dear Mr. Munson:

I have reviewed two portions of the Thornburgh Final Master Plan Application. These are the *Thornburgh Resort Fish and Wildlife Mitigation Plan Addendum relating to Potential Impacts of Ground Water Withdrawals on Fish Habitat* prepared by Newton Consultants (Newton, 2008) and the *Revised Well Indemnification Plan* contained in Exhibit 3.

**Background**

The Thornburgh Resort development would use groundwater to supply all uses. These uses include: irrigation of three golf courses, landscaping irrigation, maintenance of artificial lakes and potable water. The annual volume of groundwater withdrawn from new wells would be 2,129 acre feet (af) and of this amount 1,356 af must be mitigated for impacts to streamflow. The basis for the mitigation requirement for new groundwater withdrawals is the established principle that virtually all water pumped from the Deschutes Formation aquifer and consumed is water that will not discharge to streams in the upper Deschutes River basin (Gannet and others, 2001, and Gannett and Lite, 2004).

In the summary and conclusions section of the U.S. Geological Survey (USGS) report, *Ground-Water Hydrology of the Upper Deschutes Basin, Oregon*, the following conclusion is stated:

> "Groundwater and surface water are, therefore, directly linked, and removal of ground water will ultimately diminish streamflow." (Gannett and others, 2001).

The questions are where will the streamflow diminishment occur and what resources will be impacted as a result of the Thornburgh development. To address the first question we used the numerical groundwater flow model developed jointly by the USGS and Oregon Water Resources Department (OWRD) and simply added to the model input the pumping of the six proposed Thornburgh wells. Based on the model output the primary stream reaches with diminished flow would be the Deschutes River from Odin Falls to the mouth of Whychus Creek and lower Whychus Creek (Yinger and Strauss, 2008). In these areas cold groundwater discharge from springs and seeps is critical to bull trout and native redband trout habitat and unique riparian

ecology. The cold water of lower Whychus Creek is also critical to the successful re-introduction of Chinook salmon and steelhead.

The Thornburgh developer proposes to mitigate its impact on streamflow with a combination of transferring irrigation water rights on Deep Canyon Creek to instream flow rights, the purchase of 100.7acres of water right from the McCabe Family Trust and the remainder from Central Oregon Irrigation District (COID) water rights. The developer claims that their mitigation plan will fully mitigate negative impacts to habitat and fishery resources.

**Comments on Fish and Wildlife Mitigation Plan**

The following are my comments on the *Thornburgh Resort Fish and Wildlife Mitigation Plan Addendum relating to Potential Impacts of Ground Water Withdrawals on Fish Habitat* in the Thornburgh Final Master Plan (FMP, 2008). The following comments are organized using the headings in the above referenced document.

*II. BACKGROUND* (page 1)
The statement to the effect that the use of groundwater is expected to indirectly impact flows of the Deschutes River is incorrect. The pumping of the Thornburgh wells will directly impact flow of the Deschutes River. It has been well established that in the upper Deschutes Basin groundwater that is withdrawn and consumed is groundwater that does not discharge to streams.

*III. D. 1. OWRD Mitigation for Phase A*
*Big Falls Ranch Water Right* (page 5)
No evidence is given to support the expectation that an acre of irrigation water right should be converted at the rate of 1.8 acre feet of mitigation water. No evidence is given as to the volume of irrigation water actually applied annually per acre for the 464.9 acres.

No evidence is given that the 464.9 acres of Big Falls Ranch irrigation water rights on Deep Canyon Creek are valid water rights. No proof is given that all of the 464.9 acres have been irrigated within the last five years (ORS 540.610). It is apparent in a June 2005 color aerial photograph that significant portions of the acreage have not been irrigated (USGS, 2005). In fact, some areas bordering pivots that are claimed as irrigated acres appear to have been fallow for some time.

The claim that the initial 175 acres of irrigation water right transferred to instream for Phase A will result in 2.07 cfs from Deep Canyon creek is not supported with any data, evidence or explanation. No data or evidence is given to substantiate what the flow volume of Deep Canyon Creek actually is.

*III. D. 2. OWRD Mitigation for Phase B/Full Build-Out* (page 6)
Again the validity of an additional 289.9 acres of Big Falls Ranch irrigation water rights on Deep Canyon Creek is not substantiated. No evidence is given that all of these acres have been irrigated within the last five years.

No evidence is given that the 100.7 acre McCabe water right is valid. The particular water right is not identified.

No specifics are given on the COID mitigation water which is apparently based only on an expectation of availability of water due to conversion of land to urban uses.

*III, E. Summary of OWRD Mitigation Plan* (page 6)
The claim that mitigation will result in 5.5 cfs of flow from Deep Canyon Creek during the irrigation season is not supported with evidence. No evidence is given that the creek is actually capable of a flow of 5.5 cfs. No evidence is given that the irrigation pump or pumps are capable of pumping 5.5 cfs. It is possible that the Big Falls Ranch water rights exceed the capacity of the creek.

The claim is made that the Big Falls Ranch mitigation water from Deep Canyon Creek will be cool water. No evidence is given to support this claim. What is the water temperature of the creek now and how does it vary seasonally and along its course?

*IV. FISH HABITAT POTENTIALLY AFFECTED BY GROUND WATER USE* (page 7)
It is implied that because the state requires mitigation there will be no impact to streamflow and stream temperature due to the Thornburgh groundwater withdrawals. The state's mitigation requirement is no assurance that this particular impact will be mitigated by this particular plan. The mitigation plan is Thornburgh's plan, not the state's, and Thornburgh must present clear and convincing evidence that their mitigation plan will actually mitigate their impacts on streamflows, water temperature in the streams, fish and critical fish habitat. This evidence is not given.

The impact to lower Whychus Creek cold water springs and seeps is dismissed in the mitigation plan. Our groundwater modeling of the impacts of the Thornburgh withdrawals show that there will be reduced discharge of cold groundwater to the lower reach of Whychus Creek (Yinger and Strauss, 2008). We used the USGS-OWRD developed groundwater flow model with no modifications other than the added stress of the Thornburgh groundwater withdrawals. No evidence is given to support the Thornburgh position that the impacts will occur only on the Deschutes River.

The modeled reduction in cold groundwater discharge to lower Whychus Creek is 106 af annually. This reduction in cold spring water discharge is not a negligible impact. The ecology of Whychus Creek is cold groundwater dependent.

The statement that "...NCI (Newton Consultants Inc.) determined the potential temperature impacts attributable to the project (Thornburgh) are expected to be slight and below levels that can be effectively measurable." is not supported with any evidence. On what basis did NCI make this determination?

There is also some discussion of ODFW "Habitat Categories." The impacted reaches of the Deschutes River and Whychus Creek should be considered Habitat Category 1 as defined in Oregon Department of Fish and Wildlife (ODFW) administrative rule (OAR 635-415-0025). The cold water springs and seeps are irreplaceable and essential for fish and wildlife and a unique ecology. The ODFW's mitigation goal is no loss of habitat. It does not allow dismissal of impact based on arguments that the impact will be negligible or un-measurable. Nor does ODFW habitat mitigation policy specifically allow impact to occur in one area in exchange for improvements in another area.

*V. C. Elimination of Existing Irrigation Pond* (page 9)
The statement is made to the effect that Thornburgh will work with Big Falls Ranch to remove the pond at the point of diversion (near the mouth of Deep Canyon Creek). Notes on Figures 3 and 4 of the mitigation plan state that a second pond located approximately 1,800 feet upstream on Deep Canyon Creek will also be removed. However, the upstream pond is located on property owned by Nolan Weigand. Will this property owner allow the pond to be removed? To realize a lower temperature for the creek water both ponds must be removed.

*V. E. Funding for Thermal Modeling* (page10)
The mitigation plan characterizes the proposal to provide $10,000 for completion of a stream temperature model for Whychus Creek as enhancement and part of its mitigation "package". The completion of this model and its use provides no mitigation of the impacts the Thornburgh development will have on reaches of the Deschutes River and Whychus Creek.

*VII. CONCLUSIONS*
The statement that "...potential for loss of habitat due to reduced surface water flows was quantified in connection with the OWRD review of Thornburgh's application for a water right." is not supported with any evidence. As pointed out earlier, just because OWRD rules say you will fully mitigate consumptive use of groundwater does not mean this particular plan fully mitigates Thornburgh's impacts.

**Comments on Well Indemnification Plan**

The following are my comments on the *Revised Well Indemnification Plan,* Exhibit 3 of the Thornburgh Final Master Plan application.

**The Probability of Interference is High**

In the second paragraph of the introduction of the indemnification plan, statements are made that based on Newton Consultants original hydrology report for Thornburgh (Newton, 2005) and OWRD water rights application there will no interference with existing wells. Newton's original hydrology report failed to investigate the history of wells in the vicinity of the proposed development. It is standard practice when evaluating the impact of new large production wells to investigate the history of existing wells in the vicinity of the proposed wells. In our evaluation of the impacts of the Thornburgh development on water resources we did this basic research (Yinger and Strauss, 2008). We found that in the area of the Eagle Crest Resort, located just east of the proposed development, that there are 13 wells that have been deepened between 2001 and 2007. The documented water level decline in these wells has been as great as 42 feet. It is reasonable to conclude that the pumping of the large production wells at Eagle Crest has drawn down water levels in wells in the vicinity of this resort. Further, it is reasonable to conclude that the pumping of the six Thornburgh wells will only accelerate the decline of water levels in existing wells in the area and expand the area of water level decline associated with the Eagle Crest Resort.

Our modeling of water levels in response to the pumping of the Thornburgh wells reveals that the pumping of deep Thornburgh wells (model layer 7) will cause declines in water levels of much shallower wells (Yinger and Strauss, 2008). Newton's statement "...that because of aquifer characteristics, depth, and location of Thornburgh's proposed wells, the new groundwater

use was not expected to cause interference with other existing ground water uses (wells)" is not supported by the facts. It is clear that the effects of the pumping of deep wells are not isolated from existing shallower wells.

**Radius of Well Indemnification**

No justification is given to support a two-mile radius limit to indemnify existing wells from impact due the pumping of the Thornburgh wells. The impacted area is certain not to be circular. Based on the impact of the Eagle Crest wells and low permeability of the core of the Cline Buttes rhyolite dome the impacted area will likely be elongated in the north-south direction (Yinger and Strauss, 2008). The radius should be increased to 3 miles to be conservatively protective.

The plan does not define from where the radius of indemnification will be measured. Each new Thornburgh well should be at the center of a 3-mile radius of indemnification.

**Duration of Indemnification Agreements**

The five year duration of the indemnification agreements is too short. The USGS simulations for pumping wells in the Redmond area indicate that most of the impact on water levels occurs 7 to 10 years after the start of pumping (Gannett and Lite, 2004). The duration of the indemnification agreements should extend for ten years past the completion of the development.

**Conclusions**

I have pointed out that there are numerous statements and conclusions in the Thornburgh fish and wildlife mitigation plan addendum that are not supported with evidence. The plan cites no references. The claim that this particular fish and wildlife mitigation plan completely mitigates negative impacts to these resources is not credible.

The well indemnification plan has serious shortcomings.

Sincerely,

Mark Yinger, R.G.
Hydrogeologist

Attachment: Summary Table Diminished Streamflow, Model Results for Scenario 1 and Scenario 2, and map of reaches

References:

Gannett, Marshall and others, 2001, Ground-Water Hydrology of the Upper Deschutes Basin, Oregon, USGS Water-Resources Investigation Report 00-4162.

Gannett, Marshall and Lite, Kenneth, 2004, Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon, USGS Water Resources Investigation Report 03-4195.

Newton, David, 2005, Hydrology Report Water Supply Development Feasibility Proposed Thornburgh Resort, Deschutes County, Oregon, for Thornburgh Resorts, LLC.

Newton, David, 2008, Thornburgh Resort Fish and Wildlife Mitigation Plan Addendum Relating to Potential Impacts of Ground Water Withdrawals on Fish Habitat, Newton Consultants, Inc. in Thornburgh Final Master Plan.

Strauss, Laura, June 6, 2008, personal communications.

Watershed Sciences, 2007, Deschutes River, Whychus Creek and Tumalo Creek Temperature Modeling, for Oregon Department of Environmental Quality.

Yinger, Mark and Strauss, Laura, 2008, A Case Study: Thornburgh Resort Water Resources Impact Evaluation Upper Deschutes Basin, Oregon, for Steve Munson and Sandy Lonsdale, Native Restoration Fund, Vulcan Power Co.

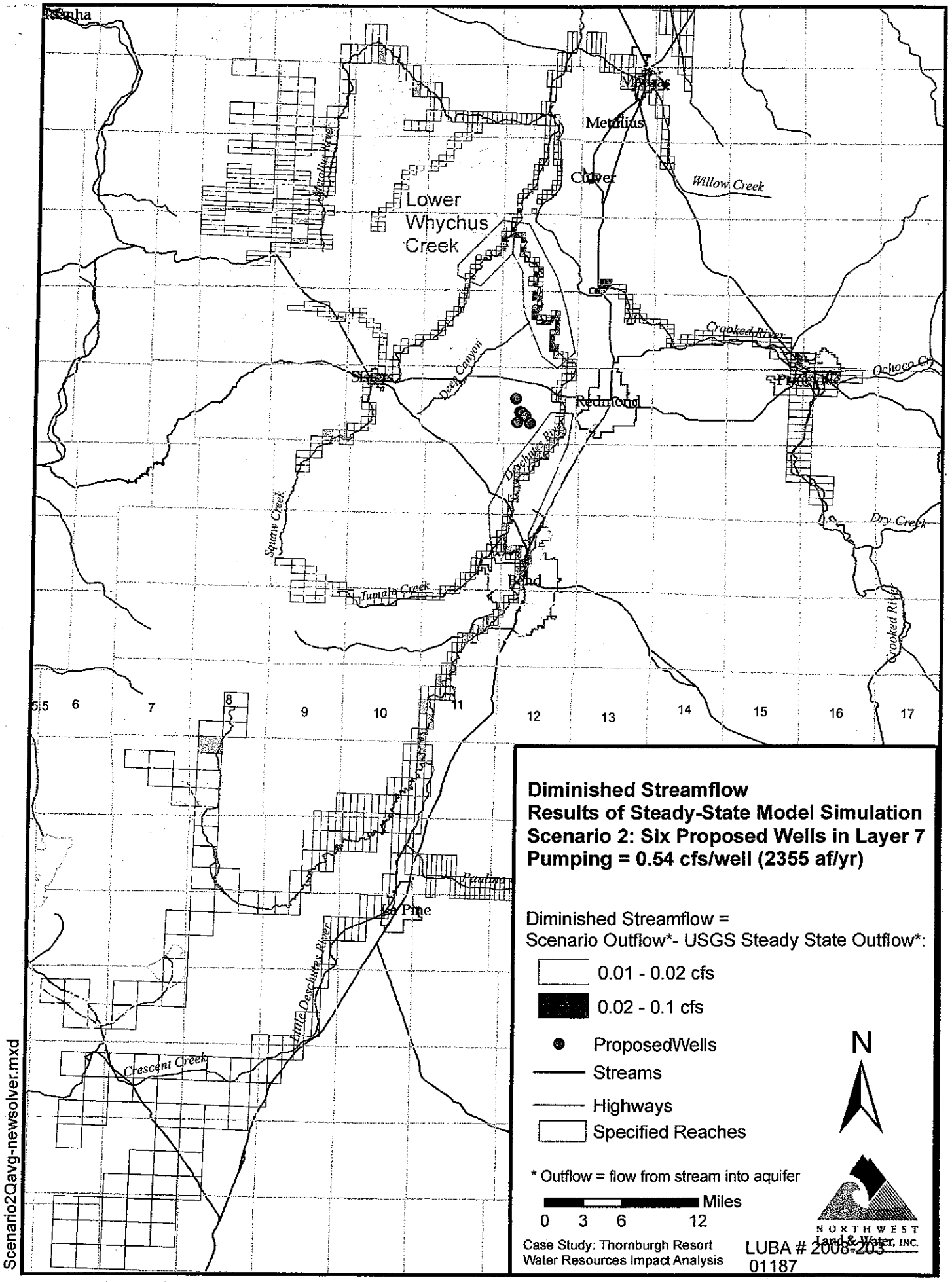
## Summary of Diminished Streamflow, Model Results for Scenario 1 and Scenario 2

| Reach | Diminished Streamflow, cfs | | | |
|---|---|---|---|---|
| | Scenario 1 | as percent of total pumping | Scenario 2 | as percent of total pumping |
| **Bend to River Mile 149** | 0.681 | 21% | 0.299 | 9% |
| **Odin Falls to Whychus Creek and Lower Whychus Creel** | 1.648 | 51% | 1.780 | 55% |
| **Combined for two reaches** | **2.329** | **72%** | **2.079** | **64%** |
| Total diminished streamflow for stream system | 3.090 | 95.1% | 3.240 | 99.7% |

| Reach | Diminished Streamflow, cfs | | | |
|---|---|---|---|---|
| | Scenario 1 | as percent of total pumping | Scenario 2 | as percent of total pumping |
| **Lower Whychus Creek** | 0.143 | 4% | 0.145 | 4% |
| **Upper Whychus Creek** | 0.021 | 1% | 0.021 | 1% |
| **Whychus Creek** | **0.164** | **5%** | **0.166** | **5%** |
| Total diminished streamflow for stream system | 3.09 | 95.1% | 3.24 | 99.7% |

Notes:

1) Total pumping is 3.25 cfs for both Scenarios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Diminished Streamflow
Results of Steady-State Model Simulation
Scenario 2: Six Proposed Wells in Layer 7
Pumping = 0.54 cfs/well (2355 af/yr)
Diminished Streamflow =
Scenario Outflow*- USGS Steady State Outflow*:
0.01 - 0.02 cfs
0.02 - 0.1 cfs
ProposedWells
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Highways
Specified Reaches
* Outflow = flow from stream into aquifer
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Water Resources Impact Analysis
LUBA # 2008-203
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Groundwater & Environmental Consultants

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June 5, 2008

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Ref: Review of portions of the Thornburgh Final Master Plan Application, Deschutes County file number M-07-2.

Dear Mr. Munson:

I have reviewed two portions of the Thornburgh Final Master Plan Application. These are the *Thornburgh Resort Fish and Wildlife Mitigation Plan Addendum relating to Potential Impacts of Ground Water Withdrawals on Fish Habitat* prepared by Newton Consultants (Newton, 2008) and the *Revised Well Indemnification Plan* contained in Exhibit 3. I have also discussed the fish mitigation plan with fish Ted Wise, fisheries biologist with the Oregon Department of Fish and Wildlife.

The following are my comments on the *Thornburgh Resort Fish and Wildlife Mitigation Plan Addendum relating to Potential Impacts of Ground Water Withdrawals on Fish Habitat.*

**Deschutes River and Whychus Creek –Habitat Category 1**

The mitigation plan states in paragraph one on page eight that the Oregon Department of Fish and Wildlife (ODFW) changed its initial finding that Whychus Creek is Habitat Category 1 to Habitat Category 2. This is untrue, ODFW still considers the cold springs and seeps of Whychus Creek Habitat Category 1. The Alder Springs area of lower Whychus Creek meets all aspects of the definition of Category 1 Habitat as stated in OAR 635-415-0025(1). Ted Wise assured me that lower Whychus Creek is considered Habitat Category 1. Therefore, Newton's use of Habitat Category 2 as applied to Whychus Creek is incorrect.

Further, the middle Deschutes River from the Lower Bridge area downstream to Whychus Creek is also considered by ODFW as Habitat Category 1 due to the large inflow of cold water from springs and seeps (Wise, 2008). This cold groundwater discharge is essential and irreplaceable for the fish habitat. The Thornburgh mitigation plan also incorrectly refers to this reach as Habitat Category 2.

The Habitat Category 1 mitigation goal is "no loss either of habitat quantity or quality" this is achieved by recommending or requiring the "avoidance of impacts through alternatives to the proposed development action" or "...no authorization of the proposed development action if impacts cannot be avoided..." (OAR 635-415-0025(1)(a)(A) and (B). Our groundwater modeling of the impacts of the Thornburgh withdrawals shows that there will be reduced discharge of cold groundwater to the lower reach of Whychus Creek (Yinger and Strauss, 2008).



LUBA # 2008-203
01188

We used the USGS-OWRD developed groundwater flow model with no modifications other than the added stress of the Thornburgh groundwater withdrawals. The Habitat Category 1 mitigation goal is simple "no loss". It does not allow dismissal of impact based on arguments that the impact will be negligible or un-measurable. Nor does ODFW habitat mitigation policy allow the impact in one area for improvements in another area.

Since there will be impacts to Whychus Creek and Deschutes River reaches that are Habitat Category 1 the ODFW should clearly state in its comments on the mitigation plan that the Thornburgh development not be authorized by Deschutes County.

**Whychus Creek Mitigation**

The mitigation plan proposes no mitigation for impacts to Whychus Creek. Newton's statements in paragraph three of page eight imply that based on Oregon Water Resources Department (OWRD) findings there will be no flow reduction on Whychus Creek as a result of the Thornburgh development. In paragraph three of page 10 of the mitigation plan the statement is made "Thornburgh water use is not projected to impact Whychus Creek based on OWRD analysis...". Neither the implication nor the statement that there is no impact to Whychus Creek is true. The USGS-OWRD groundwater flow model with the Thornburgh withdrawals added shows that cold groundwater discharge to lower Whychus Creek will be reduced by 0.145 cubic feet per second (cfs, steady state conditions) (Strauss, 2008). The groundwater reduction for the entire creek is 0.166 cfs. In July 2000 the flow from Alder Springs was 8.7 cfs and on Whychus Creek above Alder Springs the flow was 10.85 cfs (Watershed Sciences, 2007).

The modeled reduction in cold groundwater discharge to lower Whychus Creek amounts to 106 acre feet (AF) annually. This reduction in cold spring water discharge is not a negligible. The ecology of Whychus Creek is cold groundwater dependant. Since the impacted area of lower Whychus Creek is Habitat Category 1 ODFW's comments on the mitigation plan should state that Deschutes County should not authorize the Thornburgh development.

**Enhancement Measure – Funding for Thermal Modeling**

The mitigation plan characterizes the proposal to provide $10,000 by the developer for completion of a stream temperature model for Whychus Creek as enhancement and part of its mitigation "package". The completion of the model and its use provides no mitigation of the impacts the Thornburgh development will have on Habitat Category 1 reaches of the Deschutes River and Whychus Creek that will be impacted by the Thornburgh development.

The following are my comments on the *Revised Well Indemnification Plan*, Exhibit 3.

**Probability of Interference is High**

In the second paragraph of the introduction statements are made that based on Newton Consultants original hydrology report for Thornburgh (Newton, 2005) and OWRD water rights application there will no interference with existing wells. Newton's original hydrology report failed to investigate the history of wells in the vicinity of the proposed development. It is standard practice when evaluating the impact of new large production wells to investigate the history of existing wells in the vicinity of the proposed wells. In our evaluation of the impacts of the Thornburgh development on water resources we did this basic research (Yinger and Strauss, 2008). We found that in the area of the Eagle Crest Resort, located just east of the proposed development, that there are 13 wells that have been deepened between 2001 and 2007. The

document water level decline has been as great as 42 feet. It is reasonable to conclude that the pumping of the large production wells at Eagle Crest have drawn down water levels in wells in the vicinity of this resort. Further, it is reasonable to conclude that the pumping of the six Thornburg wells will only accelerated the decline of water levels in existing wells in the area and expand the area water level decline associated with the Eagle Crest Resort.

Our modeling of water levels in response to the pumping of the Thornburgh wells reveals that the pumping of deep Thornburgh wells (model layer 7) will cause declines in water levels of much shallower wells (Yinger and Strauss, 2008). Newton's statement "...that because of aquifer characteristics, depth, and location of Thornburgh's proposed wells, the new groundwater use was not expected to cause interference with other existing ground water uses (wells)" is not supportable. It is clear that the affects of the pumping of deep wells is not isolated from existing shallower wells.

**Two-Mile Radius of Indemnification**

No justification is given to support a limit of a two mile radius. The impacted area is certain not to be circular. Based on the impact of the Eagle Crest wells and low permeability of the core of the Cline Buttes rhyolite dome the impacted area will be elongated in the north-south direction (Yinger and Strauss, 2008). The radius should be increased to 3 miles to be conservatively protective.

**Duration of Indemnification Agreements**

The five year duration of the indemnification agreements is too short. The USGS simulations for pumping wells in the Redmond area indicate that most of the impact occurs 7 to 10 years after the start of pumping (Gannett and Lite, 2004). The duration of the indemnification agreements should be 10 years.

I you have any questions please call me.

Sincerely,

Mark Yinger, R.G.
Hydrogeologist

Attachments:

References:

Gannett, Marshal and Lite, Kenneth, 2004, Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon, USGS Water Resources Investigation Report 03-4195.

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Strauss, Laura, June 6, 2008, personal communications.

Watershed Sciences, 2007, Deschutes River, Whychus Creek and Tumalo Creek Temperature Modeling, for Oregon Department of Environmental Quality.

Wise, Ted, June 4, 2008, personal communications.

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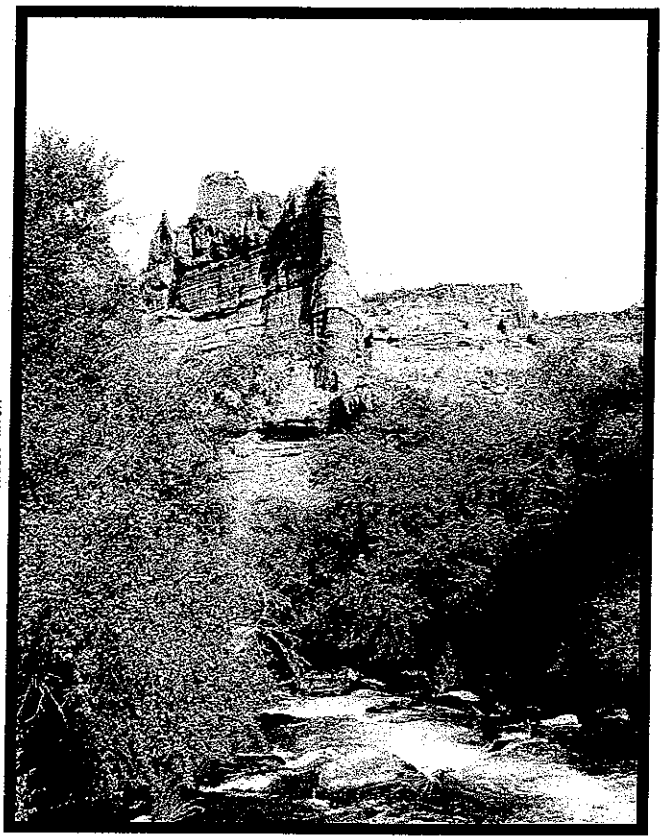
# A Case Study: Thornburgh Resort Water Resources Impact Evaluation

## Upper Deschutes Basin, Oregon



Whychus Creek at the confluence with the Deshutes River.

**Mark Yinger Associates**
and
**Northwest Land & Water, Inc.**

February 2008

NORTHWEST Land & Water, INC.

Mark Yinger ASSOCIATES

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**Case Study:**
**Thornburgh Resort Water Resources Impact Evaluation**
**Upper Deschutes Basin, Oregon**

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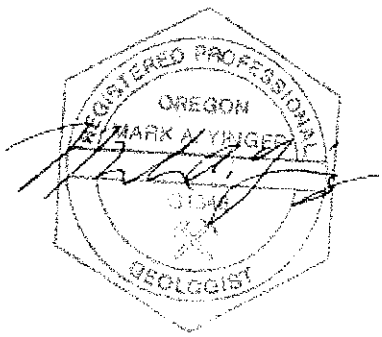

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# 1.0 Executive Summary

This report details the results of an investigation conducted to assess the potential impacts of pumping 3.25 cubic feet per second (cfs) of water from six new wells in the Upper Deschutes Basin (UDB). These wells are part of the proposed Thornburgh destination resort, which is located near important ecological resources. The proposed Thornburgh development will exacerbate rising trends in water use, which has increased consistently since 1998. Likewise, water right permits and applications have also increased significantly since 1998. They reflect the history of water rights policy in the UDB.

To assess the potential impacts to ecological resources, we analyzed geologic, water level, climate, streamflow, water use, water quality, temperature, seepage, and habitat data. We also ran a model developed by the U.S. Geological Survey (USGS). Our modeling and hydraulic analyses identified reaches of the middle Deschutes River and lower Whychus Creek that will be impacted by pumping from the proposed Thornburgh wells. Listed critical bull trout, core populations of redband trout, and unique plant communities live within these reaches.

- **Groundwater level impacts**. Declines in groundwater levels are important because they impact not only other water users but also streamflows. Hydraulic and well deepening data indicate that groundwater levels are already declining in parts of the UDB. A concentration of wells has been deepened near the Eagle Crest Resort, which is located a short distance east of Thornburgh, indicating declines. Recent hydrogeologic information for the Cline Buttes area also indicates that impacts to groundwater levels in the Thornburg area will exceed the predictions of the USGS model. The Thornburgh wells will accelerate water level declines, impact existing water wells and reduce streamflows.
- **Water quality impacts**. The temperature in UDB streams currently exceeds the recommended quality for bull trout and general stream health. Cold groundwater discharges are essential to reducing stream temperatures. Pumping from the Thornburgh and other future wells will cumulatively reduce these groundwater discharges if not properly mitigated. More specifically, modeling indicates that pumping from proposed Thornburgh wells would reduce cold spring discharges to the middle Deschutes River and Whychus Creek reaches that have federally listed critical bull trout habitat, core populations of redband trout, and important ecological resources for reintroducing Chinook salmon and summer steelhead. As cold groundwater discharges decline in response to new pumping, warm water will migrate downstream, negatively impacting these resources.

- **Streamflow impacts**. Our analysis indicates that impacts will occur to the middle Deschutes River above RM 125, lower Whychus Creek, and Tumalo Creek. Seepage does not occur consistently along the Deschutes River; rather, it is strong in some places and weak in others, indicating significant preferred groundwater flow paths. River sections with small gains are most vulnerable to small changes in groundwater level. Water temperature in these sections is at great risk of increasing as cool groundwater inflow declines.

Mitigation must be within this zone of impact. The water permit for Thornburgh allows mitigation in the general zone, anywhere in the basin above the Madras gauge. This will result in an unmitigated new groundwater permit. In addition, current mitigation strategies rely on current streamflow measurements to evaluate the effectiveness of the water rights banking system. Streamflows will undoubtedly change in response to declines in precipitation and increased pumping.

Success of the mitigation program must be measured against the goal of moving toward a more natural hydrograph, not by comparing streamflow to the historically lowest streamflow, when diversions were at their maximum.

# 2.0 Introduction

Development in the Upper Deschutes Basin (UDB) has increased dramatically over the past 20 years. However, land use authorities and regulatory agencies have not required developers to comprehensively evaluate impacts to hydrological (streamflows, aquifer levels) and ecological resources due to new groundwater development. Although the USGS has characterized the hydrogeology of the UDB, the potential impacts to hydrological and ecological resources have not been adequately evaluated. Furthermore, recent data suggests declining trends in both precipitation and groundwater levels. These trends would not only impact streamflows, groundwater levels, and ecological resources of the upper and middle Deschutes River, but they would also be aggravated by future groundwater pumpage if not correctly mitigated.

Key ecological resources along the upper and middle Deschutes River include habitat for native bull and Redband trout; in addition, some reaches contain critical spawning and rearing habitat. Reduced streamflow and discharges from cold springs would impact fisheries. The middle Deschutes canyon is also home to unique riparian habitat.

This study focuses on impacts that a 1,970 acre destination resort planned in Deschutes County will have on water resources and water dependant ecology. In addition to this resort there are fourteen other destination resorts that are either under construction or in some stage of planning in Deschutes, Jefferson and Crook Counties. The total acreage of these resorts may range from 20,000 to 25,000. These destination resorts will rely almost entirely on groundwater. Their impact on water resources will be significant. The impact of each resort and the cumulative impact of all the resorts should be evaluated.

## 2.1 Proposed Development

Legislation passed in 2005 authorized the allocation of water from the Deschutes River and from the aquifers that feed it during seasons when instream flows are unmet. The legislation allows further groundwater development, which may diminish both quantity and quality of water in the Deschutes River and its tributaries.

A recent case of this legislation in action is the destination resort proposed by the Thornburgh Resort Company, LLC. This resort would cover about 1,970 acres west of the City of Redmond and would require new groundwater supplies to sup-

port 1,425 dwelling units, three golf courses, two clubhouses, a community center, shops, and meeting / dining facilities.

As part of the review process, Thornburgh hired David Newton and Associates to prepare a hydrology report to inform and support Deschutes County land-use decisions about the resort. This report was released in 2005. Unfortunately, it falls far short of evaluating the impacts that pumping six proposed wells will have not only on valuable hydrological and ecological resources but also on existing wells.

## 2.2 Purpose

We have undertaken this study for two reasons. The first is to evaluate the impacts of the Thornburgh resort's use of groundwater. The work summarized in this report represents an effort to better understand the current hydrogeologic conditions in the UDB and to evaluate impacts to the hydrogeologic system from the proposed resort. However, an additional—equally important—goal is to demonstrate an appropriate level of evaluation that regulators should apply to any proposed developments involving new groundwater withdrawals (pumpage from new wells). We see the Thornburgh project as a case study that has a potential to establish new standards for reviewing current and future projects in the UDB. We hope these results help establish mitigation and water use strategies that sustain the Deschutes' high habitat and recreational values.

This study was authorized by Steve Munson, long-time resident of the UDB, out of his concern for the region's resources.

## 2.3 Scope of Investigations

Work for this study was conducted under two separate phases, by Mark Yinger Associates (MYA) and Northwest Land & Water, Inc. (NLW). MYA, the project manager, was responsible for evaluating the regional and local geology and hydrogeology. NLW analyzed water resource data and conducted groundwater flow modeling.

### 2.3.1 Phase I

Phase I of this study was outlined in a scope of work our team prepared to evaluate the impacts resulting from pumping large amounts of groundwater for the Thornburgh Resort. It entailed using a U.S. Geological Survey (USGS) ground-


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water flow model (McDonald and Harbaugh, 1988) to predict impacts to the Deschutes River and its tributaries from the proposed pumping. The proposed Thornburgh wells were incorporated into the USGS model so we could simulate conditions under a range of steady-state scenarios.

### 2.3.2 Phase II

The scope of work was revised under Phase II to review and assess recent hydrologic data, and to compare this data to the data used by the USGS for its 1993–1997 study. Major components of Phase II included:

- Summarizing information about water use, policy, and legislation pertinent to the UDB.
- Compiling and summarizing hydrologic data collected since 1997.
- Evaluating trends in hydrologic data—specifically, trends in parameters that can profoundly affect fish habitat: water levels, stream temperature, streamflows, climate, seepage, and groundwater use, among others.
- Using the steady-state USGS flow model "as is" to predict the effects of pumping the proposed Thornburgh wells on streamflows and groundwater levels.
- Evaluating the ecological impacts resulting from reduced streamflows and groundwater levels predicted by the modeling.

## 2.4 Study Area

The study area for this report, shown in **Figure 2-1**, covers the same area as the USGS modeling investigation but focuses on the geology and hydrogeology near the proposed Thornburgh resort. The USGS study area encompasses approximately 4,500 square miles of the Deschutes River drainage basin in central Oregon, which includes several major tributaries: the Little Deschutes River, Tumalo and Whychus Creeks, and the Metolius River from the west, and the Crooked River from the east.

Land-surface elevation ranges from less than 1,300 feet near Gateway in the northern part of the study area to more than 10,000 feet in the Cascades. The study area also includes the basin's major population centers, where groundwater development is most intense and resource-management questions are most urgent. These communities include Bend, Redmond, Sisters, Madras, Prineville, and La

Pine. **Figure 2-2** shows the location of the Thornburgh resort property, the proposed wells, and public and private lands.

## 2.5 Warranty

This work was requested by Steve Munson and completed by MYA and NLW. It was performed, and this report was prepared, in accordance with hydrogeologic practices generally accepted at this time, in this area, for the exclusive use of Steve Munson. No other warranty, express, or implied, is made.

# 3.0 Background Information

The UDB is presently one of the fastest growing areas in Oregon. The number of people in Deschutes County, the most populous in the basin, quadrupled between 1970 and 2001 (Gannett and Lite, 2004), and grew by about 29 percent from 2001 to 2006. Approximately 160,000 people lived in the UDB as of 2001. Growth is expected to continue, and residents and government agencies are concerned about supplying water to the growing population while protecting the rights and resources of existing water users. Surface-water resources in the area have been closed to additional appropriation for many years. Therefore, virtually all new development in the region must rely on groundwater sources.

## 3.1 USGS Investigation

In response to this concern, the USGS conducted an investigation of the hydrogeology of the UDB, collecting data from 1993 to 1997. Prior to the USGS study, researchers had insufficient data to quantitatively evaluate the connection between groundwater and streamflow—or even the behavior of the regional groundwater flow system in general. At the time of the USGS investigation, and prior to 2005, Oregon water law required those applying for new groundwater rights to evaluate the potential effects of groundwater development on streamflow.

The USGS investigation was born out of the hydrologic information void. The objectives of the study were to quantitatively assess the regional groundwater system and to provide analytical tools for making sound resource-management decisions. It has helped State and local government agencies, geologists, hydrologists, and residents when considering applications for new groundwater rights.

## 3.2 Regulatory Framework

### 3.2.1 Scenic Waterways Act

The *Scenic Waterways Act* was voted into law in November, 1970 to protect the free-flowing character of designated rivers for fish, wildlife and recreation and protect and enhance scenic, aesthetic, natural, recreation, scientific and fish and wildlife qualities along scenic waterways. Under this law, the portion of the Deschutes River below the Pelton Reregulation Dam to the Columbia River is

classified as a Recreational River Area under the Scenic Waterway Act (OAR 736-040-0070).

In accordance with a 1988 Supreme Court Decision (Diack vs. City of Portland) the Water Resources Commission must find that scenic waterway flows will not be impaired before issuing new water rights. As originally enacted, the Oregon Scenic Waterway Act prohibited new allocation of water from scenic waterways unless the Water Resources Commission determined the use was consistent with the scenic waterway law.

### 3.2.2 Instream Flows Established

In 1991 the Oregon Water Resources Department (OWRD), Oregon Parks and Recreation Department, and Oregon Department of Fish and Wildlife (ODFW) established the specific flow levels needed for fish, wildlife, and recreation in the Deschutes Scenic Waterway. The State also established instream water rights to protect flows in the river system for fish and recreational values. According to the 2006 Water Summit report on instream flows (Golden and Aylward, 2006) these protected flows are already not met many months of the year for reaches in the study area. In general, irrigation storage and diversions are the primary reasons. Streamflow in the Little Deschutes River and upper Deschutes River is primarily affected by reservoir storage operations. Conversely, streamflow in the middle Deschutes River, Tumalo Creek, and Whychus Creek is affected by irrigation diversions (Golden and Aylward, 2006).

### 3.2.3 SB 1033 & Appeals

In 1995, the State legislature approved Senate Bill 1033, which amended Oregon's *Scenic Waterways Act*, allowing new groundwater uses that measurably reduce streamflows of scenic waterways—if mitigated. A measurable reduction is defined as 1 percent or 1 cubic foot per second (cfs), whichever is less. All new rights would be subject to the proviso that groundwater use would be curtailed if data demonstrated a negative impact to scenic waterways. A public process to develop mitigation rules was started in 1998. Based on preliminary results of the USGS study, OWRD determined there was significant potential that new groundwater use would result in reduced streamflow on scenic waterways, and therefore, in 1998, a moratorium was placed on granting new groundwater permits. Issuance of final mitigation rules occurred in September 2002.

In November 2002, WaterWatch, an advocacy group for Oregon rivers, filed a case against OWRD arguing that the mitigation rules violated the *Scenic Waterways Act* and over allocated surface water in the UDB—thus failing to protect in-

stream water rights. In May 2005, the Court of Appeals found in favor of WaterWatch. The mitigation rules were rejected because the Court found that they allow a lessening of impact even though the law requires maintaining current flow. The Court in its opinion recognized that the legislature could choose to alter water resource policy established in statutes, opening the door for House Bill 3494.

### 3.2.4 House Bill 3494

In 2005, House Bill 3494 passed, authorizing allocation of groundwater whether or not it impacts the Deschutes River, regardless of the instream flows already established under the *Instream Water Rights Act*. The potential effects of groundwater development on streamflow did not need to be evaluated when considering applications for new groundwater rights. House Bill 3494 undermines Oregon's *Scenic Waterways Act*, passed in 1970 to protect flows needed for fish, wildlife, and recreation in the Deschutes and other world-class rivers in Oregon.

HB 3494 passed with a "sunset provision" of January 2, 2014. After HB 3494 sunsets, the rules found illegal by the Oregon Court of Appeals in 2005—but which became legal under HB 3494—will be terminated, precipitating the development of a new mitigation and water use strategy for the Deschutes basin.

### 3.2.5 Current Concerns

The sunset provision raises a number of concerns related to the long-term ecological health of the UDB. Developers now have an incentive to rush projects requiring new groundwater sources before the sunset date. Developments and associated water rights may be approved without adequate scientific investigation to quantify hydrogeologic impacts. Because development is essentially unchecked, the current and future health of the Deschutes hydrogeologic system is threatened by declining groundwater levels, spring flows, and streamflows, along with increased river water temperatures.

Although the USGS did much to characterize the hydrogeologic system of the UDB in the 1990s, development has been significant since then. As a result, trends in water use, streamflows, and groundwater levels have changed, potentially affecting the region's ecological resources.

# 4.0 Previous Work

Many researchers have studied water resources in the UDB. This section identifies much of the work conducted, the agency responsible for the work, and how it was used in this report. Rather than listing all work done in the UDB, we have focused on investigations that provided the most pertinent information for understanding the general history and technical hydrogeology of water resources in the UDB. A complete list of references used to prepare this report is included in Section 14.

## 4.1 Geology & Hydrogeology

The USGS has published many reports on different aspects of water resources in the UDB. A complete list of this work can be obtained online[1]. The work described below was the basis of the geology and hydrogeology summary in Section 5, the comparison of recent and previously available hydrologic data presented in Section 6, and the modeling efforts detailed in Section 7.

- *Groundwater and Water Chemistry Data for the Upper Deschutes Basin* (Caldwell and Truini, 1997). Presents basic data collected and compiled for the UDB, such as well log records, water levels, and water chemistry data for selected well, spring, and surface water sites.

- *Groundwater Hydrology of the Upper Deschutes Basin, Oregon* (Gannett et al., 2001). Provides a comprehensive, qualitative description of regional groundwater flow in the UDB and an analysis of the data compiled or collected for the study.

- *Geologic Framework of the Regional Groundwater Flow System in the Upper Deschutes Basin, Oregon* (Lite and Gannett, 2002). Describes the geologic structures and stratigraphic units that form the framework for the groundwater flow system in the UDB. The geology has a direct effect on the occurrence and movement of groundwater.

- *Hydrogeology of the Upper Deschutes Basin, Central Oregon: A Young Basin Adjacent to the Cascade Volcanic Arc* (Sherrod, Gannett, and Lite, 2002). Explores the visible and conceptual aspects of the regional groundwater hydrology of the UDB, including the interaction between groundwater and streams.

[1] *http://or.water.usgs.gov/proj/deschutes_gw/pubs.html*

- *Simulation of Regional Groundwater Flow in the Upper Deschutes Basin, Oregon* (Gannett and Lite, 2004). Describes the mathematical simulation of regional groundwater flow in the UDB. It includes a description of the hydrology of the UDB and the methodology for representing the hydrologic system in the numerical model. It also includes hydrologic data used for the model calibration and a description of the calibration procedures.

## 4.2 Other Technical Work

Other technical work has been conducted to quantify seepage in the gaining and losing reaches of the streams in the UDB, to document stream temperature, to identify critical habitat for listed fish, and to survey and document flora and fauna. This report does not discuss the flora and fauna surveys, but the reports are listed here because they comprise important technical work that has been done in the UDB.

**Seepage Data** (McSwain, pers. comm., 2008). Seepage measurements were made for OWRD and Bureau of Land Management (BLM). These data were used to quantify seepage in gaining and losing stream reaches as reported in Section 6.

**Stream Temperature** (Watershed Sciences, 2002). Continuous temperature measurements and aerial visible and infrared photographs were collected and reported for the Oregon Department of Environmental Quality (ODEQ) by Watershed Sciences. Temperature measurements were used in Section 6.

**Critical Fish Habitat** (USFW, 2005) and (Fies et al., 1996). Identifies critical habitat for bull trout and native redband trout; also, identifies and discusses the reintroduction of salmon and steelhead. These data were used for Section 10.

**Botanical Surveys** (WPN, 2006). A botanical inventory on the Middle Deschutes from Odin Falls to Culver gauge that was prepared for the BLM.

**Aquatic Invertebrate Survey**. A macroinvertebrate study was conducted for BLM to establish baseline conditions for comparison to data collected in the future. Invertebrate populations and diversity are indicators of stream health.

## 4.3 Management & Mitigation

Much work has been done towards managing water resources in the UDB. Although there is a large body of information about the legislative history of water

resources in Oregon and the UDB, it is beyond the scope of this report to compile that information. However, a few crucial documents describe water resource management, and, in particular, mitigation of diminished streamflow in the UDB. They are described below.

*Hydrology Report, Water Supply Development Feasibility: Proposed Thornburgh resort, Deschutes County, Oregon* (Newton, 2005). Prepared for the Thornburgh destination resort, this documents reports on the feasibility of groundwater development. The Deschutes County Board of Commissioners accepted this report as an adequate demonstration of sufficient groundwater supply for the proposed project, deeming that the potential impact to groundwater levels and nearby streams is acceptable.

*Deschutes Groundwater Mitigation Program, 5-Year Program Evaluation Report Draft* (OWRD, 2008). Evaluates the first 5 years of the groundwater mitigation program. We used this information in Section 12.

Deschutes Basin Water Summit 2006. This conference brought together stakeholders to enroll them in a consensus process for developing a comprehensive water management plan. It communicated the findings of a number of comprehensive studies on the following topics: instream flows; growth, urbanization, and land use changes; water management scenarios; groundwater demand; irrigation district water efficiency; and reservoir management. All of these reports can be viewed from the Deschutes River Conservancy website[2]. While most of these reports were not used directly in the report, they comprise an important body of work on management strategy in the UDB. The report on instream flow was used in Section 12.

[2] *http://www.deschutesriver.org*

# 12.0 Analysis of Projected Impacts

In Section 6 we analyzed data collected over the last 10 years to identify trends that will affect future water and ecological resources in the UDB. In section 7 we conducted modeling to evaluate the effect of pumping Thornburgh wells on the hydrogeologic system. In Sections 8, 9, and 10 we analyzed water rights activity since 1998, deepened wells in the Thornburgh vicinity, and fish habitat, respectively. This section summarizes the results of these analyses with respect to impact to water resources and the current mitigation program (Section 11) and offers a roadmap for evaluating the impacts of future development.

## 12.1 Impacts Related to Thornburgh Case

### 12.1.1 Modeling Results

Our model simulations show that pumping from the new Thornburgh wells will reduce streamflows primarily in two segments of the middle Deschutes River and lower Whychus Creek (**Table 7-1**, **Figures 7-1** and **7-2**). The two reaches on the Deschutes River are from Bend to just south of Cline Buttes (RM 149) and from Odin Falls to the mouth of Whychus Creek. On Whychus Creek, streamflows are reduced from approximately Alder Springs downstream to the Deschutes River.

These streamflow reductions are related to groundwater level declines. Because a significant portion of streamflow originates from groundwater seepage—especially during the low-flow season—these declines mean less groundwater is available to feed the stream. Reaches of the Deschutes River near the proposed Thornburgh development are especially vulnerable to water level declines because baseflows are relatively low. Water level decline could also affect Whychus Creek, which has base flows of about 7 to 15 cfs, and Tumalo Creek, which has baseflows of 10–20 cfs.

All of these reaches are important to fish resources near the proposed development.

### 12.1.2 Related Impacts

The predicted groundwater level declines—and the resulting reductions in streamflow—also have profound impacts on stream temperatures, which in turn can impair fish habitat. The mildly gaining reaches are especially vulnerable to water


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level declines, which can lead to higher water temperatures because less cool groundwater is available to enter the stream.

Groundwater level declines also impact existing wells and water rights. As water levels decline, a well's production may also decline. Many owners in the UDB have already resorted to deepening their wells to obtain the supplies they need.

## 12.2 Climate Change

If future precipitation is less than historic precipitation, this will eventually manifest in reduced streamflow. If impact to streamflow from groundwater pumping is expressed as a percent of streamflow, then relative impact from pumping would be greater under conditions of reduced precipitation and reduced streamflow.

## 12.3 Habitat Resources

Pumping from the six proposed Thornburgh wells will cause water level declines and associated reductions in cold spring discharges. It is reasonable to assume that if mitigation for the Thornburgh wells does not occur at the specific reaches affected by pumping, cold water discharge into the stream will be less at those reaches, causing water temperatures to increase on both the Deschutes River and Whychus Creek. Increased stream temperature negatively impacts not only critical habitat for bull trout, a federally listed species, but also a core redband trout population. In addition, this warming trend will impede the success of the reintroduction of Chinook salmon and summer steelhead.

## 12.4 Considerations for Future Developments

In a region that is growing as rapidly as the UDB, it is imperative to consider impacts in the context of trends in water usage. Although the impacts on streamflow due to pumping the Thornburgh wells alone will never exceed 3.25 cfs (the Q-average), the effect of declining groundwater levels is cumulative. If streamflows decrease, impacts to the Deschutes River from the proposed Thornburgh development would become more significant because they would represent a larger percentage of streamflow.


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Furthermore, groundwater development will undoubtedly continue in the UDB, and water level declines will be additive. It is reasonable to assume that pumping the six wells at the Thornburgh destination resort will contribute to the rate of groundwater level decline, perhaps requiring other wells in the area to be deepened. Similarly, while reduction in stream temperature from reduced cool groundwater inflow due to Thornburgh pumping may be relatively small, the cumulative effect from other groundwater developments in the vicinity will be significant.

Section 13, "Recommendations," lists specific actions that planners can take to ensure the long-term health of ecosystems along the Deschutes River.

# 13.0 Recommendations

Agencies and planners should…

- …consider the cumulative impact of individual proposed groundwater developments rather than considering each one individually.
- …require the use of the best available scientific method to evaluate the impacts of groundwater development on water resources.
- … acknowledge the effects of lining and piping canals on groundwater levels and related groundwater discharges to streams. The "conserved" water may enhance flows at the diversion, but any benefits are subtracted downstream because groundwater discharges to streams are diminished.
- …acknowledge that when pumping is not mitigated at the place of impact, cold groundwater discharges to streams are reduced, resulting in higher water temperatures. A greater emphasis on evaluating and monitoring water quality is needed.
- …target mitigation for Thornburgh pumping to the middle Deschutes River and Whychus Creek zones, which will be impacted the most.
- …monitor stream temperature and use the data to measure the effectiveness of mitigation.
- …address the Endangered Species Act and other laws protecting fish and fish habitat when considering groundwater withdrawals.
- …use the natural hydrograph for Deschutes River as a means by which to evaluate the success of water resource management in the UDB, rather than a comparison to the historic low flow.

The critical habitat listing prohibits federal actions that would adversely modify critical habitat ODFW, ODEQ, OSPRD, and the BLM should develop programs specifically to monitor and evaluate the effectiveness of mitigation for new groundwater development.

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## THORNBURGH RESORT COMPANY'S RESPONSES

## TO THE HEARINGS OFFICER'S QUESTIONS

The following discussion addresses the questions (in bold) posed by the Hearing Officer in her July 7, 2008 Memorandum to the parties. The Hearing Officer's questions are shown in bold, followed by a summary of the applicant's response. The responses also refer to additional documents that are being submitted as exhibits.

**General:**

**1. The applicant asserts that the proposal is consistent with the Conceptual Master Plan (CMP) approval. Mr. Dewey argues that the applicant has not specified the modifications that have been made to the proposal in the interim between initial CMP approval and the present. In his written testimony, Mr. Dewey identified some specific examples where he contends further review is required to ensure the proposal is consistent with the CMP.**

DCC 18.113.040(B) requires the preparation of "a final master plan ('FMP') which incorporates all requirements of the County approval for the CMP." DCC 18.113.100(B) states that if the County Planning Director "finds evidence in the FMP of a substantial change from the CMP, the Planning Director shall advise the applicant to submit an application for modification or amendment of the CMP." DCC 18.113.080 defines substantial change to an approved CMP to mean "an alteration in the type, scale, location, phasing or other characteristic of the proposed development such that findings of fact on which the original approval was based would be materially affected."

As the materials submitted by applicant with this letter indicate, County staff correctly found that there is no substantial change between the development approved by the County's CMP decision and the development proposed by this FMP application. Each of the refinements in the various maps was discussed with County staff and none were found to be even remotely close to "substantial changes." In any event, as LUBA found in its decision on appeal of the CMP, "If significant decisions about the nature, design and characteristics of the destination resort are deferred to the FMP stage, petitioners might not have an opportunity to comment on those decisions." *Gould v. Deschutes County*, 54 Or LUBA 205, 211-12 (2007). In fact, petitioners now have been provided an opportunity to comment.

LUBA also said, "DCC 18.113 . . . clearly envisions that the CMP will be refined by the FMP which in turn will be further refined by site design and subdivision review decisions." 54 Or LUBA at 212. What applicant has done in the FMP is to refine the maps submitted and approved as part of the CMP as more specific information has become available about the site itself and the likely uses on the site. None of these relatively minor changes are significant enough to materially affect the CMP approval findings.

**I would like the applicant to respond to Mr. Dewey's assertions by:**

**a. Graphically separating out areas that are planned for "natural" open space from areas that will be used as golf courses, developed open space, buffer.**



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The FMP Open Space Plan, FMP Exhibit A.1.1, shows three categories of open space: "Common" (530 acres); "Golf/water feature" (660 acres); and "Buffer" (91 acres). There is a total of 1,281 acres of open space, which comprise 66 percent of the total acreage of the resort. This is well in excess of the 50 percent open space requirement stated in DCC 18.113.060(D)(1).

The CMP Open Space Plan had the same categories of open space. As stated in the May 10, 2006 CMP approval ("May CMP Decision"), "The Open Space Plan (Revised), RM, Ex. 9, B-1.4, proposes approximately 1,358 acres as permanent open space. This projected acreage amount represents approximately 69 percent of the total site and therefore considerably exceeds the required 50 percent minimum."[1]

On both plans, the common open space is "natural" open space, in contrast with the golf courses, developed open spaces and buffer. When placed side by side, RM Ex. 9, B-1.4 and FMP Exhibit A.1.1 are essentially the same. The changes shown reflect the more careful location of the roads, an effort to avoid and protect various natural features, and a greater awareness of the topography on the site. The total open space has been reduced by about 3 percent as a result of greater precision in delineating the specific areas as the applicant has moved away from the "blobs" in the earlier exhibit. The May CMP Decision, page 20, acknowledges that "the final location, acreage and dimensions of any open space area are subject to limited refinement during the process of developing a final master plan." The changes made are well within the scope of the term "limited refinement."

**b. Graphically delineating among residential densities (from most dense to least dense).**

Newly prepared FMP, Exhibit G.1.2 shows the estimated residential density in each area of the resort, delineated from most dense to least dense. This does not include overnight lodging, which is treated as a separate category of housing in DCC 18.113.060(D)(1) and ORS 197.445(4)(b)(E).

**c. Addressing claims that the MOU with ODOT is insufficient to identify the methods the applicant will use to manage automobile traffic demand.**

It is unclear what, if anything, DCC 18.113.090(M) requires beyond what is already required by DCC 18.113.050(A)(6) and (7), DCC 18.113.050(B)(2) and DCC 18.113.070(G), which must be satisfied to gain CMP approval. All of these identify the methods the applicant will use to manage automobile traffic demand. The May CMP Decision contains elaborate findings in response to these criteria, based on hundreds of pages of traffic studies and other substantial evidence. With one exception, LUBA affirmed the findings. It remanded for additional findings in response to DCC 18.113.070(G)(3)(b). The April 9, 2008 CMP approval decision contains two pages of findings, which demonstrate that this standard has been met.

The MOU with ODOT requires: (1) the construction of a west bound left turn lane and an east bound right turn lane on Highway 126 at Eagle Crest Blvd and, (2) an unspecified financial

[1] As noted in the May CMP Decision, the legend on RM, Ex. 9, B-1.4, which shows the total to be 1,552 acres, is incorrect.

contribution from Thornburgh to ODOT for a portion of the cost of constructing transportation infrastructure at the Highway 20/Cook Avenue interchange in Tumalo. Thornburgh has complied with the terms of the MOU and the conditions of CMP approval. The Highway 126 turn lanes that were contemplated by the MOU have been constructed and installed by the neighboring Eagle Crest resort and are operational as of the date of this submission. The constructed turn lanes will facilitate the safe and orderly movement of traffic from Highway 126 to the Thornburgh resort's northern access point in Section 17.

In compliance with the MOU, the Applicant has continued to negotiate with ODOT to reach final agreement on the terms of a financial contribution to the cost of transportation infrastructure improvements to be constructed by ODOT at Highway 20/Cook Avenue in Tumalo. To the extent opponents argue that the MOU with ODOT (Agreement Number 22759, dated 10/10/05) is insufficient to identify the methods the applicant will use to manage automobile traffic demand, their argument constitutes a collateral attack on the May CMP Decision, unless they contend that DCC 18.113.090(M) requires something more than the criteria already addressed in that decision. A careful reading of the MOU indicates that it is a non-binding proposal "and is not and should not be construed as a commitment by any party." It observes that "ODOT and Thornburgh are jointly working to develop a 'Cooperative Improvement Agreement' that will further define the terms and timing of Thornburgh's proportionate share contribution." It imposes no timeline on the completion of the Cooperative Improvement Agreement, and it provides for a "collaborative process" to resolve any differences between ODOT and Thornburgh.

Notwithstanding opponent Annunziata Gould's contention, in a Memorandum dated June 17, 2008, that there has been a "failure to fulfill the MOU," ODOT does not contend there has been a failure on Thornburgh's part. As noted by Gould, the anticipated cost of highway infrastructure improvements at this location has increased beyond that originally anticipated in the County's comprehensive plan. Applicant is voluntarily providing a higher level of contribution than was originally contemplated. A July 14, 2008 email from Mark DeVoney, ODOT's Region 4 Program and Planning Manager, states:

> "I am writing to confirm that I support the general terms of the most recent draft Cooperative Improvement Agreement we have worked on together. I have worked closely with our Region Manager and he also supports these terms. We appreciate Thornburgh's willingness to substantially increase the level of its financial contribution to reflect the increased costs of infrastructure improvements in this location."

In short, Thornburgh has done, and continues to do, far more than the ODOT MOU requires. The negotiated Cooperative Improvement Agreement will be shortly be forwarded to the Attorney General's Office and Oregon Transportation Commission for final review and approval. In the extremely unlikely event that negotiations between the Applicant and ODOT were to reach an impasse, the parties will initiate a collaborative mediation process as prescribed by the Oregon Consensus Program.

The evidence offered in response to the criteria of the CMP shows DCC 18.113.090(M) is also met. *See* May CMP Decision, pages 6, 16-17, 65-69 (evidence identified in findings). Thornburgh will manage automobile traffic demand through the following methods: (1) the construction and maintenance of an extensive system of internal roadways within the boundaries of the resort; (2) the construction and maintenance of access and connecting roads on publicly owned lands surrounding the resort; (3) the construction and maintenance of non-motorized/pedestrian and bicycle trails within the resort; (4) the construction of specified off-site roadway improvements; and (5) compliance with the terms of a negotiated agreement with ODOT.

Thornburgh will construct and maintain a system of internal roadways within the boundaries of the resort that will serve to manage automobile traffic demand. Roadways will be designed and constructed to applicable County road standards and will easily serve the volume of traffic anticipated at the resort. The location and circulation pattern of the internal resort road system is depicted on the Access Circulation and Trail Plan, FMP Exhibit A7. This plan also illustrates the location of the access and connecting roads to be located on publicly owned lands surrounding the resort. These include two roadways on state-owned land that connect the northern and southern portions of the resort, as well as the northern resort access road that runs across land owned and managed by BLM. The resort's northern access road has been constructed in compliance with applicable County road standards and the specific terms and conditions imposed by the BLM in its grant of access. *See* FMP Exhibit I2a.

Thornburgh will also construct and maintain an internal system of non-motorized trails and pathways that will facilitate pedestrian, bicycle and recreational travel within the boundaries of the resort. Exhibit A7 shows the resort's internal trail system. It has been designed to provide visitors and guests with access to the various resort amenities. Internal trails will foster pedestrian and bicycle travel and will assist in managing automobile demand within the resort boundaries. Trails and pathways will be constructed to standards that will accommodate a variety of different forms of non motorized travel. Thornburgh will construct trail heads, also illustrated on FMP Exhibit A7, to provide access to the trail system in multiple locations. As noted in its MOU with the BLM, Thornburgh is working through the Cline Buttes Planning Process to coordinate access and trail connections between the resort and surrounding federal lands. The coordinated selection of access points to areas of federal land will serve to reduce vehicular traffic and impacts on publicly owned resources.

Gould improperly attempts to incorporate the standards of Goal 12 and the Division 12 Transportation Planning Rules (OAR 660-012-000 through 0070) to argue Thornburgh must utilize all of the "transportation demand management measures" identified in the rule. The requirements of Goal 12 are not directly applicable to the application because Thornburgh seeks permit approval under the terms of the County's acknowledged comprehensive plan and land use regulations. *McArthur v. Lane County*, 31 OR LUBA 309, 317(1996). The Division 12 planning rules are intended to implement Goal 12 and to guide local governments in the transportation planning process. The rules identify tools that local governments may utilize in their local transportation planning process. For example, the term, "Demand Management" (OAR 660-012-0005(7)), identifies actions designed to change travel behavior to improve the performance of transportation facilities, including alternative modes, ride-sharing and trip-reduction ordinances.

Similarly, the term "Transportation System Management Measures" (OAR660-012-0005(31)), provides for techniques that increase the capacity of a transportation facility without increasing its size, such as signal improvements, channelization, access management, medians and parking removal.

Nothing in state law or the County code requires Thornburgh to utilize any or all of the demand management measures identified in this rule, many of which would have no place in a destination resort. DCC 18.113.090(M) requires Thornburgh to identify the methods it will use to manage automobile traffic demand. As specified above, Thornburgh will manage traffic demand through development of its internal system of roadways and pedestrian trails and the construction and/or funding of the specific transportation improvements identified through approval of the CMP.

DCC 18.113.090(L) requires a discussion of the status of required off-site roadway improvements. The following discussion supplements and updates the discussion in the FMP Burden of Proof Statement ("BOP").

Thornburgh has obtained a Right-of-Way grant from BLM authorizing a connection between Oregon Highway 126 and the northern resort access point in Section 17. A copy of the BLM grant is attached as Exhibit I2 to the Burden of Proof Statement. Thornburgh has constructed a northern access road within the boundaries of the BLM Right-of-Way Grant. The roadway has been constructed in compliance with applicable County road standards and exceeds the requirements of CMP Condition 4, which requires construction of 20-foot wide "all-weather surface capable of supporting a 60,000-lb fire vehicle."

Thornburgh has also applied to ODOT for an "approach road permit" authorizing a connection between the resort and Oregon Highway 126. A copy of this pending application is attached to the FMP BOP as Exhibit I1. Thornburgh's Transportation MOU with ODOT states that, "at the time ODOT issues an approach road permit to Thornburgh for an approach onto Highway 126 at Eagle Crest, Blvd., Thornburgh shall construct to ODOT standards a westbound left-turn lane and an eastbound right-turn lane at Eagle Crest Blvd". *See* FMP Exhibit I4. ODOT placed a similar condition in its agreement with the neighboring Eagle Crest Resort. Eagle Crest has constructed each of the turn lanes contemplated by this condition and they are fully operational as of the date of this submission.

Thornburgh anticipates the construction of off-site roadway improvements that connect the northern and southern portions of the resort in the locations depicted on FMP Exhibit A7. As of today, Thornburgh has received authorization to construct such improvements from the State of Oregon and BLM but the road connections have not been constructed.

Thornburgh will also construct turn lanes on the Cline Falls Highway at the main resort entry point. As of today, no construction has been initiated in this location. Details and specifications of such improvements will be incorporated in future subdivision and/or site plan approvals.

**2. The standard for deciding whether a criterion can be satisfied is whether the evidence shows that a proposal is "possible, likely and reasonably certain to succeed." *Meyer v. City of Portland*, 67 Or App 274, 678 P2d 741 (1984). How do I apply that standard to circumstances that are subject to other governmental/personal timetables? For example, DCC 18.113.070(D) requires a demonstration that the impact of the development on fish and wildlife will be fully mitigated, but some of the proposed mitigation depends on the development of programs in the future. Does compliance with the mitigation plan require a demonstration that the other entities are reasonably likely to follow through with their programs? Or is it enough to show that the plan, overall, is reasonably likely to succeed?**

The mitigation plan was designed to address DCC 18.113.070(D) ("Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource.") In evaluating the plan, ODFW used its own "Fish and Wildlife Habitat Mitigation Policy," which is set forth in OAR 635, division 415.

The plan calls for offsite mitigation on BLM land and requires consultation with BLM and ODFW. Both of these entities have regulations intended to protect wildlife and both can be expected to enforce these regulations. In the case of ODFW, protection of wildlife is the agency mission. The record discloses that ODFW has been aggressive in achieving its mission. Even if that were not the case, denial of an application should not be based on the possibility that an agency will fail to enforce its own regulations. *Sanders v. Yamhill County,* 34 Or LUBA 69, 88 (1998).

For the most part, the wildlife mitigation plan gives the agencies an advisory role. Specifically, the mitigation plan requires:

- A weed control program consistent with the BLM's current Upper Deschutes Resource Management Plan and policy. The program must incorporate "an integrated pest management strategy approved by the BLM" and "reseeding of disturbed areas with a mixture of native shrubs, grasses and forbs . . . approved by BLM." Thornburgh must annually evaluate and modify the weed control program "with the guidance of BLM."

- Vegetation enhancement, which requires administration and evaluation by Thornburgh with BLM and ODFW "to maximize success."

- Reduction of unauthorized Off-Road Motor Vehicle Use on Public Land. Thornburgh shall work with the BLM to reduce unauthorized ORV use through the adoption of a more cohesive and comprehensive trail plan. Thornburgh, BLM and ODFW will annually review and make recommendations to the trail reconfiguration effort.

- Wildlife water sources. BLM will identify the two guzzlers to be maintained.

In addition, Thornburgh is required to prepare an annual report for the County, BLM and ODFW, who will meet annually "to review and confirm that mitigation is

being implemented as designed until mitigation is fully completed and a funding source is in place to assure long-term maintenance is established."

In deciding if a plan is "possible, likely and reasonably certain to succeed," a decision maker must focus on the plan itself. If the plan cannot succeed without the participation of public agencies (BLM, ODFW and the County), it is appropriate to assume that it is "possible, likely and reasonably certain" that the agencies will fulfill their missions and responsibilities. That is the assumption made each time a local government imposes conditions of approval. Ultimately, as with all conditions of approval, the County has the authority to see that the wildlife mitigation plan is implemented.

**Wildlife Mitigation Plan**

**1. I understand that the applicant applied a mathematical formula to calculate the likely impact its water use will have on surface waters in the Deschutes Basin based on the assumption that the consumptive use equals the estimated impact on the basin. The opponents have used a methodology developed by USGS for the entire basin. I would like the parties to provide a little more information regarding the two methodologies to help me better understand the relative advantages/disadvantages of each approach.**

A. Overview

There are two key differences between the applicant's approach and the project opponents' approach as described by the Yinger report and presentation. First, the Yinger approach attempts to "run" the USGS model to determine site-specific impacts for the Thornburgh project, while the applicant OWRD and ODFW rely on a site specific assessment by OWRD hydrogeologists. The OWRD review, in turn, is informed by the USGS study and modeling results on a regional basis, coupled with staff experience and project-specific information. Second, the applicant, OWRD and ODFW determined the estimated quantity of impact on surface waters based on the project's "consumptive use", while the Yinger approach assumes all ground water pumped for project purposes is consumed and no portion of the water appropriated from the ground returns to the ground water system. These differences are described further below. Additional technical analysis regarding the different approaches is provided in separate submissions from TetraTech EC, Inc. (TetraTech), and Newton Consultants Inc. (NCI) on behalf of the applicant.

To understand the differences in approach taken by the applicant, state agencies and project opponents, it is important to first address key factors and terms common to all:

*USGS Study and Model*: The USGS "Study" is comprised of a number of technical reports prepared by staff of the U.S. Geological Survey, with input and assistance from OWRD. In addition to the study reports, the USGS developed a model (MODFLOW) for estimating the location of impact of ground water development on surface waters within the Deschutes Basin. The model utilizes input data relating to the location, depth and pumping capacity of wells along with other information to predict the extent of impact, based on hydraulic connection between ground water and surface water. Modeling results have allowed OWRD and USGS to simulate the regional ground water flow throughout the basin. This information about ground water flow

has been used by OWRD to develop generalized "zones of impact" for purposes of evaluating individual water right applications and prescribing mitigation requirements. OWRD does not typically "run" the model for individual water right applications. Instead, OWRD relies on the ground water mapping and regional simulation developed by USGS coupled with other site-specific information to evaluate individual water right applications.

*Maximum Authorized Pumping Rate and Volume:* The Final Order approving the Thornburgh water right application authorizes a maximum pumping rate of 9.97 cubic feet per second (cfs) and a maximum annual volume of 2,129 AF. (Note – an early version of the draft permit for Thornburgh identified an annual volume of 2,355 AF which was used in the Yinger analysis; the Final Order issued by OWRD reduced the volume to 2,129.)

*Consumptive Use:* OWRD defines the term "Consumptive Use" in OAR 690-505-0050(2) as follows:

> " 'Consumptive use' means the Department's determination of the amount of a ground water appropriation that does not return to surface water flows in the Deschutes Basin due to transpiration, evaporation or movement to another basin."

This definition and OWRD policies for the ground water mitigation program reflect the nature of water use, and the nature of hydraulic connection between ground water and surface waters. That is, in almost all cases, some portion of a ground water appropriation will eventually return to the ground water (through seepage) or directly to surface waters (through run-off). For example, when water is applied to crops for irrigation, a portion of the water is consumed by the plants (transpiration), a portion is evaporated, a portion may seep back into the ground and become part of the aquifer, and a portion may run-off the land and discharge directly into surface waters. OWRD uses an estimate of 60% consumptive use for typical agricultural irrigation uses in the Deschutes Basin, reflecting a 40% return to the system through seepage or run-off.

*OWRD Mitigation Requirement:* The OWRD mitigation requirement is tied to the water right application, and is determined by the OWRD Ground Water Mitigation Rules (OAR 690-505-0050 through 0630). The rules are intended to provide mitigation for impacts for surface water as a result ground water pumping. As described above, the amount of mitigation required by OWRD is equal to the amount of annual consumptive use on a volumetric basis.

*Impacts to Surface Water Flow Rate and Temperature:* The OWRD mitigation rules are based on the annual volume of impact and do not address the impacts of change in flow rates due to ground water pumping. For purposes of addressing the county mitigation standard, ODFW asked the applicant to address these factors, in addition to the annual volume of impact. Accordingly, the applicant's approach includes quantification of the rate of flow impact and potential temperature impact. (Addendum and TetraTech report). Yinger also identifies impacts to flow and suggests that changes in flow rates will result in a change of temperature. However, the Yinger report does not attempt to quantify temperature impacts.

B. Comparison of Applicant, State Agencies and Yinger Approaches

1. Location of Impact

The applicant, OWRD, and ODFW have estimated the location of impact of Thornburgh pumping on the basis on the findings of the "Public Interest Review for Ground Water Applications" conducted by OWRD for the Thornburgh water right application. A copy of the OWRD Review is attached to the Applicant's Fish and Wildlife Mitigation Plan (Addendum Relating to Potential Impacts of Ground Water Withdrawals on Fish Habitat). The advantage of this approach is that it reflects the generalized nature and intent of the USGS model, as stated by the USGS 2004 report:

> "The model is intended to simulate the regional ground-water flow system and is most useful at regional scales. The model accurately simulated hydrologic conditions in specific local areas (usually corresponding to areas where data were plentiful); however, there are also areas where the model does not accurately simulate local or small-scale conditions. Simulation results must be evaluated within the context of overall hydrologic knowledge of the area."

Accordingly, this approach relies on the individual ground water report prepared for the Thornburgh project by OWRD, which determined the location of impact on the Deschutes Main Stem approximately five to eight miles north of the project. The OWRD analysis, in turn, relies on known, peer-reviewed determinations about the regional ground water flow system demonstrated by the use of the USGS model on a large-scale basis, coupled with the experience of the OWRD staff in reviewing similar applications in the area and compared with known information about the proposed well and surrounding wells. All of this information is contained in the OWRD Public Interest Review report.

Yinger estimates the location of impact by conducting a "run" of the USGS model with data inputs he provided for the Thornburgh project. The potential advantage of this type of approach is that it *can* yield more site-specific information about potential impacts. However, the significant disadvantage is that in this case, the model required data to be inputted by Mr. Yinger and his associates, without peer review of the data, parameters or results. Yinger concludes the primary impact will be in the Deschutes Main Stem, with some impact (106 AF/year) on Whychus Creek. As described below, the Yinger results appear to be an over-statement of potential impact because Yinger does not include an adjustment for consumptive use. Additionally, without peer review of the inputs used by Mr. Yinger in running the model for Thornburgh, it is impossible to assess the credibility of the outputs.

2. Quantity of Impact

For purposes of assessing the potential impacts to fish habitat, the quantity of impact on surface water is expressed in terms of the total volume of water potentially removed from the surface water system each year, as well as the rate of flow reduction.

a. Volume of Impact

OWRD, ODFW and the applicant determined the annual volume of impact by applying the approach used in the OWRD mitigation rules. As noted above, the rules equate annual impact to the annual volume of consumptive use. This policy in the rules reflects the fact that not all ground water pumped for an appropriative use is permanently removed from the hydrologic system. Some quantity of the water is expected to return to the system. The formula for quantifying the consumptive use is described in detail in the Final Order approving the Thornburgh water right application. The formula includes different consumptive use factors for different types of water use activities within the resort. For example, golf course irrigation for Thornburgh is estimated at 90% consumptive use because the irrigation system is expected to be highly efficient. Standard irrigation for domestic landscaping is estimated at 60% consumptive use because this amount is typical for general irrigation use within the basin. The advantage of this approach is that it is consistent with the intended use of the USGS model for identifying the ground water flow system on a regional scale and with state policy reflected in OWRD rules. This approach also reflects physical facts and practical experience associated with appropriative water use. Using these consumptive use factors, the volume of impact was estimated at 1,356 AF/year, based on total pumping volume of 2,129 AF/year.

The Yinger report estimates the volume of impact based on 100% consumptive use; there is no adjustment for seepage or return flows.

b. Rate of Impact

OWRD does not estimate the rate of flow impact in its Final Order or Public Interest Review because the OWRD mitigation program is tied to replacement of the annualized volume of impact. However, ODFW and the applicant calculated the rate of flow in order to assess potential impacts to fish habitat in connection with the county approval standard. The flow rate impact was identified as 1.87 cfs year round. This amount was determined by converting the total volume in acre-feet per year, to a rate in cubic feet per second: 1 cfs = 1.98 AF/day; 1356 AF/year divided by 365 days/year = 3.715 AF/day divided by 1.98 = 1.87 cfs. (This constant year-round rate is consistent with data indicating that natural ground water discharge to surface waters in the Deschutes Basin occurs on a steady basis; even though pumping rates may vary from day to day it does not change the discharge rate from the regional aquifer to the surface water system. The parties do not disagree on this aspect of the analysis.)

Yinger estimated the rate of flow impact at 3.25 cfs year round based on total annual volume of 2,355 AF/year. Again, although Yinger and the applicant used the same "formula" to determine the rate of impact, the results are different because Yinger assumes 100% consumptive use while the applicant and agencies adjust for consumptive use. (Note – if Yinger's approach is applied to the final maximum pumping volume of 2,129, the calculation results in flow impact of 2.945 cfs.)

The NCI letter responding to the Hearing Officer's questions includes a table a table comparing the approach and findings of OWRD, ODFW, Thornburgh and Yinger. A TetraTech letter also addresses differences between the methodologies and includes a technical comparison of approaches and findings.

C. Adequacy of Thornburgh Mitigation Plan -- Regardless of Approach

Despite the differences between the applicant's and Yinger's approach to identifying the potential impacts, the Thornburgh mitigation plan provides for complete mitigation of impacts. As described in the attached memorandum from TetraTech, even when the Yinger conclusions are used, the Thornburgh plan provides for complete mitigation as required under the county standard.

The mitigation actions proposed by Thornburgh will result in flow restoration of 3.19 cfs (1.97 cfs from Big Falls Ranch water rights conversion to instream flow and 1.22 cfs from COID water rights conversion to instream flow). This amount exceeds the full rate impact even at 100% consumptive use, using the Yinger approach. Although the Yinger report states an impact of 3.25 cfs, that amount was based on an incorrect volume of annual pumping. When the correct volume of 2,129 AF/year is used (as specified in the OWRD Final Order), the rate impact drops to 2.945 cfs.

The Yinger report also differs from the applicant and agencies' conclusions regarding the location of impact. Yinger estimates an impact of 106 AF/year on Whychus Creek and Alder Springs that is not specifically addressed in the applicant's plan. However, the potential loss of cool water associated with this localized impact can be mitigated by the Big Falls Ranch water rights which will result in replacement of cool, spring-fed waters. As noted by ODFW, the habitat values of springs and seeps are effectively mitigated by Big Falls water rights, which will result in replacement flow of 1.97 cfs during the irrigation season, when fish habitat may be affected by temperature. Additionally, as shown in the TetraTech analysis, potential temperature impacts to Whychus Creek are statistically insignificant when using the Yinger estimate of 106 AF/year.

D. Conclusion

The applicant, OWRD and ODFW have relied on general, peer-reviewed findings from the USGS study and model regarding flows and impacts within the regional aquifer system as a foundation for the state mitigation policy, coupled with an analysis of site specific information by OWRD staff, to identify the location of impact of the Thornburgh project. The annual volume of impact is determined on the basis of consumptive use, as provided under the OWRD mitigation rules. The annual volume of flow rate impact is determined in the same manner as the project opponents, but is based on consumptive use rather than on the maximum volume of water authorized for pumping.

The project opponents have used the USGS model as the basis for a customized analysis of the Thornburgh project based on inputs and results that were not subject to peer review. The outputs from the Yinger approach are based on 100% consumptive use with no adjustment for ground water that is returned to the system.

Under either approach, the Thornburgh plan provides full mitigation for annual volume, flow rate and temperature impacts.

**2. The opponents argue that the applicant's wildlife study too heavily on the expert opinions of Tetra Tech and agency staff biologists and the HEP methodology but does little to analyze the actual habitat values on the property. The opponents argue that this analysis is improper in at least two respects: (1) it does not provide an accurate assessment of the existing habitat values on the property; and (2) it does not provide a baseline for assessing the success of the plan in the long term. I would like the applicant to respond to this argument, first by providing a more detailed history of the iterative process, especially with respect to choices made to establish "habitat values" and the species that best represent those values. The applicant should explain why the loss of golden eagle habitat was identified but not quantified in its HEP analysis.**

While DCC 18.113.070(D)[2] sets a high standard, it presumably is not intended to be impossible to meet. If the focus is on *all* individual species, it could include everything from one-celled microbes to the most advanced forms of life. When Gould's biologist, Bret Michalski, calls for "exhaustive field study," it is unclear what that means. It obviously does not mean 100 years (or 50 years or 25 years) of investigation of *all* species. Another Gould biologist, David S. Dobkin, Ph.D., calls for at least two years of investigation and a "rudimentary metric of actual species composition." It isn't evident why two years would be enough or why one year is not enough or how many species would be enough. It seems obvious that nothing Thornburgh does will satisfy opponents, who can always call for more study.

As explained by TetraTech in its Memorandum dated July 15, 2008 ("TetraTech Memorandum"), the HEP methodology adopted by ODFW and TetraTech is a sensible and scientific approach to the challenge of fish and wildlife resource mitigation.[3] The focus is not on individual species, but on habitat preservation. This is the approach suggested by ODFW, which has been a partner throughout the development of the wildlife mitigation plan. The TetraTech Memorandum contains an extensive chronology that details the iterative process resulting in the wildlife mitigation plan.

**3. How do I evaluate the broader impacts of the development ascribed to the proposal? For example, the opponents argue that cumulative impacts must be considered in the wildlife analysis, but do not explain how those impacts can be quantified or measured against the proposed mitigation.**

As explained by the TetraTech Memorandum, the HEP analysis considered both indirect and cumulative impacts. The impacts were quantified (e.g., reduction of habitat units), and then the amount of appropriate mitigation acreage was decided upon. In this case, it was somewhat increased, based on the result of the analysis.

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[2] DCC 18.113.070(D) provides: "Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource."

[3] The TetraTech Memorandum is divided into sections that correspond to the Hearings Officer's questions.

**4. How do mitigation payments/fees assure that the "no net loss" standard is satisfied? Also, how did the applicant reach the estimated value of the habitat in order to establish a fee-based system to address those impacts?**

As explained in the TetraTech Memorandum, the mitigation payments are calculated to assure the implementation of the habitat mitigation requirements, which in turn were established in reliance on the HEP analysis and the HSIs. The second question above suggests there is (or should be) some relationship between the "estimated value of the habitat" (in dollars?) and the amount of money collected through a fee-based system. In fact, the amount of money to be collected was determined in response to the perceived need for and cost of mitigation.

**5. How does compliance with the "Firewise" development standards encourage/inhibit maintenance or restoration of on-site habitat?**

As noted in the TetraTech Memorandum, implementation of the "Firewise" development standards will actually be beneficial to on-site habitat.

**Transportation Issues**

**Is it enough to conclude that the applicant has satisfied the condition of approval that it enter into a MOU with ODOT to address traffic mitigation, or must I evaluate compliance with the CMP standard that requires that those impacts be addressed?**

The May CMP Decision contains more than three pages of findings in response to DCC 18.113.070(G), which largely duplicates the 1991 version of OAR 660-012-060. At the conclusion of these findings, at page 69, the decision states, "Applicant will only have to meet the conditions of the ODOT MOU in order to satisfy this standard." The Board of County Commissioners ("BOCC") then imposed Condition 29, which requires the applicant to "abide at all times with the MOU with ODOT." For the Hearings Officer to "evaluate compliance with the CMP standard that requires those impacts be addressed" would be to duplicate the work already completed by the BOCC. The commissioners' findings were not challenged on appeal and cannot be altered at this stage in the proceedings without launching a collateral attack on a final land use decision.

**While responding to these particular claims will help me analyze compliance with the criteria and the CMP conditions of approval, response to the other identified deficiencies may also save me time in reviewing the file prior to rendering my decision.**

In his June 17, 2008 memorandum on behalf of Nunzie Gould, attorney Paul Dewey lists a series of changes between the CMP approval and the FMP application. The Hearings Officer's question indicate that she has concluded some of these changes may be significant, but she has not requested further comment on any other changes. In fact, these changes are minor and reflect the ongoing refinement process. Further refinements will occur during the subdivision and site plan process.

**APPLICANT'S SUBMISSION**
**July 15, 2008**

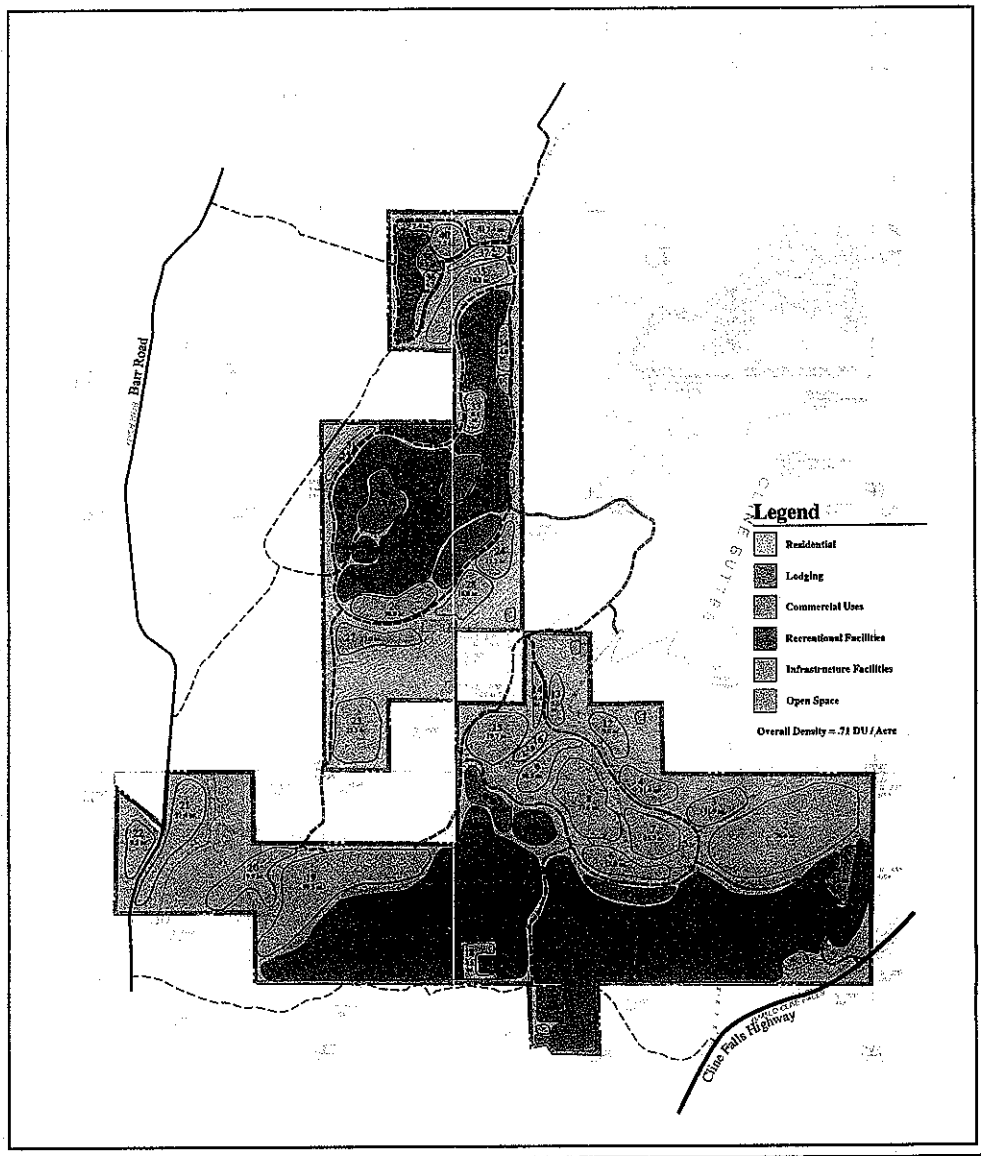
**Hearings Officer Request for Additional Information**

1. **Thornburgh's Response to Questions of Hearings Officer**
2. **Conceptual Master Plan Exhibit A-4**
3. **Conceptual Master Plan Exhibit B-4**
4. **Graphic Delineating Residential Densities**
5. **July 2, 2008 Memorandum Tetra Tech,** ***Summary of Thornburgh Mitigation Plan Assuming Yinger's Conclusions***
6. **July 8, 2008 Memorandum Tetra Tech,** ***Information Regarding the Two Methodologies used by the Applicant and Opponents***
7. **July 14, 2008 Memorandum Tetra Tech,** ***Evaluation of Lower Whychus Creek Assuming Yinger's Conclusions***
8. **July 15, 2008 Newton Consultants, Questions of Hearings Officer**
9. **July 15, 2008 Memorandum Tetra Tech,** ***Response to Wildlife Mitigation Plan Questions 2-5***

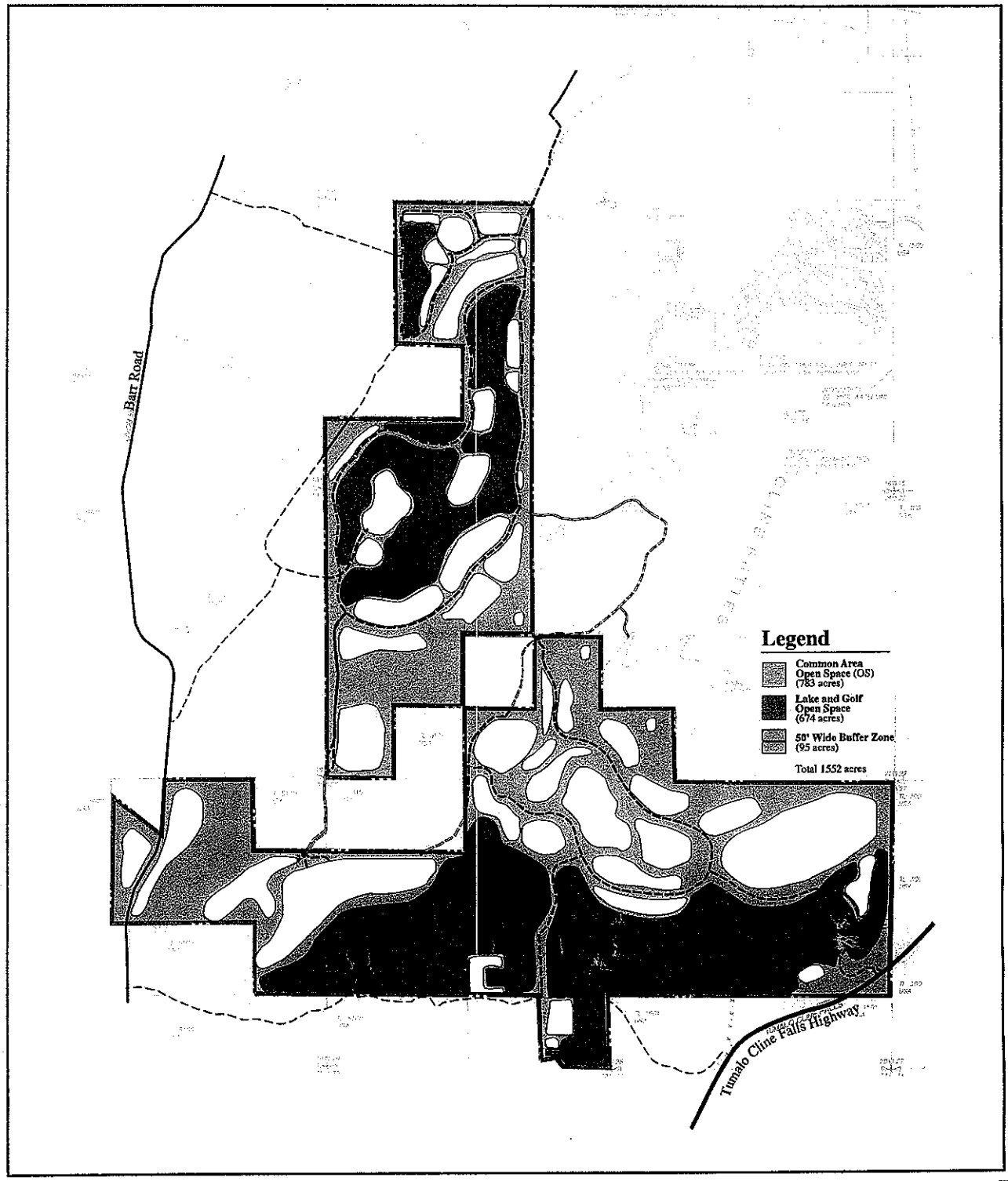
**General Rebuttal Materials**

10. **Fire District Annexation Materials**
11. **International Fire Code Provisions**
12. **Email from ODOT**
13. **IBLA Documents**
14. **DEQ Letter to Hickman Williams**
15. **July 14, 2008 Newton Consultants, Rebuttal to Native Fish Society (waste water)**
16. **July 15, 2008 Newton Consultants, Rebuttal to Native Fish Society (storm water)**
17. **WRG Letter re: Stormwater**
18. **USGS Map**
19. **Gould Property**

EXHIBIT H PAGE ____




THORNBURGH RESORT
*CONCEPTUAL DEVELOPMENT PLAN - EXHIBIT # A-4*
DESCHUTES COUNTY OREGON




# THORNBURGH RESORT

*OPEN SPACE PLAN - EXHIBIT # B-4*

*DESCHUTES COUNTY OREGON*

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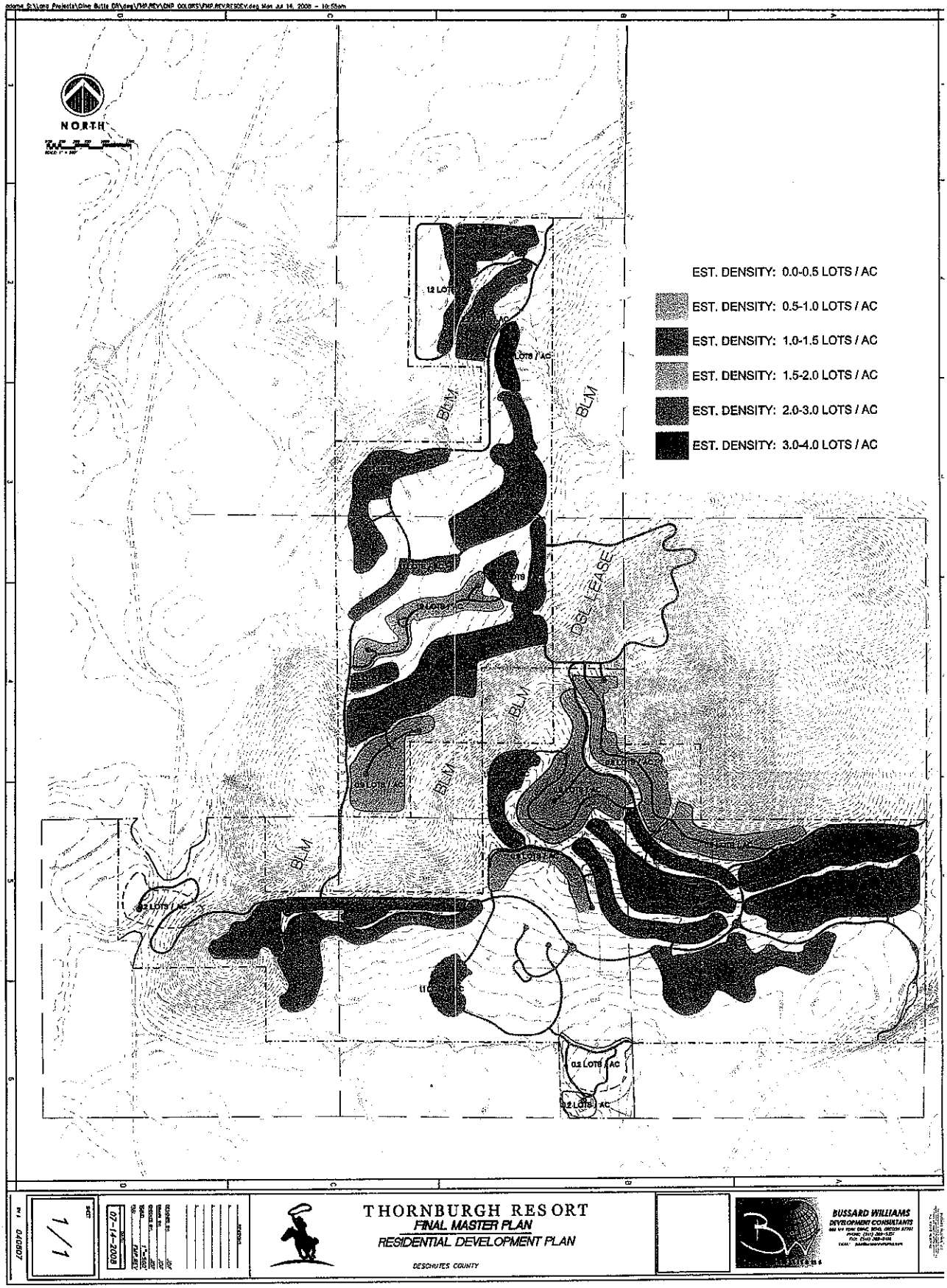
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DSL LEASE
0.5 LOTS / AC
0.2 LOTS / AC
THORNBURGH RESORT
FINAL MASTER PLAN
RESIDENTIAL DEVELOPMENT PLAN
DESCHUTES COUNTY
BUSSARD WILLIAMS
DEVELOPMENT CONSULTANTS

TETRA TECH EC, INC.

# Memorandum

Date: July 2, 2008

To: Anne Corcoran Briggs, Hearing Officer

From: Tetra Tech EC, Inc.

RE: Summary of Thornburgh Mitigation Plan Assuming Yinger's Conclusions

The Thornburgh Resort Co., LLC (Thornburgh) proposes to build a resort in Deschutes County, Oregon. As described in applications submitted to Deschutes County for land use approval and to the Oregon Water Resources Department (OWRD) for related water rights, Thornburgh plans to use a maximum of 2,129 acre-feet (AF) of groundwater at a rate of 9.97 cubic feet per second (cfs) to provide water for the proposed resort. Water development is proposed in two phases. At a public hearing on Thornburgh's Final Master Plan application held on June 17, 2008, project opponents offered testimony and a written report suggesting that mitigation measures proposed by Thornburgh to address potential impacts on fish and wildlife would not be adequate.

The report, offered by Yinger and NWLW, A Case Study: Thornburgh Resort Water Resources Impact Evaluation (herein referred to as the Yinger and NWLW report [2008]), evaluates the potential impacts of the proposed production wells and mitigation measures for the proposed resort. The Yinger and NWLW report is based on a previous report, Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon, prepared by U.S. Geological Survey (USGS) in 2004, and details the results of an investigation to assess the potential impacts of pumping ground water from six new wells in the Upper Deschutes Basin near the proposed resort using a model from the USGS 2004 report called MODFLOW. The Yinger and NWLW report concluded the following:

- The estimated volume of water drawn from the proposed Thornburgh wells will accelerate water level declines, impact existing wells, and reduce stream flows; and
- The proposed supply wells will impact the water quality by reducing the volume of cold spring water discharged to the middle Deschutes River and Whychus Creek reaches, thereby allowing an increase in the water temperatures.

In response to these comments from Yinger and others, Thornburgh asked Tetra Tech EC, Inc. (TtEC) to review its mitigation plan from the standpoint of assuming that the impacts concluded in the Yinger and NWLW report are correct. This letter summarizes our findings with respect to that request. As described below, the mitigation plan proposed by Thornburgh addresses these impacts.

One component of the mitigation proposed by Thornburgh is to acquire water rights from springs currently being used for irrigation. Under Thornburgh's plan, the potential impact to springs and seeps will be mitigated by transferring cold, spring-fed flows currently used for irrigation directly back into Deep Canyon Creek and the Deschutes River. As described in the TtEC report, Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat (TtEC 2008), the spring flows are expected to provide similar habitat quantity and quality in the Deschutes River.

The estimated consumptive use for the proposed project is 1,356 acre-feet (AF) as determined by OWRD in its Final Order approving the water right application. Pursuant to the OWRD Deschutes Basin Groundwater Mitigation Rules (OAR 690-505-0600 to 0630), the amount of mitigation for the proposed use is equal to the amount of consumptive use, or 1,356 AF. To meet this mitigation obligation, Thornburgh proposes transferring "irrigation" water to "instream flow" from a combination of Central Oregon Irrigation District (COID) and Big Falls Ranch water rights.

Thornburgh will acquire 288.78 acres of irrigation water rights from COID. The water rights will be converted to mitigation water by completing permanent water right transfers to change the use from "irrigation" to "instream flow." This will provide 519.18 AF of water into the Deschutes River in two phases of construction (153.43 AF in Phase 1 and 365.75 AF in Phase 2).

Thornburgh will also acquire 464.9 acres of irrigation water rights from Big Falls Ranch located near Lower Bridge. The water rights will be converted to mitigation water and provide 836.82 AF (315.0 AF in Phase 1 and 527.82 AF in Phase 2). Table 1 summarizes the mitigation plan.

**Table 1. Proposed Mitigation Summary**

| | COID | | | Big Falls (Deep Canyon Creek) | | |
|---|---|---|---|---|---|---|
| Phase | Annual Volume | Average Flow for full year (365 days) | Average Flow for Irrigation Season (214 days) | Annual Volume | Average Flow for full year (365 days) | Average Flow for Irrigation Season (214 days) |
| Phase 1 | 153.43 AF | | 0.36 cfs | 315.0 AF | | 0.74 cfs |
| Phase 2 | 365.75 AF | | 0.86 cfs | 527.82 AF | | 1.24 cfs |
| Total | 519.18 AF | 0.717 cfs | 1.22 cfs | 836.82 AF | 1.16 cfs | 1.97 cfs |

The estimated annual (365 days) consumptive use of 1,356 AF equates to 1.87 cfs per day, year-round (0.717 cfs from the COID plus 1.16 cfs from Big Falls Ranch). However, the irrigation water rights discussed above are seasonal: April 1 to November 1 (214 days). As shown in Table 1, the proposed instream water to be provided during the irrigation season amounts to 3.19 cfs (1.22 cfs from the COID plus 1.97 cfs from Big Falls Ranch).

Irrigation season flow averages (cfs) in Table 1 are different than those listed in the TtEC 2008 report. The TtEC report values were based on the irrigation season actually practices in the basin (April 15 to October 15), therefore the irrigation season flow values (cfs) were averaged over the span of 180 days. According to the letter from Oregon Department of Fish and Wildlife (ODFW) to Deschutes County dated June 13, 2008, the ODFW identified the irrigation year based on the water right's decree (April 1 to November 1), and ODFW averaged the irrigation season flows over the span of 214 days. The ODFW values are lower than those listed in the TtEC report because they were averaged over a longer time period. Regardless of the flow averages, the volume returned to the Deschutes River system is the same - 1,356 AF for the year,

meeting the mitigation requirement. Table 1 includes flow values for the irrigation season of April 1 to November 1 (214 days).

According to the ODFW letter, ODFW is most concerned about impacts to springs and flows in the Deschutes River during the irrigation season. The Big Falls Ranch mitigation water from the springs in Deep Canyon Creek exceeds the flows needed to mitigate for potential spring and seep impacts from the development (1.97 cfs vs 1.87 cfs) during the irrigation season. Additional flows from COID (1.22 cfs) provide a net benefit of instream flows for the Deschutes River during the irrigation season.

There will be a potential net deficit of 1.87 cfs to surface flows from the resort between November 1 and March 31 because the mitigation water is being provided only during the irrigation season. However, ODFW does not believe there will be an adverse impact to the fish and wildlife habitat during this time period because flows are generally sufficient and stream temperatures are cool enough that mitigation water is not necessary to increase the flow and lower the temperature during this time period (ODFW 2008).

A second component of the mitigation plan involves removal of dams to improve necessary habitat functions. Prior to the beginning of Phase 1, an existing dam upstream of the Deep Canyon Creek point of diversion would be removed to provide for unimpeded spring/creek flow. The dam associated with the transferred Deep Canyon Creek water rights would be removed prior to beginning construction of Phase 2. The water to be used for mitigation of resort groundwater would be acquired and transferred to instream flow prior to the implementation of each phase of development.

In addition to the above mitigation measures addressing flow and temperature concerns, Thornburgh proposes to abandon three existing domestic wells located on the development property and provide funds to help complete an ongoing thermal modeling project on Whychus Creek. Abandonment of the existing wells will contribute to habitat quality and quantity by restoring a small amount of groundwater to the natural aquifer system. The funding for thermal modeling will have an indirect benefit by providing technical data to inform future decision-making.

ODFW has determined that providing the proposed mitigation outlined above should adequately mitigate for potential impacts and provide a net benefit to fish habitat quantity and quality, including potential impacts to springs and seeps. TtEC agrees with ODFW. As described above, even assuming the conclusions of Yinger and NWLW are correct, we believe the potential impacts should be mitigated by the Thornburgh plan.

References:

ODFW (Oregon Department of Fish and Wildlife). 2008. Letter to Ruth Wahl at Deschutes County Community Development Department from Amy Stuart, Deschutes District Watershed Manager at Oregon Department of Fish and Wildlife dated June 13, 2008.

TtEC (Tetra Tech EC, Inc.) 2008. Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat. Prepared for Thornburgh Resort Co. LLC. May 2008

Yinger and NWLW (Mark Yinger Associates and Northwest Land & Water, Inc). 2008. A Case Study: Thornburgh Resort Water Resources Impact Evaluation, Upper Deschutes Basin, Oregon. Prepared for Native Restoration Fund, Vulcan Power Company. February 2008.

TETRA TECH EC, INC.

# Memorandum

Date: July 8, 2008

To: Anne Corcoran Briggs, Hearing Officer

From: Tetra Tech EC, Inc.

RE: Information Regarding the Two Methodologies used by the Applicant and Opponents

Following the June 17, 2008 hearing regarding the Thornburgh Resort Co., LLC (Thornburgh) proposed project in Bend, a request for Additional Evidence/Briefing was received July 7, 2008. This memorandum addresses item number 1 under Wildlife Mitigation Plan in the request:

> "I understand that the applicant applied a mathematical formula to calculate the likely impact its water use will have on surface waters in the Deschutes Basin based on the assumption that the consumptive use equals the estimated impact on the basin. The opponents have used a methodology developed by the USGS for the entire basin. I would like the parties to provide a littler more information regarding the two methodologies to help me better understand the relative advantages/disadvantages of each approach."

This memorandum outlines the analysis methods from the report by Yinger and Northwest Land and Water (NWLW), A Case Study: Thornburgh Resort Water Resources Impact Evaluation (2008, herein referred to as the Yinger and NWLW report), and outlines the analysis methods from the report by Tetra Tech EC, Inc. (TtEC), Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat (2008). It is intended to fulfill the request for additional information regarding the two methodologies used by the applicant and opponents.

**Similarities of the two Methodologies**

Both the Yinger and NWLW report and the TtEC report based their analysis on a previous report, Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon prepared by U.S. Geological Survey (USGS) in 2004 (herein referred to as the USGS 2004 report), which uses the model called MODFLOW.

Both reports used data from USGS 2004 report to evaluate hydrology in the Deschutes River system.

**TtEC Methodology**

The purpose of the TtEC report was to document any potential loss in either habitat quantity or quality as a result of Thornburgh groundwater pumping activities. The TtEC report evaluates the potential impacts of the proposed production wells, specifically the consumptive use, and incorporates mitigation measures for the proposed resort into the evaluation.

The mitigation obligation was assessed by evaluating changes in flow and changes in temperature. The calculations were based on the assumption that the pumping effects of Thornburgh wells are directly proportional to groundwater discharge rates to the Deschutes river system at a 1 to 1 ratio.

The methodology used in the TtEC report encompasses hydrology, hydrogeology, drainage basin, etc., and calculates values based on fundamental hydrologic flow and thermal mass balance equations used for evaluating changes in flow quantity and water temperature (Oregon Department of Environmental Quality utilizes the equations for calculating water temperature change resulting from receiving water mixing of inflows from surface and subsurface sources in the stream heat and mass transfer analytical methodology Heat Source. The Heat Source methodology is publicly available and has been peer reviewed). The results from the equations used in TtEC report calculations were then used to evaluate impacts on fish habitat quantity and quality at a site-specific level.

Data from the USGS 2004 was used to assess the hydraulic connection between the immediate surface streams and the groundwater beneath the proposed resort. It does not appear likely that the connection between well water withdrawal and loss to the Deschutes River is 1 to 1, therefore, the TtEC calculations likely provide overestimates of the flow loss to the Deschutes River.

The attached table further demonstrates the methodology used in the TtEC report and outlines advantages and disadvantages to using the fundamental hydrologic flow and thermal mass balance equations for this site-specific evaluation.

The following lists information used in the TtEC analysis and findings:

- The USGS determined in the 2004 report that virtually all groundwater not consumptively used in the upper Deschutes Basin discharges to the stream system upstream of the vicinity of Pelton Dam.
- For new groundwater uses, the Oregon Water Resources Department (OWRD) determines the "mitigation obligation," which is equivalent to the consumptive portion of the use proposed in the permit application.
- For the Deschutes Ground Water Mitigation Program, the OWRD calculates consumptive use by using average consumptive data for different types of use obtained from the USGS and OWRD own information on consumptive use.
- Thornburgh proposes to pump a maximum of 2,129 acre-feet (AF) of groundwater at a maximum rate ($Q_{max}$) of 9.97 cubic feet per second (cfs) to provide water for the proposed resort constructed in two phases.

- The OWRD determined the amount of mitigation obligation for Thornburgh to be the total consumptive use.
- The total mitigation obligation for Thornburgh's consumptive use is 1,356 AF/year (1.87 cubic cfs year round) as determined by the OWRD for the groundwater use permit.
- Required mitigation flow will be added from the Central Oregon Irrigation District (COID) and Big Falls (Deep Canyon Creek) in the amounts of 519.18 AF and 836.52 AF respectively. This equates to a total of 1,356 AF that will be added to the Deschutes River system in two phases.
- If the mitigation water was pumped back into the system over the course of the entire year, the flow rate would equate to an average of 1.87 cfs; however, the mitigation water will be concentrated during the irrigation season, to correspond to existing water rights.
- The mitigation water needs to be returned to the system during the course of the irrigation year (April 1 to November 1 which is 214 days) because the water rights are seasonal.
- The flow rate for the irrigation season equates to be an average of 3.19 cfs to accumulate the required 1,356 AF.
- The flow rate of the mitigation water exceeds the flows needed to mitigate for potential spring and seep impacts from the development during the irrigation year (3.19 cfs vs 1.87 cfs), but does not meet the flow rate between November 1 and March 31 (0 cfs vs 1.87 cfs).
- According to the letter from Oregon Department of Fish and Wildlife (ODFW) to Deschutes County dated June 13, 2008, ODFW is most concerned about impacts to springs and flows in the Deschutes River during the irrigation season.
- Oregon Department of Fish and Wildlife (ODFW) does not believe there will be an adverse impact to the fish and wildlife habitat during the non-irrigation portion of the year (November 1 – March 31) because flows are generally sufficient and stream temperatures are cool enough that mitigation water is not necessary to increase the flow and lower the temperature during this time period (ODFW 2008).

<u>TtEC Methodology Calculation Information</u>

- The estimated annual (365 days) consumptive use of 1,356 AF equates to 1.87 cfs per day, year-round (0.717 cfs from the COID plus 1.16 cfs from Big Falls Ranch). However, the irrigation water rights discussed above are seasonal: April 1 to November 1 (214 days). As shown in Table 1, the proposed instream water to be provided during the irrigation season amounts to 3.19 cfs (1.22 cfs from the COID plus 1.97 cfs from Big Falls Ranch).There will be a potential net deficit of 1.87 cfs to surface flows from the resort between November 1 and March 31 because the mitigation water is being provided only during the irrigation season. However, this 1.87 cfs decrease in flow during the non-irrigation season represent 0.3, 0.1, 0.2, and 0.1 percent for the Deschutes River minimum, maximum, mean, and median flows, respectively.
- In the TtEC report, changes in water temperature were calculated using a thermal mass balance equation. The thermal mass balance equation is a fundamental hydrologic

equation used in modeling programs that quantitatively evaluate changes in water temperature resulting from receiving flows from surface and groundwater sources. Using the thermal mass balance equation a 0.0 to 0.1 °C change in the 7-day peak temperature would occur during the irrigation season. During the non-irrigation season, a 0.0 °C change in the mean and maximum temperature would be registered at the Culver stream gauge. (Note: for quantifying temperature, the increased instream flow from Big Falls Ranch was based on the irrigation season as actually practiced in the basin (April 15 to Oct. 15) instead of the 214 day irrigation season as set forth in the water right's decree. The increased instream flow from Central Oregon Irrigation District (COID) is based on OWRD's COID calculator which can be found on OWRD's website. Using these flows produced a more conservative result.)

- The TtEC report concludes the following:
    - Implementation of the proposed Thornburgh mitigation plan will likely provide a net increase of habitat quantity, and will not likely result in a net loss of quality during the irrigation season—the time of year that has been identified as the primary time when habitat conditions limit fish production.
    - During the non-irrigation season, there could be a negligible reduction to habitat quantity and no change in quality because overall changes are very slight and habitat conditions are not considered to be a primary limiting factor to fish stocks.
    - Overall, the Thornburgh pumping activities, as mitigated, are unlikely to have an adverse effect on fish habitat quantity or quality, or to result in a net loss or net degradation of the resource. The assumptions used in report analysis provide a conservative basis for this conclusion.

<u>Comments Regarding the TtEC Methodology</u>

- The TtEC methodology is transparent and based on fundamental hydrologic flow and thermal mass balance equations. The TtEC report focused on evaluating the effects of pumping activities on fish habitat quantity and quality. Calculations rely on values determined by the OWRD, USGS, and agreements with OWRD for mitigation flows. Methodology provides seasonal evaluation in specific stream segments. Due to a lack of more detailed data available for each specific river mile, results are confined to the specific segments where data from the OWRD and USGS is available.
- Calculations are conservative because it was assumed that there is a direct proportional connection between groundwater pumping and stream flow. Assumed local lithology does not influence this direct proportional connection. Conservative calculations were used because as local lithology is considered, there becomes less of a direct proportional connection between groundwater pumping and stream flow.
- The TtEC analysis 1)was straightforward and did not need a numerical grid like a model such as MODFLOW; 2) has less input data required; and 3) has direct calculation and rapid interpretation of hydrogeologic system; however, all assumptions need to be valid and calculation is limited to smaller, simple, and steady-state problem. Methodology used in the report takes results from the analytical approach and performs an additional

quantitative evaluation on how changes in stream flows impact fish habitat quantity and quality seasonally at a site-specific level.

**Yinger and NWLW Methodology**

The Yinger and NWLW report evaluates the potential impacts of the proposed production wells and recommends mitigation measures for the proposed resort. The attached table further demonstrates the methodology used in the Yinger and NWLW report and outlines advantages and disadvantages to using the USGS model for this type of evaluation.

The following outlines information used and findings:

- The Yinger and NWLW report details the results of an investigation to assess the potential impacts of pumping 3.25 cfs (2,355 AF) of water from six new wells in the Upper Deschutes Basin near the proposed resort using a model from the USGS 2004 report called MODFLOW.
- In Table 7-1 of the Yinger and NWLW report under scenario 1 and scenario 2 total diminished streamflow for the stream system are 3.09 and 3.24 cfs, respectively.
- The Yinger and NWLW report concluded the following:
  - The estimated volume of water drawn from the proposed Thornburgh wells will accelerate water level declines, impact existing wells, and reduce stream flows; and
  - The proposed supply wells will impact the water quality by reducing the volume of cold spring water discharged to the middle Deschutes River and Whychus Creek reaches, thereby allowing an increase in the water temperatures.

<u>Comments Regarding the Yinger and NWLW, Inc. Methodology</u>

- The complexity of the geology beneath the proposed Thornburgh site makes modeling challenging. The USGS model (MODFLOW), though layered, tends to treat units homogenously. However, after reviewing the boring logs available from the area, there is little lithologic consistency between the drilling locations. A lack of homogeneity is expected given the depositional environment for the Deschutes Formation and data from existing boring logs. Therefore, correlating the local water bearing units to develop a model that would predict or be representative of local groundwater flow requires a significant amount of data. Treating the formation as single homogenous unit, or breaking it down into only a few horizontal layers (as accomplished in the USGS model), is not appropriate for use at the small scale of the Thornburgh Resort Project. The USGS 2004 report concluded:

  "The model is intended to simulate the regional ground-water flow system and is most useful at regional scales. The model accurately simulated hydrologic conditions in specific local areas (usually corresponding to areas where data were plentiful); however, there are also areas where the model does not accurately simulate local or small-scale conditions. Simulation results must be evaluated within the context of overall hydrologic knowledge of the area."

- Based on our findings, TtEC has concluded that the Yinger and NWLW report does not appear to properly address site-specific pumping scenarios for the proposed water supply wells because it is not applicable to apply the USGS regional model for the Upper Deschutes Basin to determine localized impacts from pumping. The conclusions and recommendations from the USGS 2004 report also support this finding.
- The Yinger and NWLW report provides no quantitative evaluation of changes in water temperature due to the Thornburgh groundwater pumping activities. Instead, only statements are made regarding the potential diminishing stream flow equating to an increase in water temperature. While this statement *may be* valid, providing only qualitative statements without quantification permits subjective judgments to be made against temperature requirements for fisheries resources. In comparing diminishing stream flows to changes in water temperature it is necessary to perform a quantitative evaluation regardless of the methodology that is used.
- The Yinger and NWLW report only evaluates diminished stream flow based on total annual use and does not evaluate changes in stream flow based on consumptive use. The USGS determined that ground water not consumptively used in the upper Deschutes Basin discharges to the stream system upstream of the vicinity of Pelton Dam. The OWRD determined that the "mitigation obligation" for Thornburgh is equivalent to the consumptive portion of the use proposed in the permit application. Therefore, it is necessary to model changes in stream flow based on consumptive use.
- The Yinger and NWLW report does not incorporate any mitigation flows into their modeling, nor does it recognize nonconsumtive use that returns to the river.
- Overall, the numerical approach used in the Yinger and NWLW model 1) is a powerful tool to approximate real world hydrogeologic problems; 2) is a conceptual representation of the hydrogeologic system; 3) performs both steady state and transient analyses; 4) has a wide variety of boundary conditions and input options; 5) simulates different scenarios once the model is calibrated. However, it requires intensive input data, especially site-specific data to determine potential localized affects. An additional quantitative evaluation is needed to determine if changes in stream flow impact fish habitat quantity and quality.

**References**

ODFW (Oregon Department of Fish and Wildlife). 2008. Letter to Ruth Wahl at Deschutes County Community Development Department from Amy Stuart, Deschutes District Watershed Manager at Oregon Department of Fish and Wildlife dated June 13, 2008.

TtEC (Tetra Tech EC, Inc.) 2008. Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat. Prepared for Thornburgh Resort Co. LLC. May 2008

USGS (U.S. Geological Survey). 2004. Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon. Water-Resources Investigation Report 03-4195.

Yinger and NWLW (Mark Yinger Associates and Northwest Land & Water, Inc). 2008. A Case Study: Thornburgh Resort Water Resources Impact Evaluation, Upper Deschutes Basin, Oregon. Prepared for Native Restoration Fund, Vulcan Power Company. February 2008.

# Comparison of Flow and Temperature Analyses of Two Approaches

| | Yinger and NWLW Methodology | Notes, Advantages, and Disadvantages |
|---|---|---|
| Summary | Flow was evaluated with steady-state model | MODFLOW is a USGS model that provided a quantitative evaluation of diminished stream flow from various pumping scenarios. The model simulated regional flow fields that may not be site-specific. Because data inputs, runs of the model under different scenarios, and output files are not available in the report, it is difficult to evaluate the results of the model. The question remains: Due to a lack of quantifiable calculations and evaluations, just because there are diminished stream flows, how great of a change is that in terms of the natural hydrograph, and what does that mean for fish habitat quantity and quality? How great of a change is there when mitigation flows are incorporated into the model? |
| | No seasonal variation for pumping activity | No consideration is given to seasonal differences in fish habitat availability. |
| | Stream loss (gain) depends on lands and streambed conductance, p.36. Streambed conductance was not a calibration parameter in this model. | With the USGS model, streambed conductance terms were calibrated with 10 ft thickness and 20 to 50 ft width, and hydraulic conductivity was based on a zoning approach, which may not be site-specific values |
| | No quantitative evaluation of habitat quantity or quality | In the Yinger and NWLW report, only a qualitative discussion on impacts to water temperature and fisheries resources (i.e., habitat quality and quantity) is provided. |
| | Does not consider mitigation flows or run model evaluating consumptive use | Without considering the mitigation flows that are added, the methodology may not appropriately describe the stream flow conditions resulting in the Deschutes River. No consideration is given to the OWRD determination of consumptive use. The draft maximum pumping rate of 2,355 AF used in the Yinger and NWLW report is greater than the maximum pumping rate (total build-out), which is estimated at 2,129 AF. This difference may affect the results reported in the Yinger and NWLW report. |
| | Model is influenced by difference in local lithology. The methodology in the Yinger and NWLW report assumes a simplified local lithology. | Two additional points surface from our evaluation of the Yinger and NWLW report: 1) why do six proposed wells need to be installed in layer 2 and not layer 7 which has little or no impact on surface water?; and 2) there are large-scale wells (Eagle Crest Resort) pumping from the Deschutes formation, which is the primary aquifer in this area (p. 18), and the well reports document 300 to 500 gpm in sandstone formation, which is a confined aquifer. Because it is a confined aquifer, there would not likely be any impact to any surrounding streams and rivers. This further demonstrates differences in local lithology and the problem with treating layers as homogenous units as is done in this methodology. Overall, the model assumes a simplified local lithology, which does not appear to be the case. |

| | TtEC Methodology | Notes, Advantages, and Disadvantages |
|---|---|---|
| Summary | Changes in flow and temperature due to pumping activities and the OWRD required mitigation flows were determined and used to evaluate effects on fish habitat quantity and quality during both irrigation and non-irrigation seasons in specific stream segments. | Methodology is simple and based on fundamental hydrologic calculations that focused on evaluating the effects of pumping activities on fish habitat quantity and quality. Calculations rely on values determined by the OWRD, USGS, and agreements for mitigation flows. It provides seasonal evaluation in specific stream segments. Due to lack of data, results are confined to the specific segments where data from the OWRD and USGS are available. |
| | Does not depend on local lithology | Calculations are conservative because it was assumed there is a direct proportional connection between groundwater pumping and stream flow. It is assumed that local lithology does not influence this direct proportional connection. Conservative calculations were used because as local lithology is considered there becomes less of a direct proportional connection between groundwater pumping and stream flow. |

| | Comparison Area | Yinger and NWLW Methodology | Notes, Advantages, and Disadvantages |
|---|---|---|---|
| 1 | Study Field | Hydrogeology | This focuses on simulating regional flow fields. |
| | | Model-simulated regional flow fields | This includes model-simulated regional flow fields that may not be site-specific. |
| | | Model Input | |
| | | Regional and aggregated data | The USGS model is a Regional Model that is useful for evaluating the hydrology on a regional basis. Additional site-specific data is required to determine potential impacts of pumping in the vicinity of the proposed resort. |
| | | Aggregated stream data used in USGS model | |
| | | OWRD reach gains and losses data | These data require further validation. |
| | | OWRD permitted annual withdraw of 2,355 AF (p.37); Q avg. = 3.25 cfs (avg. pumping or flow needed) | Yinger and NWLW only used draft maximum pumping rate of 2,355 AF and did not use maximum pumping rate (total build-out), which is estimated at 2,129 AF. Yinger and NWLW did not run the model using only consumptive use (1,356 AF) or include mitigation flows in model. Consumptive use was determined by OWRD as the impact. This difference may affect flow field and water level estimates in the model, especially because the consumptive use is about 58 percent of average pumping rate (3.25 cfs) used in the MODFLOW simulation. This assumes that all water that is withdrawn does not return to the system despite acknowledgment from OWRD that only consumptive use does not return to the system. |
| | | Instaneous withdrawal (Q-max) = 9.28 cfs (p.38) was also used in the model for each predictive scenario | OWRD permitted an instaneous withdrawal rate of 9.28 cfs. However, in the Yinger and NWLW report, it is also referenced as 9.26 cfs. This creates a discrepancy as to which of the values was actually used in the model for each predictive scenario. |
| | | Yinger and NWLW report states that total pumping from USGS model was 31.2 cfs (p.38) | No information was found in the USGS report for 31.2 cfs. In the USGS report, the model simulated pumping scenarios in layers 2 and 7, with a constant pumping rate of 10 cfs (compared to 31.2 cfs used in the Yinger and NWLW report) for 50 years. The lack of reference for the 31.2 cfs (compared to the 10 cfs) in the USGS report creates a discrepancy. If 31.2 cfs is used for the methodology in the Yinger and NWLW report, the pumping effects would be much greater than actual effects. |
| | | Yinger and NWLW report states that total pumping from USGS model was 31.2 cfs (p.38) | No information was found in the USGS report for 31.2 cfs. In the USGS report, the model simulated pumping scenarios in layers 2 and 7, with a constant pumping rate of 10 cfs (compared to 31.2 cfs used in the Yinger and NWLW report) for 50 years. The lack of reference for the 31.2 cfs (compared to the 10 cfs) in the USGS report creates a discrepancy. If 31.2 cfs is used for the methodology in the Yinger and NWLW report, the pumping effects would be much greater than actual effects. |
| | | Water Temperature Data | |
| | | No temperature data used | In the Yinger and NWLW report, only a qualitative discussion on impacts to water temperature and fisheries resources (i.e., habitat quality and quantity) is provided. |
| | | Model Output | |
| | | Diminished stream flows resulting from different pumping scenarios | This requires taking the model-derived values for diminished stream flows resulting from different pumping scenarios and performing two additional quantitative evaluations on how diminished stream flows impact water temperature and flow quantity seasonally. This analysis was not completed in the Yinger and NWLW report. The model output provides diminished stream flow resulting from different pumping scenarios, but does not evaluate how diminished stream flows quantitatively impact water temperature and flow quantity seasonally. |
| | | Lithology/Geology | |
| | | Zonation approach for hydraulic conductivity was used in the USGS model and adopted in this numerical model. A constant value of hydraulic conductivity was used in each zones. | This may not reflect the site-specific conditions for the proposed pumping field. |
| 2 | Math Approach | Numerical Model | |
| | | USGS Mudflow | The numerical approach (Yinger and NWLW model) 1) is a powerful tool to approximate real world hydrogeologic problems; 2) is a conceptual representation of the hydrogeologic system; 3) performs both steady-state and transient analyses; 4) has a wide variety of boundary conditions and input options; and 5) simulates different scenarios once the model is calibrated. However, it requires intensive input data, especially site-specific data. |
| | | Model Influenced By: | This requires intensive site-specific input data. There appears to be a lack of detailed site-specific data necessary for this type of methodology. |
| | | Model calibration (both steady-state and transient) | |
| | | Hydraulic conductivity zonation approach | This is a lack of site-specific representation. |
| | | Streambed conductance (connection between surface and ground water) is not calibrated for site-specific data | Calibration with site-specific data for streambed conductance would influence local stream loss/gain. |
| 3 | Flow Calculations | Regional | The USGS model simulated flow for aggregated stream reaches. |
| | | Averaged Flow | This does not evaluate changes over a range of the natural hydrograph. |
| 4 | Temperature Calculation | Only Qualitative Evaluation | There was no quantitative evaluation. MODFLOW simulated interaction between stream and aquifer, which may not be able to quantitatively define the changing of temperature in streams. |
| | | "Similarly, while reduction in stream temperature from reduced cool groundwater inflow due to Thornburgh pumping may be relatively small," p.56 | This statement conflicts with recommendation, p.57. |

| | Comparison Area | TtEC Methodology | Notes, Advantages, and Disadvantages |
|---|---|---|---|
| 1 | Study Field | Hydrogeology | Domains of hydrology include surface hydrology, hydrogeology, drainage basin, etc. |
| | | Site (study area)-specific flow rates used | Methodology encompasses hydrology, hydrogeology, drainage basin, etc., and evaluates conditions related to fisheries resources at a site-specific level. |
| | | Analytical Input | |
| | | Site-specific data on flow rates from USGS stream gauge data and OWRD data | Input data is site-specific and is used to evaluate impacts from withdrawals on habitat quantity and quality at specific local segments. |
| | | OWRD reach gains and losses data | These data require further validation. |
| | | Maximum pumping rate (total build-out) is estimated at 2,129 AF. OWRD total consumptive use (1,356 AF; Q avg = 1.87 cfs) determined from Thornburgh Resort groundwater withdrawal application that was approved by the OWRD. Mitigation flows from the COID (4.90 cfs) and Big Falls (2.35 cfs) were incorporated into the evaluation under this methodology. | Values are determined by the OWRD and monitored and continually evaluated over time. The TtEC method incorporate the OWRD-determined impact (consumptive use) and required mitigation flows. The methodology assumes that non-consumptive water use returns to the system in the same condition as before it is withdrawn. |
| | | Water Temperature Data | |
| | | ODEQ stream temperature data used for segments of the Deschutes River and Whychus Creek. In addition, ODEQ stream temperature requirements for various fish species was used under this methodology. | Methodology encompasses hydrology, hydrogeology, drainage basin, etc., and calculates values based on fundamental hydrologic flow and thermal mass balance equations used for evaluating changes in flow quantity and water temperature (ODEQ utilizes the equations for calculating water temperature change resulting from receiving water mixing of inflows from surface and subsurface sources in the stream heat and mass transfer analytical methodology Heat Source. This methodology is publicly available and has been peer reviewed). The results from these calculations were then used to evaluate impacts on habitat quantity and quality at a site-specific level. |
| | | Analytical Output | |
| | | Seasonal changes in stream flow and water temperature in specific stream segments resulting from the mixing of inflows from surface (Deschutes River, Whychus Creek, and mitigation flows) and subsurface (withdrawal from ground water pumping and mitigation flows) sources. | Methodology provides direct calculation and rapid interpretation of seasonal changes in stream flow and water temperature in specific stream segments which facilitates in comparing resulting conditions to effects on fish habitat quantity and quality. |
| | | Lithology/Geology | |
| | | Reviewed borings | Boring logs indicated a lack of homogeneity in local lithology. |
| 2 | Math Approach | Analytical | |
| | | Cumulative changes in flow and thermal mass balance calculations | The analytical approach (TtEC model) 1) does not require a discretization of the problem domain; 2) requires less input data; and 3) has direct calculation and rapid interpretation of the hydrogeologic system; however, all assumptions need to be valid and calculation is limited to smaller, simple, and steady-state problems. Methodology used in the report takes results from analytical approach and performs an additional quantitative evaluation on how changes in stream flows impact fish habitat quantity and quality seasonally at a site-specific level. |
| | | Methodology Influenced By: | This requires intensive site-specific input data. There appears to be a lack of detailed site-specific data necessary for this type of methodology. |
| | | No calibration is needed | |
| | | USGS, OWRD, and ODEQ data inputs | |
| 3 | Flow Calculations | Flow loss and gains were calculated for (Table 2 in report) each of the Deschutes River segments, and pumping was evaluated for min, max, mean, median flows of the Deschutes River. Natural hydrographs from USGS data were used. Seasonal evaluation was conducted. | Methodology incorporated calculating seasonal changes in flow in specific segments of the Deschutes River with mitigation flows. The resulting seasonal changes were then compared to Deschutes River hydrograph (from USGS data) to evaluate what affect the changes had on flow during the irrigation and non-irrigation season. |
| 4 | Temperature Calculation | Quantitative thermal mass balance study evaluating changes in flow versus pumping with mitigation flows and its effect on habitat quality (water temperature) for each Deschutes River segments during irrigation and non-irrigation seasons. | Methodology provides direct calculation and rapid interpretation of seasonal changes in stream flow and water temperature in specific stream segments, which facilitates in comparing resulting conditions to effects on fish habitat quantity and quality. ODEQ utilizes the equations for calculating water temperature change resulting from receiving water mixing of inflows from surface and subsurface sources in the stream heat and mass transfer analytical methodology Heat Source. This methodology is publicly available and has been peer reviewed. This is a simplistic approach, but it is based on fundamental hydrologic equations that are widely accepted. Models that incorporate calculating changes in water temperature from mixing of inflows utilize these basics equations in their calculations. Methodology was intended to be transparent and provide direct answers to the question of impacts on fish habitat quantity and quality. Modeling could have been incorporated into this methodology, but it was not in order to maintain a transparent method for determining changes in conditions. |

LUBA # 2008-203
01244

TETRA TECH EC, INC.

# Memorandum

Date: July 14, 2008

To: Anne Corcoran Briggs, Hearing Officer

From: Tetra Tech EC, Inc.

RE: Evaluation of Lower Whychus Creek Assuming Yinger's Conclusions

This memorandum responds to comments received from Northwest Land and Water, Inc. (NWLW) submitted after the Thornburgh hearing on June 17, 2008.

**Comment:** "**Omission:** Whychus Creek was omitted from both the discussion and graph of stream temperature. Tetra Tech shows data for the mouth of Whychus Creek, which is misleading because it does not represent temperature along most of Whychus Creek."

**Response:** Whychus Creek was addressed in the Tetra Tech EC Inc., report (TtEC 2008) to provide comparable analysis to the Yinger and NWLW report (Yinger and NWLW 2008). The Tetra Tech temperature analysis focuses on areas "below Whychus Creek" and "at the mouth of Whychus Creek". In Table 7-1 of the Yinger and NWLW report, the data for Odin Falls to Whychus Creek and Lower Whychus Creek diminished streamflow were combined as one value for each scenario as the report did not separate effects for Whychus Creek:

**Table 7-1. Summary of Diminished Streamflow, Model Results for Scenario 1 and Scenario 2**

| Reach | Diminished Streamflow, cfs | | | |
|---|---|---|---|---|
| | Scenario 1 | as percent of total pumping | Scenario 2 | as percent of total pumping |
| Bend to River Mile 149 | 0.68 | 21% | 0.30 | 9% |
| Odin Falls to Whychus Creek and Lower Whychus Creek | 1.65 | 51% | 1.78 | 55% |
| Combined for two reaches | 2.33 | 72% | 2.08 | 64% |
| Total diminished streamflow for stream system | 3.09 | 95.1% | 3.24 | 99.7% |

Notes:
1) Total pumping is 3.25 cfs for both Scenarios

The "lower Whychus Creek" reach is defined here as extending from Alder Springs to the mouth of Whychus Creek and the mouth of Whychus Creek is defined here as the confluence of Whychus Creek with the Deschutes River. This memorandum evaluates Lower Whychus Creek utilizing the same methodology as the TtEC report.

Evaluation:

The following data and assumptions were used to calculate water temperature changes in Alder Springs that flows into lower Whychus Creek due to Thornburgh pumping during the irrigation season:

- Stream flow from Alder Springs into lower Whychus Creek is 100 cfs as reported by the Oregon Water Resource Department (OWRD).
- Diminished stream flow in Alder Springs that would impact lower Whychus Creek due to the suggested Thornburgh ground water pumping is 0.15 cfs (high end of diminished flow value suggested in comments from Mark Yinger to Steve Munsun, (which assumes no return benefit to groundwater supply or stream flow for pumped water not consumptively used).
- The analysis utilizes thermister data available from ODEQ and the Upper Deschutes Watershed Council.
- Based upon thermister data available from the Oregon Department of Environmental Quality (ODEQ) LASER data base and from the data base maintained by the Upper Deschutes Watershed Council, the average water temperature of Alder Springs is about 11 °C.
- The conservative assumption is made that Whychus Creek contributes no water to the flow in lower Whychus Creek other than the flow emanating from Alder Springs.
- Thermister data is available for Whychus Creek just below Alder Spring for the year 2005 for the period of April to November and was used in this analysis. April to September would typically be evaluated as this period has been identified as the primary time when habitat conditions limit fish production. However, to ensure that "shoulder" seasons are evaluated, November data was included in this evaluation.
- The analysis determined the impact on stream temperature by using a thermal mass balance equation, reducing the flow in the creek by 0.15cfs (as predicted by Yinger) and determining the resulting temperature. The temperature of the 0.15 cfs flow was assumed to be 11° C, the same as Alder Springs.

Results of analysis:

- The 0.15 cfs diminished stream flow in Alder Springs that would impact lower Whychus Creek due to the proposed Thornburgh ground water pumping represents only 0.15 percent of the 100 cfs provided by Alder Springs.
- Using the same transparent thermal mass balance equation described in the TtEC report, which is used in many models that evaluate changes in surface and ground water flow effect on water temperature (such as the ODEQ Heat Source model), the maximum increase in the 7 day average maximum water temperature between April and November would be less than 0.01 °C when diminished stream flow in Alder Springs that would affect lower Whychus Creek due to the suggested Thornburgh ground water pumping is 0.15 cfs.

Figure 1 illustrates that due to the suggested diminished stream flow in Alder Springs that would affect lower Whychus Creek there likely would not have been any change in the 7 day average maximum temperature in 2005. This is demonstrated by the fact that the measured 7 day average maximum stream temperature lies on top of the calculated change in the 7 day average maximum stream temperature that incorporates the diminished stream flows (Figure 1).

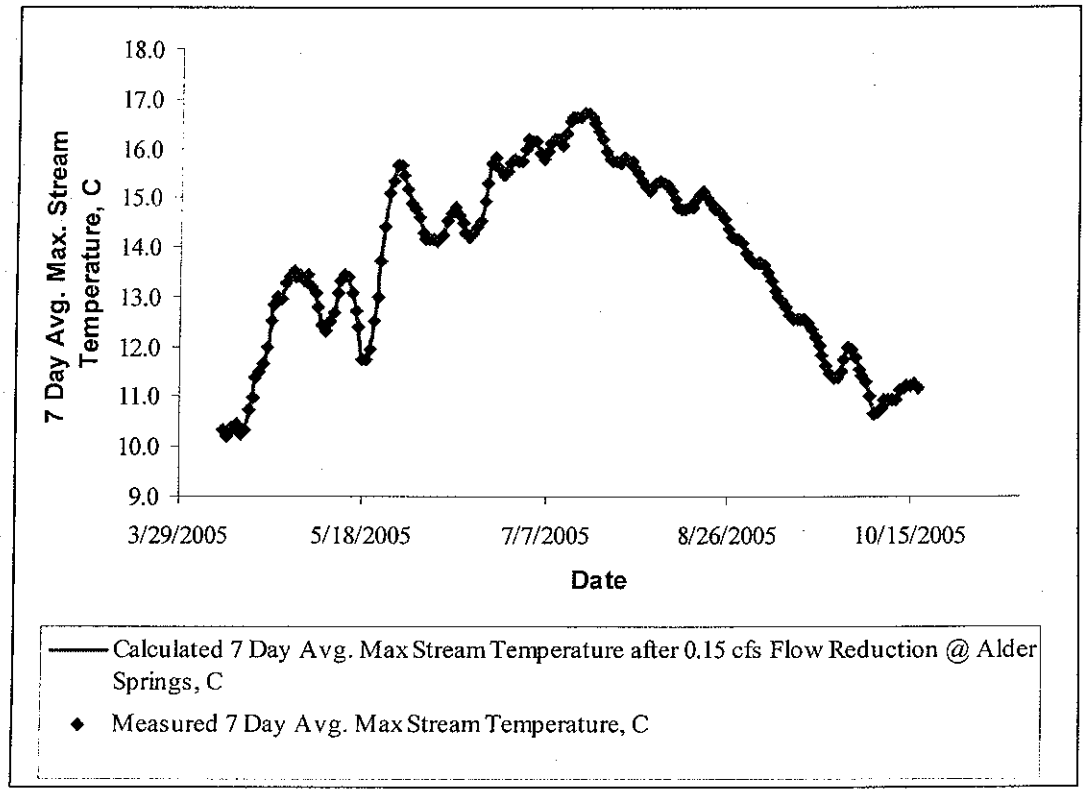



**Figure 1. Lower Whychus Creek calculated and measured stream temperature below Alder Springs in 2005.** Note that the blue line depicting the "calculated 7 day average maximum stream temperature" is covered by the pink line depicting "measured 7 day average maximum stream temperature".

Figure 2 illustrates the estimated change in lower Whychus Creek stream temperature due to the flow reduction of 0.15 cfs in Alder Springs. As shown in Figure 2, the change in lower Whychus Creek would be less than 0.01 °C.

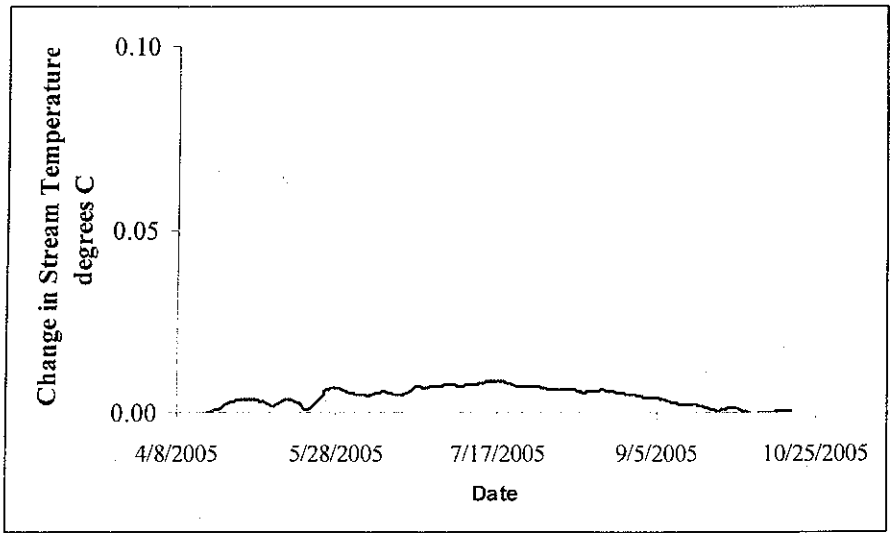



**Figure 2. Change in lower Whychus Creek stream temperature below Alder Springs due to flow reduction of 0.15 cfs in Alder Springs.**

Conclusion:

Based on using the assumptions described in this calculation, the Thornburgh pumping activities are unlikely to have an adverse effect on fish habitat quantity or quality, or to result in a net loss or net degradation of the resource. The assumptions used in report analysis provide a conservative basis for this conclusion. It should be noted that if there is flow in Whychus Creek that is not from Alder Springs, whether warmer than Alder Springs or not, the resulting increase in temperature at the mouth would be even less than the estimated maximum of 0. 01 °C determined in this analysis because additional flow would provide dilution.

The above flow loss estimates are based on the Yinger and NWLW report, which assumed all flow pumped from wells leaves the system. Thornburgh proposes to pump a maximum of 2,129 acre feet (AF) of groundwater. The OWRD Deschutes Basin Groundwater Mitigation Rules (OAR 690-505-0600 to 0630) requires the applicant to mitigate for consumptive use which is an estimated 1,356 AF, or 63 percent. A large portion of the pumped well water will be returned to the system (36 percent). Without incorporating the water that will be returned to the system, the estimates of change in flow and temperature analyzed in this memorandum are very conservative.

References:

TtEC 2008. Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat. Prepared for Thornburgh Resort Co. LLC. May 2008

Yinger and NWLW (Mark Yinger Associates and Northwest Land & Water, Inc). 2008. A Case Study: Thornburgh Resort Water Resources Impact Evaluation, Upper Deschutes Basin, Oregon. Prepared for Native Restoration Fund, Vulcan Power Company. February.

NEWTON CONSULTANTS INC.

July 15, 2008
Project No. 1007-101-07

Anne Corcoran Briggs
Hearings Officer
c/o Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, OR 97701

**THORNBURGH RESORT FINAL MASTER PLAN; FISH AND WILDLIFE MITIGATION PLAN**

**RESPONSE TO ANNE CORCORAN BRIGGS, HEARINGS OFFICER, RELATIVE TO THE METHODOLOGY FOR DETERMINING IMPACTS TO DESCHUTES RIVER AND WHYCHUS CREEK**

Dear Ms. Briggs:

The following comments are offered on behalf of the applicant in response to the question you presented regarding the Thornburgh wildlife mitigation plan. Specifically, this memo addresses questions about the difference between the applicant's approach and the project opponents' (Yinger) approach to determining the likely impact on surface waters as a result of ground water pumping.

The Yinger Report did not quantify temperature impacts. The applicant's approach, as described in the Addendum to the Wildlife Mitigation Plan prepared by Newton Consultants Inc. (NCI), attempts to quantify impacts to both flow and temperature as a result of ground water pumping. The starting point for the applicant's approach is to quantify the impacts to flow, based on findings by the Oregon Water Resources Department (OWRD) in connection with the Thornburgh water right application. The OWRD findings, in turn, are based on data obtained from the USGS Study of the Deschutes Basin (USGS Water-Resources Investigations Report 03-4195: *Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon*, 2004), and related modeling. The OWRD mitigation program is directly based on the USGS study findings regarding hydraulic connection between ground water and surface water.

The OWRD ground water mitigation program utilizes information from the USGS study and model to predict the general location of impact of a proposed ground water use and determines the amount of mitigation required on the basis of consumptive use. As defined by OWRD rules, "Consumptive use" means "the Department's determination of the amount of a ground water appropriation that does not return to surface water flows in

the Deschutes Basin due to transpiration, evaporation or movement to another basin." OAR 690-505-0605((2).

In determining consumptive use, OWRD applies generalized standards associated with specific uses. For example, OWRD typically assumes consumptive use of 40% of the total ground water volume for municipal use and 60% for irrigation use. The difference is due to the higher seepage and run-off typically associated with irrigation use. (See discussion in Deschutes Ground Water Mitigation 5-Year Program Evaluation, OWRD, February 29, 2008, page 6, 19-20, Attachment 1)

In the case of Thornburgh, OWRD initially estimated consumptive use at 40% for the resort, because quasi-municipal use is similar to municipal use. This consumptive use rate was used by OWRD in the "Proposed Final Order" (PFO) issued in connection with the water right application. WaterWatch of Oregon, Inc. challenged the OWRD estimate of consumptive use in a protest filed against the water right application. In response to the protest, Thornburgh worked directly with WaterWatch to undertake a more detailed evaluation of consumptive use for the specific activities proposed as part of the resort's "quasi-municipal' water use. As a result of these discussions, WaterWatch, Thornburgh, and OWRD entered into a Settlement Agreement that included a higher calculation of consumptive use for the project. The higher rate assumed 90% consumptive use for golf course irrigation within the resort due to higher efficiency associated with new golf course development. A consumptive use rate of 60% was used for other types of "standard" (landscape) irrigation within the project, and 40% for other types of quasi-municipal use. These revised calculations were included in the Final Order issued by OWRD approving the Thornburgh water right application, and are the basis for determining the amount of mitigation needed for addressing the county fish and wildlife mitigation standard as reflected in the applicant's proposed mitigation plan. Applying these calculations, OWRD determined that the total consumptive use for Thornburgh will be 1,356 acre-feet (AF), based on a maximum annual pumping volume of 2,129 AF.

In contrast, the Yinger Case Study uses the USGS model without adjusting for consumptive aspects of the proposed ground water use. As a result, we believe the Yinger approach shows an overstatement of the potential impact on stream flow.

Following are key points that distinguish the applicant's approach from the Yinger Case Study approach for determining the potential impact on fish and wildlife habitat due to ground water pumping:

- The Yinger Report predicts flow reduction impacts in the Deschutes River and Whychus Creek assuming that all water pumped from the wells is totally removed from the system. This results in an overstatement of impact because it does not include an adjustment for consumption. In fact, all water used for domestic and/or agricultural purposes is not consumed and removed from the system. Much of the water used for domestic, municipal and quasi-municipal purposes returns to ground water via septic systems and sewage treatment systems, and through seepage from

landscape irrigation. Similarly, a significant component of agricultural irrigation also seeps back into the ground. For these reasons, OWRD has developed and applies consumption factors for various water uses such as domestic or agricultural uses.

- In determining impacts to the Deschutes River, Thornburgh used the consumptive use factors prescribed by OWRD in the Final Order approving Thornburgh's water right application to determine the volume of water that would be lost to the system. It is this volume of water that was used by Thornburgh to predict flow and temperature impacts.

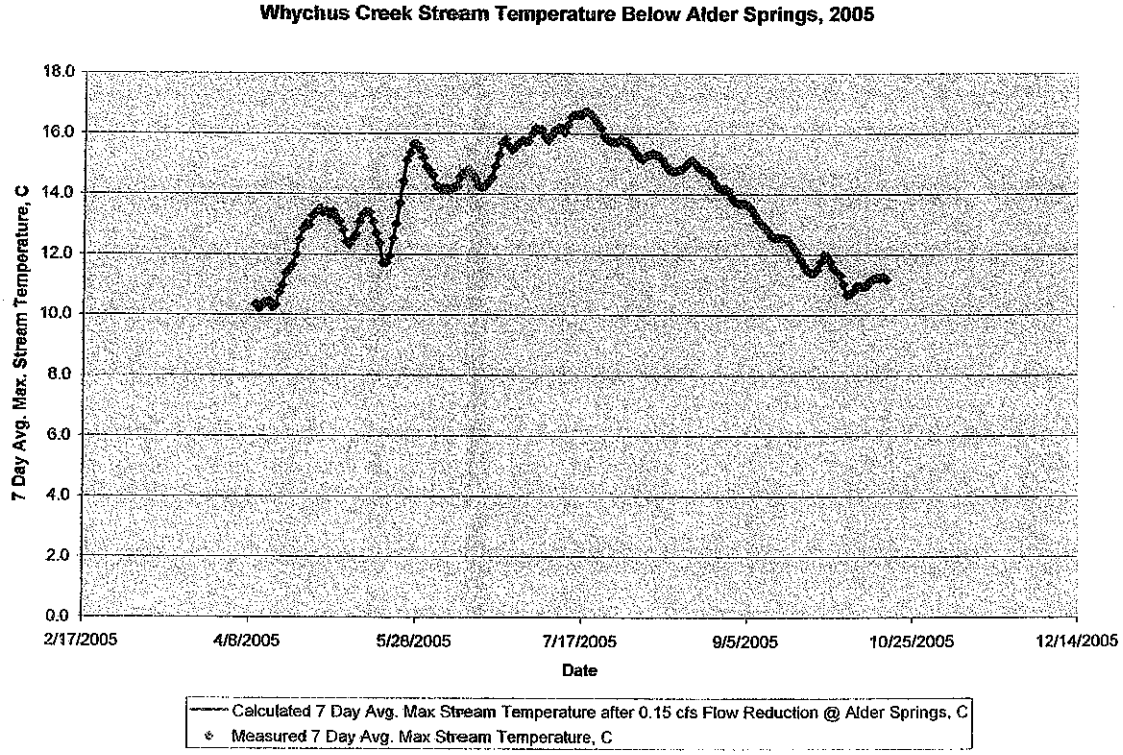
- The Yinger report concludes that there will be an impact on stream temperature due to reduced ground water and spring discharges; however, the Yinger report does not attempt to quantify the asserted change in stream temperature.

- Thornburgh acknowledges in its Fish and Wildlife Mitigation Plan that the USGS Study and OWRD ground water mitigation program do not address temperature concerns. Therefore, NCI and TetraTech, Ec. Inc., estimated temperature impacts based on the consumptive use volume from the OWRD Final Order. The amount of water that would be consumed by Thornburgh is 1.87 cubic feet per second (cfs) year-round. This number reflects the fact that ground water discharge occurs on a steady, year-round basis even though ground water pumping rates may vary throughout the year. The rate of 1.87 cubic feet per second (cfs) year round is determined by multiplying the projected annual consumptive use of 1,356 acre-feet (AF) by 0.001381 (cfs per annual acre-foot). It is reasonable to expect that the reduction in surface flows within the Deschutes River will be in proportion to the amount of flow gained from the ground water discharge. OWRD has measured the flow gain in the Deschutes River and is provided in Table 1 (page 15) of *Evaluation of the Proposed Thornburgh Resort Project Impact on Hydrology and Fish Habitat, May,2008* by **TETRA TECH EC, INC.** (Part of the record previously submitted.)

- Based upon a mass balance analysis for both flow and stream temperature, NCI and TetraTech have determined that only very slight changes in stream temperature ($\approx$ 0.1°C) will occur in the Deschutes River as a result of Thornburgh pumping during the summer. This slight temperature increase is off set by mitigation water provided from the Big Falls Ranch water rights, contributing cooler, spring fed water from Deep Canyon Creek to the Deschutes River. See tables 2 and 4 of the TETRA TECH report.

- There will be no significant change in Deschutes River temperature during the non-irrigation season/winter months as a result of reduced spring flow along the Deschutes River. Winter time flows would be reduced by no more than 0.3% and the resulting impact on river temperature would not result in a negative impact to fish habitat. See page 21 of the TETRA TECH report.

- The Yinger Report predicts a maximum of 0.15 cfs reduction in Alder Springs that feeds into Whychus Creek. There are no flow gages on Whychus Creek, but OWRD has indicated that flow from Alder Springs is 100 cfs year around. The following graph indicates the projected change in temperature that would have occurred in 2005 should Alder Springs flow be reduced by 0.15 cfs.




The predicted, resulting stream temperature is virtually identical to the measured data as the two lines overlap each other. The measured temperature data was extracted from the Upper Deschutes Watershed Council data base.

**Conclusion**

The Applicant's approach (or formula) for quantifying the impact of ground water pumping on surface water flows utilizes factors provided by OWRD for determining consumptive use. This approach is consistent with OWRD's rules and with the OWRD Final Order approving the Thornburgh water right. The OWRD rules acknowledge that some portion of ground water pumped for appropriative use will be returned to the ground water system. The factors for quantifying consumptive use are based on technical data and experience by OWRD. Therefore, the maximum volume of water withdrawn from well pumping is reduced by OWRD factors to reflect actual consumptive use. Mitigation is then required in an amount equal to consumptive use. Thornburgh followed this approach in determining the volume of water required for fish and wildlife mitigation purposes, and ODFW concurred with this approach in determining that the Thornburgh plan would meet the county approach standard.

The Yinger approach to quantifying the impact of ground water pumping assumes 100% consumptive use. This approach results in an overstatement of actual impact.

Yinger did not quantify temperature impacts to the Deschutes River or Whychus Creek. The Applicant's approach to quantifying temperature impacts is based upon spring flow reductions proportional to rates of spring discharge to the Deschutes River and Whychus Creek and thermal mass balance equations commonly used to predict temperature impacts.

The attached table compares the approach and findings used by OWRD, ODFW, Thornburgh and Yinger in addressing and quantifying the extent of impact. (Attachment 2.)

Please contact us if you have any questions.

Sincerely,

NEWTON CONSULTANTS, INC.

David J. Newton, P.E., CWRE
Owner

Richard J. Nichols, P.E.
Senior Engineer

Attachments

1 OWRD 5-Year Program Evaluation
2 Comparison Table

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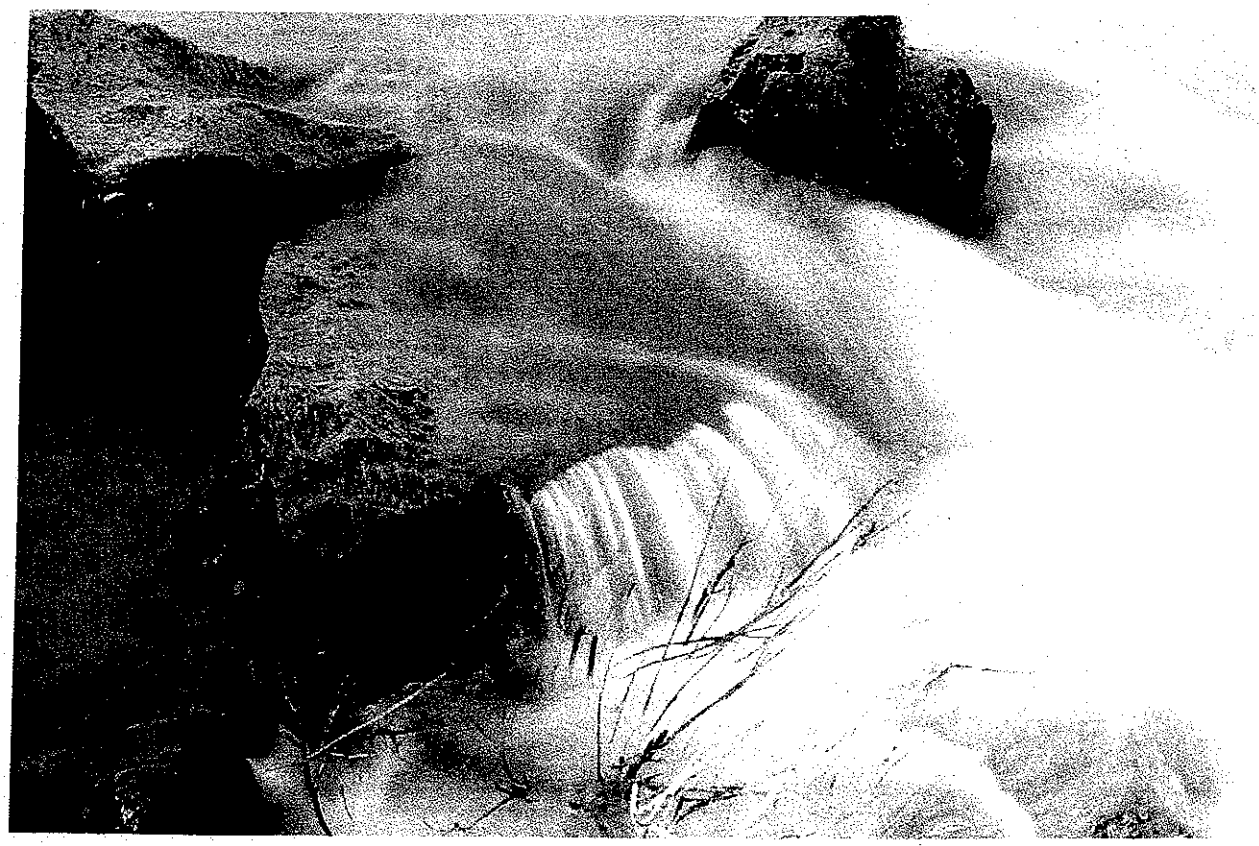
REGISTERED PROFESSIONAL ENGINEER
OREGON
OCT 6, 1978
DAVID J. NEWTON
EXPIRES: 12-31-08

REGISTERED PROFESSIONAL ENGINEER
8838 PE
OREGON
JULY 30, 1980
RICHARD JAMES NICHOLS
Expiration Date 12-31-08

# Deschutes Ground Water Mitigation Program

## Five-Year Program Evaluation Report



January 18, 2008 DRAFT

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State of Oregon
Water Resources Department

LUBA # 2008-203
01254

# 5-Year Evaluation of the Deschutes Ground Water Mitigation Program

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## Introduction

The Deschutes Ground Water Mitigation Program was developed to provide for new ground water uses while maintaining scenic waterway and instream water right flows in the Deschutes Basin. The program is authorized under ORS 537.746 and House Bill 3494 (2005 Oregon Law) and implemented in Oregon Administrative Rules (OAR) Chapter 690, Divisions 505 and 521.

Much of the mainstem Deschutes River and its tributaries are protected by scenic waterway designations and instream water rights. There are also existing surface water rights on the Deschutes River and its tributaries for out of stream uses, such as irrigation and municipal. In the Deschutes Basin above Lake Billy Chinook there is a hydraulic connection between ground water and surface water flows. Because of the hydraulic connection between ground water and surface water, ground water withdrawals affect surface water flows. Since scenic waterways flows and instream water rights are not always satisfied, the Department may not approve new ground water permits unless the impacts are mitigated. The mitigation program provides a set of tools that applicants for new ground water permits can use to establish mitigation and, thereby, obtain new permits from the Department.

Every five years the Water Resources Commission (WRC) is required to evaluate the effectiveness of the mitigation program. The purpose of this evaluation is to ensure that scenic waterway and instream water right flows continue to be met on at least an equivalent or more frequent basis compared to a flows within a representative base period. Depending upon the outcome of this evaluation, the Commission may modify the program accordingly. This may include adjusting the allocation cap on new ground water uses that was established under the program. The Commission may also initiate proceedings to declare all or part of the basin a critical ground water area, close all or part of the basin to additional ground water use, or take other administrative action. This report provides the background and evaluation material to help inform the Commission as it reviews the program.

## The Basin

The Deschutes River Basin covers about 10,700 square miles in central Oregon, making it the second largest watershed in the state and one of the major subbasins of the Columbia River system. The basin is bounded on the west by the Cascade Mountains, on the south by lava plateaus, to the east by the Ochoco Mountains and the plateau between the Deschutes and John Day Rivers, and to the north by the Columbia River. The basin measures 170 miles in the north-south direction and ranges up to 125 miles at its greatest width.

The major tributaries feeding the Deschutes River include the Little Deschutes River, Tumalo Creek, Fall River, Shitike Creek, the Crooked River, the Metolius River, Whychus Creek, Trout Creek, the White River, and the Warm Springs River (Figure 1).

## Deschutes Ground Water Study

The U.S. Geological Survey (USGS) initiated a ground water study in 1993 to provide much needed information on the ground water resources of the upper Deschutes Basin. The study was conducted in cooperation with the Water Resources Department; the cities of Bend, Redmond and Sisters; Deschutes and Jefferson counties; the Confederated Tribes of the Warm Springs Reservation of Oregon; the U.S. Environmental Protection Agency and the Bureau of Reclamation. The area of the study is shown in Figure 1.

Conclusions from the study demonstrated that nearly all ground water originating in, or flowing through, the upper Deschutes Basin discharges into relatively short reaches of the Deschutes, Metolius and Crooked Rivers above and within Lake Billy Chinook.

The study concluded that:

- Virtually all ground water not consumptively used in the upper Deschutes Basin discharges to surface water near Pelton Dam;
- Virtually the entire flow of the Deschutes River at Madras is supported by ground water discharge during the summer and fall; and
- Ground water and surface water are directly linked, and removal of ground water will ultimately diminish streamflow.

Based on initial study conclusions available in 1998, Department determined ground water use in the Deschutes Ground Water Study Area (DGWSA) had the potential for substantial interference with surface water and the "measurably reduce" standard in the Scenic Waterway Act (ORS 390.835) was triggered.

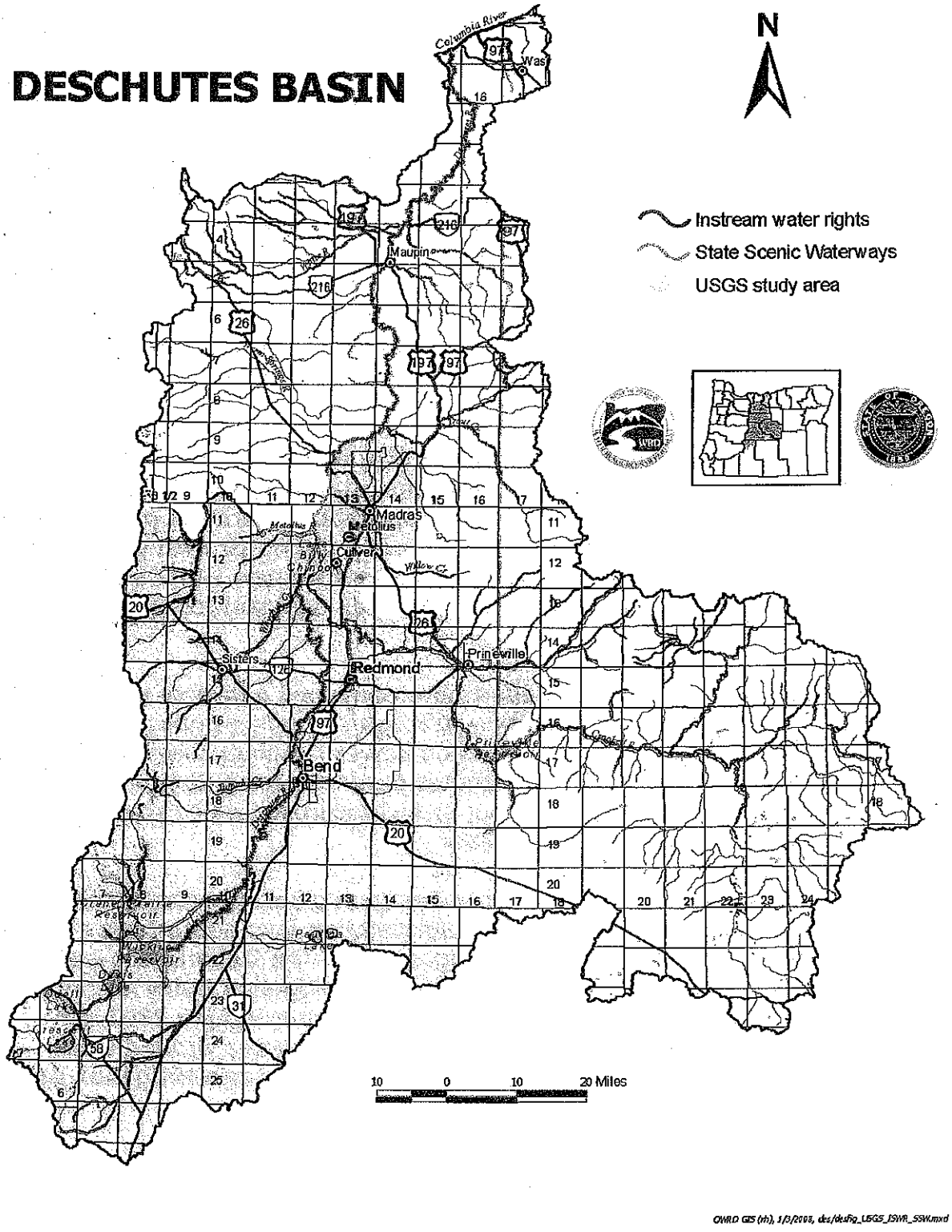



Figure 1. Deschutes River Basin and ground water study area.

## Mitigation Program Development

The 1995 amendments to the Scenic Waterway Act require the examination of each ground water right to determine whether the ground water use will "measurably reduce" surface flows necessary to maintain the free flowing character of the scenic waterway. If such a reduction occurs, the proposed permit application cannot be approved. A use measurably reduces if it individually or cumulatively reduces streamflow by 1% of average daily flow or 1 cubic foot per second (cfs), whichever is less. The statute requires conditioning of permits issued after 1995 to allow for regulation in the future if the measurably reduce standard is triggered, and requires mitigation by new ground water applicants once the measurably reduce standard is triggered.

Based on the Deschutes Ground Water Study, in 1998 the Department determined that the measurable reduction standard was triggered. At that time, pending and new ground water applications were put on hold while the Department explored various options for the basin. Growth pressures in the Deschutes River Basin had increased demand for new water supplies, with a particular emphasis on ground water as additional surface water was not available.

Beginning in late 1999, the Department convened a diverse group of stakeholders to develop mitigation strategies to offset impacts of new ground water permit appropriations on Lower Deschutes River. This working group became known as the Deschutes Basin Steering Committee. The Department worked with this group, which represented a broad spectrum of basin interests, for almost four years.

In 2001, mitigation concepts for the Deschutes Basin began to take shape. In June 2001, House Bill 2184 was enacted into law, authorizing a system of mitigation credits and banking arrangements. The Department issued two drafts of the Deschutes Basin Ground Water Mitigation Rules for public review, one draft in September 2001, and another in April 2002. On September 13, 2002, the WRC adopted the Deschutes Ground Water Mitigation Rules (Division 505) and the Deschutes Basin Mitigation Bank and Mitigation Credit Rules (Division 521).

## Mitigation Program Goals

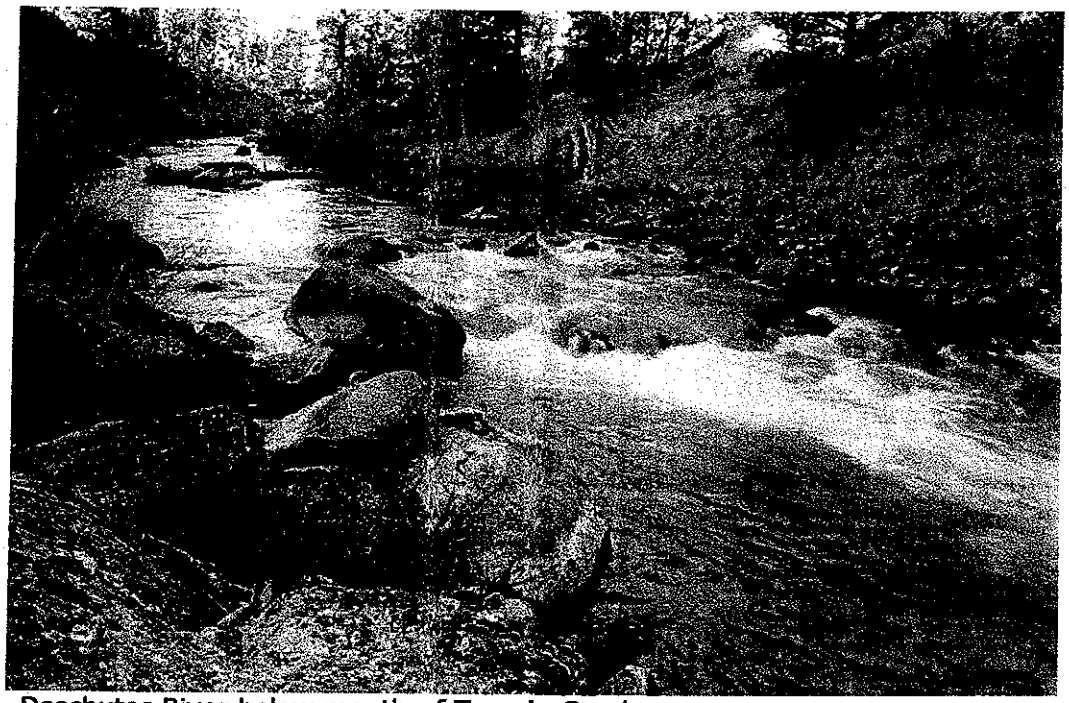
The goals of the Deschutes Mitigation Program are to:

- Maintain flows for Scenic Waterways and senior water rights, including instream water rights;
- Facilitate restoration of flows in the middle reach of the Deschutes River and related tributaries; and
- Sustain existing water uses and accommodate growth through new ground water development.

## Elements of Mitigation Program

The mitigation program has five basic elements:

- Requires mitigation for all new ground water permits in the DGWSA;
- Identifies tools for providing mitigation through either a mitigation project or by obtaining mitigation credits;
- Establishes a system of mitigation credits, which may be used to offset the impacts of new ground water permits, and to establish mitigation banks; and
- Provides for adaptive management through annual evaluations and review of the mitigation program every five years.



Deschutes River below mouth of Tumalo Creek

## Establishing New Ground Water Uses

The process for establishing a new ground water use in the Deschutes Basin is depicted in Figure 2. For each ground water application submitted, the Department reviews the application and notifies the applicant of their "mitigation obligation." The "mitigation obligation" is expressed as a volume of water in acre-feet and is equivalent to the consumptive portion of the use proposed in the permit application. Mitigation must be provided in the amount (mitigation water) and in the location (zone of impact) specified by the Department. Zones of impact are based upon where the proposed use will primarily impact surface water flows. Each applicant has five years from the date the final order is issued to provide the required mitigation. Ground water permit applicants must provide mitigation before a new permit may be issued.

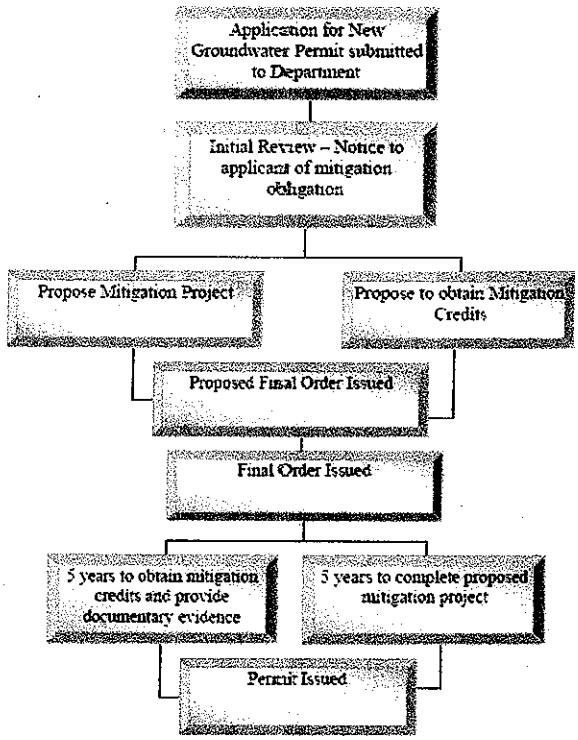



Figure 2. Process to establish new ground water uses under the Deschutes ground water mitigation program.

## Status of the 200 cfs Allocation Cap

The Deschutes Ground Water Mitigation Program is a performance based, adaptive approach to managing new ground water permits in the Deschutes Ground Water Study Area. As part of this adaptive approach, the program included a cap on how much new ground water use can be approved. Department may issue final orders approving ground water permit applications for a cumulative total of up to 200 cfs. This limitation is one of the elements of the program that is to be reviewed as part of the evaluation of the program. The 200 cfs cap represents the rate up to which water may be withdrawn from the ground water resource. It is important to note that this rate-based limitation is different from the consumptive use portion (in acre-feet) for which ground water permit applicants must provide mitigation.

Since adoption of the rules in September 2002, 66 new ground water permits with associated mitigation have been issued, totaling 52 cfs of water (Figure 3). An average of 13 new ground water permits have been issued annually since the program began.

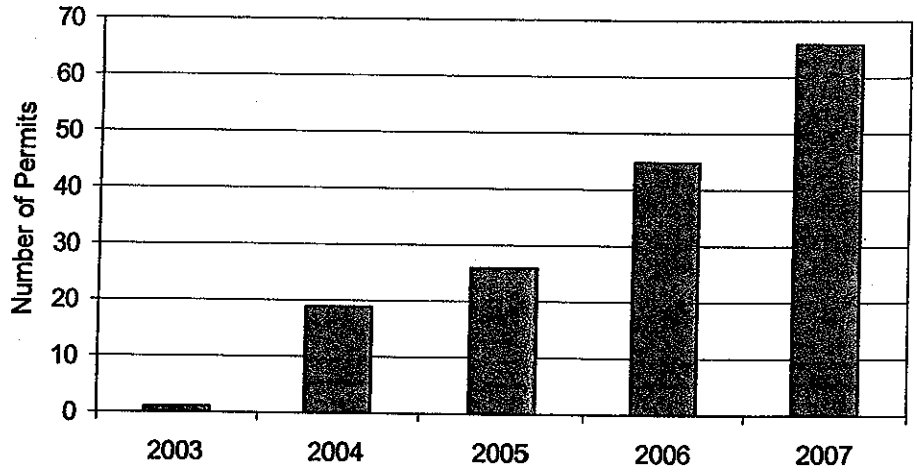



Figure 3. Cumulative total permits issued by year.

Permits for those applications that have been issued final orders[1] with proposed approvals can be issued if the required mitigation is received by the Department. Each applicant has five years from the date the final order is issued to provide the required mitigation. As shown in Figure 4, the cumulative amount of water approved in new permits and in permit applications with final orders is 85 cfs. This is roughly 42% of the total amount allowed under the allocation cap.

[1] A final order is the last stage of the permitting process prior to issuance of the permit.

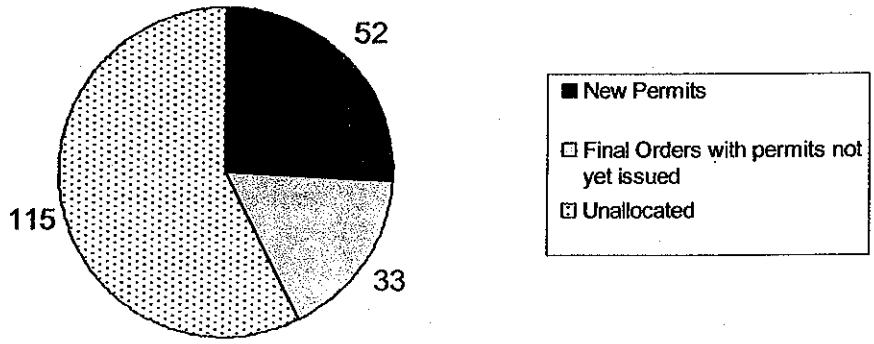
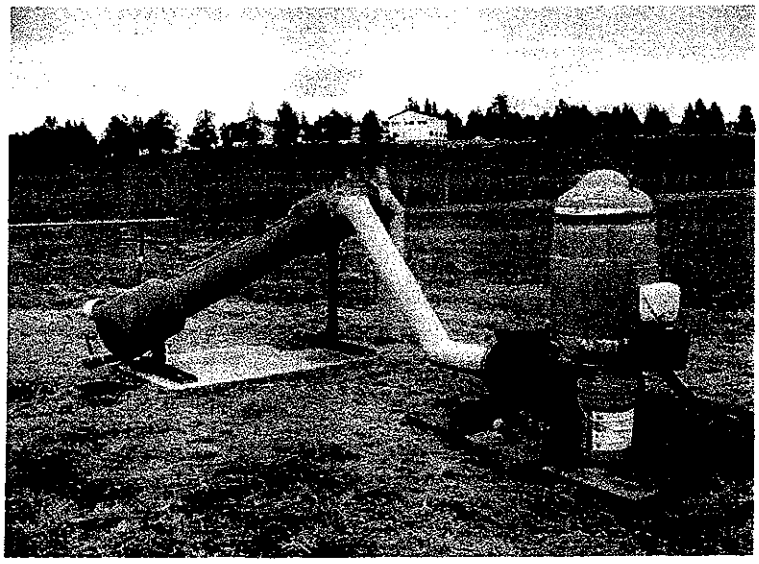



Figure 4. Amount in water in cfs of the 200 cfs allocation cap that has been allocated under new permits and final orders and the amount unallocated.

There are currently 39 applications pending without final orders that total over 142 cfs. Nine of these pending applications fall outside of the 200 cfs cap. Applications that are pending or submitted outside of the 200 cfs cap cannot be processed by the Department, even in case where the use is non-consumptive and has no mitigation obligation. As applications move up in the application "cue", the amount requested is sometimes modified to reduce the requested rate or the application is withdrawn or denied. As this occurs, other applications can be processed within the 200 cfs cap.

***Allocation Summary***

- *66 new ground water permits issued*
- *42% of cap allocated under final orders and new ground water permits*
- *Pending applications exceed remaining balance of the 200 cfs cap*



## Establishing Mitigation Water and Credits

The Deschutes Basin Ground Water Mitigation Rules provide ground water permit applicants two options to satisfy the requirement to mitigate: 1) completion of their own mitigation project or 2) acquisition of mitigation credits.

The rules identify several types of projects that can be used to establish mitigation water:

- Instream Leases[2]
- Time-Limited Instream Transfers
- Permanent Instream transfers
- Allocations of Conserved Water
- Aquifer Recharge
- Releases of Stored Water

For each mitigation project submitted, the Department identifies the amount of water resulting from the project that can be used for mitigation purposes. The resulting protectable water, expressed in acre feet, is also referred to as "mitigation water" or "mitigation credits". One acre-foot of mitigation water is equal to one mitigation credit. For each project submitted, the Department also identifies the primary zone(s) of impact in which the mitigation water provides instream benefits and may be used for mitigation purposes.

Mitigation credits are simply a means for accounting for mitigation water made available by completion of a mitigation project by an individual or organization. Mitigation credits, unless generated by instream leases or time-limited instream transfers, may be held by anyone. Credits can be conveyed from a "mitigation credit holder" to a ground water permit applicant and used to satisfy the mitigation obligation of the proposed use.

To use mitigation credits, ground water permit applicants show that they have obtained the needed mitigation credits by submitting a documentary evidence form (developed by the Department). This form must be completed by the mitigation credit holder and the permit applicant. The documentary evidence form is submitted to the Department for review. If the mitigation credits conveyed to the ground water applicant matches the mitigation obligation, a new permit may be issued.

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[2] Instream leases and time-limited instream transfers may only be used by mitigation banks to establish mitigation credits.

The Department maintains an accounting record of mitigation projects and mitigation credits with links to any associated ground water permits. As shown in Figure 5, in each year that the program has been in place, there has been sufficient mitigation to meet the needs of ground water permits issued under the program. This includes mitigation that is maintained as "reserve" credits by the mitigation banks.

Mitigation banks that use instream leases to generate mitigation credits are required to hold in reserve one matching credit for each credit they assign to a ground water permit. Leases are allowed for periods of one to five years and can be terminated early so the active number of leases fluctuates from year to year. The reserve mitigation credit provides some backup for ground water permit holders and additional assurance for streamflow protection.

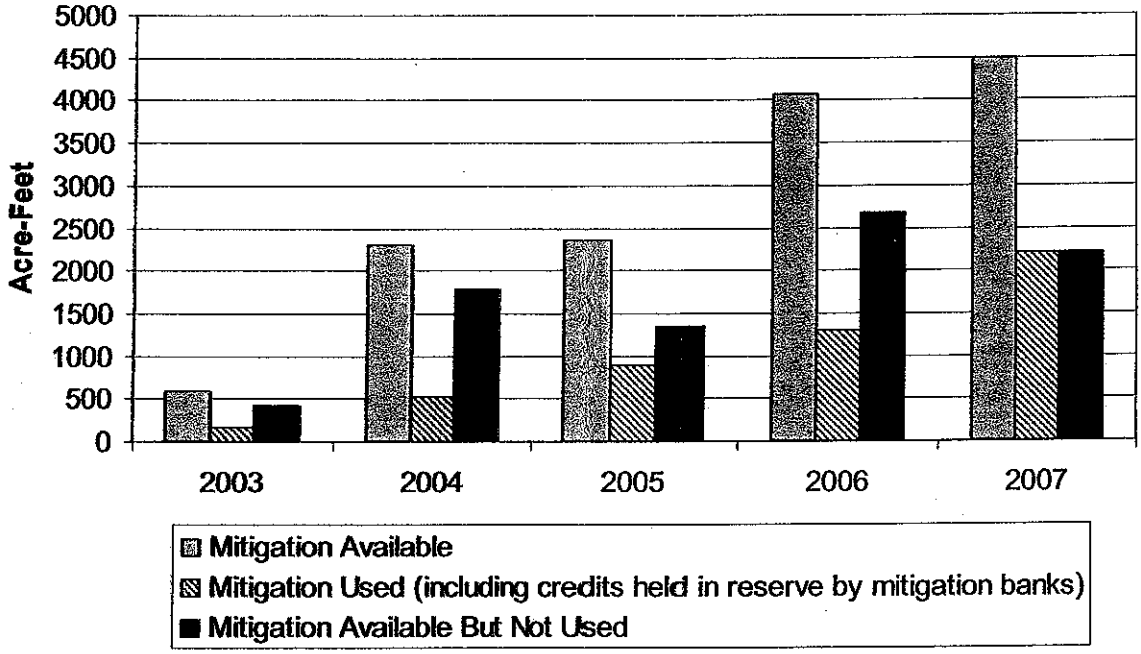



Figure 5. Mitigation available compared to mitigation used by new ground water permits and used as bank "reserves." The amount of mitigation established but not used is also shown.

***Mitigation Summary***

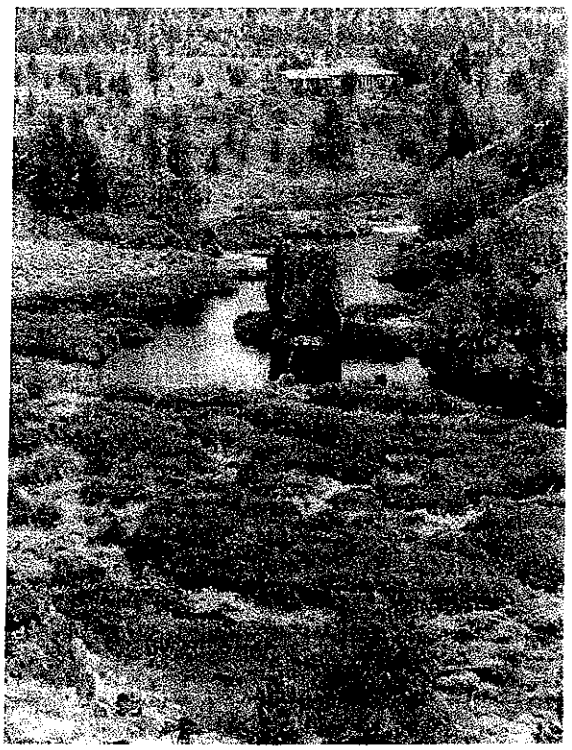
*Mitigation established each year has consistently exceeded the amount needed (including for reserves) on average by 66%.*

## Mitigation Banks

The Deschutes Basin Mitigation Bank and Mitigation Credit Rules (Division 521) provides for the formation of mitigation banks for the Deschutes Basin. Anyone may apply to become a mitigation bank. Successful applicants must enter into an agreement, called a mitigation bank charter, with the Department. Each charter must be approved by the WRC. The charter describes the types of mitigation credits that may be held by the bank, how credits transactions should be conducted and reported to the Department, and requires the mitigation bank to submit an annual report to the Department.

The types of mitigation credits that can be held by a bank include:

- Permanent Credits – based upon instream transfers and allocation of conserved water projects.
- Performance Dependant Credits – based upon storage release and aquifer recharge projects.
- Temporary Credits – based upon instream leases and time-limited instream transfers.



Deschutes River at Lower Bridge

There are two mitigation banks in the Deschutes Ground Water Study Area.

Deschutes Water Exchange Mitigation Bank

The first mitigation bank to be established was the Deschutes Water Exchange (DWE) (affiliated with the Deschutes River Conservancy). The DWE Mitigation Bank was authorized under a charter agreement approved by the WRC in February 2003. The primary source of mitigation in the DGWSA has been mitigation credits held by the DWE Mitigation Bank. They brokered the first mitigation credit transaction under the mitigation program in 2003. The DWE has worked extensively with ground water applicants and permit holders to provide assistance, education and outreach on the Mitigation Program. They have partnered with irrigation districts and landowners in the basin to lease water rights to instream use and use those instream leases to generate mitigation credits. DWE is the sole mitigation bank in the basin that may broker in this type of temporary credits.

In 2007 the DWE Mitigation Bank also began to hold permanent mitigation credits based upon an instream transfer. The 40 permanent mitigation credits were assigned to five ground water permit holders that had been using temporary mitigation credits. These permit holders now have a permanent source of mitigation.

Deschutes Irrigation Mitigation Bank

The second mitigation bank, Deschutes Irrigation (DI) LLC is operated by John Short and deals only with permanent credits. The DI Mitigation Bank charter was approved by the WRC in May 2006. To date, DI has not completed any mitigation credit transactions as a bank. Deschutes Irrigation

LLC, acting solely as a company, has established mitigation credits based upon instream transfers and has completed many mitigation credit transactions with ground water permit applicants and permit holders to provide those ground water users with a permanent source of mitigation. To date, none of these transactions have been brought through the DI Mitigation Bank.

## Effectiveness of Mitigation Projects

Under the Deschutes Ground Water Mitigation Rules, the WRC is required to evaluate the effectiveness of mitigation projects that involve instream leases, time-limited instream transfers, and allocations of conserved water.

As shown in Figure 6, mitigation projects have been dominated by instream leases and instream transfers, with instream leases representing on average 85.6% of the total volume of mitigation water (in acre-feet) established under the program each year.

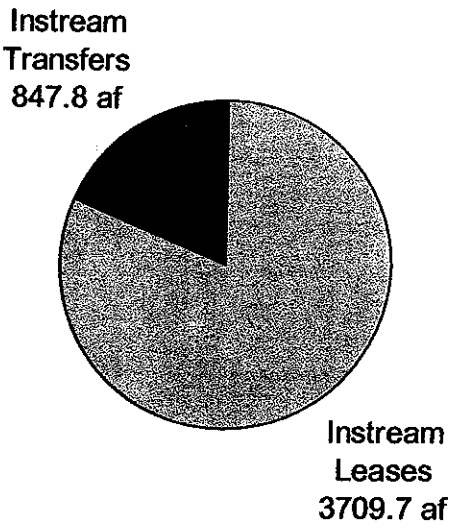



Figure 6. Distribution of mitigation water in acre feet (af) between instream leases and instream transfers in 2007.

Instream Leases

An instream lease is a temporary conversion (for up to five-years) of all or a portion of an existing water use to an instream water right. Since the mitigation program began, each year the amount of mitigation credits generated by instream leases has far exceeded the amount needed to satisfy the mitigation obligations of those permits using these credits as their mitigation source and to meet "reserve" credit requirements (Figure 7). Credits based on instream leases have also been sufficient in each zone of impact where these credits were used. Presently, only the DWE can use instream leases to establish mitigation credits.

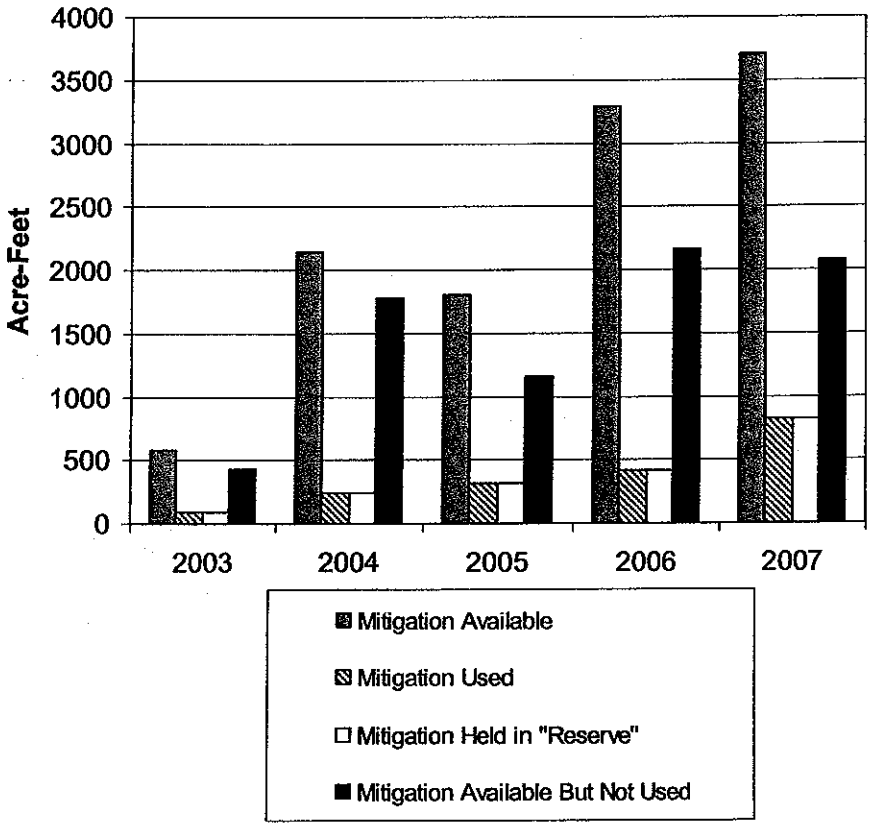



Figure 7. Mitigation created through instream leases.

Overall, the volume of mitigation water provided through instream leases has increased over time (Figure 7). However, there was a reduction in 2005 in the quantity compared to the previous calendar year. This was likely due to the outcome of a legal challenge of the mitigation program that resulted in a brief suspension of the program at that time. Several instream leases that had initially been submitted as mitigation projects were modified to exclude mitigation and preceded through the instream lease process solely

as streamflow restoration projects. These modified instream lease applications did not result in any mitigation water (credits).

In the five years of the program, only one issue has been encountered involving an instream lease used to generate mitigation credits. In 2004, several water rights were leased instream under a single lease on Paulina Creek, tributary to the Little Deschutes River. This instream lease resulted in mitigation credits within the Little Deschutes Zone of Impact. However, while this lease was in effect, difficulties were encountered in keeping the leased instream flows in the stream channel itself. Following an effort to correct, this problem this lease was terminated early by the Department, prior to the 2005 water use period. No credits resulting from this project were used during the 2004 calendar year, the only year that this mitigation project was active.

Instream Transfers

Any ground water permit applicant or other individual can use instream transfers to generate mitigation credits. As the mitigation program has grown, the number of mitigation projects submitted involving instream transfers has increased steadily each year (Figure 8).

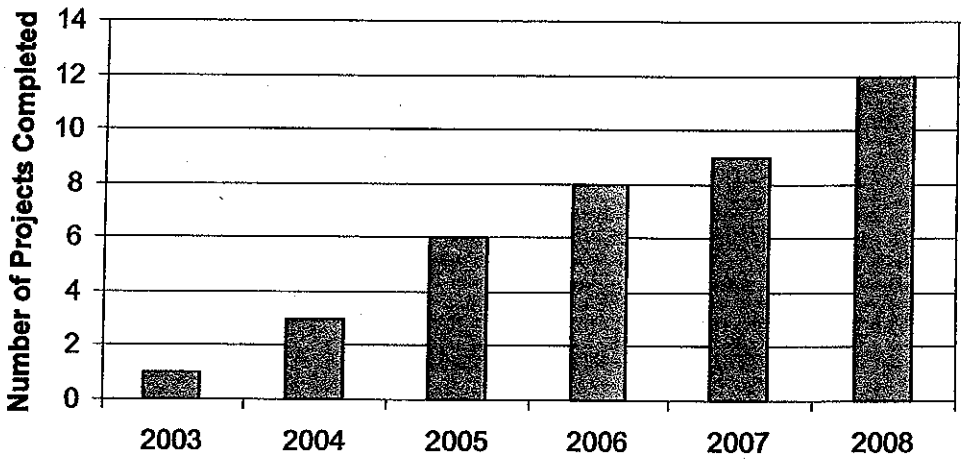



Figure 8. Mitigation projects involving permanent instream transfers.

Mitigation credits generated from projects based upon instream transfers are permanent in nature. Water is permanently protected instream as a result of the completion of an instream transfer application, resulting in a new instream water right. Use of these types of credits by a ground water permit holder does not require any ongoing maintenance of credits by the ground water user. Use of temporary mitigation credits (based on instream leases) requires annual ongoing maintenance of the credits.

In each year that the mitigation program has been in place, not all of the mitigation credits established by instream transfers have been used to provide mitigation to new ground water permits (Figure 9). Some of these mitigation credits have remained available. As more ground water permit applications are processed through to permit, more of these mitigation credits will be used.

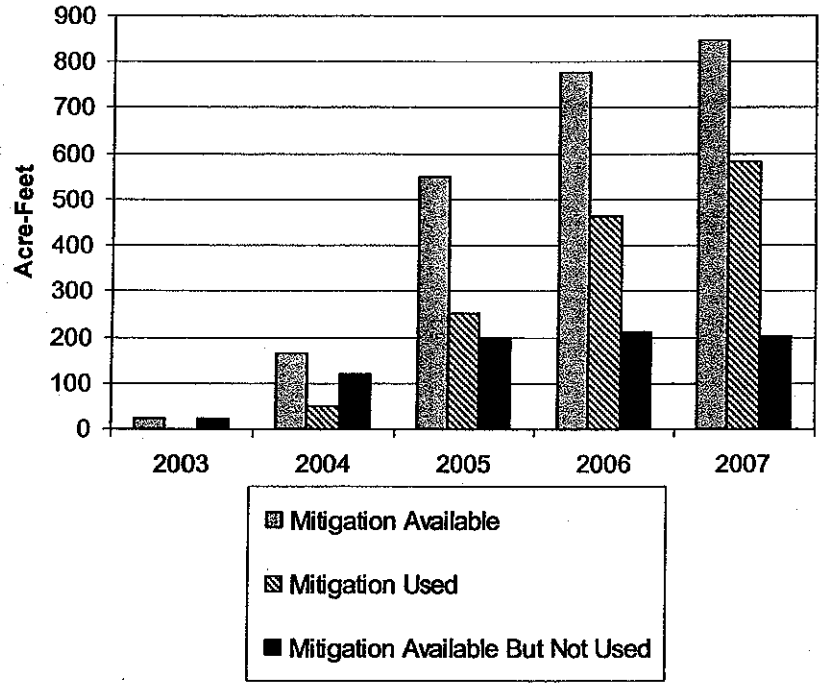



Figure 9. Mitigation created through permanent instream transfers.

Aquifer Recharge

One mitigation project has been proposed to the Department involving an aquifer recharge project. This project application has been protested, and the applicants are working with the Department to resolve the issues raised by the protest.

Other Mitigation Project Types

To date, no mitigation projects have been proposed to the Department involving time-limited instream transfers, allocations of conserved water, or release of stored water. A time-limited instream transfers differ from instream leases in that they can be issued for any length of time specified in the application. An allocation of conserved water is the reduction in the amount of water diverted to satisfy an existing beneficial use by improving the method of transporting or applying the water, with all or a portion of the conserved water going to instream use.

## Zone of Impact Evaluation

As part of the five year evaluation, the WRC is required to evaluate the zones of impact identified by the Department. This evaluation may include analysis of where the zones are located, whether adequate zones are identified, and whether the mitigation program is doing an effective job of distributing mitigation water to the affected stream reaches within each zone of impact.

Ground water users with permits issued under the mitigation program are required to provide mitigation in a zone of impact identified by the Department. The purpose of these zones of impact is to target mitigation in and above stream reaches, on a subbasin level, where impacts on streamflows by ground water pumping are expected to occur.

Mitigation projects establish mitigation water within a zone of impact and may establish mitigation in more than one zone. This would generally be a mitigation project that resulted in water that would benefit flows in each zone of impact identified. If credits are used in one zone they are also subtracted from use in the other zones in which they were available.

There is a general zone of impact to address regional impacts to surface water and local zones of impact for localized impacts. The general zone of impact is defined as anywhere in the Deschutes Basin above the Madras gage, located on the Lower Deschutes River, below Lake Billy Chinook. Ground water users with a general impact on surface water (i.e. impacting the regional confluence area of the Deschutes, Crooked and Metolius Rivers) may provide mitigation anywhere within the general zone of impact provided that the mitigation water (protected instream) flows into the impacted reach.

Mitigation within a local zone of impact is required for ground water uses that impact surface water on a localized level (e.g. impacting the surface waters of Whychus Creek). To define boundaries for the local zones of impact, the Department used subbasin boundaries, the locations within the stream or river reach that instream water rights or scenic waterway flows were not being met, and identification of where stream reaches were influenced by ground water discharge.

The zones of impact are shown in Figure 10 and described as:

- General – In the Deschutes Basin above Lake Billy Chinook;
- Middle Deschutes River – In the Deschutes Basin above River Mile 125 on the Deschutes River;
- Crooked River – In the Crooked River subbasin above River Mile 13.8 on the Crooked River;
- Whychus Creek – In the Whychus Creek subbasin above River Mile 16 on Whychus Creek;
- Upper Deschutes River – In the Deschutes River basin above River Mile 185 on the Deschutes River;
- Little Deschutes River – In the Little Deschutes River subbasin above the mouth of the Little Deschutes River;
- Metolius River – In the Metolius River subbasin above River Mile 28 (the confluence with Jefferson Creek) on the Metolius River.

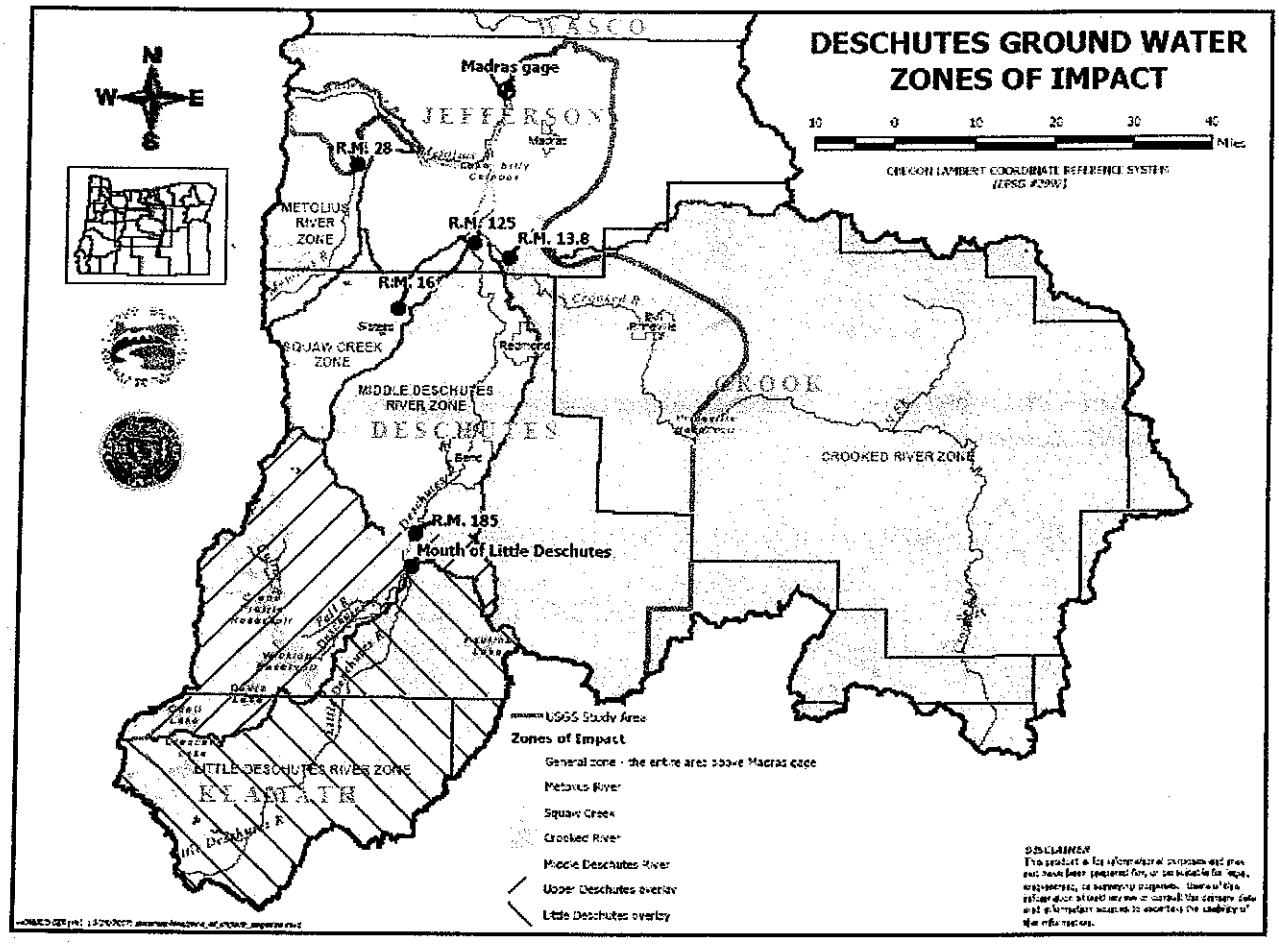



Figure 10. Map showing the location of each zone of impact identified by the Department.

As demonstrated in Figure 11, the majority of new ground water uses were found to have an impact on the General Zone of Impact. The quantity of permits by zone is shown in Table 1.

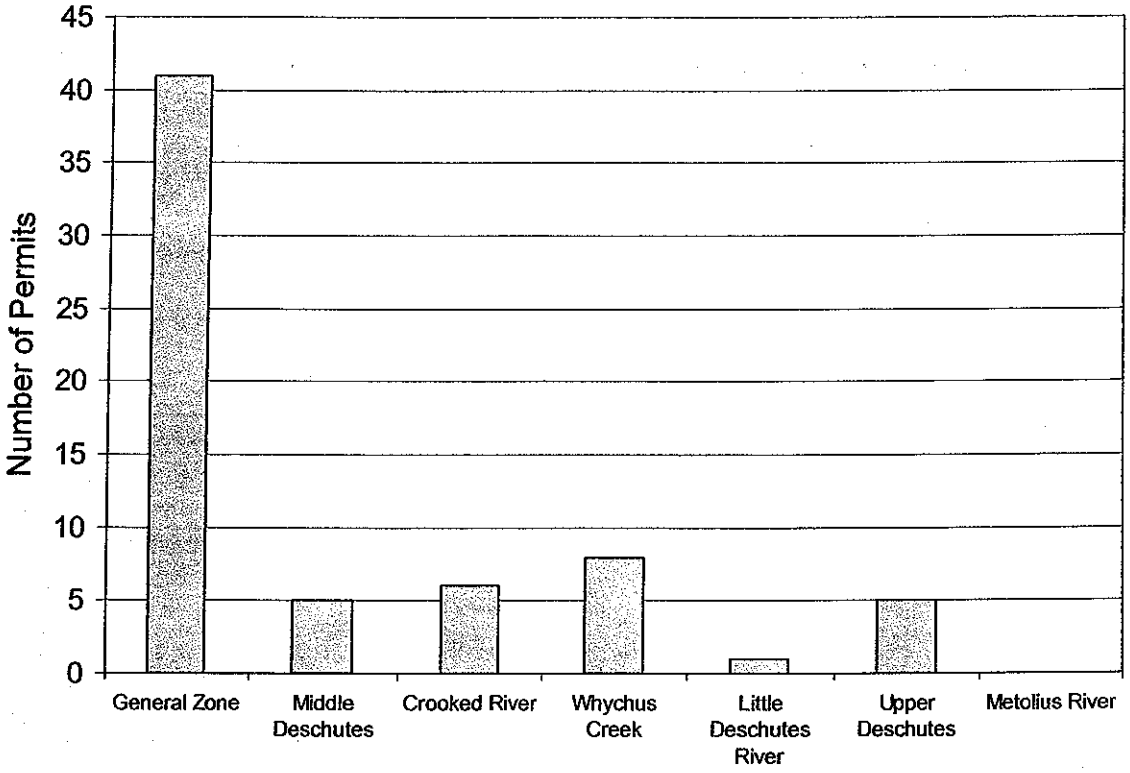



Figure 11. Number of ground water permits issued by zone of impact from 2003 to 2007.

Table 1. Number of ground water applications permits by zone.

| Zone of Impact | Number of Permits | Rate (cfs) Approved by Permit |
|---|---|---|
| General | 41 | 46.1 |
| Middle Deschutes | 5 | 0.67 |
| Crooked River | 6 | 1.93 |
| Whychus Creek | 8 | 2.40 |
| Little Deschutes | 1 | 0.22 |
| Upper Deschutes | 5 | 0.29 |
| Metolius River | -- | -- |
| **Totals** | **66** | **51.6** |

During the five years of the program, more mitigation than needed for each new ground water use has been provided in the appropriate zone of impact as shown in the Figure 12.

General zone: Most mitigation projects that established mitigation in the General Zone protected instream flows in the Deschutes River and down to Lake Billy Chinook. However, a few of the mitigation projects that established mitigation credits in the General Zone did not protect water instream into that zone but still provided instream benefits. For example, projects on Whychus Creek protected flows to the mouth of Whychus Creek only. While instream flows are not protected into the mainstem Deschutes, the flows in the Deschutes River at the confluence with Whychus Creek are at such a high level that there is still an instream benefit even considering downstream users.

Middle Deschutes: Only five new ground water permits have been approved in this zone. Mitigation projects generated in this zone established mitigation water (credits) for this zone and the General Zone of Impact. The majority of the mitigation water was used to provide mitigation for uses in the General Zone of Impact.

Whychus Creek: The amount of mitigation water generated in the Whychus Zone has generally increased each year, except in 2007. Mitigation projects in this zone of impact also generated mitigation water in the General Zone of Impact. Mitigation water was used by ground water permit holders in both zones.

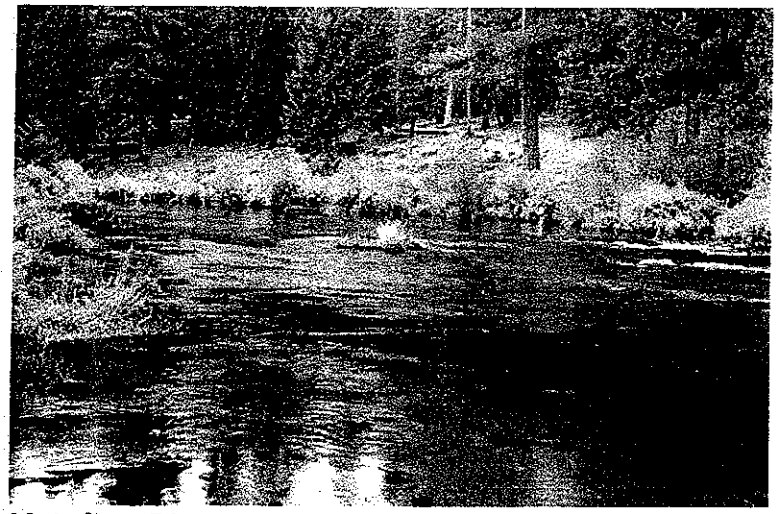
Crooked River: The amount of mitigation water generated in the Crooked River Zone of Impact has generally increased each year. In 2005, the amount of mitigation water sharply increased. Up until 2007, mitigation projects in this zone were generally small and with individual landowners. In 2007, North Unit Irrigation District along with the DWE Mitigation Bank requested that their annual instream lease be used, for the first time, to generate mitigation credits. Mitigation projects in this zone also generated mitigation water in the General Zone of Impact. Mitigation water was used by ground water permit holders in both zones.

Little Deschutes River: None of the mitigation water established in the Little Deschutes has been used to provide mitigation for new uses within this zone. Presently there is only one new ground water permit within this zone. This permit is for a non-consumptive use (commercial heat exchange) and has a mitigation obligation of zero acre feet. One mitigation project generated mitigation credits in this zone in 2004. This project was terminated early by the Department due to regulatory issues. In 2006, another two instream lease applications established mitigation credits in this

zone. Credits from these projects were available for use as mitigation also within the Upper Deschutes, Middle Deschutes, and General Zones of Impact. Water from these projects was protected instream in the Little Deschutes River and into the mainstem Deschutes River. Credits from these projects were used to provide mitigation to ground water permits in the Upper Deschutes Zone of Impact.

Upper Deschutes: Mitigation credits for the Upper Deschutes Zone of Impact first became available in 2006. The mitigation projects that were used to establish mitigation in this zone did not originate in the Upper Deschutes area. The two projects that established mitigation in this zone originated in the Little Deschutes Zone of Impact. However, mitigation water (protected instream flows) provided instream benefits to flows in the impacted stream reach of the Upper Deschutes Zone of Impact.

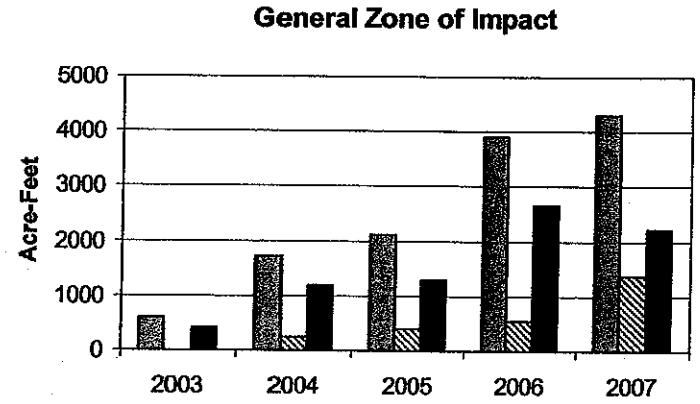
Metolius River: To date, no mitigation projects have been proposed that would establish mitigation water within the Metolius Zone of Impact. No ground water applications to date have received notices of mitigation obligation within this zone.

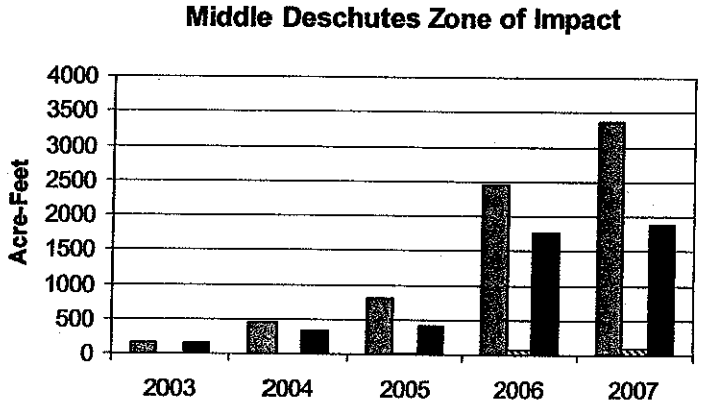


Metolius River

***Zone of Impact Summary***

- *Majority of ground water mitigation provided in general zone of impact*
- *Mitigation provided in each zone met requirements for new ground water uses for that each zone*
- *More than 39 cfs of instream flow as a result of mitigation*



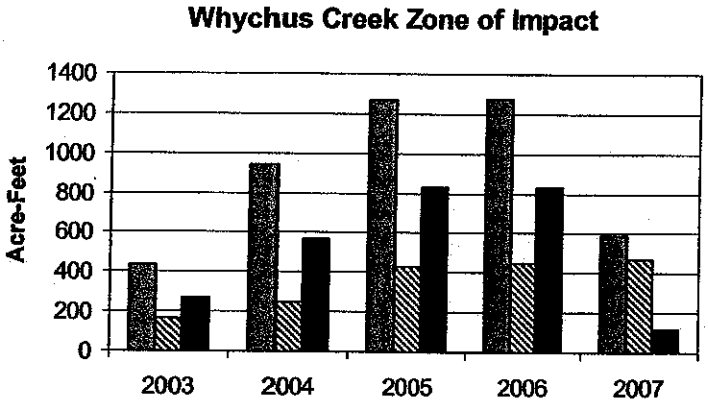




Figure 12. Mitigation supplied and used for each zone by year.

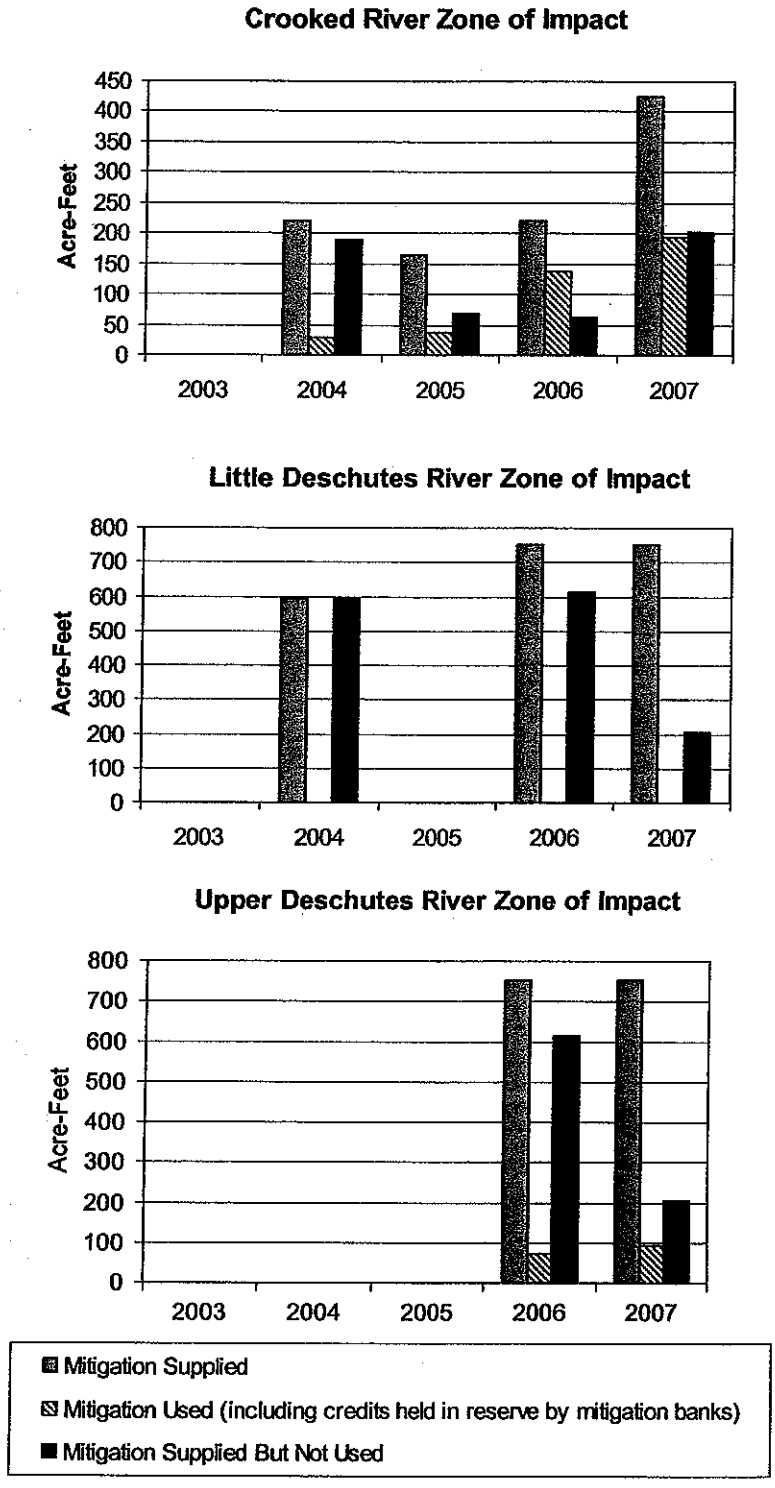



Figure 12 continued. Mitigation supplied and used for each zone by year.

## Scenic Waterway & Instream Water Right Flow Evaluation

As part of the five year evaluation, the WRC is required to evaluate mitigation activity in the Deschutes Basin to determine whether scenic waterway flows and instream water right flows continue to be met on at least an equivalent or more frequent basis as compared to long-term, representative base period flows established by the Department.

Instream Flow Model

To monitor the impact of new ground water permits and mitigation on scenic waterway flows and instream water right flows, the Department developed a streamflow monitoring model using historic streamflow data. The streamflow model was constructed using a base period of flows from 1966 to 1995 at selected gaging stations around the basin. This base period represents river flows during a period of time after all of the dams were constructed and before the Scenic Waterway Act was amended to include consideration of ground water impacts.

The model considers the effects of new permitted ground water use and mitigation projects on streamflows.[3] Table 2 shows the model results through mid-2007 for all gaging station sites used in the model. With only one exception, instream requirements are met or improved compared to base line conditions. Based on modeled results, streamflow overall has improved by as much as 27 cfs in some areas due to mitigation.

Instream flows for the Deschutes River below Bend showed a slight decrease in the percent of time the instream flows are met. However, streamflows overall were increased by 15 cfs.

Gaging station on Deschutes River below Bend

[3] R.M. Cooper, Assessing the Impact of Mitigation on Stream Flow in the Deschutes Basin. Draft not yet available. Peer review scheduled in 2008.

Table 2. Modeled results showing baseline and changes in the percent of time instream requirements are met.

| Gage Site | Base Line % Time Instream Requirements are met | Change in Percent of Time Instream Requirements are Met | Annual change in streamflow (cfs) |
|---|---|---|---|
| Deschutes River at Mouth | 96.2 | +0.02 | 1.17 |
| Deschutes River below Pelton Dam | 69.3 | +0.59 | 1.17 |
| Deschutes River at Lake Billy Chinook | 99.3 | +0.6 | 15.2 |
| Deschutes River Downstream of Bend | 28.6 | -0.36 | 15.2 |
| Deschutes River above Arnold Canal | 56.8 | +1.98 | 27.3 |
| Little Deschutes River at mouth | 45.3 | +3.55 | 8.74 |
| Deschutes River below Wickiup and Fall River | 63.5 | 0 | 0 |
| Metolius River at Lake Billy Chinook | 99.7 | 0 | 0 |

In the Whychus zone of impact, the Department installed an additional gage at Camp Polk Road in May 2007 to monitor groundwater inputs through springs. This gage is specifically designed to monitor localized impacts to the ground water system near Sisters and surrounding areas by local well pumping. In addition, the Department added a gage on the Metolius River just downstream of Camp Sherman to monitor similar effects. Lastly, the USGS and the US Department of Interior's Bureau of Land Management installed a gage on the Crooked River near Osborne Canyon some years ago to additionally monitor ground water fluxes in that reach of river.

Real-time Streamflow Records

The Department primarily uses a database and streamflow model to monitor the effectiveness of the mitigation program. However, over time, yearly real-time streamflow records can also be tracked at appropriate gaging stations or other measurement locations. In the short term, streamflow data will not provide information on how the system is responding, given changes in climatic conditions and other variables. It is not possible to correct real-time data for effects of year-to-year changes in weather (or other variables) with sufficient accuracy. In addition, it may be years before

the effects of mitigation activities and ground water use reach equilibrium though trends may become apparent over a longer period of time.

Because of the variability of the system, streamflow records will not be able to detect changes due to mitigation activity. One exception is the Deschutes River below Bend which a combination of mitigation, conservation, flow restoration, and changes in water management are detectable. This is shown in Figure 13.

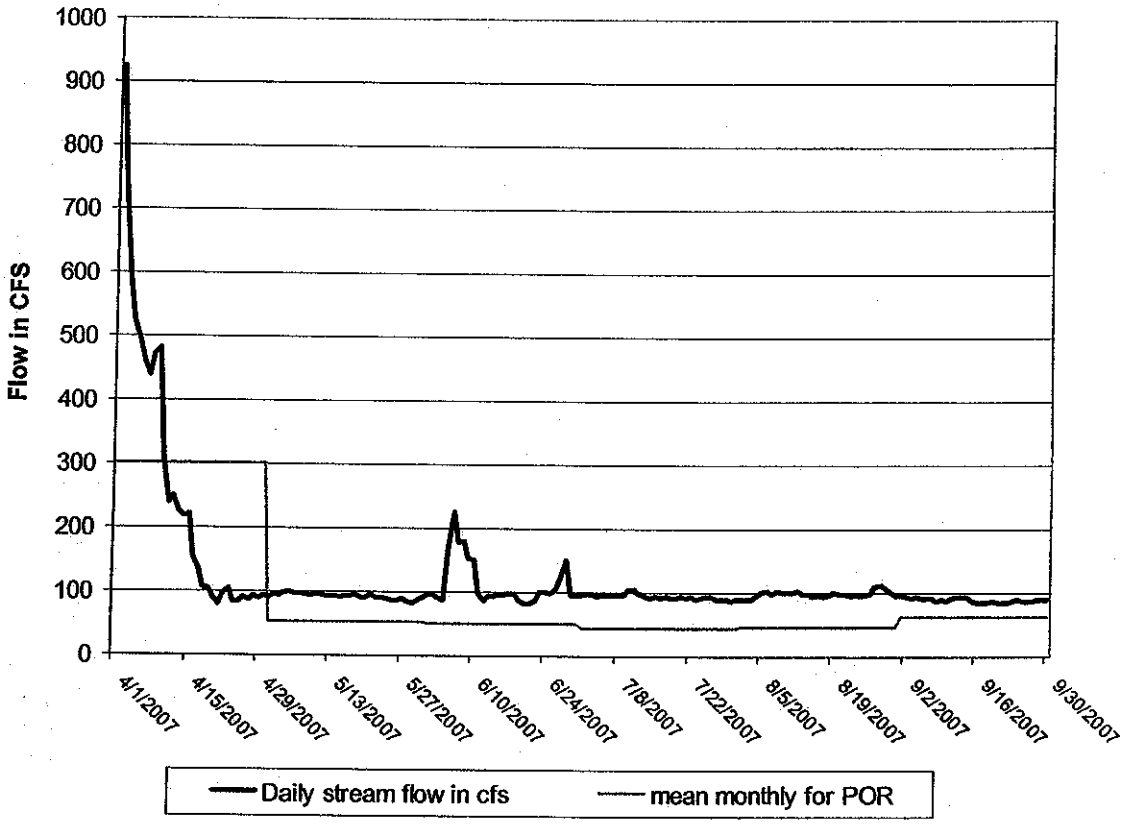
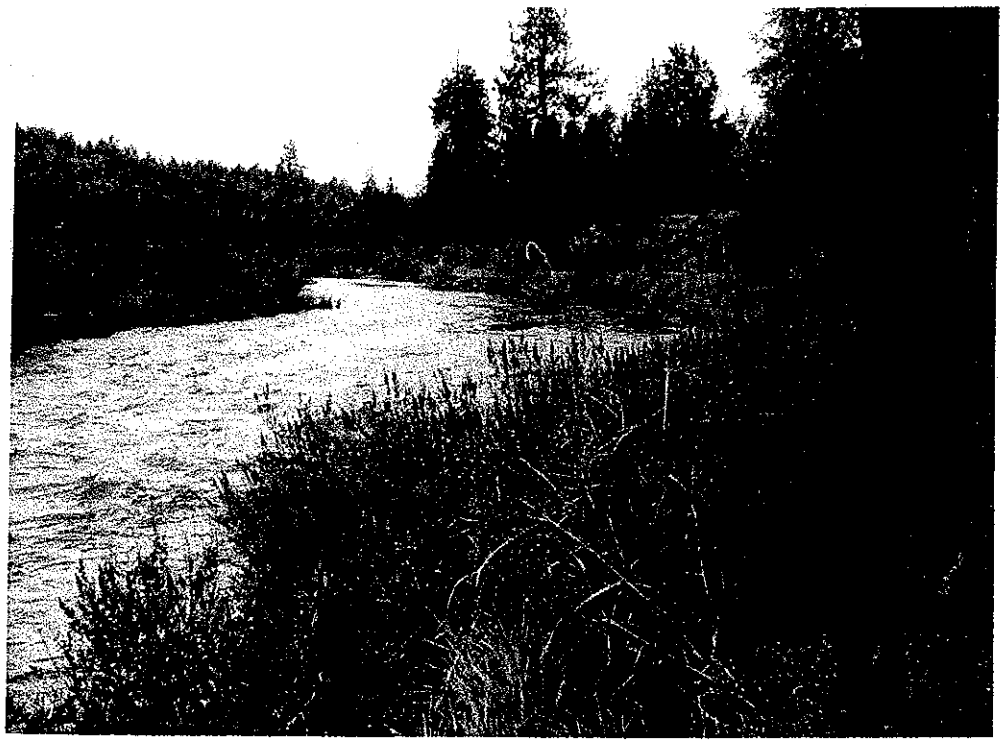



Figure 13. Flow in cubic feet per second on the Deschutes River below Bend compared to period of record (POR).

## Summary

The Deschutes Ground Water Mitigation Program has been in place since 2002. To date, 66 permits have been issued in the ground water study area for irrigation, industrial, quasi-municipal and municipal uses. Permits and final orders awaiting mitigation total over 85 cfs of ground water. Pending ground water applications exceed the quantity available under the 200 cfs cap.

Mitigation has been available to meet the needs of new permits in all zones of impact identified the basin. The majority of that mitigation has been provided through temporary credits through the Deschutes Water Exchange Mitigation Bank. With only one exception, instream requirements are met or improved compared to base line conditions. Based on modeled results, streamflow overall increased by as much as 27 cfs in some areas due to mitigation.



**Comparison of Approach / Findings**
**for Determining Impacts to Surface Water and Related Mitigation for**
**Impacts to Fish and Wildlife**

| | OWRD | ODFW | Thornburgh | Yinger |
|---|---|---|---|---|
| Maximum authorized rate of pumping for Thornburgh (expressed in cubic feet per second – "cfs") | 9.97 cfs (OWRD Final Order) | 9.97 cfs | 9.97 cfs | 9.28 cfs (based on OWRD draft permit) |
| Maximum authorized volume of ground water pumping per year (expressed in acre-feet – "AF") | 2,129 AF (OWRD Final Order) | 2,129 AF | 2,129 AF | 2,355 AF (based on OWRD draft permit) |
| Annual volume of Consumptive Use (total volume of pumping reduced to reflect water that is expected to return to the ground water system as a result of seepage) | 1,356 AF/year based on breakdown of component uses under heading of "quasi-municipal" (See OWRD Final Order)<br>- Golf course irrigation = 90%<br>- Standard irrigation (landscape) = 60%<br>- Other quasi-municipal = 40% | 1,354 AF/year | 1,356 AF/year | 2,355 AF/year (Assumes 100% consumptive use) |
| Annual volume of mitigation required | 1,356 AF/year (equal to consumptive use) | 1,354 AF/year<br>(Note: this number appears to be a typo; the correct number is 1,356.) | 1,356 AF/year | Not addressed. |
| Estimated location of impact on surface water due to ground water | Deschutes River about 5.8 to 8.0 miles toward the North from project | Deschutes River about 5.8 to 8.0 miles toward the | Deschutes River about 5.8 to 8.0 miles toward the North | Primarily Deschutes River plus 106 AF/year reduction in Whychus Creek from |

LUBA # 2008-203
01284

| | OWRD | ODFW | Thornburgh | Yinger |
|---|---|---|---|---|
| pumping | location | North from project location | from project location | Alder Springs to mouth |
| Location of mitigation | "General Zone" (Deschutes River & Tributaries) | "General Zone" (Deschutes River & Tributaries) | "General Zone" (Deschutes River & Tributaries) | Primary impact in Deschutes River with 106 AF/year impact in Whychus Creek |
| Estimated reduction in stream flow rate due to round water pumping at maximum diversion rate (in cfs) | Not addressed. | 1.87 cfs per day/year round<br>(Based on 1,356 annual volume of consumptive use converted to daily rate of flow.) | 1.87 cfs per day/year round<br>(Based on 1,356 annual volume of consumptive use ) | 3.25 cfs per day/year round<br>(Based on 2,355 annual volume of pumping) |
| Net stream flow restoration due to mitigation (in rate/cfs) during irrigation season (includes deduction from authorized irrigation diversion rate to reflect non-consumptive portion of existing irrigation water rights) | Not addressed. | Big Falls Ranch 1.97 cfs<br>COID 1.22 cfs<br>(based on standard conversions) | Big Falls Ranch 2.35<br>COID (based on breakdown according to specific COID water rights, using COID "converter")<br>Season 1 1.985 cfs<br>Season 2 2.647 cfs<br>Season 3 4.90 cfs | Not addressed. |

Sources:

OWRD: Final Order Approving Thornburgh Application G-

ODFW: Letter dated June 23, 2008 from Amy Stuart to Deschutes Co.

Thornburgh: - Thornburgh Resort Fish and Wildlife Mitigation Plan
- Addendum Relating to Potential Impact of Ground Water Withdrawal on Fish Habitat, April 28, 2008;
- Evaluation resort Project Impact on Hydrology and Fish Habitat, Tetra Tech, May 2008

Yinger: A Case Study: Thornburgh Resort Water Resources Impact Evaluation, Yinger and Northwest Land & Water, Inc., Feb. 2008

# Memorandum

**Date:** July 15, 2008

**To:** Anne Corcoran Briggs, Hearings Officer

**From:** Lynn Sharp, Tetra Tech EC, Inc.

**RE:** Response to Wildlife Mitigation Plan Questions 2-5 dated July 7, 2008

**Question 2. The opponents argue that the applicant's wildlife study relies too heavily on the expert opinions of Tetra Tech EC, Inc. (TtEC, formerly Tetra Tech FW, Inc.) and agency staff biologists and the HEP methodology but does little to analyze the actual habitat values on the property. The opponents argue that this analysis is improper in at least two respects: (1) it does not provide an accurate assessment of the existing habitat values on the property; and (2) it does not provide a baseline for assessing the success of the plan in the long term. I would like the applicant to respond to this argument, first by providing a more detailed history of the iterative process, especially with respect to choices made to establish "habitat values" and the species that best represent those values. The applicant should explain why the loss of golden eagle habitat was identified but not quantified in its HEP analysis.**

**Response:** The HEP (Habitat Evaluation Procedures) methodology was designed by the U.S. Fish and Wildlife Service (USFWS 1981), *specifically* to quantitatively document baseline habitat values, to define impacts, and therefore to define mitigation needs. It was initially used to deal with the effects of large water projects such as dams. HEP is basically an accounting system for habitat in that it calculates habitat units, which are a function of the suitability of the habitat for a particular species or group of species with similar habitat requirements, and the acres of the habitat. The habitat suitability index is given a numerical value from 0 (no suitability) to 1 (the best around). For example, 2 acres of habitat with a Habitat Suitability Index (HSI) of 0.5 equals 1 Habitat Unit. One Habitat Unit is equivalent to 1 acre of the best habitat available for that species or group, within the region. Suitability can be estimated by a group of experts, as was the case for the earliest versions of HEP. Later, in-depth studies of individual species were conducted that resulted in development of mathematical Habitat Suitability Models for individual species that are based on measurements or presence/absence of habitat features such as height and density of herbaceous and woody vegetation, water, snags, and large trees.

HEP is a consensus based process, and the mathematical models if used nearly always need to be adjusted to the specific region. HEP uses common species that will occur on a project site. The common species also represent a suite of species that use similar habitat types in a very general way, similar to the 16 life forms developed by Thomas' (1979) *Wildlife Habitats in Managed Forests the Blue Mountains of Oregon and Washington*. HEP models are based on select habitat

characteristics, some of which are weighted over others. All models are based on subjective professional judgment derived from research and professional experience.

The Habitat Suitability Indices in the modified HEP that was used for Thornburgh were based on quantitative habitat data gathered in the field, for Eagle Crest, and was used to define impacts and mitigation needs for that project. The undeveloped part of Eagle Crest is very close to Thornburgh and supports very similar habitat, so it is a reasonable assumption that defining baseline conditions at Thornburgh could start with the results of the Eagle Crest III analysis.

This modified HEP method has been used, at Oregon Department of Fish and Wildlife's (ODFW) direction, as a means of evaluating wildlife habitat value, impacts, and mitigation for a number of destination resorts in central and eastern Oregon, including Eagle Crest, Running Y (1996 - Klamath), Brasada (2003 - Crook), Cascade Highlands (2005 - Deschutes), Remington Ranch (2007 - Crook), Hidden Canyon (2007 - Crook), Crescent Creek (HEP is being developed - Klamath).

The opponents of this project state that this method does not provide an accurate assessment of existing values on the property, but do not provide any evidence to support that statement. In biology, it is always better to have more information, but the types of population studies proposed by the opponents have their own set of uncertainties. For example, populations of some wildlife species or groups, such as migratory songbirds and small mammals, vary considerably from year to year. For that reason, ODFW has adopted Habitat Mitigation Rules (OAR 635-415) that focus on protecting and enhancing habitat with the well-founded expectation that when the habitat needs of a species are met; the species is likely to be present.

The expectation that two years of study would be needed to more accurately define habitat values at the Thornburgh site is far beyond that which ODFW, the state wildlife agency, and Deschutes County, the permitting agency, have required in relation to previous destination resorts. This level of study is only required by natural resource agencies in relation to species listed as Endangered or Threatened by the USFWS. such as the northern spotted owl and marbled murrelet. No such species, listed as Threatened or Endangered by either the USFWS or ODFW are known or even suspected to occur at the Thornburgh property.

As to the history of how this modified HEP approach was developed, TtEC contacted ODFW in September 2004 to get input on the wildlife issues and approach that ODFW would like to see used in assessing impacts and developing mitigation for the Thornburgh project. ODFW indicated that the habitats at Thornburgh were the same as those at Eagle Crest and that we could virtually use the same criteria and species, and that Glen Ardt was to be the ODFW contact for this project. ODFW recommended that we start with the Eagle Crest III analysis, and then spot check the analysis. ODFW indicated that the HEP species list should be comparable, and indicated that the same modified process in estimating Habitat Suitability Indices for each evaluation species had been used for the Powell Butte project.

A summary of the iterative history of development of the mitigation plan is provided below. The majority of the revisions to both the mitigation plan and accompanying modified HEP calculations were minor and editorial in nature, and part of the normal process of working with ODFW and BLM from the fall of 2004 to the present. The more significant changes made are highlighted in the table. Several of these more significant changes were made as project planning

by Thornburgh, particularly for the golf course, provided more specific information about the types and acreages of the habitats that would be present after construction.

| Summary of Thornburgh Mitigation Plan and Modified HEP Analysis History | |
|---|---|
| **Time Frame** | **Description of Work and/or Changes** |
| September-October 2004 | Project initiation. Prepare initial modified HEP analysis, based on summary sheet of HSIs for Eagle Crest III ODFW provided and phone conversations with ODFW. Make site visit with ODFW. ODFW recommends using modified HEP. ODFW indicated in phone call September 15, 2004 that the species for the two projects would be virtually the same as would the HSIs. Potential offsite mitigation activities that would best offset impacts were discussed with ODFW. |
| November-December 2004 | Remove golden eagle and revise baseline and impact HSIs, per Memorandum from Glen Ardt (ODFW) dated November 22, 2004 to Lynn Sharp. This suggestion was made because the golden eagle is more of a specialist species rather than a generalist species and that red-tailed hawk and American kestrel would better represent raptors for the Thornburgh project. In particular, Eagle Crest was located near bluffs over the Deschutes River where eagles nested; Thornburgh is not and only provides foraging habitat for this species which can have home ranges of up to 10 square miles per pair. |
| January-February 2005 | Increase project acreage from 1,825 to 1,989 due to land acquisition by Thornburgh and to account for 9 acres of impact from road construction on BLM land; revise calculations of impact based on new golf course habitat information provided in response to request by ODFW. Meet with BLM and ODFW to discuss impacts and how to address these in the BLM EA on the proposed project. Prepare Wildlife Report for CMP including Mitigation Plan. |
| March-December 2005 | BLM requested that mitigation take place on BLM Maston Allotment and so modified HEP calculations of existing habitat and mitigation gains at the Maston Allotment were added. This included a visit to the Maston Allotment by TtEC, ODFW, and BLM staff, follow up by TtEC, and development of a site-specific mitigation plan for the Maston Allotment that included a detailed mitigation monitoring plan. Made minor revisions to mitigation plan in response to initial BLM and ODFW comments.. |
| January-November 2006 | Revisions made in response to BLM and ODFW comments and new information obtained on golf course habitat characteristics and acreages and discussions with ODFW. Make minor revisions to Maston mitigation plan and mitigation gain calculations based on ODFW input. |

| | |
|---|---|
| November 2006 - January 2007 | Add modified HEP calculations of additional mitigation that could be provided by Deschutes Ranch, per client request; added to Maston Allotment mitigation. |
| January 2007 | Combine Maston and Deschutes Ranch mitigation in modified HEP. |
| February – March 2007 | Revise Maston Mitigation plan in response to BLM comments. Later, revise modified HEP and Mitigation Plan based on BLM request to make mitigation site generic "Cline Buttes" area instead of Maston Allotment. This included BLMs request for deletion of site-specific mitigation and monitoring plan for Maston Allotment, since BLM had not completed their Cline Buttes Subarea Plan and thus was not able to specifically identify mitigation sites. BLM suggested developing mitigation and monitoring plan once mitigation areas were identified, and leveraging mitigation activities by adding other sources of funding to achieve BLM land management goals. See attached email from Bill Dean, BLM dated February 26, 2007. |
| March-July 2007 | Make very minor changes to HSIs per ODFW request; add more explanation of rationale for HSIs. |
| August-December 2007 | Continue discussions with ODFW on Mitigation Plan elements including fencing, shoreline vegetation at golf course and other created ponds, funding, guarantees, and cost estimate for mitigation, golf course and development acreages, fire management effects. Revise the modified HEP HSIs per discussion with ODFW which resulted in an increase in estimated mitigation acreage. |
| January-February 2008 | Make major changes to modify HEP analysis as requested by ODFW to include offsite impacts for adjacent areas within 1 mile of the proposed resort to account for indirect impacts by conducting a literature review and working with ODFW to establish disturbance distances and reduction in HSI value due to disturbance for each species, make corresponding revisions to Mitigation Plan. |
| March-April 2008 | Conduct GIS analysis of disturbance zone acreages, work with ODFW to decide that in overlapping zones, the zone with the greatest reduction in HSIs would be used in overlap areas. Revise calculations in modified HEP and revise Mitigation Plan. Adjust HEP model per ODFW comments (this is Table D-2 in the FMP). Add calculations of impacts of traffic increases on Cline Falls Highway to HEP, modify Mitigation Plan. Make minor revisions in response to BLM and ODFW comments on Mitigation Plan. |

**Question 3. How do I evaluate the broader impacts of the development ascribed to the proposal? For example, the opponents argue that cumulative impacts must be considered**

**in the wildlife analysis, but do not explain how those impacts can be quantified or measured against the proposed mitigation.**

**Response:** Indirect and cumulative impacts were considered in the modified HEP analysis. Figures E-1 through E-6 and the Modified HEP Analysis spreadsheet first show the indirect impacts of disturbance during current (baseline) conditions and then calculate the future indirect and cumulative impacts of disturbance after development. Table E-1 in the Wildlife Mitigation Plan shows the reduction factors that TtEC and ODFW developed to account for disturbance of various types of development; these factors were applied to the HSIs for each evaluation species. The reductions in HSIs were applied over the disturbance distance for each evaluation species and this was translated into habitat units. The reduction in habitat units was included in the overall model and the result was an increase in estimated mitigation acreage from 3,906 acres without looking at indirect/cumulative impacts to 4,501 acres after accounting for indirect/cumulative impacts. In a regional sense, development of the resort will result in a loss/urbanization of an additional 1,980 acres, or 6 percent, of juniper habitat in 31,864 acres of land managed by the BLM in the Cline Buttes Subarea of the Upper Deschutes planning area. Development of the resort will not block movement of animals between the Cascades to the west and the Deschutes River to the east because native habitat managed by the BLM will remain to the west, south, and east. It should be noted that the proposed resort is within the area designated as suitable for destination resorts by Deschutes County, after natural resource considerations such as the absence of important winter range mapped by ODFW.

**Question 4. How do mitigation payments/fees assure that the "no net loss" standard is satisfied? Also, how did the applicant reach the estimated value of the habitat in order to establish a fee-based system to address those impacts?**

**Response:** The mitigation payments/fees provide assurance that the necessary funding will be available for execution of the mitigation when it is needed, as phases of the development are constructed. Since ODFW has concluded that the mitigation plan results in no net loss, and the funding will be provided for construction as well as long-term maintenance, and monitoring of the mitigation, this is how the standard would be met.

The modified HEP model made a set of assumptions, to which ODFW agreed, as to the habitat quality gains that could be achieved through the mitigation activities proposed. At the bottom of the modified HEP model (Modified HEP analysis in Exhibit E of the Mitigation Plan dated April 9, 2008, these calculations are shown. The costs of each mitigation activity were estimated, based on existing cost information provided by the BLM or other sources; these sources are documented in Table 2 in the Mitigation Plan.

**Question 5. How does compliance with the "Firewise" development standards encourage/inhibit maintenance or restoration of on-site habitat?**

**Response:** These development standards occur in several different zones. The zones within the resort that overlay native preserved and restored habitat, as affected by the Firewise program, will actually result in restoration of vegetative structure and species composition that more closely resembles the original old growth juniper vegetation of the area. The pre-settlement vegetation of the area consisted of few young junipers and scattered old junipers, with an understory dominated by native herbs and shrubs. After settlement and fire suppression, invasion by younger junipers has changed the vegetation, along with the introduction of invasive herbaceous

species such as cheatgrass. Juniper management will include removal of 75% of young junipers and preservation of old growth trees. Cheatgrass is fire-prone and will be removed. Native shrub vegetation will be thinned if it reaches over 50% cover and patches with this density are rare on the Thornburgh property. Overall, according to information provided by Joe Stuttler, the Deschutes county forester, this fire management will be beneficial to habitat.

**Specific Responses to Opposition Letters**

Responses from Mr. Bret Michalski and Mr. David Dobkin were addressed to Paul Dewey and discussed some of the concerns and limitations of the wildlife mitigation plan for the proposed Thornburgh project. There were several similarities between the two letters. Below is a summary of the general issues and responses to each.

*Issue: The Use of the Habitat Evaluation Procedure is Problematic*

- Specific concerns regarding the use of the HEP analysis and how it was applied in this project and the assumed limitations were addressed earlier in this memo.

*Issue: Mule deer habitat impact is poorly addressed in the plan*

- The proposed area of the Thornburg Resort is not considered critical winter or summer habitat for mule deer; however this area is considered as part of the maximum range for mule deer, both historic and current. The lack of distinct seasonal use by mule deer in the proposed project areas led to the use of "periodic" rather that "seasonal." In an email dated April 9, 2008, Steven George, Deschutes District Wildlife Biologist with ODFW, stated that mule deer habitat in the project area "has not been significant enough to warrant protection under Deschutes County Goal 5." Goal 5 outlines guidelines and implementation to protect natural resources, scenic and historic areas and open spaces (Oregon Administrative Rule 660-015-0000(5)).
- Michalski further speculates, based on his assumption that the area provides critical winter habitat for mule deer, that bitterbrush is likely a critical resource for deer in this area. He further states that the retention of bitterbrush within the project area and in areas considered for off-site mitigation is essential. Biologically, the use of the words "critical and essential" assumes that this resource is a limiting factor influencing the species survival in the area. This statement has not been verified using past studies and employs the same baseless assumptions he states as an underlying flaw in the mitigation plan. Further, the Maston Allotment, a parcel of land managed by the BLM and considered for off-site mitigation is located within 2 miles of the proposed project has been identified as having densities of bitterbrush that exceed normal levels. This area was considered for rabbitbrush thinning to promote a more diverse plant community and provide suitable habitat for wildlife species, including mule deer.

*Issue: Increased road impacts to mule deer and other wildlife are poorly documented and addressed.*

- The direct and cumulative impact of roads was addressed as part of the mitigation plan that was submitted with the Final Master Plan. The acreage within 1 mile of all existing and proposed roads were calculated and applied to HEP model to determine the net change of Habitat Units both onsite and offsite (Mitigation Plan dated April 9, 2008; Exhibit E, Table E-1, Figure E-6). This distance, along with the Habitat Suitability Index were derived in consultation with ODFW and relied on past studies concerning wildlife and habitat disturbances from roads (Forman 2000, Gaines et al. 2003). The mitigation plan goes further to limit off-road travel beyond designated roadways and recommended the enforcement of a speed limit within the resort.

*Issue: The mitigation plan does not adequately consider the impact of increased European starling populations on reduced available cavities for mountain bluebird and northern flicker.*

- The placement of a minimum of 100 bluebird boxes will appropriately mitigate for the loss of cavities from starling populations. Using the correct nestbox design, starlings have been effectively excluded from mountain bluebird nest boxes (Aylesworth 1984, Lehmann 1997).

*Issue: The creation of undercrossing suitable to prevent increased mortality to reptiles and small mammals is unlikely.*

- The use of road undercrossings to provide wildlife a safe and effective means to travel within a roaded area is nothing new. This technique has successfully been used for a variety of wildlife species from bears to beetles and best management practices outlining the instillation and maintenance of undercrossings are available (Beier et al 2008). Sites of undercrossings were chosen based on topography and the presence of preserved native habitat on both sides of the roads.

*Issue: The noxious weed plan mentions noxious weed and weed control and offers to eliminate cheatgrass. The feasibility of this action is in question.*

- At the direction of ODFW and BLM, the specific plan on how to manage noxious weeds and cheatgrass (by biological, mechanical or chemical means) was left general to be able to adapt to the appropriate management plan once the presiding agency was identified. Reference to the Deschutes County noxious weed program was removed from previous versions of the document.

*Issue: Free-roaming dogs and cats will still be allowed in the resort due to a lack of enforcement. No compliance rate is provided.*

- The enforcement and compliance associated with activities at the resort are contained with the Conditions, Covenants and Restrictions, which Michalski cites but proceeds to discount in his statement. The statement that dog and cat owners will willingly unleash or otherwise set their animals free is speculative. To state that this would be the situation at the proposed resort is baseless. At other local resorts such as Sunriver, free-roaming pets are prohibited and the compliance level is actually very high.

*Issue: Areas considered for off-site mitigation have not been identified.*

- As stated in the final mitigation report: "The BLM has yet to complete a subarea plan for the Cline Buttes, it is still not possible to identify specific sites or areas where the proposed offsite mitigation will be implemented. Nevertheless, some of the mitigation actions described below can be implemented on BLM lands before the Cline Buttes Subarea Plan is completed. When the BLM completes the subarea plan for the Cline Buttes area, the BLM, TRC, and ODFW will specify the areas where the remaining mitigation will take place." In an email from Bill Dean, BLM Wildlife Biologist on February 26, 2007, to TtEC (attached) it underscores the uncertainly of selecting a specific parcel of land for off-site mitigation and suggests the use of generalized habitat types and sizes to be considered for mitigation.

*Issue: The plan fails to address cumulative impacts.*

- The response to question #3 of the hearing officer addresses this issue.

*Issue: The species list provided in the mitigation plan is inaccurate.*

- This comment is correct; the wrong species list was inadvertently provided in the Mitigation Plan and the correct species list is provided in this submittal.

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# MEMORANDUM
# OREGON DEPARTMENT OF FISH AND WILDLIFE

Phone: (541) 388-6444 ex. 30 Fax: (541) 388-6049
e-mail: glen.t.ardt@state.or.us

To: Lynn Sharp
From: Glen Ardt
Date: November 22, 2004
Subj: Thornburgh HEP

Following are a few suggestions, observations:

- **Golden Eagle** - Drop the Golden Eagle, I'd say it's adequately covered by the Red-tailed Hawk.
- **Kestrel** - Even though lakes represent few acres, it's not clear how they provide breeding habitat for Kestrels or small mammals. Are there upland acres that are part of the lake acres?
- **Red-tailed** - Enhancing Red-tailed breeding habitat by 33% and foraging habitat by 66% over current conditions in the undeveloped area seems to be high given human harassment. I think we'd be doing well if we broke even on this one.
- **Bluebird** – golf course after enhancement, I'd drop it to 0.3 for breeding and foraging. 28% is in rough, which will provide foraging, however, will it really provide better breeding habitat than the undeveloped area (0.5), or the residential area (0.3)?
- **Small Mammals** – As I recall, the area is in pretty poor shape so I'd give it an 0.3 for current conditions for breeding and foraging. Post development 0.3 B/F for undeveloped, 0.0 B/F for everything else – residential, facilities, golf courses, lakes. After enhancement 0.5 B/F for undeveloped, 0.2 B/F for residential (cats, dogs and intolerance by residents), 0.3 B/F golf courses since 28% is in rough, and 0.1 B/F for Lakes if 10% of the Lake acreage is in upland fringe.
- **Western Fence Lizard** – I'd drop your 0.6 to 0.3 for breeding and foraging in the residential area due to cats. Also, I'd drop your 0.6 to 0.3 for the golf course as well since 28% is in rough.
- **Northern Flicker** – I'd add the Northern Flicker as an evaluation species since many trees will be removed thereby reducing breeding and foraging habitat. Current Northern Flicker habitat is probably high for breeding and foraging given the old growth trees. I'd give it a 0.7 or 0.8. Post development would reduce the habitat by the amount of tree clearing. I don't see much in the way of enhancement opportunities so I'd carry the post development figure over to after enhancement as well.

EAGLE CREST, INC. WILDLIFE MITIGATION PLAN

# HABITAT EVALUATION ASSESSMENT

FOR

EAGLE CREST EXPANSION #3

FOLLOWING ARE WILDLIFE HABITAT VALUES (**B**)EFORE DEVELOPMENT, (**A**)FTER DEVELOPMENT, AND AFTER (**E**)NHANCEMENT ACTIVITIES. COLUMNS ARE TIED TO BREEDING HABITAT AND FORAGING HABITAT, AND ARE BROKEN OUT BY ACREAGE BLOCKS. EACH ACREAGE BLOCK WILL BE TREATED DIFFERENTLY DURING DEVELOPMENT. 70 ACRES WILL NOT BE DEVELOPED, BUT WILL BE ENHANCED. 170 ACRES WILL BE DISTURBED AREAS OF OPEN SPACE THAT WILL BE RESTORED AND ENHANCED. 100 ACRES WILL BE DISTURBED ACRES AROUND DWELLINGS WHERE THE NATIVE VEGETATION WILL BE RESTORED TO NATURAL CONDITIONS.

| SPECIES | BREEDING | | | BREEDING | | | BREEDING | | | FORAGING | | | FORAGING | | | FORAGING | | | B & F | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 70 | | | 170 | | | 100 | | | 70 | | | 170 | | | 100 | | | 140 | |
| | B | A | E | B | A | E | B | A | E | B | A | E | B | A | E | B | A | E | Before | |
| Golden Eagle | .0 | 0 | 0 | .0 | 0 | 0 | .0 | 0 | 0 | .3 | .1 | .2 | .3 | 0 | 0 | .3 | 0 | 0 | 0 | .3 |
| | .0 | 0 | 0 | .0 | 0 | 0 | .0 | 0 | 0 | .21 | .7 | .14 | .51 | 0 | 0 | .30 | 0 | 0 | 0 | 42 |
| American | .2 | .2 | .2 | .2 | .1 | .2 | .2 | 0 | 0 | .2 | .2 | .4 | .2 | .3 | .4 | .2 | .1 | .2 | .2 | .2 |
| Kestrel | 14 | 14 | 14 | 34 | 17 | 34 | 20 | 0 | 0 | 14 | 14 | 28 | 34 | 51 | 68 | 20 | 10 | 20 | 28 | 28 |
| Red-tailed | .2 | .2 | .2 | .2 | 0 | 0 | .2 | 0 | 0 | .3 | .3 | .5 | .3 | .2 | .4 | .3 | 0 | .1 | .2 | .3 |
| Hawk | 14 | 14 | 14 | 34 | 0 | 0 | 20 | 0 | 0 | 21 | 21 | 35 | 51 | 34 | 68 | 30 | 0 | 10 | 28 | 42 |
| Mountain | .4 | .4 | .4 | .4 | .4 | .7 | .4 | .2 | .2 | .3 | .4 | .5 | .3 | .4 | .6 | .3 | .4 | .5 | .4 | .3 |
| Bluebird | 28 | 28 | 28 | 68 | 68 | 119 | 40 | 20 | 20 | 21 | 28 | 35 | 51 | 68 | 102 | 30 | 40 | 50 | 56 | 42 |
| Small | .7 | .7 | .8 | .7 | .6 | .8 | .7 | .1 | .2 | .6 | .6 | .8 | .6 | .6 | .8 | .6 | .3 | .4 | .7 | .6 |
| Mammals | 49 | 49 | 56 | 119 | 102 | 136 | 70 | 10 | 20 | 42 | 42 | 56 | 102 | 102 | 136 | 60 | 30 | 40 | 98 | 84 |
| Western | .6 | .6 | .8 | .6 | .6 | .8 | .6 | .2 | .3 | .6 | .6 | .8 | .6 | .6 | .8 | .6 | .3 | .4 | .6 | .6 |
| Fence Lizard | 42 | 42 | 56 | 102 | 102 | 136 | 60 | 20 | 30 | 42 | 42 | 56 | 102 | 102 | 136 | 60 | 30 | 40 | 84 | 84 |
| Mule Deer | .5 | .3 | .3 | .5 | .2 | .2 | .5 | 0 | 0 | .5 | .3 | .4 | .5 | .3 | .4 | .5 | 0 | 0 | .5 | .5 |
| | 35 | 21 | 21 | 85 | 34 | 34 | 50 | 0 | 0 | 35 | 21 | 28 | 85 | 51 | 68 | 50 | 0 | 0 | 70 | 70 |
| SUMMARY | 182 | 168 | 189 | 442 | 323 | 459 | 260 | 50 | 70 | 196 | 175 | 252 | 476 | 408 | 578 | 280 | 110 | 160 | 364<br>756 | 392 |

Total habitat units before development = 2592
Total habitat units after development = 1234
Total habitat units after enhancement = 1708

2592 – 1234 = 1358 lost habitat units
1708 – 1234 = 474 on-site restored habitat units
2592 – 1708 = 884 habitat units to be restored off-site

T.B KN

Oregon
Ted Kulongoski, Governor

**Department of Fish and Wildlife**
**High Desert Region**
61374 Parrell Road
Bend, OR 97702
(541) 388-6363
FAX (541) 388-6281

February 9, 2005

Deschutes County
Community Development Department
Planning Division
117 NW Lafayette Ave
Bend, OR 97701

ATTN: Kevin Harrison
RE: Thornburgh Resort Development – Cline Butte

Thank you for the opportunity to comment on this land use application.

The property associated with this application, although not within a County adopted Goal 5 resource area includes habitat that is important for shrub step dependant wildlife species..

The ODFW has been working with the applicant to develop an acceptable wildlife report with mitigation measures that we feel will be adequate to protect the wildlife resources impacted by this project. The report is not yet completed but we feel that the applicant will be able to develop an acceptable program to mitigate the impacts.

We would like the County to consider, as a condition of approval, that the applicant provide an acceptable wildlife plan that the applicant, County, and ODFW agree with.

If we can be of any further assistance please feel free to contact me.

Sincerely,

Steven George
Deschutes District Wildlife Biologist
steven.w.george@state.or.us

cc: Miles Conway
Lynn Sharp

LUBA # 2008-203
01298

Oregon
Theodore R. Kulongoski, Governor

**Department of Fish and Wildlife**
**High Desert Region**
61374 Parrell Road
Bend, OR 97702
(541) 388-6363
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February 14, 2006

Lynn Sharp
Tetra Tech EC, Inc.
1020 SW Taylor, Suite 530
Portland, Oregon 97205-2543

RE: Thornburgh Wildlife Mitigation Plan

Thank you for the latest iteration of the Thornburgh wildlife mitigation plan (January 31, 2006). I reviewed the plan and via the track change feature have provided comments back to you.

Due to the number of Destination Resorts in Deschutes County, being implemented, planned, or proposed, Oregon Department of Fish and Wildlife (ODFW) is requesting additional information from the Thornburgh Destination Resort developer to assure no net loss of wildlife values. ODFW requests the following:

- Three maps as specified below, for ODFW use and to be included in the County planning process,
- A maintenance schedule to track wildlife mitigation that will require maintenance over time (identify what mitigation will be maintained and how often),
- A complete accounting of the wildlife mitigation foundation fund; fund tracking, who has access to funds, how funds will be dispersed, etc.

This information will enable better communication between the developer, ODFW and the County during resort planning, implementation, and long-term maintenance to ensure wildlife mitigation is addressed and maintained.

1) Map of Existing Conditions including (12" or greater to the mile):

- Topography 20' contours
- Soil types and associated vegetation types (i.e., NRCS),
- Existing roads, trails, structures, fences, power lines, canals, ownership, etc.
- Water sources
- Unique features (rocky outcrops)
- Township, range, and section numbers along with latitude and longitude along the map edge

2) Aerial photo taken within the past five years (i.e., orthoquad) with township, range and section numbers

3) Map of Proposed Developments including (12" or greater to the mile):

- Topography 20' contours
- Resort developments including structures (lot footprint), roads, water features, paths, fences, drainages, power lines, ownership, etc.
- Retained native vegetation areas
- Township, range, section numbers with latitude and longitude along the map edge
- Unique features (rocky outcrops)
- Identify each area in which the resort plans to implement a specific wildlife mitigation measure, i.e., areas where bird boxes will go, areas where rocky piles will be constructed, etc.
- Identify anticipated restoration areas

Sincerely,

Glen Ardt
Wildlife Habitat Biologist

TB

Bill_Dean@or.blm.gov
02/26/2007 03:35 PM

To Lynn.Sharp@tteci.com, Glen.T.Ardt@STATE.OR.US, kameron@bendcable.com
cc Steven_Cohn@blm.gov, Greg_Currie@or.blm.gov, Janet_Hutchison@or.blm.gov
bcc

Subject Mitigation Plan Review

Lynn, Glenn and Kameron attached please find a new copy of the proposed mitigation plan. I used "Track Changes" to provide edits and comments. I high-lighted my comment in yellow. Because the file was large in size I deleted all the images and all of the Appendix since I did not make any edits/comments there. Take a look and call me if you have questions.

There are two main points I want to mention. First, I think the plan should be general in relation to the types of habitats and the amounts of each habitat type to be improved/restored. For example, I suggest you talk about total acres of old growth juniper woodlands and shrub-steppe habitats combined and not split them out Often times the habitats are intermingled and difficult to separate them out for a logical treatment unit. I think it will be easier to pick one or more blocked areas and manage what is there and not worry so much about counting individual habitat units. Also, the methods could change as we are continuing to develop the Cline Buttes plan and we'll have to be consistent with what is said in the Decision Record.

The second point is that we should not be completely focussed on doing all the work in the Maston Allotment. We could possibly use the Thornburg Resort mitigation funds as a match to acquire other funds (Federal sources) to manage a larger area in the Cline Buttes area. I believe we could apply for federal grants and if we already have private funding then we are only looking for a match. Often times the difficult part is getting private dollars for the federal match. The BLM is already planning to do work in this area and so if we can show 3 different parties working together then additional partners may be more easily recruited.

I beleive our "collective" goal is to improve the habitat conditions across as much of the area as possible. If we all work together I think we can get additional partners. Some partners may provide funding while other may provide work support. The BLM (interdisciplinay team members) could provide the coordination, apply for grants and direct the implementation. We have not yet talked about this together in a group setting, but I think during one of our next group meetings we should begin talking about how we can get things done on the ground.

Sincerely,

Bill Dean
Wildlife Biologist
Deschutes Resource Area,
Prineville District, Bureau of Land Management
541-416-6887

(See attached file: Maston Allot Mit Plan 020707 rev 1 bd edits 022607.doc)

Maston Allot Mit Plan 020707 rev 1 bd edits 022607.doc

# MEMORANDUM
# OREGON DEPARTMENT OF FISH AND WILDLIFE

Phone: (541) 388-6444 ex. 30 Fax: (541) 388-6049
e-mail: glen.t.ardt@state.or.us

To: Amy Stuart, Steven George, Ted Wise, Molly Brown, Bill Dean, Kameron DeLashmutt, Lynn Sharp, Peter Livingston, Ruth Wahl
From: Glen Ardt
Date: February 5, 2008
Subj: Thornburgh Fish and Wildlife Impact Assessment and Mitigation Plan - Update

ODFW (myself, Steven George, Ted Wise) had a conference call with Thornburgh (Kameron DeLashmutt, Lynn Sharp, Peter Livingston, Martha Pagel) to discuss the status of Thornburgh's fish and wildlife impact assessment and mitigation plan 1/31/08. Thornburgh asked ODFW to help bring BLM up-to-date and in-sync with the impact assessment and development of mitigation measures. The intent of this Memo is to bring BLM up to speed relative to the group conference call and a conversation I had with Peter regarding assessment of projected fish and wildlife impacts and development of mitigation measures to meet the intent of Deschutes County code "*Any negative impact on fish and wildlife resources will be completely mitigated so that there is no net loss or net degradation of the resource*" (DCC 18.113.070(D). This standard was reaffirmed via the 15 page State Court of Appeals finding (November 7, 2007).

For the following bulleted information, all of you on the distribution list please provide clarification where needed, information where there are gaps, or identify issues or concerns relative to the bullets below. Please reply to all on the distribution list.

- ODFW's role with the County is to provide technical advice by reviewing Thornburgh's submitted fish and wildlife impact assessment and mitigation plan and to provide comments on the adequacy of the plan meeting the intent of Deschutes County code, DCC 18.113.070(D).
- ODFW's role with Thornburgh is to provide recommendations relative to fish and wildlife impact assessments and associated mitigation measures that ODFW thinks are needed to meet the intent of DCC 18.113.070(D).
- A Deschutes County decision (2/06) and Land Use Board of Appeals decision allowed Thornburgh to finalize their fish and wildlife impact assessment and mitigation plan (initiated in 2004) sometime in the future. The State Court of Appeals reversed the County and LUBA decisions, thereby putting Thornburgh in the position of completing their fish and wildlife impact assessments and mitigation plan before the County will approve their Final Master Plan. Thornburgh indicated that completion of the impact assessments and development of fish and wildlife mitigation measures is on a fast track. Thornburgh's proposed timeline:
  - Draft Plan to ODFW & BLM by the end of February 2008
  - Finalized Plan to County by mid-March 2008
  - County hearing April 1st, 2008
- Deschutes County standard of "…no net loss or net degradation…" has been in place since 1992 (DCC 18.113.070(D)). Thornburgh mentioned that they were under the impression that their fish and wildlife impact assessment and mitigation plan would be similar to Eagle Crest (2000), Pronghorn (2002), and other approved destination resort fish and wildlife mitigation plans. The difference between Thornburgh and the previous fish and wildlife mitigation plans is that ODFW is providing Thornburgh recommendations to assess fish and wildlife impacts and develop mitigation measures that should meet the intent of the 1992 standard that were missing or not specific enough in the other plans. Since the earlier plans, ODFW has come to recognize the impact destination resorts have on offsite wildlife resources. One critical factor is to ensure the mitigation plan is measurable and enforceable. ODFW requested Thornburgh's attorney to help with this language.
- Thornburgh is developing mapped information ODFW recommended in February 2006 (21406 Maps email attachment) along with some additions or modifications to that information (08-01-31 Kameron DeLashmutt Letter attached) that ODFW thinks is needed to assess fish and wildlife impacts and to develop associated mitigation measures required by Deschutes County code DCC 18.13.070(D).

- During the conference call Thornburgh said they would conduct an offsite wildlife impact assessment and develop associated wildlife mitigation measures. ODFW provided the following human disturbance literature to Lynn Sharp in order to help her determine human disturbance criteria and methodology needed to conduct an offsite impact assessment. Thornburgh signed an MOU with BLM in 2005 that gives BLM approval authority of the developed wildlife mitigation plan. The MOU states: "*The Wildlife Mitigation Plan will be reviewed and approved by both the Oregon Department of Fish and Wildlife ("ODFW") and the BLM.*" (II. Terms of Agreement #7). Since BLM is party to approval of the fish and wildlife mitigation plan, and that offsite impacts will occur on BLM lands, ODFW recommends a meeting or conference call between Thornburgh, ODFW, and BLM (and maybe the County) to discuss and finalize human disturbance criteria and methodology to be used to conduct an offsite wildlife impact assessment.
    - Gaines, W.L., P.H. Singleton, R.C. Ross. 2003. Assessing the Cumulative Effects of Linear Recreation Routes on Wildlife Habitats on the Okanogan and Wenatchee National Forests. Gen. Tech. Rep. PNW-GTR-586. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 79 p.
    - Glennon, Michale, and Heidi Kretser 2005, Impacts of Wildlife from Low Density, Exurban Development; Information and Considerations for the Adirondack Park. Wildlife Conservation Society, Adirondack Communities & Conservation Program, Technical Paper No. 3, October 2005.
    - Hansen, A.J., R.L. Knight, J.M. Marzluff, S. Powell, K. Brown, P.H. Gude, K. Jones 2005, Effects of Exurban Development on Biodiversity: Patterns, Mechanisms, and Research Needs. Ecological Applications, 15(6), 2005, pp. 1893-1905. Ecological Society of America.
    - Rowland, M.M., M.J. Wisdom, B.K. Johnson, and M.A. Penninger. 2005. Effects of Roads on Elk: Implications for Management in Forested Ecosystems. Pages 42-52 in Wisdom, M.J., technical editor, The Starkey Project: a synthesis of long-term studies of elk and mule deer. 2004 Transactions of the North American Wildlife and Natural Resources Conference, Alliance Communications Group, Lawrence, Kansas, USA.
    - Wisdom, M.J., M.M. Rowland, L.H. Suring editors. 2005. Habitat Threats in the Sagebrush Ecosystem: Methods of Regional Assessment and Applications in the Great Basin. Alliance Communications Group, Lawrence, Kansas, USA.
    - Prineville BLM Upper Deschutes Resource Management Plan (2005); Effects Analysis for Wildlife Species of Focus and Source Habitats
    - Bill Ruediger traffic volume information on impacts to wildlife movement across roads

  <u>Background</u>

  October 26, 2007, ODFW recommended Thornburgh conduct an offsite wildlife impact assessment on three species most sensitive to human disturbance: American Kestrel (1/8 mile), Red-tailed hawk (1/4 mile), and Mule Deer (1/4 mile). Thornburgh said this recommendation was unreasonable since the other destination resorts only did a project boundary assessment and that this was the first time ODFW recommended this level of assessment. ODFW agreed and rescinded our recommendation November 9, 2007. ODFW received a copy of the State Court of Appeals findings January 23, 2008 and we realized Thornburgh would not meet the intent of DCC 18.113.070(D) unless offsite wildlife impacts were assessed and mitigation measures were developed. ODFW informed Thornburgh of our interpretation and recommended that Thornburgh do an offsite wildlife impact assessment and develop associated mitigation measures. Partial or full offsite wildlife impact assessments and mitigation measures were recommended for Remington Ranch (Golden Eagles - 2007), Hidden Canyon (EFU & access roads -2007), and Crescent (full -2007).
- ODFW brought an independent ground water study (Yinger Report 8/2007) to Thornburgh's attention that potential impacts to springs and seeps in the Middle Deschutes and in Whychus Creek from Thornburgh and other water withdrawals could occur. ODFW is concerned that Thornburgh's water withdrawal could impact the fisheries, some listed, in these reaches and recommended that Thornburgh assess the report and provide documentation that no impact to spring and seep water quantity or quality will occur (January 31, 2008 DeLashmutt Letter).
- Thornburgh will put together the list of action items generated from the conference call and distribute them.

"Glen Ardt"
<Glen.T.Ardt@state.or.us>
02/06/2008 03:45 PM

To "<Lynn.Sharp@tteci.com>

cc "Steven George" <Steven.W.George@state.or.us>, "Ted Wise" <Ted.G.Wise@state.or.us>, "Amy Stuart" <Amy.M.Stuart@state.or.us>

bcc

Subject Thornburgh Mitigation Options

Lynn, below is ODFW's prioritized list (with flexibility depending on availability) of offsite mitigation options. Details need to be discussed and developed such as timeframes (within 5 years), ownerships (public/ non-profit), development of a correlation between habitat units to be mitigated for and corresponding habitat unit value of each mitigation option (acres, dollars, cfs), etc.

1) Land purchase within Deschutes County
2) Conservation Easement(s) on property to protect fish and wildlife values inperpetuity
3) Wildlife mitigation trust fund to improve wildlife habitat in Deschutes County
4) Water back into the middle Deschutes

Glen Ardt - ODFW
Wildlife Habitat Biologist
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Bend, Oregon 97702
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541-388-6049 fax

TB

"Glen Ardt"
<Glen.T.Ardt@state.or.us>
02/28/2008 08:05 AM

To <Lynn.Sharp@tteci.com>
cc <Erik.Jansen@tteci.com>
bcc
Subject RE: Proposed effects of disturbances on SIs - TB

Lynn, I suspect the default for any of the disturbance bands broken into four bands would be 0, 25, 50, 75, 100 beyond the 4th band (or summed -50% if my math is correct). Modifications to this would be based on professional judgement.

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-----Original Message-----
From: Lynn.Sharp@tteci.com [mailto:Lynn.Sharp@tteci.com]
Sent: Tuesday, February 26, 2008 2:02 PM
To: ARDT Glen T
Cc: Erik.Jansen@tteci.com
Subject: Proposed effects of disturbances on SIs - TB

Glen, here's a draft table detailing what the effects on habitat suitability indices (HSIs) would be for the five types of disturbance that exist now on and within 1 mile of the Thornburgh property, and which we would also apply similarly to our calculations of impacts of the proposed project.

The percent reductions for the Eagle Crest and Exurban development were derived from the reductions in SI we agreed on in the latest HEP model (at least I think I was looking at the latest version!); the reductions for the other three disturbances (motorized trail, smaller trail, and highway) are best professional judgment on my and Erik Jansen's part. We couldn't find anything specific in the literature that related to HSI reduction.

In addition, I would like to propose that in places on our map where two or more of the disturbance zones overlap, that we use the reduction amount that's the largest among them.

Please review and I'll call you at 4 to discuss. Hopefully we can agree on these soon so we can crunch the numbers.

(See attached file: Disturbance distances and SI effects 022608.xls)

Lynn Sharp | Senior Ecologist and Project Manager
Direct: 503.222.4546 | Main: 503.221.8636 | Fax: 503.227.1287 | Cell: 503.702.3198
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1750 SW Harbor Way, Suite 400 | Portland, OR 97201 | www.tteci.com

"Glen Ardt"
<Glen.T.Ardt@state.or.us>
03/14/2008 09:30 AM

To "Ruth Wahl" <Ruth_Wahl@co.deschutes.or.us>
cc "Amy Stuart" <Amy.M.Stuart@state.or.us>, "Steven George" <Steven.W.George@state.or.us>, <Lynn.Sharp@tteci.com>, "Livingston, Peter"
bcc
Subject Thornburgh Wildlife Mitigation Plan

Ruth,
Thornburgh has been actively working on the recommendations ODFW provided that we think are needed to meet the intent of DCC. However, there are some recommendations that are unresolved as to how Thornburgh will proceed that could modify the impact assessment (i.e., fencing standards), and there are some recommendations that have not been acted upon or discussed as to the need to do them (i.e., increase in traffic on Cline Falls Hwy and impacts to wildlife movement). ODFW has not reviewed the latest version of Thornburgh's mitigation plan (3/11/08) so we are not able to provide specific comments relative to this latest version. Overall, Thornburgh has made considerable progress assessing potential resort impacts to fish and wildlife resources along with identifying measures that could mitigate those impacts.

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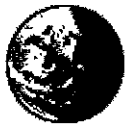
**From:** Ruth Wahl [mailto:Ruth_Wahl@co.deschutes.or.us]
**Sent:** Thursday, March 13, 2008 5:20 PM
**To:** Glen Ardt
**Subject:** Thornburgh Wildlife Mitigation Plan

Hi Glen,
Just checking in to see how things are going. Does Thornburgh have a wildlife mitigation plan that is satisfactory?
Please let me know.

*Ruth Wahl*
*Associate Planner*
*Deschutes County Community Development*
*117 NW Lafayette*
*Bend, OR 97701*
*Phone: 541-388-6555*
*Fax: 541-385-1764*



"Glen Ardt"
<Glen.T.Ardt@state.or.us>
03/25/2008 11:22 AM

To "Kameron DeLashmutt" <kameron@bendcable.com>
cc <Lynn.Sharp@tteci.com>, "Amy Stuart" <Amy.M.Stuart@state.or.us>, "Steven George" <Steven.W.George@state.or.us>
bcc
Subject Wildlife Assessment and Mitigation Plan

Kam,
Lynn asked me to send you an email relative to ODFW's "approval" or "signing" of the Thornburgh Fish and Wildlife Assessment and Mitigation Plan (mitigation plan). For clarification, it is not ODFW's role or position to approve or sign the mitigation plan. However, ODFW typically obtains a copy of the submitted mitigation plan from the County, we review it, and we provide comments back to the County relative to the plan meeting the intent of DCC 18.113.70 D. Now points you could expect to see would be the same stuff we have been discussing since November 2004 such as there being extensive collaboration between TRC and ODFW, discussion of recommendations by ODFW to TRC relative to the assessment and various mitigation measures that are in the plan that we thought were needed to meet the intent of DCC, etc.

I hope this helps

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"Glen Ardt"
<Glen.T.Ardt@state.or.us>
03/26/2008 11:31 AM

To -<Lynn.Sharp@tteci.com>
cc "Amy Stuart" <Amy.M.Stuart@state.or.us>, "Steven George" <Steven.W.George@state.or.us>
bcc
Subject HEP

History: This message has been replied to and forwarded.

Lynn,
Ok, here's my take on the disturbance HEP after talking to two groups of ODFW biologists.
Tetk & ODFW collaborated on qualitative HEP factors for:
* Disturbance Factors for a) existing eagle crest, b) exurban, c) existing motorized, d) existing motorized small trail, e) existing Hwy
* We agreed to combine a) & b) into one factor (A) and c), d), & e) into another factor (B) with A being a higher disturbance factor than B
Onsite:
* Before development Suitability Index (SI) less the disturbance factor associated with A or B and using the higher of the two (A) where the two overlap
* Post development SI
* Post development after enhancement SI
Offsite:
* Before development SI less the disturbance factor associated with A or B and using the higher of the two (A) where the two overlap
* Post development SI less the disturbance factor associated with A or B and using the higher of the two (A) where the two overlap, or in other words where there is an existing B disturbance factor and TRC overlaps the existing B, the the overlap portion will become an A

These qualitative factors were applied to acreage to come up with a quantitative number, or X wildlife habitat units.

Realizing that where A & B overlap there is a quantitative (cumulative) effects occurring, but it wouldn't be a sum of both. It would be the high (A), plus a portion of the lower (B) disturbance factor. To figure this out would require a qualitative adjustment to B.

Given the amount of qualitative (professional judgement) that has gone into the HEP, it seems that tetk could justify the model developed, using the higher of the two disturbance factors rather than conducting another qualitative adjustment to B when A & B overlap. The model is based on qualitative factors or professional judgement, rather than quantitative field measurement, so the level one can tweak the model realistically is limited.

Of course the elephant in the room is how realistic is the model anyway when it is based on professonal judgement, rather than quantifiable field measurements. Of course a full HEP would also entail professional judgement to build the field measurements for each of the species being evaluated. In other words we would be right back where we are, except field measurements would also need to be conducted.

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"Glen Ardt"
<Glen.T.Ardt@state.or.us>
04/15/2008 05:08 PM

To "Kameron DeLashmutt" <kameron@bendcable.com>, "GEORGE Steven W" <Steven.W.George@state.or.us>
cc "Lynn Sharp" <lynn.sharp@tteci.com>, "Peter Livingston" <plivingston@schwabe.com>, "Erik.Jansen@tteci.com>
bcc
Subject Thornburgh mitigation plan BLM Comments

Kameron,
BLM's comments look fine.

Glen Ardt - ODFW
Wildlife Habitat Biologist
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-----Original Message-----
From: Kameron DeLashmutt [mailto:kameron@bendcable.com]
Sent: Monday, April 14, 2008 10:36 AM
To: Glen Ardt (ORFW); GEORGE Steven W
Cc: Lynn Sharp; Peter Livingston; Erik.Jansen@tteci.com
Subject: FW: FW: Thornburgh mitigation plan rev 25

Glen,
BLM had a couple of last minute edits. Please look it over and make sure you are ok. If so I will assemble the document.

Kameron DeLashmutt
O) 541-318-9950 ext 104
C) 541-350-8479
F) 541-318-9954
E) kameron@bendcable.com

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If you receive this in error please advise the sender and destroy the electronic file that are included in this communication. Unless you have been given the express permission to forward this on or transmit it to others please do not do so.

-----Original Message-----
From: Kameron DeLashmutt [mailto:kameron@bendcable.com]
Sent: Monday, April 14, 2008 9:49 AM
To: Greg_Currie@or.blm.gov
Subject: FW: FW: Thornburgh mitigation plan rev 25

Greg,
I made a couple of edits to your edits.

Kameron DeLashmutt
O) 541-318-9950 ext 104
C) 541-350-8479
F) 541-318-9954
E) kameron@bendcable.com

This communication is confidential and intended only for the addressee(s).
If you receive this in error please advise the sender and destroy the electronic file that are included in this communication. Unless you have
been given the express permission to forward this on or transmit it to others please do not do so.

-----Original Message-----
From: Greg_Currie@or.blm.gov [mailto:Greg_Currie@or.blm.gov]
Sent: Monday, April 14, 2008 9:13 AM
To: Kameron DeLashmutt
Subject: Re: FW: Thornburgh mitigation plan rev 25

Kameron:

What I am suggesting is fairly minor edits, basically to clarify things, at
the review and request of Molly. But lets chat. I will call you shortly.
The best way for you to get ahold of me is to try my pers cell, 541-788-5106, as I still do not have an office phone. I understand your concerns.

Greg Currie
Recreation Planner - Upper Deschutes Planning Team
Bureau of Land Management, Prineville District
541-416-6711

080415 Mit Plan Final BLM Comments.doc

TB

"Glen Ardt"
<Glen.T.Ardt@state.or.us>
07/11/2008 01:46 PM

To -<Lynn.Sharp@tteci.com>
cc
bcc
Subject FW: ODFW Comments Thornburgh Final Master Plan

Glen Ardt - ODFW
Wildlife Habitat Biologist
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---

**From:** Glen Ardt
**Sent:** Tuesday, June 17, 2008 10:28 AM
**To:** 'Kameron DeLashmutt'; Peter Livingston; 'Pagel, Martha'
**Cc:** Alan Dale; Amy Stuart; Steven George; Ted Wise; Rick Kepler; 'Ruth Wahl'
**Subject:** ODFW Comments Thornburgh Final Master Plan

Kameron, Peter,
Kameron and Peter, sorry I didn't respond to your phone calls last week, I was on vacation and returned today. Attached is ODFW's June 13th letter to the County, a June 16th email to the County clarifying that the mitigation plan should meet the intent of DCC, and another June 16th letter to the County clarifying our June 13th letter regarding dam removal.

The intent of the wildlife assessment section of our letter was to support the methodology used rather than conducting a full HEP that would have most likely come up with comparable results. ODFW worked with the US Fish and Wildlife Service and the developers for the Running Y Ranch in Klamath County in 1993 to build HEP models for select evaluation species. From that effort, we concluded that developers could use a modified HEP to obtain comparable results, which ODFW has recommended to destination resort developers in Central Oregon ever since.

The intent of the wildlife mitigation section was to point out that implementation of the mitigation plan, if followed as outlined, should address the mitigation requirements for Deschutes County. Likewise, the plan is conceptual until implemented, yet there are checks in the plan to help assure implemention will be implemented as intended.

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080613 Thornburg ODFW Letter Final 6-13-08 Final.doc

080616 Wildlife Mitigation - Thornburg.doc

080616 ODFW clarification Thornburgh Final Master Plan RE dams.doc

## Exhibit C. List of Wildlife Species Potentially Occurring on the Thornburgh Property

| Common Name | Scientific Name | Status | Occurrence | | | Habitat | | |
|---|---|---|---|---|---|---|---|---|
| | | | Permanent Resident | Summer Resident | Migrant | Juniper/ Woodland | Shrub Steppe/ Grassland | Rock Outcrop |
| **Reptiles** | | | | | | | | |
| Gopher Snake | *Pituophis melanoleucus* | | X | | | | X | X |
| Night Snake | *Hypsiglena torquata* | | X | | | | | X |
| Racer | *Coluber constrictor* | | X | | | | X | X |
| Striped Whipsnake | *Masticophis taeniatus* | | X | | | | | X |
| Western Rattlesnake | *Crotalus viridis* | | X | | | | | X |
| Collared Lizard | *Crotaphytus bicinctores* | | X | | | | X | |
| Sagebrush Lizard | *Sceloporus graciosus* | | X | | | | X | |
| Short-horned Lizard | *Phrynasoma douglassii* | | X | | | X | X | |
| Side-blotched Lizard | *Uta stansburiana* | | X | | | | | X |
| Western Fence Lizard | *Sceloporus occidentalis* | | X | | | X | X | X |
| Western Whiptail | *Cnemidophorus tigris* | | X | | | | X | |
| Western Skink | *Eumeces skiltonianus* | | X | | | X | | |
| | | | | | | | | |
| **Birds** | | | | | | | | |
| American Kestrel | *Falco sparverius* | | X | | | | X | |
| Bald eagle | *Haliaeetus leucocephalus* | FT, ST | X | | X | X | X | X |
| Cooper's Hawk | *Accipiter cooperii* | | X | | | X | X | |
| Ferruginous Hawk | *Buteo regalis* | | X | X | | | X | |
| Golden Eagle | *Aquila chrysaetos* | | X | | | X | X | X |
| Red-tailed Hawk | *Buteo jamaicensis* | | X | | | X | X | X |
| Rough-legged Hawk | *Buteo lagopus* | | | | X | X | X | |
| Swainson's Hawk | *Buteo swainsoni* | | | X | | | X | |
| Gyrfalcon | *Falco rusticolus* | | | X | | | X | X |
| Merlin | *Falco columbarius* | | | | X | | X | |
| Prairie Falcon | *Falco mexicanus* | | X | | X | X | X | X |
| Burrowing Owl | *Athene cunicularia* | | X | | | | X | X |
| Great Horned Owl | *Bubo virginianus* | | X | | | X | | |
| Long-eared Owl | *Asio otus* | | X | | | X | | |
| Western Screech-Owl | *Otus kennicottii* | | X | | | X | | |
| Turkey Vulture | *Cathartes aura* | | | X | X | | X | X |
| Chukar | *Alectoris chukar* | | X | | | | X | X |
| Sage Grouse | *Centrocercus urophasiansu* | | X | | | | X | |
| Common Nighthawk | *Chordeiles minor* | | | X | | | X | |
| Common Poorwill | *Phalaenoptilus nuttallii* | | | X | | X | X | X |
| Mourning Dove | *Zenaida macroura* | | X | | | X | X | |
| Lewis's Woodpecker | *Melanerpes lewis* | | | X | | X | | |

| Common Name | Scientific Name | Status | Occurrence | | | Habitat | | |
|---|---|---|---|---|---|---|---|---|
| | | | Permanent Resident | Summer Resident | Migrant | Juniper/ Woodland | Shrub Steppe/ Grassland | Rock Outcrop |
| Rock Pigeon | *Columba livia* | | X | | | | | X |
| Brown-headed Cowbird | *Molothrus ater* | | | X | X | | X | |
| Western Meadowlark | *Sturnella neglecta* | | X | | | | X | |
| Black-billed Magpie | *Pica pica* | | X | | | | X | |
| House Finch | *Carpodacus mexicanus* | | X | | | X | | |
| Ash-throated Flycatcher | *Myiarchus cinerascens* | | | X | | | | |
| Gray Flycatcher | *Empidonax wrightii* | | | X | X | X | X | |
| Say's Phoebe | *Sayornis saya* | | | X | | X | X | |
| Loggerhead Shrike | *Lanius ludovicianus* | | X | | | X | X | |
| Black-throated Sparrow | *Amphispiza bilineata* | | | X | | | X | |
| Brewer's Sparrow | *Spizella breweri* | | | X | | | X | |
| Chipping Sparrow | *Spizella passerina* | | | X | | X | | |
| Dark-eyed Junco | *Junco hyemalis* | | X | | X | X | | |
| Green-tailed Towhee | *Pipilo chlorurus* | | | X | X | X | X | |
| Lark Sparrow | *Chondestes grammacus* | | | X | | | X | |
| Sage Sparrow | *Amphispiza belli* | | | X | | | X | |
| Savannah Sparrow | *Passerculus sandwichensis* | | | X | | | X | |
| Vesper Sparrow | *Pooecetes gramineus* | | | X | X | | X | |
| Barn Swallow | *Hirundo rustica* | | | X | X | | X | X |
| American Robin | *Turdus migratorius* | | X | | X | | X | |
| Mountain Bluebird | *Sialia currucoides* | | X | | X | | X | |
| Northern Mockingbird | *Mimus polyglottos* | | X | | | X | X | |
| Sage Thrasher | *Oreoscoptes montanus* | | | X | X | | X | |
| Townsend's Solitaire | *Myadestes townsendi* | | X | | | X | | |
| Black-throated Gray Warbler | *Dendroica nigrescens* | | | X | X | X | X | |
| Orange-crowned Warbler | *Vermivora celata* | | | X | X | | X | |
| Canyon Wren | *Catherpes mexicanus* | | X | | | | | X |
| Rock Wren | *Salpinctes obsoletus* | | X | | | | | X |
| Horned Lark | *Eremophila alpestris* | | X | | | | X | X |
| | | | | | | | | |
| **Mammals** | | | | | | | | |
| Long-eared Myotis | *Myotis evotis* | | X | | | | X | |
| Townsend's (Western) Big-eared Bat | *Plecotus townsendi* | | X | | | X | X | |
| Mountain Lion | *Felis concolor* | | X | | | | X | |
| Coyote | *Canis latrans* | | X | | | | X | |
| Mule Deer | *Odocoileus hemionus* | | X | | | X | X | |
| Pronghorn Antelope | *Antilocapra americana* | | X | | | X | X | |
| American Badger | *Taxidea taxus* | | X | | | X | X | |
| Bushy-tailed Woodrat | *Neotoma cinerea* | | X | | | | | X |

| Common Name | Scientific Name | Status | Occurrence | | | Habitat | | |
|---|---|---|---|---|---|---|---|---|
| | | | Permanent Resident | Summer Resident | Migrant | Juniper/ Woodland | Shrub Steppe/ Grassland | Rock Outcrop |
| Canyon Mouse | *Peromyscus crinitus* | | X | | | | | X |
| Dark Kangaroo Mouse | *Microdipodops megacephalus* | | X | | | | X | |
| Deer Mouse | *Peromyscus maniculatus* | | X | | | X | X | |
| Great Basin Pocket Mouse | *Perognathus parvus* | | X | | | X | X | |
| Northern Grasshopper Mouse | *Onychomys leucogaster* | | X | | | | X | |
| Ord's Kangaroo Rat | *Dipodomys ordi* | | X | | | | X | |
| Pinon Mouse | *Peromyscus truei* | | X | | | X | | X |
| Western Harvest Mouse | *Reithrodonotomys megalotis* | | X | | | | X | |
| Belding's Ground Squirrel | *Spermophilus beldingi* | | X | | | | X | |
| California Ground Squirrel | *Spermophilus beecheyi* | | X | | | | | X |
| Least Chipmunk | *Eutamias minimus* | | X | | | | X | |
| Townsend's Ground Squirrel | *Citellus townsendi* | | X | | | | X | |
| Sagebrush Vole | *Lagurus curtatus* | | X | | | | X | |
| Mountain Cottontail | *Sylvilagus nuttalli* | | X | | | | X | X |
| Pigmy Rabbit | *Sylvilagus idahoensis* | | X | | | | X | |
| White-tailed Jackrabbit | *Lepus townsendi* | | X | | | | X | |
| Merriam Shrew | *Sorex merriami* | | X | | | | X | |
| Preble's Shrew | *Sorex preblei* | | X | | | | X | |
| | | | | | | | | |
| Closest distance to Tumalo Deer Winter Range | Closest distance to Tumalo Deer Winter Range (Source Deschutes County Gis Service Center / ODFW) | Area 1, 1.5 miles to the north of the project area across Highway 126 | | | | | | |
| | | Area 2, 5 miles to the west across Highway 20 | | | | | | |
| | | Area 3, 10 miles to the northeast across Highway 126 and Highway 97 | | | | | | |
| P:\2980. Thornburgh Resort\Mitigation Plan\Mit Implement\Wildlife Species List\[Wildlife Species List Final 071508.xls]Sheet1 | | | | | | | | |

LUBA # 2008-203
01314

RECEIVED
JUN 26 2008
Initial:

RECEIVED
JUN 19 2008
By William Lee & Wyatt
Co Counsel

DESCHUTES COUNTY

# Legal Counsel

1300 NW WALL STREET, SUITE 200 • BEND, OREGON 97701
TELEPHONE ☎541-388-6623
541-388-6624
FACSIMILE ☎541-617-4748

Mark Pilliod, Legal Counsel
Laurie E. Craghead, Assistant Legal Counsel
Christopher Bell, Assistant Legal Counsel
Steven Griffin, Assistant Legal Counsel

June 18, 2008

PLEASE REFER TO
FILE NO.: 16/6-008

Robert Ayers
Cartography Dept.
Oregon Department of Revenue
PO Box 14380
Salem, OR 97309-5075

RE: Thornburgh Resort Annexation
Into Deschutes County Rural Fire Protection District #1
Final Order No. 2008-044

Dear Mr. Ayers:

Enclosed is a certified copy of the Deschutes County Board of County Commissioners' Order No. 2008-044 approving the above-referenced boundary change, along with its legal description and a map setting forth the boundaries. This is submitted in accordance with ORS 308.225 as a boundary change.

If you need any further information, please do not hesitate to contact me.

Sincerely,

J. Alison Hilber, Legal Assistant
to Laurie E. Craghead, Assistant Legal Counsel

/ah
enclosure
cc: Chief Tim Moor, DCRFD #1
W. Randy Miller, Jr.
9-1-1 Service District

DESCHUTES COUNTY

# Legal Counsel

*1300 NW WALL STREET, SUITE 200 • BEND, OREGON 97701*
*TELEPHONE ☎541-388-6623*
*541-388-6624*
*FACSIMILE ☎541-617-4748*

*Mark Pilliod, Legal Counsel*
*Laurie E. Craghead, Assistant Legal Counsel*
*Christopher Bell, Assistant Legal Counsel*
*Steven Griffin, Assistant Legal Counsel*

June 18, 2008

PLEASE REFER TO
FILE NO.: 16/6-008

Linda Bjornstad
State Archives
800 Summers Street NE
Salem, OR 97310

RE: Thornburgh Resort Annexation
into Deschutes County Rural Fire Protection District #1
Final Order 2006-044

Dear Ms. Bjornstad:

Enclosed is a certified copy of the Deschutes County Board of County Commissioners' Order No. 2006-044 approving the above-referenced boundary change, along with its legal description and a map setting forth the boundaries. This is submitted in accordance with ORS 198.780.

If you need any further information, please do not hesitate to contact me.

Sincerely,

J. Alison Hilber, Legal Assistant for
Laurie E. Craghead
Assistant Legal Counsel

/ah
enclosures
cc: Deschutes County Assessor
Tim Moor, DCRFPD #1
W. Randy Miller, Jr., Counsel for Thornburgh Resort Co., LLC

REVIEWED
LEGAL COUNSEL

DESCHUTES COUNTY OFFICIAL RECORDS
NANCY BLANKENSHIP, COUNTY CLERK
COMMISSIONERS' JOURNAL
CJ 2008-649
06/18/2008 12:43:01 PM
2008-649

BEFORE THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON

| | | |
|---|---|---|
| Order Approving the Thornburgh Resort Annexation into the Deschutes County Rural Fire Protection District #1 | * * * | ORDER NO. 2008-044 |

WHEREAS, a petition requesting annexation of territory into Deschutes County Rural Fire Protection District #1 was duly filed with the Board of County Commissioners of Deschutes County on or about April 22, 2008; and

WHEREAS, the Deschutes County Clerk's Office has verified that the annexation petition was signed by the real property owner within the areas to be annexed; and

WHEREAS, a public hearing was held on June 2, 2008, to hear the petition and any objections thereto, and to determine whether, in accordance with the Comprehensive Plan and the criteria prescribed by 198.805, the affected areas would be benefited by annexations of said territory into Deschutes County Rural Fire Protection District #1; now, therefore

THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON, HEREBY ORDAINS as follows:

Section 1. That the Thornburgh Resort petition for annexation into Deschutes County Rural Fire Protection District #1 attached to and referenced in Order No. 2008-039 is hereby incorporated by reference and is approved.

Section 2. That the boundaries of the territory annexed to the said district are as set forth in Exhibit "A" and depicted on the map marked Exhibit "B" of the Thornburgh Resort Annexation and as set forth, shall be known as the "Thornburgh Annexation."

Section 3. That the applicable land use criteria pertinent to the proposed Annexations, the facts found by the Board and the reasons why the Board believes those facts to bring the proposal within the requirements of the applicable land use criteria are described in Exhibit "C," attached to the petition hereto and by this reference incorporated herein.

Section 4. That the territory included in the Thornburgh Resort Annexation is declared to be annexed into Deschutes County Rural Fire Protection District #1 as of the date of this Order.

Section 5. That after signature, the Board Clerk shall forward a copy of this Order to the Oregon Department of Revenue, Oregon Secretary of State Archives Division, Deschutes County Assessor's Office, Deschutes County 911 County Service District, and Deschutes County Rural Fire Protection District #1.



LUBA # 2008-203
01317

Section 6. The purpose of this District is to provide fire protection services within the District.

Dated this 2nd 16th day of June 2008

BOARD OF COUNTY COMMISSIONERS
OF DESCHUTES COUNTY, OREGON

DENNIS R. LUKE, CHAIR

TAMMY (BANEY) MELTON, VICE CHAIR

MICHAEL M. DALY, COMMISSIONER

ATTEST:

Recording Secretary

FILE COPY

# Resolution 2007-01

## Resolution of the Deschutes County Rural Fire Protection District #1 to Accept Thornburgh Resort Property Annexation

**WHEREAS**, Deschutes County Rural Fire Protection No. 1 is a special district surrounding the City of Redmond that was formed to provide fire protection for property within the District;

**WHEREAS**, the District levies a tax on property in the District which is collected as a part of property taxes paid to the County. District residents pay on assessed valuation (whichever is higher);

**WHEREAS**, Thornburgh Resort has completed Annexation requirements to be included in the District;

**WHEREAS**, Thornburgh Resort has agreed to comply with all planning requirements associated with this Annexation;

**WHEREAS**, Thornburgh Resort has agreed to comply with the State of Oregon, the Deschutes County statutes, and Oregon Fire Code, as applicable. All new construction must be consistent with applicable zoning requirements.

**WHEREAS**, the procedure to annex Thornburg Resort property to the District has been completed and approved by the DCRFPD#1 Board of Directors.

**NOW, THEREFORE, IT IS HEREBY RESOLVED** that Thornburgh Resort Annexation of properties has been completed and approved by the DCRFPD#1 Board of Directors.

**Dated this 09th DAY OF MAY, 2007**

| | | |
|---|---|---|
| Carroll Penhollow | 5/9/07 | |
| Jim Wilson | 5/9/07 | |
| Carroll McIntosh | 5/9/07 | |
| Gary Ollerenshaw | 5/9/07 | |
| Pam Steinke | 5/9/07 | |
| Attest: Mona Novotny, 5/9/07 | | |

**Fire Protection District Annexation**
**(Not Surveyed)**

A parcel of land located in Township 15 South, Range 12 East, Willamette Meridian, Deschutes County, being more particularly described as follows:

Beginning at the southeast corner of Section 28 of said Township and Range; thence along the south boundary of said Section 28, North 89°44'49" West a distance of 2605.72 feet to the south one-quarter corner of said Section 28; thence continuing along said south boundary, North 89°45'08" West a distance of 2605.82 feet to the southwest corner of said Section 28 and the southeast corner of Section 29 of said Township and Range; thence along the south boundary of said Section 29, North 89°23'42" West a distance of 2661.15 feet to the south one-quarter corner of said Section 29; thence continuing along said south boundary, North 89°15'33" West a distance of 2635.03 feet to the southwest corner of said Section 29 and the southeast corner of Section 30 of said Township and Range; thence along the south boundary of said Section 30, South 89°59'43" West a distance of 2639.43 feet to the south one-quarter corner of said Section 30; thence continuing along said south boundary, South 89°52'19" West a distance of 1002.10 feet to the easterly right-of-way of Barr Road; thence along said right-of-way line the following one (1) course and one (1) curve:

North 00°20'28" West a distance of 2455.89 feet;
188.80 feet along the arc of a tangent curve to the right with a radius of 1880.00 feet, the chord of which bears North 02°32'09" East for a distance of 188.72 feet to a point on the south boundary of the East One-Half of the Northwest One-Quarter (E1/2 NW1/4) of said Section 30;

thence along the south boundary of said E1/2 NW1/4, South 89°38'21" West a distance of 332.61feet to the southwest corner of said E1/2 NW1/4; thence along the west boundary of said E1/2 NW1/4, North 00°18'19" East a distance of 2662.85 feet to the northwest corner of said E1/2 NW1/4; thence along the north boundary of said E1/2 NW1/4, North 89°53'40" East a distance of 1028.68 feet to said easterly right-of-way of Barr Road;

thence along said easterly right-of-way line the following eight (8) courses and seven (7) curves:

North 04°15'02" East a distance of 1883.55 feet;
632.79 feet along the arc of a tangent curve to the left with a radius of 603.77 feet, the chord of which bears North 25°46'28" West for a distance of 604.23 feet;
North 55°47'58" West a distance of 243.90 feet;
477.87 feet along the arc of a tangent curve to the right with a radius of 543.79 feet, the chord of which bears North 30°37'28" West for a distance of 462.64 feet;
North 05°26'58" West a distance of 2079.04 feet;
816.33 feet along the arc of a tangent curve to the right with a radius of 2834.69 feet, the chord of which bears North 02°48'02" East for a distance of 813.51 feet;
North 11°03'02" East a distance of 2108.24 feet;
262.49 feet along the arc of a tangent curve to the left with a radius of 1462.53 feet, the chord of which bears North 05°54'32" East for a distance of 262.14 feet;
North 00°46'02" East a distance of 353.20 feet;

500.78 feet along the arc of a tangent curve to the right with a radius of 1880.46 feet, the chord of which bears North 08°23'47" East for a distance of 499.30 feet;
North 16°01'32" East a distance of 468.40 feet;
579.82 feet along the arc of a tangent curve to the right with a radius of 925.38 feet, the chord of which bears North 33°58'32" East for a distance of 570.38 feet;
North 51°55'32" East a distance of 210.63 feet;
525.12 feet along the arc of a tangent curve to the left with a radius of 985.38 feet, the chord of which bears North 36°39'32" East for a distance of 518.92 feet;
North 21°23'32" East a distance of 5839.99 feet to the southerly right-of-way line of the McKenzie Highway;

thence along said southerly right-of-way line, South 79°34'08" East a distance of 5414.34 feet to the east boundary of the Northeast One-Quarter (NE1/4) of Section 8 of said Township and Range; thence along said east boundary, South 00°56'33" West a distance of 1737.63 feet to the east one-quarter of said Section 8 and the west one-quarter corner of Section 9 of said Township and Range; thence along the north boundary of the Southwest One-Quarter (SW1/4) of said Section 9, North 89°49'36" East a distance of 2708.74 feet to the center one-quarter corner of said Section 9; thence along the east boundary of said SW1/4, South 00°34'51" West a distance of 1328.46 feet to the northwest corner of the South One-Half of the Southeast One-Quarter (S1/2 SE1/4) of said Section 9; thence along the north boundary of said S1/2 SE1/4, North 89°44'57" East a distance of 2699.08 feet to the northeast corner of said S1/2 SE1/4 and the northwest corner of the Southwest One-Quarter of the Southwest One-Quarter (SW1/4 SW1/4) of Section 10 of said Township and Range; thence along the north boundary of said SW1/4 SW1/4, South 89°58'00" East a distance of 1326.38 feet to the northeast corner of said SW1/4 SW1/4; thence along the east boundary of said SW1/4 SW1/4, South 00°20'12" West a distance of 1323.94 feet to the southeast corner of said SW1/4 SW1/4 and the northwest corner of the east One-Half of the west One-Half (E1/2 W1/2) of Section 15 of said Township and Range; thence along the north boundary of said E1/2 W1/2 of said Section 15, South 89°59'43" East a distance of 1323.04 feet to the northeast corner of said E1/2 W1/2; thence along the east boundary of said W1/2, South 00°13'13" West a distance of 5393.31 feet to the southeast corner of said W1/2 and the northeast corner of the West One-Half (W1/2) of Section 22 of said Township and Range; thence along the east boundary of said W1/2, South 00°01'41" West a distance of 1302.13 feet to the northwest corner of the Southwest One-Quarter of the Northeast One-Quarter (SW1/4 NE1/4) of said Section 22; thence along the north boundary of said SW1/4 NE1/4, North 88°49'51" East a distance of 1307.80 feet to the northeast corner of said SW1/4 NE1/4; thence along the east boundary of said SW1/4 NE1/4, South 00°01'48" East a distance of 1313.64 feet to the southeast corner of said SW1/4 NE1/4 and the northwest corner of the Northeast One-Quarter of the Southeast One-Quarter (NE1/4 SE1/4) of said Section 22; thence along the north boundary of said NE1/4 SE1/4, North 89°20'08" East a distance of 1308.95 feet to the northeast corner of said NE1/4 SE1/4 and the northwest corner of the Northwest One-Quarter of the Northwest One-Quarter of the Southwest One-Quarter (NW1/4 NW1/4 SW1/4) of Section 23 of said Township and Range; thence along the north boundary of said NW1/4 NW1/4 SW1/4, South 89°45'45" East a distance of 666.35 feet to the northeast corner of said NW1/4 NW1/4 SW1/4; thence along the east boundary of said NW1/4 NW1/4 SW1/4, South 00°10'39" East a distance of 663.19 feet to the southeast corner of said NW1/4 NW1/4 SW1/4; thence North 89°46'01" West a distance of 666.71 feet to the southwest corner of said NW1/4 NW1/4 SW1/4 and a point on the east

boundary of said NE1/4 SE1/4 of said Section 22; thence along said east boundary, South 00°08'48" East a distance of 663.24 feet to the southeast corner of said NE1/4 SE1/4; thence along the south boundary of said NE1/4 SE1/4, South 89°18'55" West a distance of 1310.98 feet to the southwest corner of said NE1/4 SE1/4 and the northeast corner of the Southwest One-Quarter of the Southeast One-Quarter (SW1/4 SE1/4) of said Section 22; thence along the east boundary of said SW1/4 SE1/4, South 00°03'33" East a distance of 333.85 feet to the westerly right-of-way line of the Tumalo-Cline Falls Market Road; thence along said right-of-way line the following four (4) curves and three (3) courses:

35.19 feet along a non-tangent curve to the left with a radius of 1462.81 feet, the chord of which bears South 14°37'08" West a distance of 35.19 feet;
South 13°55'48" West a distance of 807.50 feet;
841.01 feet along the arc of a tangent curve to the right with a radius of 925.47 feet, the chord of which bears South 39°57'48" West for a distance of 812.37 feet;
South 65°59'48" West a distance of 402.90 feet;
1223.53 feet along the arc of a tangent curve to the left with a radius of 2894.82 feet, the chord of which bears South 53°53'18" West for a distance of 1214.44 feet;
South 41°46'48" West a distance of 2285.26 feet;
535.05 feet along the arc of a tangent curve to the right with a radius of 2835.55 feet, the chord of which bears South 47°11'08" West for a distance of 534.26 feet to a point on the east boundary of the Southeast One-Quarter (SE1/4) of said Section 28;

thence along said east boundary, South 00°56'04" West a distance of 1932.31 feet to the point of beginning, the terminus of this description.

**Excepting Therefrom:**

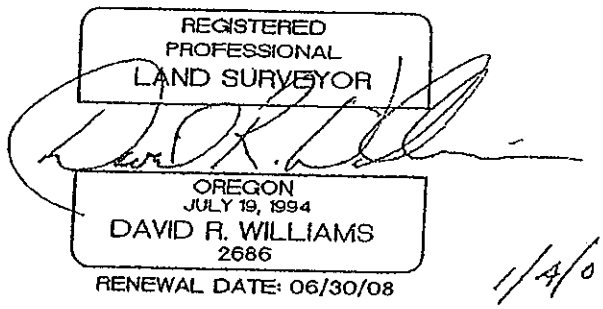
Beginning at the northwest corner of Section 16 of said Township and Range; thence along the north boundary of the Northwest One-Quarter (NW1/4) of said Section, North 89°40'45" East a distance of 2704.48 feet to the north one-quarter corner of said Section 16; thence along the north boundary of the Northeast One-Quarter (NE1/4) of said Section 16, North 89°40'28" East a distance of 2702.95 feet to the northeast corner of said Section 16; thence along the east boundary of said NE1/4, South 00°26'22" West a distance of 2640.57 feet to the east one-quarter corner of said Section 16; thence along the south boundary of said NE1/4, South 89°28'55" West a distance of 2689.05 feet to the center one-quarter corner of said Section 16; thence along the east boundary of the Southwest One-Quarter (SW1/4) of said Section 16, South 00°08'10" West a distance of 2693.31 feet to the south one-quarter corner of said Section 16; thence along the south boundary of said SW1/4, North 89°47'34" West a distance of 2729.45 feet to the southwest corner of said Section 16; thence along the west boundary of said Section 16, North 00°24'21" East a distance of 5317.87 feet to the point of beginning, the terminus of this description.

**Also Excepting Therefrom:**

Beginning at the southeast corner of said Section 29; thence along the south boundary of said Section 29, North 89°23'42" West a distance of 1330.57 feet to the southeast corner of the Southwest One-Quarter of the Southeast One-Quarter (SW1/4 SE1/4) of said Section 29; thence

along the east boundary of said SW1/4 SE1/4, North 01°15'50" West a distance of 1327.53 feet to the northeast corner of said SW1/4 SE1/4; thence along the north boundary of said SW1/4 SE1/4, North 89°15'44" West a distance of 1326.28 feet to the northwest corner of said SW1/4 SE1/4 and the northeast corner of the South One-Half of the Southwest One-Quarter (S1/2 SW1/4) of said Section 29; thence along the north line of said S1/2 SW1/4, North 89°12'18" West a distance of 2613.32 feet to the northwest corner of said S1/2 SW1/4 and the northeast corner of the Southeast One-Quarter of the Southeast One-Quarter (SE1/4 SE1/4) of said Section 30; thence along the north boundary of said SE1/4 SE1/4, South 89°46'54" West a distance of 1317.64 feet to the northwest corner of said SE1/4 SE1/4; thence along the east boundary of the West One-Half of the Southeast One-Quarter (W1/2 SE1/4) of said Section 30, North 00°02'56" West a distance of 1329.16 feet to the northeast corner of said W1/2 SE1/4 and the southeast corner of the West One-Half of the Northeast One-Quarter (W1/2 NE1/4) of said Section 30; thence along the east boundary of said W1/2 NE1/4, North 00°05'11" West a distance of 1325.46 feet to the southwest corner of the Northeast One-Quarter of the Northeast One-Quarter (NE1/4 NE1/4) of said Section 30; thence along the south boundary said NE1/4 NE1/4, North 89°46'00" East a distance of 1317.82 feet to the southeast corner of said NE1/4 NE1/4 and the southwest corner of the North One-Half of the Northwest One-Quarter (N1/2 NW1/4) of said Section 29; thence along the south boundary of said N1/2 NW1/4, South 88°57'37" East a distance of 2586.84 feet to the southeast corner of said N1/2 NW1/4; thence along the east boundary of said N1/2 NW1/4, North 00°16'30" West a distance of 1315.54 feet to the northeast corner of said N1/2 NW1/4 and the northwest corner of the Northeast One-Quarter (NE1/4) of said Section 29; thence along the north boundary of said NE1/4, South 89°16'27" East a distance of 2590.72 feet to the northeast corner of said Section 29 and the northwest corner of said Section 28; thence along the north boundary of said Section 28, South 89°45'33" East a distance of 2707.84 feet to the north one-quarter of said Section 28; thence continuing along said north boundary, South 89°37'12" East a distance of 2719.27 feet to the northeast corner of said Section 28; thence along the east boundary of said Section 28, South 00°53'32" West a distance of 2639.93 feet to the east one-quarter corner of said Section 28; thence continuing along said east boundary, South 00°56'04" West a distance of 1319.71 feet to the northeast corner of the South One-Half of the South One-Half (S1/2 S1/2) of said Section 28; thence along the north boundary of said S1/2 S1/2, North 89°43'04" West a distance of 5266.70 feet to the northwest corner of said S1/2 S1/2; thence along the west boundary of said S1/2 S1/2, South 01°27'20" East a distance of 1323.13 feet to the point of beginning, the terminus of this description.

**Subject to:** All easements, restrictions and right-of-ways of record and those common and apparent on the land.

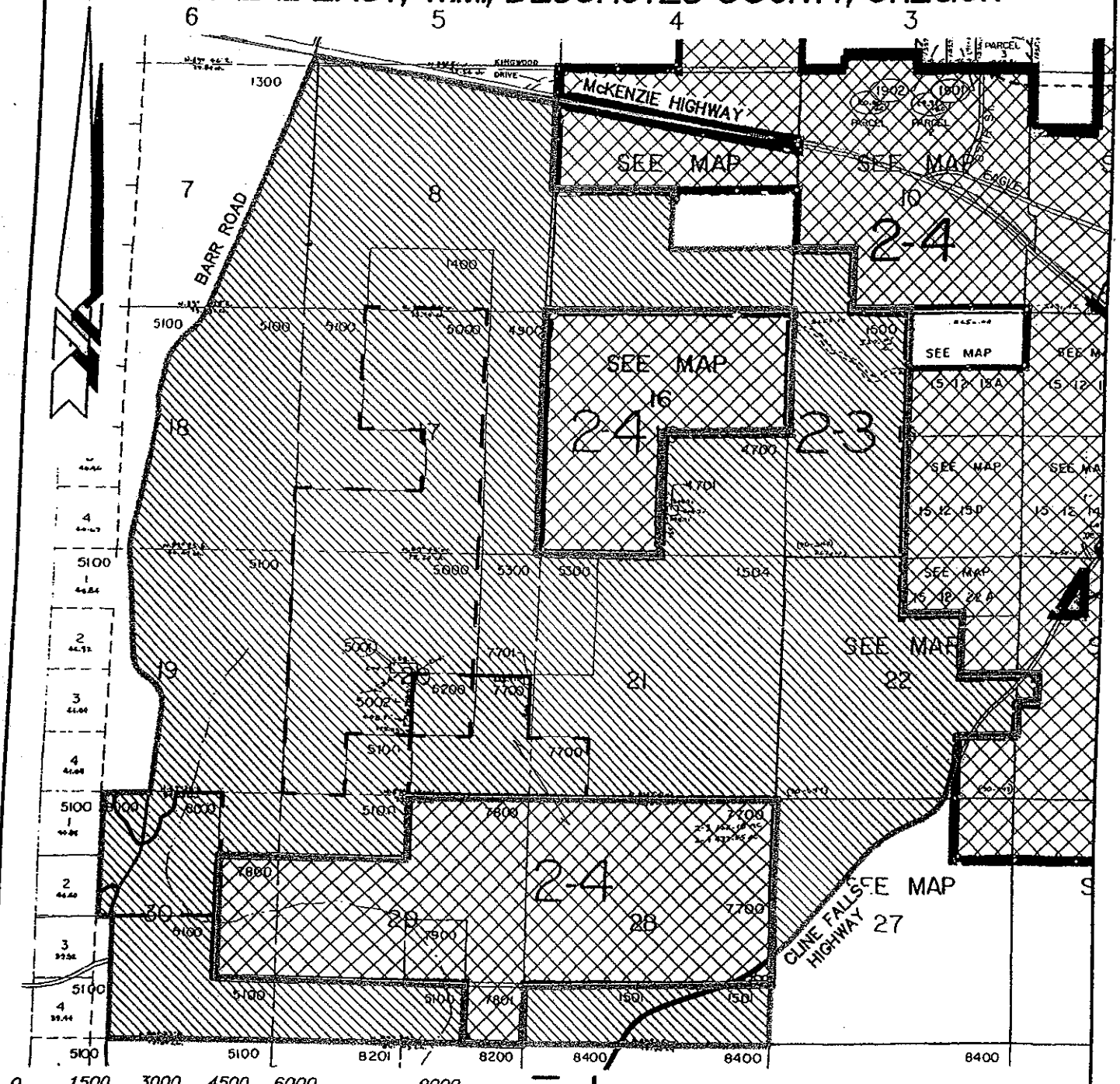



1/4/08

S:\Land Projects\Cline Butte DR\dwg\040807-plan\docs\fire district annexation - boundary.doc

# THORNBURGH RESORT

## EXHIBIT B-11: FIRE PROTECTION DISTRICT, TOWNSHIP 15 SOUTH, RANGE 12 EAST, W.M., DESCHUTES COUNTY, OREGON




THORNBURGH DESTINATION RESORT

EXISTING FIRE PROTECTION DISTRICT BOUNDARY

PROPOSED FIRE PROTECTION DISTRICT ANNEXATION

PREPARED BY:

HW&A SURVEYORS, ENGINEERS & PLANNERS

HICKMAN, WILLIAMS & ASSOCIATES, INC
698 NW YORK DRIVE, BEND, OREGON 97701
PHONE (541) 389-9351

040807-FD.DWG

LUBA # 2008-203
01324

**Community Development Department**
Planning Division Building Safety Division Environmental Health Division

117 NW Lafayette Avenue Bend Oregon 97701-1925
(541)388-6575 FAX (541)385-1764
http://www.co.deschutes.or.us/cdd/

**MEMORANDUM**

**DATE:** May 13, 2008

**TO:** Georgia Springer, County Legal Counsel, Legal Assistant

**FROM:** Ruth Wahl, Associate Planner

**RE:** Annexation to Deschutes County Rural Fire Protection District No. 1; Thornburgh Resort Co., LLC Annexation, Your file no. 16/6-008

The Deschutes County Comprehensive Plan, which is acknowledged to be in compliance with the Statewide Planning Goals, encourages the formation of special service districts to serve rural needs.

Under the Public Facilities and Services section of the County Comprehensive Plan (Chapter 23.68 of Title 23 of the County Code, Section 23.68.020), Policies, is the following policy:

e. **Deschutes County shall encourage the formation of special service districts to serve rural needs rather than becoming involved with serving those needs. The County will foster coordination and mutual planning between the County, special districts, utility companies and service corporations. This shall include common trenching where appropriate.**

Fire protection is an important part of rural development, as evidenced by the comprehensive plan chapter on natural hazards, which includes fire. It is clear that the ability to acquire fire protection is a valuable public resource. Staff finds that the proposed annexation to the Deschutes County Rural Fire Protection District #1 is consistent with the County Comprehensive Plan and Statewide Planning Goals.

RECEIVED
MAY 14 2008
DESCHUTES COUNTY
LEGAL COUNSEL

## Kameron DeLashmutt

**From:** Kameron DeLashmutt [kameron@bendcable.com]
**Sent:** Tuesday, July 15, 2008 1:09 PM
**To:** Kam DeLashmutt
**Subject:** FW: International Fire Code

The location of fire apparatus roads is defined in Section D104.3 of the 2006 International Fire Code.

"**D104.3 - Remoteness.** Where two access roads are required, they shall be placed a distance apart equal to not less than one half the length of the maximum overall diagonal dimension of the property or area to be served, measured in a straight line between accesses."

Jeff Fuchs, PE
Bussard Williams, LLC
Consulting Engineers
389 SW Scalehouse Court, Suite 100
Bend, Oregon 97702

541-389-9351 Extension 110
jeffreyf@bussardwilliams.com

## Kameron DeLashmutt

**From:** Kameron DeLashmutt [kameron@bendcable.com]
**Sent:** Tuesday, July 15, 2008 1:33 PM
**To:** Kam DeLashmutt (kameron@bendcable.com)
**Subject:** FW: International Fire Code

Kam,

**Thornburgh:**

The longest diagonal distance is 16,440-ft. Half that distance is 8,220-ft.

The distance between the southeast entrance (Tribute) is 15,740-ft from the north entrance (Pinnacle).

The distance between the southwest entrance (Tribute) is 14,700-ft from the north entrance (Pinnacle).

Jeff Fuchs, PE
Bussard Williams, LLC
Consulting Engineers
389 SW Scalehouse Court, Suite 100
Bend, Oregon 97702

541-389-9351 Extension 110
jeffreyf@bussardwilliams.com

## Kameron DeLashmutt

**From:** DEVONEY Mark [Mark.DEVONEY@odot.state.or.us]
**Sent:** Monday, July 14, 2008 9:22 AM
**To:** Kameron DeLashmutt
**Subject:** RE: Region 4 support for the draft CIA

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**From:** DEVONEY Mark [mailto:Mark.DEVONEY@odot.state.or.us]
**Sent:** Friday, July 11, 2008 2:55 PM
**To:** Kameron DeLashmutt
**Subject:** RE: Region 4 support for the draft CIA

Kameron,
I am writing to confirm that I support the general terms of the most recent draft Cooperative Improvement Agreement we have worked on together. I have worked closely with our Region Manager and he also supports these terms. We appreciate Thornburgh's willingness to substantially increase the level of its financial contribution to reflect the increased costs of infrastructure improvements in this location. The Cooperative Improvement Agreement will be forwarded to the Attorney General's Office and the Oregon Transportation Commission for review and approval.

Thank you.
*Mark DeVoney*
Region 4 Program & Planning Manager
63085 N. Hwy 97
Bend, OR 97701
541-388-6333 x391
mark.devoney@odot.state.or.us
Oregon Department of Transportation

Mariel J. Combs
Department of the Interior
Office of the Regional Solicitor
Pacific Northwest Region
500 NE Multnomah Blvd., Suite 607
Portland, OR 97232
(503) 231-2162
(503) 231-2166 (telefax)

RECEIVED
MAY 27 2008
Schwabe, Williamson & Wyatt

**UNITED STATES DEPARTMENT OF THE INTERIOR**
**OFFICE OF HEARINGS AND APPEALS**
**INTERIOR BOARD OF LAND APPEALS**

| | |
|---|---|
| **ANNUNZIATA GOULD**<br><br>**Appellant,**<br><br>**v.**<br><br>**BUREAU OF LAND MANAGEMENT,**<br><br>**Respondent.** | **IBLA 2007-263**<br>**OR 61170**<br><br>**STATUS REPORT** |
| **THORNBURGH RESORT COMPANY, LLC**<br><br>**Intervenor.** | |

On May 6, 2008, this Board ordered a status report regarding the status of land underlying the third road the BLM authorized in its July 16, 2007 right-of-way (ROW) grant to Thornburgh Resort Company, LLC (Thornburgh). As discussed in that Order, the road would be in the NE1/4NE1/4, section 30, T. 15 S., R. 12 E., Willamette Meridian, and would extend along the section line between sections 29 and 30. In an unrelated case, the BLM represented to the Board that the State of Oregon had applied for lands, including land in sections 29 and 30, T. 15 S., R. 12 E., Willamette Meridian, as indemnity selections under the Enabling Act of February 14, 1858, 43 U.S.C. §§ 851, 852, and in compliance with the Final Judgment, Civil No. 85-646-MA, dated June 17, 1991. This Board ordered the parties to inform the Board "whether the land conveyance to Oregon anticipated in BLM's January 10, 2008, filing has taken place, whether any land underlying the third road remains under BLM's jurisdiction, and, if such a conveyance has taken place, the impact the conveyance has on the rights conveyed by the ROW." Order at 2.

The BLM issued Clearlist Number 95 on April 16, 2008, thereby transferring title of the listed land from the BLM to the State of Oregon. Attachment at 3. The selected land includes the

N1/2NW1/4, section 29, T. 15 S., R. 12 E., W.M. and the NE1/4NE1/4, section 30, T. 15 S., R. 12 E., W.M. Consequently, the land underlying the third road authorized by the BLM's ROW grant is entirely under Oregon's jurisdiction. The transfer of lands, however, was subject to the "rights for access road purposes as granted to Thornburgh Resort, its successors or assigns, by right-of-way number OR 61170 . . . as to . . . N1/2NW1/4, sec. 29; NE1/4NE1/4, sec. 30, T. 15 S., R. 12 E., W.M., Oregon." Id. at 1. Therefore, Thornburgh retained the rights conveyed by the ROW grant.

Dated: MAY 22 2008

Respectfully submitted,

For the Regional Solicitor

Mariel J. Combs, Attorney
Pacific Northwest Region

Attachment

# United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Oregon State Office
P.O. Box 2965
Portland, Oregon 97208

IN REPLY REFER TO:
2621 (OR 936.1)
OR 61026

APR 16 2008

Clearlist No. 95
State of Oregon Indemnity Selection

It is hereby certified that the land described in this list No. 95 is embraced in the original list on file in the Bureau of Land Management, of land selected by the State of Oregon, pursuant to the laws of the State, as indemnity for losses in the section and township named, which school land indemnity selections are subscribed by the Act of Congress cited.

It is further certified that the description of land reported lost or deficient in this list and those selected in lieu thereof have been examined and compared with the description of unused base lands in the Final Judgment, Civil No. 85-646-MA, dated June 17, 1991, and with the township plats and tract books in the Oregon State Office; that the indemnity land claimed has been found to be properly due the townships for which they were selected, and the selected land is shown to be subject to such selection, being surveyed public land within the meaning of 43 U.S.C. 851 and 852 and within the limits of the State and free from adverse claims of record. Reports have been received indicating that the selected land is not valuable for minerals either metalliferous or non-metalliferous.

The selected land is not affected by any withdrawal adverse to this selection.

Therefore, this list embraces 240.00 acres and is hereby approved subject to valid rights existing on the date of selection; but excepting and reserving to the United States:

1. Rights-of-way over and across the land for ditches and canals constructed by the authority of the United States, as directed and required by the Act of Congress, approved August 30, 1890 (26 Stat. 391, 43 U.S.C. 945).

This list will also be subject to:

1. Those rights for electric power transmission line purposes granted to Central Electric Cooperative, Inc., its successors or assigns, by right-of-way number ORE 12676, pursuant to the Act of October 21, 1976, (43 U.S.C. 1761) as to NE¼SW¼, sec. 17, T. 15 S., R. 12 E., W.M., Oregon.

2. Those rights for access road purposes as granted to Thornburgh Resort, its successors or assigns, by right-of-way number OR 61170, pursuant to the Act of October 21, 1976 (43 U.S.C. 1761), as to SE1/4SW1/4, NW1/4SE1/4, sec. 20; N1/2NW1/4, sec. 29; NE1/4NE1/4, sec. 30, T. 15 S., R. 12 E., W.M., Oregon.

There are no outstanding mineral leases or grazing permits on the subject lands to be transferred to the State.

If you have any questions, please contact John Styduhar, Realty Specialist, at 503-808-6454.

Sincerely,

Edward W. Shepard
State Director,
Oregon/Washington

Enclosures:
1. Form 2620-2 (1 p)
2. Form 2620-2a (1 p)

cc: OR-050 (Molly Brown)

Form 2620-2a
(August 1984)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

**SCHOOL INDEMNITY LANDS APPROVAL LIST**
(CONTINUATION SHEET TO BE USED WITH FORM 2620-2)

Approved List Number
No. 95
State
Oregon
Serial Number
OR 61026

EXHIBITING the tracts selected by the above State and District Office, in lieu of, or as indemnity for, the corresponding school lands, or losses to its grant for the support of common schools, assigned as bases for the selections, which were made under the provisions of the Act of Congress approved

| FILING DATE | SERIAL NUMBER | DESCRIPTION OF TRACTS SELECTED | SECTION | TOWNSHIP | RANGE | MERIDIAN | AREA (in acres) TRACTS | AREA (in acres) SELECTED |
|---|---|---|---|---|---|---|---|---|
| 8/15/06 | 61026 | NE1/4SW1/4 | 17 | 15 S. | 12 E. | W.M. | | 40 |
| | | SE1/4SW1/4, NW1/4SE1/4 | 20 | 15 S. | 12 E. | W.M. | | 80 |
| | | N1/2NW1/4 | 29 | 15 S. | 12 E. | W.M. | | 80 |
| | | NE1/4NE1/4 | 30 | 15 S. | 12 E. | W.M. | | 40 |

Form 2620-2
(August 1984)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

**SCHOOL INDEMNITY LANDS APPROVAL LIST**
**(TO BE USED WITH FORM 2620-2a)**

Approved List Number
No. 95

State
Oregon

Serial Number
OR 61026

Exhibiting the tracts selected by the above State and District Office, in lieu of, or as indemnity for, the corresponding school lands, or losses to its grant for the support of common schools, assigned as bases for the selections, which were made under the provisions of the Act of Congress approved

| CAUSE OF LOSS | DESCRIPTION OF BASES | SECTION | TOWNSHIP | RANGE | MERIDIAN | AREA (in acres) TRACTS | AREA (in acres) BASES (TOTAL) |
|---|---|---|---|---|---|---|---|
| Erroneous Sales/ Unsatisfied Forest Lieu Selections | Govt. lots 7-10 | 16 | 1 S. | 6 E. | W.M. | | 146.06 |
| | SW 1/4 | 16 | 5 S. | 5 E. | W.M. | | 160.00 |

4

Oregon
Theodore R. Kulongoski, Governor

Department of Human Services
Public Health Division
800 NE Oregon Street
Portland, OR 97232-2162
(503) 731-4030 - Emergency
(971) 673-0408
(971) 673-0457 - FAX
(971) 673-0372 - TTY-Nonvoice

RECEIVED
APR 17 2008

April 14, 2008

Hickman, Williams & Associates
Jeff Fuchs PE
698 NW York Drive
Bend OR 97701

Dear Jeff Fuchs PE:

Thornburgh Resort

Thank you for submitting the necessary information requested for the plan review exemption for water line projects for the above water system. At this time, the exemption status is renewed for 2008. Sometime in January 2009, please forward a summary of the 2008 water line projects for the 2009 exemption.

Again, thank you very much. If you have any questions or concerns, please contact me.

Sincerely,

Tom Charbonneau
Regional Engineering
Drinking Water Program

***If you would like this information in an alternate format, please contact Marsha Fox at (971) 673-0408.***

Deschutes County HD
Debra Lambeth, DHS
Thornburgh Resort

NEWTON
CONSULTANTS INC.

July 14, 2008
Project No. 1007-101-07

Anne Corcoran Briggs
Hearings Officer
c/o Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, OR 97701

**THORNBURGH RESORT FINAL MASTER PLAN; FISH AND WILDLIFE MITIGATION PLAN**

**REBUTTAL TO: NATIVE FISH SOCIETY TESTIMONY REGARDING THE INADEQUACY OF THE WATER POLLUTION CONTROL FACILITIES (WPCF) PERMIT FOR THE THORNBURGH RESORT WASTEWATER TREATMENT FACILITIES TO PROTECT DESCHUTES RIVER WATER QUALITY**

Dear Ms. Briggs:

Statements on Native Fish Society letterhead relative to the inadequacy of the WPCF permit for the Thornburgh Resort wastewater treatment facilities to protect water quality in the Deschutes River were submitted by Mr. Tom Davis, P.E. at the June 17 Thornburgh hearing. We offer the following response:

Mr. Davis asserts:

*"Wastewater effluent from a development as large as Thornburgh would damage aquatic resources without advanced, tertiary treatment. Phasing such treatment in later and effluent irrigation are insufficient..."*

**Rebuttal**

Thornburgh Resorts agrees that excessive nutrient discharges to the Middle Deschutes River could have detrimental effects to aquatic species and water quality. As a result, Thornburgh will take appropriate steps to avoid such excessive discharges. The approved WPCF permit for Thornburgh allows two interim septic tank and drainfield systems each to operate up to 15,000 gallons per day (gpd). Before they reach 15,000 gpd, Thornburgh is required to provide a wastewater control system that stores treated effluent in the non-growing season and irrigates it during the summer growing season.

The primary nutrient of concern is nitrogen, which can stimulate algal growth in rivers and lakes and degrade water quality. Phosphorous, which is also needed to stimulate algal growth, is not mobile in the soil and is not an issue when effluent is discharged into or onto the ground.

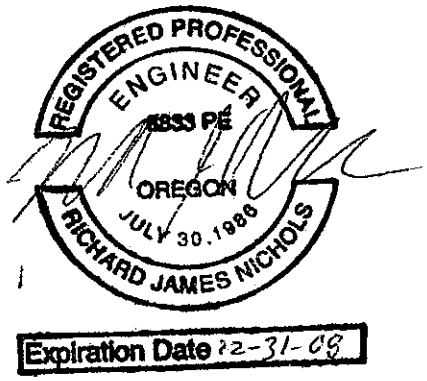
Thornburgh will provide tertiary treatment to reduce total nitrogen concentrations in the effluent discharged to the interim drainfield systems. Contrary to Mr. Davis' comment, applying effluent to growing vegetation is an excellent means for removing nitrogen from effluents. The nitrogen is removed from the irrigated wastewater by conversion to biomass or vegetation.

Wastewater effluent for Thornburgh will be managed according to all applicable DEQ requirements, and in accordance with the conditions of county land-use approval. As a result, the project will not produce excessive nutrient discharges and will not result in any significant reduction of water quality in the Deschutes River.

Sincerely,

NEWTON CONSULTANTS, INC.

Richard J. Nichols, P.E.
Senior Engineer




G:\1000\1007\101\07\REBUTTALS 2008\REBUTTAL Tom Davis wastewater inadequacy 7-15-08.doc

NEWTON CONSULTANTS INC.

July 15, 2008
Project No. 1007-101-07

Anne Corcoran Briggs
Hearings Officer
c/o Deschutes County Planning Division
117 NW Lafayette Avenue
Bend, OR 97701

**THORNBURGH RESORT FINAL MASTER PLAN; FISH AND WILDLIFE MITIGATION PLAN**

**REBUTTAL TO: NATIVE FISH SOCIETY TESTIMONY REGARDING STORMWATER RUNOFF IMPACTS TO SPAWING GRAVELS AND WATER QUALITY**

Dear Ms. Briggs:

Statements on Native Fish Society letterhead relative to stormwater impacts on spawning gravels in the Deschutes River and on water quality in general were submitted by Mr. Tom Davis, P.E. at the June 17 Thornburgh hearing. Rebuttals to these statements are presented herein.

Statements alleging impacts are re-stated below in italicized form, followed by rebuttals.

1. *"Sedimentation of the spawning gravel that will be affected by erosion during the long and multi-phased construction. The distance to the Deschutes doesn't obviate such impacts – once the material is eroded it moves downstream at variable rates depending on storm events, to a long-term deposition area, such as Lake Billy Chinook. The transport may take decades and spawning gravel will be adversely affected during the entire journey. It occurs primarily through bedload movement, which is complex and difficult to visualize".*

   **Rebuttal**

   The comment is confusing, but seems to be concerned about fine sediments in storm runoff from Thornburgh finding their way into the Deschutes River and impairing trout spawning by filling voids in the spawning gravels.

   Before sedimentation of spawning gravels in the Deschutes River will occur, sediments in storm runoff at Thornburgh must first reach the river. This is very improbable for the following reasons:

1. First, Deschutes County ordinances require that stormwater be managed on site.

2. Secondly, USGS contour maps were reviewed and field observation were made to locate potential stormwater runoff paths from the Thornburgh Resort area. This work indicates that the likelihood of stormwater originating on Thornburgh and carrying sediment from Thornburgh to the Deschutes River is not a reasonable expectation. Topographic drainage paths are indistinct in many areas without defined flow channels. In addition, many opportunities exist for flow dispersion over large areas that would confine the extent of flow to local areas near the site. Finally, potential drainage traces extending toward the Deschutes River from the southeast part of Thornburgh are blocked by highway embankments or other topographic modifications resulting from highway construction. Highway 126 embankments cross northeast-trending drainage traces. Although one culvert was observed at the location shown on Figure 1, runoff water would meander over a large, relatively flat, non-descript area before it would find and enter the culvert.

To arrive at the conclusions stated above, the Thornburgh site was divided into 5 sub-watersheds based on elevation contours and related directions of surface water flow. The 5 sub-watersheds, A through E, are shown on Figure 1.

Sub-watersheds A and E are the largest and runoff from each could flow to relict drainage courses. Evidence of surface flows is absent in these relic features

**Sub-watershed A:**

Sub-watershed A drains to the west. Examination of USGS contour maps indicates it is possible to trace a path on the maps that water could follow from the west side of sub-watershed A, northeast toward the Deschutes River. In some places, the trace is not clear due to flattening of the ground surface and loss of significant slope change. The flow distance along the trace from Thornburgh to the Deschutes River is at least 5 miles.

Photographs of points along the trace are shown on Figure 1. The photographs demonstrate the lack of defined flow channels in sandy soils blanketing the areas along the traces. They also illustrate the high probability of water spreading in permeable soils and the likelihood that runoff waters would travel over distances well short of 5 miles.

Distance, in fact, <u>does</u> obviate stormwater impacts where there is a long trace of potential (but not distinct) flow paths through permeable soils and where there is relatively flat terrain with no drainage channels to concentrate flow with the necessary energy to sustain flow. This is the case with the long distance from

Thornburgh to the Deschutes River. Highway 126 is built on an earth fill that crosses the area of possible drainage trace. This area is relatively flat and non-descript as shown in photographs on Figure 1. No discrete drainage channel was observed. One culvert was observed (Figure 1). Runoff would meander over the flat terrain before finding and entering the culvert.

**Sub-watershed E:**

Sub-watershed E drains south to southeast. Possible pathways for runoff can be traced to a relict drainage upon which the Cline Falls Highway has been constructed. This relict feature can be traced from the southeast corner of Thornburgh, approximately 2.6 miles northeast to its confluence with the Deschutes River. The highway literally occupies the drainage and has eliminated its trace in most locations.

A 12-inch diameter culvert was observed near the north end of the drainage, near the river. Drainage paths upstream of this culvert, toward Thornburgh, are obscure. The 12-inch culvert would direct runoff beneath the highway from a very localized area to a small basin on the natural drainage alignment. This basin is upstream from the large approach fill placed fully across the drainage for the Highway 126 Bridge that crosses the Deschutes River. An 18-inch diameter culvert entrance was observed in the fill; however, the outlet could not be found. Upstream of the culvert inlet, a bermed, depression within a large flat area exists that would allow deposition of sediments carried by storm runoff. Should runoff from sub-watershed E actually reach the drainage, it would be dammed by the highway near Thornburgh and restricted to areas along the highway edge. In many areas, these potential flow paths become indistinctive and runoff water would spread out to find its path. These conditions result in loss of energy and related loss of sustainable flow potential over long distances.

South of the Eagle Crest entrance off the Cline Falls Highway (about 2 miles from Thornburgh), the original drainage splits to include a secondary northeast-trending trace extending through developed areas of Eagle Crest, including home, hotel and conference center areas and golf course. This trace enters a well defined drainage feature that proceeds to the Deschutes River. This feature is now a golf course and has been blocked by an earth dam that impounds the larger of two Eagle Crest lakes (Figure 1).

Photographs at points along the way shown on Figure 1 demonstrate the improbability of Thornburgh storm runoff actually reaching the river from Sub-watershed E.

**Sub-watersheds B, C and D:**

Potential paths for runoff from sub-watersheds B, C and D can be traced to natural depressions located south and west of the Thornburgh site. These depressions would impound a water volume many orders of magnitude larger than the sub-watersheds could generate, even if the surface area on each was entirely paved. The depressions cover a total area of approximately 577 acres with maximum depths up to approximately 30 feet. Assuming an average depth of 10 feet, the total potential storage volume is at least 5,770 acre-feet.

2. *"Stormwater runoff impacts are a very serious and difficult to control problem. The Thornburgh proposal states "All storm water will be infiltrated or evaporated on the project site, and will not discharge to streams."*

**Rebuttal**

Thornburgh made this statement to comply with Deschutes County Ordinance and fully intends to comply with the requirement.

3. *"DEQ acknowledges in a letter to the Governor about destination resorts in the Metolius Watershed that Oregon has yet to come to grips with the impacts of stormwater, as quoted below."*
*"Because DEQ does not have a regulatory framework for stormwater management after construction, we believe these developments could pose a significant risk to water quality."*

**Rebuttal**

This quotation by DEQ was made relative to a destination resort proposed in the Metolius River basin. It does not say that all resort developments pose a significant risk. The degree of risk depends on the development and its relationship to waters that could be impacted in an adverse manner. Thornburgh has no close proximity to any surface water body. Potential flow path traces from the site to the Deschutes River are indistinct in many areas, blocked by highway construction, or cross relatively flat terrain in permeable soils. As such, a sustained flow that could cross several miles and actually reach the river is highly improbable and not a practical engineering consideration for Thornburgh, as it could be for other projects in closer proximity to streams with steeper drainages that demonstrate a direct connection to nearby surface water streams and rivers.

4. *"The Seattle Times article in Attachment D is about the intensive but losing battle in Puget Sound to save the areas fisheries from the impacts of stormwater runoff."*

**Rebuttal**

The Puget Sound is characterized by distinctly different climate and precipitation conditions than exist in Central Oregon and at the Thornburgh site. The statement reflects the importance of managing stormwater to prevent such impacts; however, the importance of management and how it is done must account for the degree of risk at a particular site. For the reasons above, the risk of water quality impacts to the Deschutes River from Thornburgh storm runoff is extremely low.

Current stormwater design and management practices dictate design criteria that are much more stringent than stormwater design and management practices in decades past. These current design and management practices have specific requirements that must be met to reduce the potential for impacts to surface and groundwater quality. These design and management considerations are included in the design and management of stormwater for Thornburgh.

We respect the testimony that is subject to this rebuttal; however, it is impossible to find a factual basis that reasonably supports stormwater runoff flow from Thornburgh that could carry sediments to the Deschutes River over traces of possible flow paths through flat terrain and flow impediments, over such large distances. This impossibility is further underscored considering that Thornburgh will contain stormwater on site. These findings are based on examination of potential drainage way traces on USGS contour maps followed by field observations of areas along such traces.

Please contact us if you have any questions.

Sincerely,

NEWTON GEOTECHNICAL, INC.

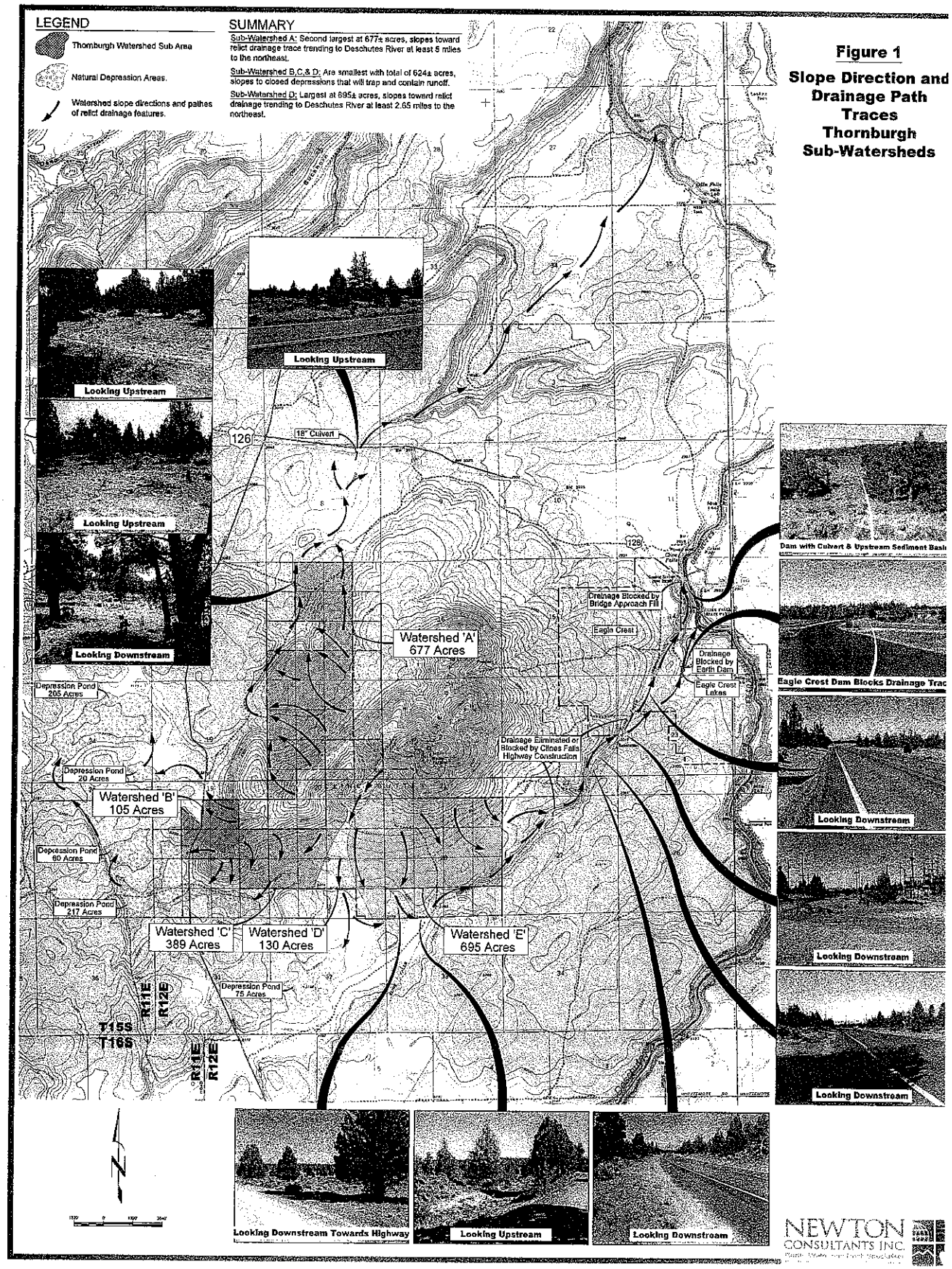
REGISTERED PROFESSIONAL ENGINEER 9975 OREGON OCT. 18, 1978 DAVID J. NEWTON

David J. Newton, P.E., C.P.G.
President

EXPIRES: 12-31-08

Attachment: Figure 1

G:\1000\1007\101\07\REBUTTALS 2008\FINAL REBUTTAL TO Native Fisheries Society RE Stormwater Runoff 7-15-08.doc




LUBA # 2008-203
01343

W R G
DESIGN INC.

July 14, 2008

**RE: Thornburgh Resort**
**Hearing Statement**

Dear Ann Corcoran, Hearings Officer,

Please accept this letter in response to Tom Davis and the Native Fish Society's Thornburgh Resort hearing statement.

Thornburgh Resort will take the steps necessary to design a comprehensive stormwater management plan. As engineers on the project we understand that stormwater runoff, if not properly managed, can transport sediment loads and degrade streams and receiving waters. For this reason our top goal is to prevent stormwater from leaving the site and to provide a high level of treatment prior to underground discharge. Our past experience has shown when the proper erosion and sediment control measures are taken and post-development best management practices are implemented, downstream impacts to water bodies are minimized. As outlined below, these steps will be taken for the Thornburgh project to avoid the kinds of adverse impacts described in Mr. Davis' comments.

Thornburgh Resort will be subject to and will comply with all Local, State and Federal requirements throughout the construction and post-construction phases of development. The Oregon Department of Environmental Quality (ODEQ) has jurisdictional authority on the requirements for stormwater management and has developed/approved guidance documents to meet these requirements. Thornburgh Resort will obtain the required Oregon DEQ permits to manager stormwater runoff including the 1200-C Construction Stormwater Permit and the Water Pollution Control Facilities Permit for Class V Stormwater Underground Injection Control System. In addition, Thornburgh Resort is in the process of obtaining a Water Pollution Control Facilities Permit for wastewater treatment.

As part of the 1200-C Construction Stormwater Permit (Oregon Administrative Rules (OAR) 340-045-0015 and 0033 (5)), Thornburgh Resort will develop an erosion and sediment control plan to prevent erosion and control sediment runoff. Best management practices will stop sediment erosion and transport will be included in the plan to meet this goal. As part of the permit Thornburgh Resort is required to inspect and maintain stormwater controls throughout the construction phase of the development.

The Thornburgh Resort post-construction stormwater management design will collect and infiltrate stormwater runoff. Stormwater runoff will discharge into drywells, classified as underground Injection Control (UIC) facilities which are regulated by the ODEQ. Oregon DEQ requires permits (40 CFR 144.25) for Class V systems to protect fresh water aquifers. Thornburgh Resort will apply for and obtain an individual Water Pollution Control Facilities Permit (WPCF) for Class V stormwater underground injection control systems. As part of this permit, Thornburgh Resort will monitor the effectiveness of treatment facilities and report findings to ODEQ. Ineffective treatment facilities are required to be replaced. This permit is intended for owners of multiple UIC facilities and requires the following items:

Stormwater Discharge Monitoring Plan (SDMP),
UIC Registration and Reporting Plan,
UIC Management Plan (UICMP) will include:
- UIC Registration Data Base,
- Operations and Maintenance (O&M) Plan,
- BMP Monitoring Plan,
- Employee Training and Public Education,
- Spill Prevention and Pollution Control (SPC) Plan,
- Abandonment, Decommissioning or Alternation of UIC Injection Systems Plan.

DEVELOPMENT SERVICES
LAND PLANNING
CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
LAND SURVEY

5415 SW Westgate Dr.
Suite 100
Portland, OR
97221

PH 503/419-2500
FX 503/419-2600

www.wrgd.com

The proposed community sewage systems will be constructed and operated under a renewable WPCF permit, OAR 340-045. The projects sewage collection, conveyance, treatment and irrigation systems will be owned by one entity in charge of operating and maintaining the systems. Full-time staff will provide services continually, and monitoring and reporting activities will comply with the requirements of the permit.

The above programs and requirements are designed to ensure appropriate stormwater management during construction and post-construction operations and to avoid the types of problems described by Mr. Davis.

Sincerely,
WRG Design, Inc.

Cedomir Jesic, PE, CFM
Director of Water Resources

W R G
DESIGN INC.

July 14, 2008

Anne Corcoran Briggs
Hearings Officer

WRG Design, Inc. is a multidisciplinary design firm that has provided expert water resources services since 1990. Our team has extensive experience working with private and public clients to provide services for master planned communities across the United States. As of 2007, WRG, including its six full-service offices in Portland, Sacramento, Boise, Las Vegas, Phoenix, and Charlotte, is a division of Cardno International, a global engineering firm headquartered in Australia.

DEVELOPMENT SERVICES

LAND PLANNING

CIVIL ENGINEERING

LANDSCAPE ARCHITECTURE

LAND SURVEY

Water Resources Capabilities:

- Hydrologic modeling
- Hydraulic analysis
- CLOMR/LOMR submittals
- SWPPP design
- Pump/lift station design
- 404 permitting/water and sewer distribution
- Erosion protection
- Channelization design
- Storm drain design
- Master drainage plans
- Bridge and culvert design
- Water Cycle Management

Sample Recent Project List (United States):

**Avimore, Boise, Idaho**
WRG Design provided landscape theming, master planning, survey and civil engineering design services for this 830 acre master planned community nestled in the foothills north of Boise, Idaho. The project features a 13 acre Village Center with up to 175,000 square feet of mixed-use building space, 684 residential lots, 20 acres of parks and sports fields, an elementary school, church, and nearly 10 miles of recreational trails. Through careful site design and the introduction of grade adaptive housing WRG was able to meet the client's vision of creating a community that respects the natural character of the landscape while providing the opportunity for active lifestyles within the nearly 500 acres of open space.

**Dry Creek Ranch, Ada County, Idaho**
WRG has been retained to provide survey services, landscape architecture, master planning and land use planning/entitlements for this JMM Dry Creek, LLC Planned Community project.

WRG is also providing project management of all subconsultants for the project. Civil Engineering including a slope analysis of the hillside, infrastructure coordination, coordination of a private sewer system to serve the development, assistance with wetland and floodplain analysis and preliminary cost estimates.

This proposed 1400-acre Planned Community sits directly in northern Ada County, northeast of Eagle, Idaho and to the west of Hidden Springs, Idaho. It is anticipated that this community will have between 4000-4500 dwelling units. The project will encompass most land uses including single-family residential in a variety of densities and terrains, multi-family residential, mixed-use, regional commercial, neighborhood commercial, a junior high/high school campus, two elementary schools, recreational fields, business campus and a potential equestrian center. A greenbelt will run east to west through the entire site.

**The Ingram Property, Newberg, Oregon**
The Ingram property is envisioned as a mixed use village with a commercial center, townhomes, condominiums and single-family residential. In achieving this goal, Willamette Builders Group contracted WRG to coordinate with governmental jurisdictions during several long-range planning endeavors. Specifically, the property is part of an area currently under consideration for inclusion into the Urban Reserve Area and ultimately into the city

5415 SW Westgate Dr.
Suite 100
Portland, OR
97221

PH 503/419-2500
FX 503/419-2600

www.wrgd.com

limits. The property is also adjacent to the proposed Highway 99E Bypass, whereas, expressway design will impact the property. WRG developed a master plan that balances the site's environmental features, implements long-range growth plans, responds to future public improvements, and considers the region's changing development markets.

**RidgeCrest, Ridgefield, Washington**
WRG's team of planners and engineers provided the guidance and expertise to create the RidgeCrest mixed-use development in Ridgefield, Washington. The project encompasses over 300 acres and is envisioned to serve a key regional employment center for southwest Washington. The project is envisioned to support office, industrial, and institutional uses that are expected to significantly contribute to the region's financial future. The project also includes a retail center and multiple residential neighborhoods to complement its employment centers. WRG's planners provided conceptual site planning and entitlement services. Civil engineering services explored solutions for all aspects of initial site development.

**City Crossing, Henderson, Nevada**
WRG provided civil engineering services which include grading plans, utility plans, drainage studies, traffic studies, and all related survey mapping for this 130 acre mixed-use community located in Henderson, Nevada. City Crossing broke ground in January of 2008 with construction staking services provided by WRG's surveying department.
WRG has been working with the City of Henderson and Plise on the infrastructure for the development of the first 30-acre phase that included office, retail, and residential. WRG has also been working on the forward planning of the 100-acre second phase. This project also includes a five acre park which would satisfy the needs of a mixed-use community.
WRG designed the park with a variety of amenities including a jogging trail, par station fitness course, horseshoe pits, Bocce ball courts, picnic shelters, shuffle board courts, tennis courts, dog run, game table plaza, shrub maze, basketball court, picnic shelters and art display areas. Given the mixed-use nature of the park's surrounding community, diverse selections of outdoor activities are being incorporated into the park in order to accommodate use by a varied range of residents.

**Cornelius Pass Road: Johnson to Francis Roads, Washington County, Oregon**
WRG Design completed the SW Cornelius Pass Road Improvement project for Washington County. It was an interim project that included widening the existing road to three lanes with bike paths and sidewalks on each side. In addition, the project modified the current storm drainage system as well as added new culverts, storm lines, catch basins, manholes, and a water quality facility. The proposed storm drainage system was designed for an ultimate build out of five lanes with bike paths and sidewalks on each side. The three 36-inch corrugated metal pipe (CMP) culverts in SW Cornelius Pass Road were replaced with a 12X4-foot concrete box culvert. Also, the existing 66X5- inch pipe arch culvert in SW 73rd Avenue was replaced with a 12X4-foot concrete box culvert to relieve existing backwater conditions. Wetland impacts required a biological assessment and National Environmental Policy Act review by Oregon Department of State Lands, Oregon Department of Fish and Wildlife, US Army Corps of Engineers, etcetera. WRG utilized HEC-RAS and XP-SWMM for design of two box culvers. Plans and specifications followed ODOT's and Washington County Standards. Client reference: Bill Hunter, Washington County, (503) 846-7828.

**NE Airport Road, Hillsboro, Oregon**
As part of the construction of the Costco Wholesale in Hillsboro, improvements to the adjacent NE Airport Road were required by the City of Hillsboro. WRG Design was hired by the City of Hillsboro to conduct the street improvement design and subsequent hydraulics design and analysis. The hydraulics design included retrofitting the storm water outfalls into Dawson Creek with two separate vegetated swales, analyzing Dawson Creek for the proposed bridge in NE Airport Road, and designing the conveyance system for the street improvements. The analysis utilized the Watershed 2000 study to model Dawson Creek using HEC-RAS. As a part of hydraulics analysis, it was determined that the existing 20-foot wooden bridge needed to be removed and replaced with a 48-foot concrete bridge. This is because it was restricting flow in the creek and caused flooding upstream. In addition to the bridge structure replacement, WRG Design preformed scour analysis and provided creek channel restoration plans, which were able to meet fish passage. WRG utilized two computer software

programs to perform the hydraulic and sizing analyses: XP-SWMM and HEC-RAS. Client reference: Roy Gibson, City of Hillsboro, (503) 681-6148.

**Springbrook, Newberg, Oregon**
Springbrook is a 500-acre, 1,345-unit master planned community located in Newberg, Oregon and is among the largest private developments in the Pacific Northwest. Springbrook is nestled in the heart of the Yamhill County's Wine Country and is just north of historic downtown Newberg. The community is designed around the historical settlement of Springbrook, and from which it receives its namesake. Multiple historical structures will be preserved and integrated into a new village center that will serve as the center piece to the project. The Springbrook community is a mixed-use development including a village center, multiple residential neighborhoods, park spaces, employment districts, and a destination resort. The community is responsive to the physical landscape including water courses, tree stands, and steep topography.

WRG has led the project in all stages of its development including the preliminary visioning and strategy plan. A public outreach effort was launched to introduce the proposed Master Plan to the citizens and local elected officials. WRG submitted a Master Plan land use application for the land addressing the land use, transportation, natural resources, and infrastructure needs of the community plan. WRG worked with the land use attorney on the creation of a development agreement that addressed creative solutions to infrastructure improvements, system development charges, and land use procedures to implement the approved Master Plan. Now, WRG is preparing the civil design documents for individual development phases.

**Happy Valley Subregional Detention and Water, Clackamas County, Oregon**
Quality Facility Construction of the Happy Valley Park Subregional Stormwater Facility was recently completed in the northeastern portion of the City of Happy Valley. The project consists of 2 detention ponds, 2 bioswales, a water quality manhole, and 4500 lineal feet of storm sewer pipe. The facilities serve a drainage basin of approximately 200 acres. Because roughly half of this area is already developed, CCSD#1 will fund half of the project cost from its SWM Capital Improvement Projects budget. The remainder of the cost will be recovered from future development through the collection of "in lieu of" fees, which allow developers to utilize our subregional system, rather than constructing separate onsite treatment and detention facilities. The economies of scale offered by subregional systems reduce land and construction costs, as well as reduce ongoing maintenance costs for CCSD#1. The total project cost was approximately $1.2 million.

The project included wetland mitigation for the impact of one of the detention ponds, as well as for previous County road improvements. Over 7.5 acres of wetland will be enhanced through invasive species removal and replacement with native wetland vegetation. Planting is scheduled for completion by December 31st of this year. In addition to the stormwater facilities, coordinating partners Clackamas County Department of Transportation and Development and the City of Happy Valley constructed half-street improvements, a public parking lot, baseball field improvements, and pedestrian trails through the park. The baseball field improvements allowed CCSD#1 to dispose of excess cut material onsite, instead of paying to have it hauled offsite. If you have questions about the project, please contact Project Manager John Cramer, 503-353-4569.

**125th/Brorockman/Greenway Intersection Improvements, Eddyville, Oregon**
Waterline lowering, new stormwater conveyance system, water quality and underground detention facilities, and underground private utilities. WRG provided a full range of utility infrastructure services on this recently completed intersection improvement including the lowering an existing 8" water main and replacing it with a 16" mainline along Brockman/Greenway and a re-design/upgrade of the existing storm system including underground detention and constructing a conveyance/bypass line for off-site stormwater flows. Our team also guided the relocation and lowering of underground fiber optics, which was a critical scheduling element as on of Verizon's switching stations located in the southwest corner of the intersection, and the relocation and undergrounding of overhead power (PGE). This project represents the first phase of the future extension of 125th Avenue north to Hall Boulevard. This project was completed in 2004.

**Hocken Bridge Replacement and Beaverton Creek Enhancement (Description 1)**
The City of Beaverton has requested a preliminary study be conducted and alternative solutions prepared to look at creek channel improvements, as well as improvements to the Hocken Bridge cross section. WRG will work

with the City of Beaverton to provide project management, surveying, hydraulic modeling, alternate evaluation, final design specifications and cost estimates. This project is in conjunction with the new Cedar Hills Crossing project (upgrade of the old Bernard's Beaverton Mall.) This is a current project for $800,000-$1,500,000.

**The Round at Beaverton Central, Beaverton, Oregon**
WRG is currently providing project management/coordination, civil engineering, survey, and landscape architecture to this resurrected transit oriented mixed-use project in downtown Beaverton. Transportation and utility work has primarily been the reconfiguring of existing utilities to align with the new development.

**Cedar Hills Crossing, Beaverton, Oregon**
Since 2002, WRG has been working with CE John on the redevelopment of Bernards Beaverton Mall (now renamed Cedar Hills Crossing) and has worked with the City of Beaverton in conjunction on this project's redevelopment efforts. WRG is providing project management, civil engineering, land surveying, planning and construction coordination for this large project. Utility infrastructure work for this project included retrofitting a portion of existing storm water run off in order to provide water quality. Additionally, WRG was required to work directly with the City of Beaverton to remove part of the parking lot at Cedar Hills Crossing in order to provide a wider channel for Beaverton Creek (See project description above). Recently WRG completed plans for future connections for a planned water line improvement which will be installed on Cedar Hills Blvd. and connect to the Cedar Hills Crossing Mall.

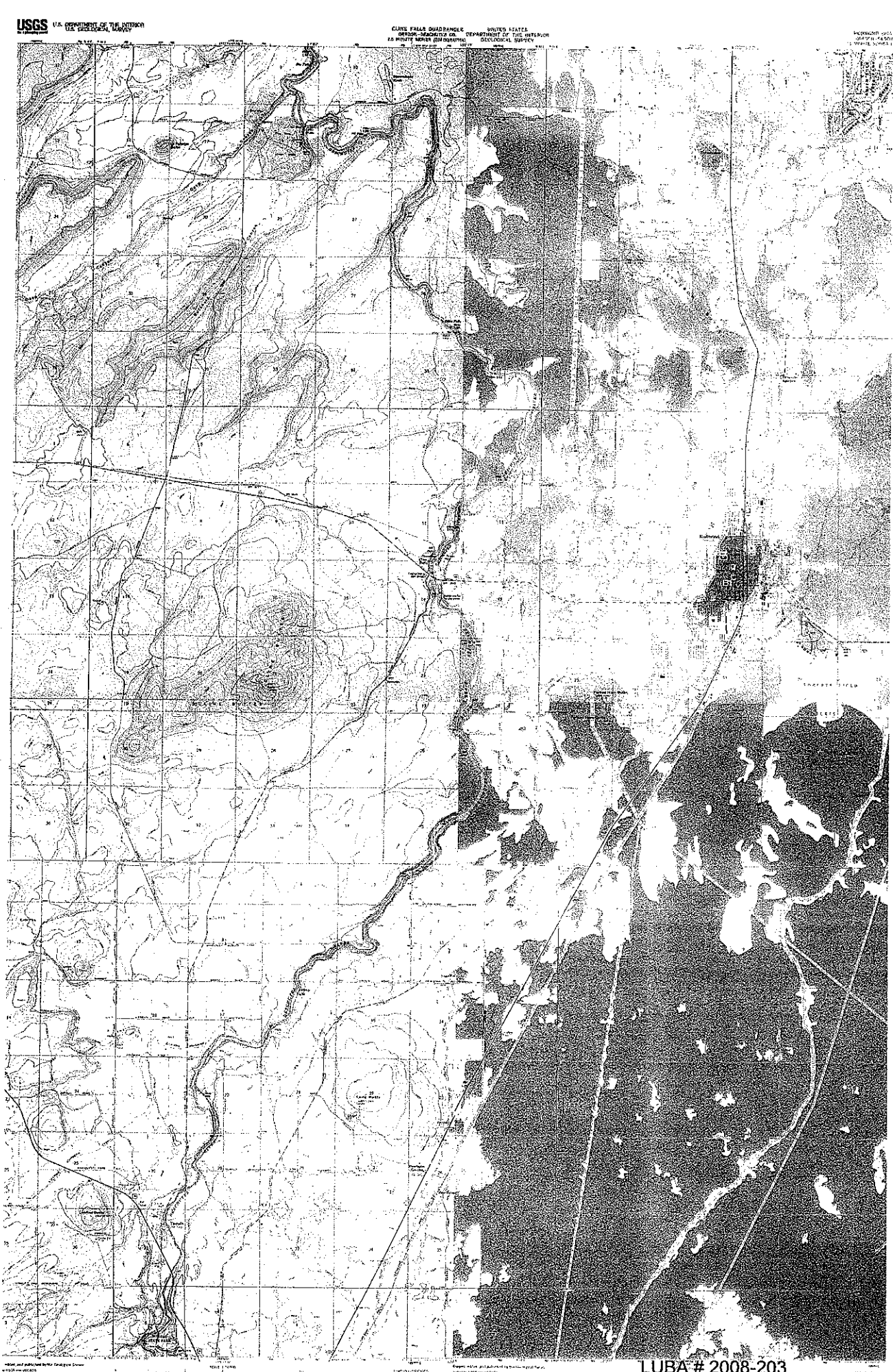
**Pleasant Valley Storm Water Master Plan Update, Gresham, Oregon**
The City of Gresham hired WRG to provide consulting/engineering services related to the Stormwater Master Plans for both Springwater and Pleasant Valley. Work included review of the Pleasant Valley Stormwater Master Plan's location of regional management facilities. Provided recommendation to add or move facilities to maximize the area managed and minimizes costs. Developed a modeling methodology to demonstrate compliance with hydraulic goals for the entire Pleasant Valley area, and to be used by the developer's consultants to model individual subdivisions and demonstrate compliance with the overall goals. WRG provided review of the Pleasant Valley Stormwater Master Plan's definition of "SDC eligible" stormwater infrastructure projects. Recommendation to revise the list of SDC-eligible projects based on simplified criteria. Review of Green Street standards as developed by the City of Gresham. Review of Green Development Practices manual for Pleasant Valley and Spring Valley.

## LOW IMPACT DESIGN PROJECTS

**Lane-Miles Standish Co. Building, Portland, Oregon**
A new parking lot consisting of porous asphalt pavement was constructed for the historic Lane Building to provide both a parking surface as well as stormwater management system. The pavement was constructed above nine inches of rock to store the entire 100-year storm event.

**Santiam River Club, Sweet Home, Oregon**
The proposed project was designed with a "green" approach to sustain the existing natural environment. Streets will be constructed of porous asphalt pavement and each driveway will be constructed of permeable materials such as gravel crushed fines, cobblestone, or permeable concrete pavers. All of the downspouts from each building will drain to underground infiltration trenches. There will be no stormwater conveyance pipes installed on the proposed site as all runoff will be infiltrated. The storage rock will have the necessary volume to retain all storm events up to and including the 100-year storm event.

**Brickworks Village, Gresham, Oregon**
The proposed Brickworks project is a low impact residential development consisting of 92 attached units, 91 single-unit buildings, and a club house on approximately 21.8 acres. Porous pavement will collect and treat all precipitation within the proposed alleyways from building roof drains. Sub-grade gravel and perforated pipe will provide detention. Additional detention will be provided in temporary surface basins and detention pipe. The remainder of the site will sheet flow to the proposed street bump-outs for water quality. Street bump-outs



LUBA # 2008-203
01350

**Land Values for Nunzi Gould Properties**

| Property # | Land | Imp | Total |
|---|---|---|---|
| | | | |
| 104009 | 286,920 | 152,330 | 439,250 |
| 192268 | 376,730 | 34,000 | 410,730 |
| 104010 | 217,220 | 69,620 | 286,840 |
| 132457 | 432,490 | 744,990 | 1,177,480 |
| 134739 | 134,150 | 2,100 | 136,250 |
| 150825 | 603,620 | | 603,620 |
| 208875 | 623,040 | | 623,040 |
| 209491 | 450,520 | 550,980 | 1,001,500 |
| | | | **4,678,710** |

DESCHUTES COUNTY OFFICIAL RECORDS
NANCY BLANKENSHIP, COUNTY CLERK

2003-38325

$31.00

00171816200300383250020023

06/09/2003 11:05:49 AM

D-D Cnt=1 Stn=2 TRACY
$5.00 $11.00 $10.00 $5.00

# DESCHUTES COUNTY CLERK

# CERTIFICATE PAGE

**This page must be included if document is re-recorded. Do Not remove from original document.**

LUBA # 2008-203
01352

WESTERN
TITLE & ESCROW COMPANY

# WARRANTY DEED -- STATUTORY FORM

HIGH DESERT DEVELOPMENT COMPANY LLC, AN OREGON LIMITED LIABILITY COMPANY, Grantor, conveys and warrants to ANNUNZIATA O. GOULD and JAMES S. GUILD, as tenants by the enitirety
Grantee, the following described real property, free of encumbrances except as specifically set forth herein, to wit:

Lot 26, ESTATES AT PRONGHORN; PHASE 1, Deschutes County, Oregon.

Tax Account No(s): 208875 Map/Tax Lot No(s): 16-13-16DA-400

51

This property is free from encumbrances, EXCEPT: All those items of record, if any, as of the date of this deed, including any real property taxes due, but not yet payable.

The true consideration for this conveyance is $ 532,000.00.

**THIS INSTRUMENT WILL NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY APPROVED USES AND TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES AS DEFINED IN ORS 30.930.**

Dated this 4th day of June, 2003.

HIGH DESERT DEVELOPMENT COMPANY LLC, AN OREGON LIMITED LIABILITY COMPANY
BY; HIGH DESERT DEVELOPMENT PARTNERS, LLC
A CALIFORNIA LIMITED LIABILITY COMPANY

BY: _____
NORTHWEST RESORT DEVELOPMENT INC., IT'S MANAGING MEMBER,
THOMAS C. HIX, PRESIDENT

STATE OF OREGON, COUNTY OF DESCHUTES ) SS.

This instrument was acknowledged before me on June 4, 2003 by THOMAS C. HIX, PRESIDENT OF NORTHWEST RESORT DEVELOPMENT, INC., MANAGING MEMBER OF HIGH DESERT DEVELOPMENT PARTNERS, LLC MANAGING MEMBER OF HIGH DESERT DEVELOPMENT COMPANY LLC, AN OREGON LIMITED LIABILITY COMPANY.

_____
(Notary Public for Oregon)
My commission expires _____

OFFICIAL SEAL
P YANCEY
NOTARY PUBLIC - OREGON
COMMISSION NO. 363751
MY COMMISSION EXPIRES FEB. 9, 2007

After recording return to:
ANNUNZIATA O. GOULD AND JAMES S. GUILD
1145 NW CUMBERLAND AVE.
BEND, OR 97701

Until a change is requested all tax statements shall be sent to the following address:
ANNUNZIATA O. GOULD AND JAMES S. GUILD
1145 NW CUMBERLAND AVE.
BEND, OR 97701

TITLE NO. 12-0066803 ESCROW NO. 12-0066803

Recorded By:
Western Title & Escrow Co.

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**Deschutes County**



## Account(s) on Record for GOULD,ANNUNZIATA

| SELECT | Account | Property ID | Address | Status |
|---|---|---|---|---|
| [000001] | 104009 | R1001171232CB11400 | 232 NW CONGRESS ST, BEND 01 | A |
| [000002] | 192268 | R2001151310D000200 | 778 NE 11TH ST, REDMOND 56 | A |

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Account: 104009 Map/TL: R 1-001 171232 CB 11400

* * * CURRENT Ownership Information ONLY

GOULD,ANNUNZIATA
19845 J W BROWN RD
BEND OR 97701

THRU: Guild Mortgage Company
AGENT: FAT (P)

Site Address: 232 NW CONGRESS ST BEND 97701

Assessor Property Description
PARK ADDITION TO BEND Lot: 9 +PT 8 Block: 13

Prop Cls:201 MA:5 VA:31 NH 000 Vol-Page:1993-3110980
Asmt Zone:CN CDD Zone:BEND (CITY OF BEND)

*** Land Values ***

| Asmt type | Acres |
|---|---|
| COMMERCIAL LOT | 0.18 |
| SD | |
| LA | |
| *Total | 0.18 |

*** Improvement Values ***

| FB | BLT | %GD |
|---|---|---|
| 132 | 1920 | 83 |

Room Grid for 132 Total SqFt: 1710

| | | | ROOMS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | LR | K | DR | FAM | BD | BATH | OTH | FP | UTL |
| Sq Ft: | 1368 | 1st Fl | 1 | 1 | | | 2 | 1 | | 1 | 1 |
| | 342 | Basemt | | | | | | | 1 | | |
| | 400 | Carport | | | | | | | | | |

- - - -

Acct 104009 Map/TL: R 1-001 171232 CB 11400
MA: 5 VA: 31 Class: 111

---

Vol Page 1988-1692183 Sales Date 09/02/88 Adjusted Sales Price $53,300

Sales Code 33 CONFIRMED SALE

Grantor: Grantee:

***
Site Address: 232 NW CONGRESS ST BEND 97701
Assessor Property Description
PARK ADD TO BEND Lot: 9 +PT 8 Block: 13

Acct 104009 Map/TL: R 1-001 171232 CB 11400
MA: 5 VA: 31 Class: 711

R 1001 171232-CB-11400 104009 Prop Class 201 Value Area 31
Maint Area 5 Neighborhood 000
Asmt Zone CN

GOULD,ANNUNZIATA
19845 J W BROWN RD 232 NW CONGRESS ST
BEND, OR 97701

* * * I N S P E C T I O N S * * *

Insp By: BELTRAM, L 04/26/04 Intr Insp Yes

Card 1 of 1

- - - - - - - R O O M S - - - - - - -

| | | LR | K | DR | FAM | BD | BATH | OTH | FP | UTL |
|---|---|---|---|---|---|---|---|---|---|---|
| Sq Ft: 1368 | 1st Fl | 1 | 1 | | | 2 | 1 | | 1 | 1 |
| 342 | Basemt | | | | | | | 1 | | |
| 400 | Carport | | | | | | | | | |

Factor Book: 132 Year Built: 1920 Percent Good: 83

* * * I N T E R I O R C O M P O N E N T S * * *

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| ROOF CVR - COMP | | ROOF - GABLE | |
| SINGLE FIREPLACE | 1 | FORCED AIR HEATING | 1368 |
| BATHTUB W/FIBRGL SHWR | 1 | TOILET | 1 |
| LAVATORY | 1 | KITCHEN SINK | 1 |
| DISHWASHER | 1 | VINYL FLOOR | |
| CARPET | | WINDOWS - SINGLE PANE | |
| WINDOWS - WOOD | | SIDING - LAP | |
| SIDING - ALUMINUM | | FOUNDATION - CONCRETE | |
| CONCRETE WALL | | HARDWOOD FLOOR | 1 |
| DRYWALL | 1 | WATER HEATER | 1 |
| CONCRETE SLAB FLOOR | | | |

* * * O T H E R I M P R O V E M E N T C O M P O N E N T S * * *

Factor Book: 132 Year Built: 1920 Percent Good: 83

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| | 1368 | DECKS-FAIR | 132 |
| DECK COVER - GOOD | 132 | | |

* * * * L A N D * * * *

| Description | Description | Description |
|---|---|---|
| ACCESS PUBLIC | ELECTRICITY | GAS |
| WATER PUBLIC | SEWER SYSTEM | VIEW - LIMITED |
| TRAFFIC - MEDIUM | | |

| AT/Class | | Desc | Adj Factor#1 | Adj Factor#2 | Adj Factor#3 |
|---|---|---|---|---|---|
| COMMERCIAL LOT | S | 7700 | | | |
| SD | | | | | |
| LA | | | | | |

* * * T A X P A Y M E N T S * * *

For current balance due information on this account select the following button **(Please note that this link will provide current balance information, including interest & fees, EXCEPT FOR ACCOUNTS IN FORECLOSURE, please call the tax office @ 388-6540 for payoff information on foreclosure accounts)**

Get real-time tax summary for this property

This web site uses the FREE Adobe® Acrobat® Reader™ plug-in. If you do not have this plug-in, click the icon to get it.

| 2007 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 2,248.95 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-14-07 0752 | -2,181.48 | -67.47 | 610476 | |

| 2006 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 2,185.40 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-14-06 0652 | -2,119.84 | -65.56 | 438436 | |

| 2005 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 2,130.70 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-14-05 5852 | -2,066.78 | -63.92 | 300221 | |

| 2004 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 2,077.73 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-04 0452 | -2,015.40 | -62.33 | 183305 | |

| 2003 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 2,024.46 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |

```
   11-12-03 2037      -1,963.73       -60.73       45754

2002 Balance Due        Adval Tax
         0.00         1,965.33
   Trn Date Btch       Received     Int/Disc Jrnl  Rcpt#  Description
   11-12-02 7454      -1,906.37       -58.96 C 90 1284203

2001 Balance Due        Adval Tax
         0.00         1,846.39
   Trn Date Btch       Received     Int/Disc Jrnl  Rcpt#  Description
   11-07-01 6763      -1,791.00       -55.39 C 90 1170072

2000 Balance Due        Adval Tax
         0.00         1,795.85
   Trn Date Btch       Received     Int/Disc Jrnl  Rcpt#  Description
   11-15-00 6166      -1,741.97       -53.88 C 90 1100367

1999 Balance Due        Adval Tax
         0.00         1,768.38
   Trn Date Btch       Received     Int/Disc Jrnl  Rcpt#  Description
   11-15-99 5594      -1,715.33       -53.05 C 90 991596

1998 Balance Due        Adval Tax
         0.00         1,718.57
   Trn Date Btch       Received     Int/Disc Jrnl  Rcpt#  Description
   11-15-98 5123      -1,667.01       -51.56 C 90 892068

1997 Balance Due        Adval Tax
         0.00         1,638.07
   Trn Date Btch       Received     Int/Disc Jrnl  Rcpt#  Description
   12-15-97 4568      -1,588.93       -49.14 C 90 794184

1996 Balance Due        Adval Tax
         0.00         1,670.25
   Trn Date Btch       Received     Int/Disc Jrnl  Rcpt#  Description
   11-15-96 4087      -1,620.14       -50.11 C 90 695037

104009 has no permits or Environmental Health site evalutions

and has no land use applications or Agricultural Permits.
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********************************************************************************
**********************   Real Property Tax Lot Record   ***********************
********************************************************************************
```

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```
17 12 32 C B 11400  Code 1-001

This description is for tax purposes ONLY and can not be
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```

PARK ADD TO BEND Lot: 9 +PT 8 Block: 13

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Account: 192268 Map/TL: R 2-001 151310 D0 00200

* * * CURRENT Ownership Information ONLY

GUILD,JAMES S
GOULD,ANNUNZIATA
19845 JW BROWN RD
BEND OR 97701

Site Address: 778 NE 11TH ST REDMOND 97756

Assessor Property Description
3 T INDUSTRIAL PARK Lot: 7

Prop Cls:301 MA:2 VA:06 NH 000 Vol-Page: 2005-06237
Asmt Zone:M2 CDD Zone:M2 (HEAVY INDUSTRIAL - REDMOND UGB)

*** Land Values ***

| Asmt type | Acres |
|---|---|
| INDUSTRIAL LOT | 1.46 |

*** Improvement Values ***

| FB | BLT | %GD |
|---|---|---|
| 571 | 1934 | 100 |

| FB | SqFt/Quantity |
|---|---|
| 571 | 3,000 |

***** Values shown below are as of the Assessment Date, January 1 of each year *****

| *** | 2007 | | 2006 | | 2005 | |
|---|---|---|---|---|---|---|
| | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. |

| | | | | | | |
|---|---|---|---|---|---|---|
| LND: | 376,730 | | 256,280 | | 153,460 | |
| IMP: | 34,000 | | 34,000 | | | |
| TOT: | 410,730 | 121,270 | 290,280 | 117,740 | 153,460 | 95,430 |

| SALES: | --- 1 --- | --- 2 --- | --- 3 --- | --- 4 --- |
|---|---|---|---|---|
| Date | 01-31-05 | | | |
| Sale $ | 300000 | 0* | 0* | 0* |
| Cndtn | 26 | 06 | 09 | 06 |
| Class | 300 | 300 | 300 | 300 |
| Inst # | 2005-06237 | 1999-8308* | 1999-8309* | 1998-4991513 |
| OthPcl | | 192267 | 192267 | 192267 |
| | | 192269 | 192269 | 192269 |
| | | 192270 | 192270 | 192270 |
| | | 192271 | 192271 | 192271 |
| | | | | 192272 |
| | | | | 192273 |
| | | | | 192274 |
| | | | | 192275 |
| | | | | 195925 |
| | | | | 195926 |
| | | | | 195927 |
| | | | | 195928 |
| | | | | 195929 |
| | | | | 195930 |

Sales Detail Information

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Vol Page 2005-06237 Sales Date 01/31/05 Adjusted Sales Price $300,000

Sales Code 26 NEW CONSTRUCTION OR NEW PROPERTY

Grantor:

HAP TAYLOR AND SONS INC

BEND OR 97709

Grantee:

GUILD, JAMES S & ANNUNZIATA
19845 JW BROWN RD
BEND OR 97701

***
Site Address: 778 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 7

Acct 192268 Map/TL: R 2-001 151310 DO 00200
MA: 2 VA: 06 Class: 300

---

Vol Page 1999-8308 Sales Date 02/19/99 Adjusted Sales Price $0

Sales Code 06 GRANTEE IS RELATED OR BUSINESS ASSOCIATES

Grantor:

3-T EQUIPMENT RENTAL L L C
PO BOX 83
BEND OR 97709

Grantee:

TAYLOR,CHARLES HAP
PO BOX 83
BEND OR 97709

****** Multiple Accounts on this Sale ******

***
Site Address: 1260 NE HEMLOCK AVE REDMOND 97756
Assessor Property Description

3 T INDUSTRIAL PARK Lot: PT 8 Block:

Acct 192267 Map/TL: R 2-001 151310 D0 00100
MA: 2 VA: 06 Class: 300

***
Site Address: 778 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 7

Acct 192268 Map/TL: R 2-001 151310 D0 00200
MA: 2 VA: 06 Class: 300

***
Site Address: 760 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 6

Acct 192269 Map/TL: R 2-001 151310 D0 00300
MA: 2 VA: 06 Class: 300

***
Site Address: 734 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 5

Acct 192270 Map/TL: R 2-001 151310 D0 00400
MA: 2 VA: 06 Class: 300

***
Site Address: 735 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 4

Acct 192271 Map/TL: R 2-001 151310 D0 00500
MA: 2 VA: 06 Class: 300

---

Vol Page 1999-8309 Sales Date 02/18/99 Adjusted Sales Price $0

Sales Code 09 TRADE OR EXCHANGE OF PROPERTIES

| Grantor: | Grantee: |
|---|---|
| TAYLOR,CHARLES HAP | HAP TAYLOR AND SONS INC |
| PO BOX 83 | PO BOX 83 |
| BEND OR 97709 | BEND OR 97709 |

****** Multiple Accounts on this Sale ******

***
Site Address: 1260 NE HEMLOCK AVE REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: PT 8 Block:

Acct 192267 Map/TL: R 2-001 151310 D0 00100
MA: 2 VA: 06 Class: 300

***
Site Address: 778 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 7

Acct 192268 Map/TL: R 2-001 151310 DO 00200
MA: 2 VA: 06 Class: 300

***
Site Address: 760 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 6

Acct 192269 Map/TL: R 2-001 151310 DO 00300
MA: 2 VA: 06 Class: 300

***
Site Address: 734 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 5

Acct 192270 Map/TL: R 2-001 151310 DO 00400
MA: 2 VA: 06 Class: 300

***
Site Address: 735 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 4

Acct 192271 Map/TL: R 2-001 151310 DO 00500
MA: 2 VA: 06 Class: 300

---

Vol Page 1998-4991513 Sales Date 06/10/98 Adjusted Sales Price $0

Sales Code 06 GRANTEE IS RELATED OR BUSINESS ASSOCIATES

| Grantor: | Grantee: |
|---|---|
| 3T EQUIPMENT RENTAL | 3-T EQUIPMENT RENTAL L L C |
| PO BOX 83 | PO BOX 83 |
| BEND OR 97709 | BEND OR 97709 |

****** Multiple Accounts on this Sale ******

***
Site Address: 1260 NE HEMLOCK AVE REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: PT 8 Block:

Acct 192267 Map/TL: R 2-001 151310 DO 00100
MA: 2 VA: 06 Class: 300

***
Site Address: 778 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 7

Acct 192268 Map/TL: R 2-001 151310 DO 00200
MA: 2 VA: 06 Class: 300

***
Site Address: 760 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 6

Acct 192269 Map/TL: R 2-001 151310 D0 00300
MA: 2 VA: 06 Class: 300

***
Site Address: 734 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 5

Acct 192270 Map/TL: R 2-001 151310 D0 00400
MA: 2 VA: 06 Class: 300

***
Site Address: 735 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 4

Acct 192271 Map/TL: R 2-001 151310 D0 00500
MA: 2 VA: 06 Class: 300

***
Site Address: 761 NE 11TH ST REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 3

Acct 192272 Map/TL: R 2-001 151310 D0 00600
MA: 2 VA: 06 Class: 300

***
Site Address: 1090 NE HEMLOCK AVE REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 2

Acct 192273 Map/TL: R 2-001 151310 D0 00700
MA: 2 VA: 06 Class: 300

***
Site Address: 990 NE HEMLOCK AVE REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: 1

Acct 192274 Map/TL: R 2-001 151310 D0 00800
MA: 2 VA: 06 Class: 300

***
Site Address: 1253 NE GREENWOOD AVE REDMOND 97756
Assessor Property Description
3 T INDUSTRIAL PARK Lot: PT 8 Block:

Acct 192275 Map/TL: R 2-001 151310 D0 00900
MA: 2 VA: 06 Class: 301

***
Site Address: 714 NE 11TH ST REDMOND 97756
Assessor Property Description
3-T INDUSTRIAL PARK PHASE TWO Lot: PT 12 Block:

Acct 195925 Map/TL: R 2-001 151310 D0 00901
MA: 2 VA: 06 Class: 999

***

Assessor Property Description
3-T INDUSTRIAL PARK PHASE TWO Lot: 11

Acct 195926 Map/TL: R 2-001 151310 D0 00902
MA: 2 VA: 06 Class: 999

***
Site Address: 919 NE GREENWOOD AVE REDMOND 97756
Assessor Property Description
3-T INDUSTRIAL PARK PHASE TWO Lot: 10

Acct 195927 Map/TL: R 2-001 151310 D0 00903
MA: 2 VA: 06 Class: 999

***
Assessor Property Description
3-T INDUSTRIAL PARK PHASE TWO Lot: 16

Acct 195928 Map/TL: R 2-001 151310 D0 00904
MA: 2 VA: 06 Class: 999

***
Site Address: 1032 NE GREENWOOD AVE REDMOND 97756
Assessor Property Description
3-T INDUSTRIAL PARK PHASE TWO Lot: 15

Acct 195929 Map/TL: R 2-001 151310 D0 00905
MA: 2 VA: 06 Class: 999

***
Site Address: 1250 NE GREENWOOD AVE REDMOND 97756
Assessor Property Description
3-T INDUSTRIAL PARK PHASE TWO Lot: 14

Acct 195930 Map/TL: R 2-001 151310 D0 00906
MA: 2 VA: 06 Class: 999

---

R 2001 151310-D0-00200 192268 Prop Class 301 Value Area 06
Maint Area 2 Neighborhood 000
Asmt Zone M2

GUILD, JAMES S & ANNUNZIATA
19845 JW BROWN RD
BEND, OR 97701

778 NE 11TH ST

---

* * * I N S P E C T I O N S * * *

Insp By: ST.ONGE-TISIOT09/28/05 Intr Insp No

---

Card 1 of 1

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* * * * L A N D * * * *

| Description | Description | Description |
|---|---|---|
| ACCESS PUBLIC | ELECTRICITY | GAS |
| UNDERGROUND UTILITY | WATER PUBLIC | SEWER SYSTEM |
| CORNER LOT | TOPO - LIGHT TO MED. | |

| AT/Class | | Desc | Adj Factor#1 | Adj Factor#2 | Adj Factor#3 |
|---|---|---|---|---|---|
| INDUSTRIAL LOT | S | 63588 | REFER TO COMM | | |

* * * TAX PAYMENTS * * *

For current balance due information on this account select the following button **(Please note that this link will provide current balance information, including interest & fees, EXCEPT FOR ACCOUNTS IN FORECLOSURE, please call the tax office @ 388-6540 for payoff information on foreclosure accounts)**

Get real-time tax summary for this property

This web site uses the FREE Adobe® Acrobat® Reader™ plug-in. If you do not have this plug-in, click the icon to get it.

| 2007 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 2,061.96 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-07 1507 | -2,000.10 | -61.86 | 631361 | |

| 2006 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 2,039.80 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-17-06 7067 | -1,978.61 | -61.19 | 472222 | |

| 2005 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 1,702.70 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-18-05 8057 | -1,651.62 | -51.08 | 340718 | |

| 2004 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 1,663.38 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-12-04 1204 | -1,613.48 | -49.90 | 172180 | |

| 2003 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 1,193.28 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-17-03 1703 | -1,157.48 | -35.80 | 58465 | |

| 2002 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 1,147.72 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-12-02 7452 | -1,113.29 | -34.43 C 90 | 1279510 | |

| 2001 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 1,099.90 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-01 6793 | -1,066.90 | -33.00 C 90 | 1194821 | |

| 2000 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 1,081.16 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-00 6153 | -1,048.73 | -32.43 C 90 | 1090145 | |

| 1999 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 1,055.86 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-12-99 5587 | -1,024.18 | -31.68 C 90 | 973387 | |

| 1998 Balance Due | Adval Tax |
|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 0.00 | 1,025.23 | | | | |
| Trn Date | Btch | Received | Int/Disc | Jrnl Rcpt# | Description |
| 11-12-98 | 5114 | -994.47 | -30.76 | C 90 878177 | |

| | | | | | |
|---|---|---|---|---|---|
| 1997 Balance Due | | Adval Tax | | | |
| 0.00 | | 982.78 | | | |
| Trn Date | Btch | Received | Int/Disc | Jrnl Rcpt# | Description |
| 12-10-97 | 4556 | -953.30 | -29.48 | C 90 772474 | |

City of Redmond Building Permit B57303 on Account number: 192268

Map/TL.....: 151310 DO 00200
ACCOUNT.....: 192268
SUBDIVISION/TRAILER PARK: 3 T INDUSTRIAL PARK
LOT.....: 7
BLOCK.....: 0
STATUS.....: Active
BUILDING CLASS.....: UNKNOWN
PERMIT CLASS.....: R
STRUCTURE TYPE.....: OTHER
PERMIT ZONING.....: REDMONDýM2
BUILDING USE.....: MOVE BLDG TO THIS SITE & REPAIR OREGON TRUNK FREIGHT DEPOT
STRUCTURE TYPE.....: OTHER
ON SEWER?.....: YES
SEPTIC PERMIT NUMBER....: N
LINKED BUILDING PERMIT..: B57303
PERMIT NAME.....: JAMES S. GUILD AND ANNUNZIATA
CONTRACTOR NAME.....: GUILD,JAMES S
SITE ADDRESS.....: 778 NE 11TH AVE,REDMOND
STORIES.....:
SQ FEET.....: 3000
BEDROOMS.....: 0
PERMIT VALUATION.....: 63,693
APPLICATION DATE.....: 12/03/04
PERMIT ISSUE DATE.....: 02/04/05

| Inspection | Initial | Comments |
|---|---|---|
| 02/22/05 | DKP | APPROVED FOOTING, UFER OK |
| 02/25/05 | HCC | STEMWALL APPROVED |
| 10/25/05 | CEW | PROGRESS INSPECTION APPROVED.... |
| 04/28/06 | RWW | PROGRESS APPROVED |
| 12/12/06 | RWW | 131**INSULATION WALL APPROVED<br>1)**1000 - INSPECTION COMMENTS: PARTIAL INSULATION |
| 01/30/07 | RWW | 146**NAILING APPROVED<br>1)**1000 - INSPECTION COMMENTS: PARTIAL ONLY IN RESTROOMS |

City of Redmond Electrical Permit E80579 on Account number: 192268

Map/TL.....: 151310 DO 00200
ACCOUNT.....: 192268
SUBDIVISION/TRAILER PARK: 3 T INDUSTRIAL PARK
LOT.....: 7
BLOCK.....: 0
STATUS.....: Active
BUILDING CLASS.....: COMMERCIAL
PERMIT CLASS.....: N
STRUCTURE TYPE.....: OTHER
PERMIT ZONING.....: REDMONDýM2
BUILDING USE.....: 3000 SF EXISTING BLDG
STRUCTURE TYPE.....: UNKNOWN
UNIT IDS.....: #23184
ON SEWER?.....: NOT LISTED
LINKED BUILDING PERMIT..: B57303
PERMIT NAME.....: GUILD,JAMES S;GOULD,ANNUNZIATA
CONTRACTOR NAME.....: B AND C SMITH CONTRACTING LLC
SITE ADDRESS.....: 778 NE 11TH ST REDMOND

APPLICATION DATE.....: 04/06/05
PERMIT ISSUE DATE.....: 04/06/05

| Inspection | Initial | Comments |
|---|---|---|
| 04/18/05 | GTJ | SERVICE APPROVED |
| 04/28/06 | RED | PROGRESS APPROVED |
| 11/03/06 | GTJ | RESTROOM ROUGH APPROVED |

City of Redmond Mechanical Permit M31103 on Account number: 192268

Map/TL.....: 151310 DO 00200
ACCOUNT.....: 192268
SUBDIVISION/TRAILER PARK: 3 T INDUSTRIAL PARK
LOT.....: 7
BLOCK.....: 0
STATUS.....: Active
BUILDING CLASS.....: UNKNOWN
PERMIT CLASS.....: N
STRUCTURE TYPE.....: OTHER
PERMIT ZONING.....: REDMONDýM2
BUILDING USE.....: EXISTING FREIGHT DEPOT BLDG
STRUCTURE TYPE.....: UNKNOWN
ON SEWER?.....: NOT LISTED
LINKED BUILDING PERMIT..: B57303
PERMIT NAME.....: HAP TAYLOR AND SONS INC,
CONTRACTOR NAME.....: MOUNTAIN VIEW HEATING INC
SITE ADDRESS.....: 778 NE 11TH ST,REDMOND
APPLICATION DATE.....: 12/02/04
PERMIT ISSUE DATE.....: 02/04/05

City of Redmond Plumbing Permit P26388 on Account number: 192268

Map/TL.....: 151310 DO 00200
ACCOUNT.....: 192268
SUBDIVISION/TRAILER PARK: 3 T INDUSTRIAL PARK
LOT.....: 7
BLOCK.....: 0
STATUS.....: Active
BUILDING CLASS.....: UNKNOWN
PERMIT CLASS.....: N
STRUCTURE TYPE.....: OTHER
PERMIT ZONING.....: REDMONDýM2
BUILDING USE.....: EXISTING FREIGHT DEPOT BLDG
STRUCTURE TYPE.....: UNKNOWN
ON SEWER?.....: NOT LISTED
LINKED BUILDING PERMIT..: B57303
PERMIT NAME.....: HAP TAYLOR AND SONS INC,
CONTRACTOR NAME.....: NOE PLUMBING INC
SITE ADDRESS.....: 778 NE 11TH ST,REDMOND
APPLICATION DATE.....: 12/02/04
PERMIT ISSUE DATE.....: 02/04/05

| Inspection | Initial | Comments |
|---|---|---|
| 03/10/05 | SFJ | SEWER FROM BLDG TO VAULT APPROVED, COMPLETE CONNECTION TO CITY. REINSPCETION FEE REQUIRED, OK TO COVER. |
| 03/17/05 | SFJ | INSPECTION NOTICE: 1. BED PIPING WITH CLEAN EARTH SEWER CONNECTION TO CITY. 2. REMOVE SOILS A MINIMUM OF 6" BELOW BACKFLOW DEVICE. 3. PROVIDE FOR TESTS ON BOTH BACKFLOW DEVICES BY FINAL. 4. PROVIDE A MINIMUM OF 30" OF COVER OVER WATER SERVICE TO PROTECT FROM FREEZING, ONLY 15" DEEP 6'7" AWAY FROM STRUCTURE. |
| 03/18/05 | SFJ | SEWER & WATER APPROVED |
| 11/03/06 | SFJ | 309**ROUGH PLUMBING CORRECTIONS<br>1)**1000 - INSPECTION COMMENTS: 1. INSTALL NAIL PLATES AT REAR HOSE BIBS. 2. IDENTIFY 1 1/2 VENT: FOR WHAT FIXTURE? AND 3/4" HOT H2O |
| 11/03/06 | SFJ | 309**ROUGH PLUMBING APPROVED<br>1)**1000 - INSPECTION COMMENTS: DWV & WATER TEST OK. |

City of Redmond Sidewalk/Driveway Permit SW5517 on Account number: 192268

Map/TL.....: 151310 D0 00200
ACCOUNT.....: 192268
SUBDIVISION/TRAILER PARK: 3 T INDUSTRIAL PARK
LOT.....: 7
BLOCK.....: 0
STATUS.....: Final
BUILDING CLASS.....: COMMERCIAL
STRUCTURE TYPE.....:
PERMIT ZONING.....: REDMONDýM2
BUILDING USE.....:
STRUCTURE TYPE.....: UNKNOWN
ON SEWER?.....: NOT LISTED
LINKED BUILDING PERMIT..: B57303
PERMIT NAME.....: HAP TAYLOR AND SONS INC,
CONTRACTOR NAME.....: UNKNOWN
SITE ADDRESS.....: 778 NE 11TH ST,REDMOND
APPLICATION DATE.....: 12/02/04
PERMIT ISSUE DATE.....: 02/04/05
FINAL DATE.....: 06/30/06

| Inspection | Initial | Comments |
|---|---|---|
| 06/14/05 | NAP | CURB APPROVED |
| 06/27/05 | NAP | APPROACH APPROVED |

***Redmond Land use application: TU043 on Account number: 192268***

Map/TL.....: 151310 D0 00200
ACCOUNT.....: 192268
REQUEST.....: MOVE OREGON TRUNK DEPOT TEMPORARY UNTIL LAND USE PROCESS IS COMPLETE
DATE SUBMITTED.....: 12/02/04
STATUS DATE.....: 12/02/04
APPLICANT.....: JIM GUILD
SITE ADDRESS.....: 111NE 11TH STREET,REDMOND

***Redmond Land use application: SP0448 on Account number: 192268***

Map/TL.....: 151310 D0 00200
ACCOUNT.....: 192268
REQUEST.....: RENNOVATE TRUNK FREIGHT DEPOT,3000 SF SHOP AND OFFICE
DATE SUBMITTED.....: 12/02/04
STATUS.....: FINAL
STATUS DATE.....: 01/06/05
APPLICANT.....: JIM GUILD CONSTRUCTION
SITE ADDRESS.....: 111 NE 11TH ST,REDMOND

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**********
********** Real Property Tax Lot Record **********
**********

Get Latest Tax Lot Record for this property

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**Tax Lot Record prior to July 2003**

For Tax Lot Records prior to 1995 please call our office at (541)388-6508

Prior Tax Lot Card is 1513000000120
**********

15 13 10 D 0 00200 Code 2-004

*** Filed Tax Lot Card has been REVIEWED ***

This description is for tax purposes ONLY and can not be attached to any legal document.

3 T INDUSTRIAL PARK Lot: 7

RC970255 03/12/97

Posted on 03/12/97 by HELENS

** Text:
ACREAGE ADJUSTMENT:
BEFORE ACRES 38.32 AFTER ACRES 39.19
*
LESS ROADS (1.77 AC)
BEFORE ACRES 39.19 AFTER ACRES 37.42
*
TL 120 CANCELLED NOW 151310D 100 THRU 900
BEFORE ACRES 37.42 AFTER ACRES 0

Source: 3 T INDUSTRIAL PARK (FILED 10-15-96, D-274), JV5542-5544, NAME SOURCE: B&S 356/2782 10-31-94

1998-26820 06/23/98 499-1513 Deed
Posted on 11/24/98 by JUDYM

Clerk Recording Remarks:
SEE DOCUMENT FOR COMPLETE LEGAL; BARGAIN AND SALE DEED

Clerk Recording Grantor:
THREE T EQUIPMENT RENTAL
TAYLOR,CHARLES HAP
TAYLOR,JEFFREY WADE
TAYLOR,TODD M

Clerk Recording Grantee:
THREE T EQUIPMENT RENTAL LLC

** Text:
ONLY ONE GRANTOR -
3-5 EQUIPMENT RENTAL CONSISTS OF OTHER NAMES LISTED

GRANTEE: 3-T EQUIPMENT RENTAL, L.L.C.

1999-8308 02/19/99 Deed
Posted on 04/08/99 by EILEENW

Clerk Recording Remarks:
BARGAIN AND SALE DEED

Clerk Recording Grantor:
THREE T EQUIPMENT RENTAL LLC

Clerk Recording Grantee:
TAYLOR,CHARLES HAP

| TAYLOR,TODD M
| TAYLOR,LORRI
| TAYLOR,JEFFERY W
| TAYLOR,TAMILA R
|
| ** Text:
| GRANTEES' INTEREST AS FOLLOWS:
| TAYLOR,CHARLES HAP 1/3
| TAYLOR,TODD M & TAYLOR,LORRI (T/E) 1/3
| TAYLOR,JEFFERY W & TAYLOR,TAMILA R (T/E) 1/3
| ALL AS T/C

1999-8309 02/19/99

| Deed
| Posted on 04/08/99 by EILEENW
|
| Clerk Recording Remarks:
| WARRANTY DEED
|
|
| Clerk Recording Grantor:
| TAYLOR,CHARLES HAP
| TAYLOR,TODD M
| TAYLOR,LORRI
| TAYLOR,JEFFERY W
| TAYLOR,TAMILA R
|
| Clerk Recording Grantee:
| HAP TAYLOR & SONS INC

Enhancing the lives of citizens by delivering quality services in a cost-effective manner

**Deschutes County**



## Account(s) on Record for GOULD,ANNUNZIATA O

| SELECT | Account | Property ID | Address | Status |
|---|---|---|---|---|
| [00001] | 104010 | R1001171232CB11300 | 254 NW CONGRESS ST, BEND 01 | A |
| [00002] | 132457 | R20071612180000700 | 19845 J W BROWN RD, BEND 01 | A |
| [00003] | 134739 | R6001151009BA06200 | 361 S SPRUCE ST, SISTERS 59 | A |
| [00004] | 150825 | R20071612180000300 | 65950 GERKING MARKET RD, BEND 01 | A |
| [00005] | 208875 | R2004161316DA00400 | 65785 PRONGHORN ESTATES DR, BEND 01 | A |
| [00006] | 209491 | R2007161220AA00112 | 20330 ROCK CANYON RD, BEND 01 | A |

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**Deschutes County**

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Account: 104010 Map/TL: R 1-001 171232 CB 11300

* * * CURRENT Ownership Information ONLY

GOULD,ANNUNZIATA O
19845 J W BROWN RD
BEND OR 97701

Site Address: 254 NW CONGRESS ST BEND 97701

Assessor Property Description
PARK ADDITION TO BEND Lot: PT 8 Block: 13

Prop Cls:101 MA:5 VA:31 NH 000 Vol-Page:1994-3302987
Asmt Zone:RM CDD Zone:BEND (CITY OF BEND)

*** Land Values ***

| Asmt type |
|---|
| URBAN LOT |
| SD |
| LA |
| *Total |

*** Improvement Values ***

| FB | BLT | %GD |
|---|---|---|
| 121 | 1925 | 69 |

Room Grid for 121 Total SqFt: 571

| | | | ROOMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | LR | K | DR | FAM | BD | BATH | OTH | FP | UTL |
| Sq Ft: 571 | 1st Fl | | 1 | 1 | | | 1 | 1 | | | |
| 216 | Garage | | | | | | | | | | |

***** Values shown below are as of the Assessment Date, January 1 of each year *****

| *** | --------2007-------- | | --------2006-------- | | ---------2005-------- | |
|---|---|---|---|---|---|---|
| | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. |
| LND: | 217,220 | | 151,360 | | 97,050 | |
| IMP: | 69,620 | | 62,160 | | 55,010 | |
| TOT: | 286,840 | 66,510 | 213,520 | 64,580 | 152,060 | 62,700 |

| SALES: | --- 1 --- | --- 2 --- | --- 3 --- |
|---|---|---|---|
| Date | 02-23-94 | 01-19-94 | 09-15-85 |
| Sale $ | 49500 | 0 | 20000 |
| Cndtn | 30 | 12 | 30 |
| Class | 101 | 101 | 711 |
| Inst # | 1994-33029871 | 1994-32703831 | 985-1040632 |

Sales Detail Information

---

Vol Page 1994-3302987 Sales Date 02/23/94 Adjusted Sales Price $49,500

Sales Code 30 UNCONFIRMED SALE

Grantor:

GRANT,JOAN M
PO BOX 6241
BEND OR 97708

Grantee:

GOULD,ANNUNZIATA O
19845 JW BROWN RD
BEND OR 97701

***
Site Address: 254 NW CONGRESS ST BEND 97701
Assessor Property Description
PARK ADD TO BEND Lot: PT 8 Block: 13

Acct 104010 Map/TL: R 1-001 171232 CB 11300
MA: 5 VA: 31 Class: 101

---

Vol Page 1994-3270383 Sales Date 01/19/94 Adjusted Sales Price $0

Sales Code 12 DEED RESULTING FROM CONTRACT BEING PAID

Grantor:

GRANT,JOAN M
PO BOX 6241
BEND OR 97708

Grantee:

THOMAS,JACK W
PO BOX 6241
BEND OR 97708

***
Site Address: 254 NW CONGRESS ST BEND 97701
Assessor Property Description
PARK ADD TO BEND Lot: PT 8 Block: 13

Acct 104010 Map/TL: R 1-001 171232 CB 11300
MA: 5 VA: 31 Class: 101

---

Vol Page 1985-1040632 Sales Date 09/15/85 Adjusted Sales Price $20,000

Sales Code 30 UNCONFIRMED SALE

Grantor: Grantee:

***
Site Address: 254 NW CONGRESS ST BEND 97701
Assessor Property Description
PARK ADD TO BEND Lot: PT 8 Block: 13

Acct 104010 Map/TL: R 1-001 171232 CB 11300
MA: 5 VA: 31 Class: 711

R 1001 171232-CB-11300 104010 Prop Class 101 Value Area 31
Maint Area 5 Neighborhood 000
Asmt Zone RM

GOULD,ANNUNZIATA O
19845 J W BROWN RD
BEND, OR 97701

254 NW CONGRESS ST

* * * I N S P E C T I O N S * * *

Insp By: REED, D 08/28/98 Intr Insp No, Owner

Card 1 of 1

- - - - - - - R O O M S - - - - - - -

| | | | LR | K | DR | FAM | BD | BATH | OTH | FP | UTL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sq Ft: | 571 | 1st Fl | 1 | 1 | | | 1 | 1 | | | |
| | 216 | Garage | | | | | | | | | |

Factor Book: 121 Year Built: 1925 Percent Good: 69

* * * I N T E R I O R C O M P O N E N T S * * *

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| ROOF CVR - COMP | | WALL UNITS | 571 |
| TOILET | 1 | WATER HEATER | 1 |
| KITCHEN SINK | 1 | VINYL FLOOR | |
| LAVATORY | 1 | WINDOWS - SINGLE PANE | |
| SIDING - LAP | | BATHTUB W/FIBRGL SHWR | 1 |
| DRYWALL | | WINDOWS - WOOD | |
| ROOF - GABLE | | | |

* * * * L A N D * * * *

| Description | Description | Description |
|---|---|---|
| ACCESS PUBLIC | ELECTRICITY | GAS |
| WATER PUBLIC | SEWER SYSTEM | VIEW - LIMITED |
| TRAFFIC - MEDIUM | | |

| AT/Class | Desc | Adj Factor#1 | Adj Factor#2 | Adj Factor#3 |
|---|---|---|---|---|

LUBA # 2008-203
01376

URBAN LOT A 0.11
SD
LA

- - - -

| Trn Date | Btch | Received | Int/Disc | Jrnl | Rcpt# | Description |
|---|---|---|---|---|---|---|
| 11-15-99 | 5602 | -759.56 | -23.49 | C 90 | 1003171 | |

| 1998 Balance Due | Adval Tax |
|---|---|
| 0.00 | 761.00 |

| Trn Date | Btch | Received | Int/Disc | Jrnl | Rcpt# | Description |
|---|---|---|---|---|---|---|
| 11-03-98 | 5095 | -738.17 | -22.83 | C 90 | 861637 | |

| 1997 Balance Due | Adval Tax |
|---|---|
| 0.00 | 725.34 |

| Trn Date | Btch | Received | Int/Disc | Jrnl | Rcpt# | Description |
|---|---|---|---|---|---|---|
| 12-15-97 | 4605 | -703.58 | -21.76 | C 90 | 815021 | |

| 1996 Balance Due | Adval Tax |
|---|---|
| 0.00 | 738.34 |

| Trn Date | Btch | Received | Int/Disc | Jrnl | Rcpt# | Description |
|---|---|---|---|---|---|---|
| 11-15-96 | 4091 | -716.19 | -22.15 | C 90 | 705984 | |

104010 has no permits or Environmental Health site evalutions

and has no land use applications or Agricultural Permits.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**********
********** Real Property Tax Lot Record **********
**********

Get Latest Tax Lot Record for this property

This web site uses the FREE Adobe® Acrobat® Reader™ plug-in.
If you do not have this plug-in, click the icon to get it.

**Tax Lot Record prior to July 2003**

For Tax Lot Records prior to 1995 please call our office at (541)388-6508

17 12 32 C B 11300 Code 1-001

This description is for tax purposes ONLY and can not be attached to any legal document.

PARK ADD TO BEND Lot: PT 8 Block: 13

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Account: 132457 Map/TL: R 2-007 161218 00 00700

* * * CURRENT Ownership Information ONLY

GUILD,JAMES S
GOULD,ANNUNZIATA O
19845 J W BROWN RD
BEND OR 97701

POTENTIAL ADDITIONAL TAX LIABILITY
Type: EXCLUSIVE FARM USE POTENTIAL ADDITIONAL TAX LIABILITY

Site Address: 19845 J W BROWN RD BEND 97701

Assessor Property Description
Lot: Block:

Prop Cls:551 MA:6 VA:19 NH 000 Vol-Page: 2002-72109
Asmt Zone:EFU CDD Zone:SMIA (SURFACE MINING IMPACT AREA COMBINING)
" :AS (AIRPORT SAFETY COMBINING ZONE)
" :EFUTRB (EXCLUSIVE FARM USE - TUMALO/REDMOND/BEND)

*** Land Values ***

| Asmt type | Acres | |
|---|---|---|
| FARM SITE | 1.00 | |
| W2 EXCLUSIVE FARM USE ZONED | 9.00 | DEFERRED |
| W3 EXCLUSIVE FARM USE ZONED | 5.00 | DEFERRED |
| FARM SITE | 5.00 | DEFERRED |
| OSD | | |
| OSD | | |
| *Total | 20.00 | |

*** Improvement Values ***

| FB | BLT | %GD |
|---|---|---|
| 143 | 1976 | 55 |
| 153 | 2002 | 100 |
| 300 | | 80 |

| | | |
|---|---|---|
| 300 | | 80 |
| 300 | | 98 |
| *Total | 0 | |

Room Grid for 143 Total SqFt: 1440

| | | | ROOMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | LR | K | DR | FAM | BD | BATH | OTH | FP | UTL |
| Sq Ft: | 720 | 1st Fl | 1 | 1 | 1 | | | 1\1 | | 1 | 1 |
| | 720 | 2nd Fl | | | | | 2 | | | | |
| | 320 | Garage | | | | | | | | | |

Room Grid for 153 Total SqFt: 3841

| | | | ROOMS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | LR | K | DR | FAM | BD | BATH | OTH | FP | UTL |
| Sq Ft: | 2177 | 1st Fl | 1 | 1 | | | 1 | 1\1 | | 2 | 1 |
| | 1664 | 2nd Fl | | | | | 4 | 3 | | | |
| | 1184 | Garage | | | | | | | | | |
| | 253 | Carport | | | | | | | | | |

***** Values shown below are as of the Assessment Date, January 1 of each year *****

| *** | 2007 | | 2006 | | 2005 | |
|---|---|---|---|---|---|---|
| | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. |
| LND: | 432,490 | | 300,750 | | 215,620 | |
| IMP: | 744,990 | | 671,160 | | 604,660 | |
| TOT: | 1,177,480 | 499,579 | 971,910 | 485,265 | 820,280 | 471,385 |

| SALES: | --- 1 --- | --- 2 --- | --- 3 --- | --- 4 --- |
|---|---|---|---|---|
| Date | 12-23-02 | 12-21-90 | 02-12-90 | 02-12-90 |
| Sale $ | 0 | 175000 | 155000 | 155000 |
| Cndtn | 06 | 30 | 12 | 30 |
| Class | 551 | 551 | 551 | 551 |
| Inst # | 2002-72109 | 1990-22525 | 062002-72108 | 1990-2021957 |

Sales Detail Information

Vol Page 2002-72109 Sales Date 12/23/02 Adjusted Sales Price $0

Sales Code 06 GRANTEE IS RELATED OR BUSINESS ASSOCIATES

Grantor:

BLANDFORD,THOMAS G
1145 NW CUMBERLAND AVE
BEND OR 97701

Grantee:

GOULD,ANNUNZIATA O
1145 NW CUMBERLAND AVE
BEND OR 97701

***
Site Address: 19845 J W BROWN RD BEND 97701

Acct 132457 Map/TL: R 2-007 161218 00 00700
MA: 6 VA: 19 Class: 551

---

Vol Page 1990-2252506 Sales Date 12/21/90 Adjusted Sales Price $175,000

Sales Code 30 UNCONFIRMED SALE

Grantor: Grantee:

***
Site Address: 19845 J W BROWN RD BEND 97701

Acct 132457 Map/TL: R 2-007 161218 00 00700
MA: 6 VA: 19 Class: 551

---

Vol Page 2002-72108 Sales Date 02/12/90 Adjusted Sales Price $155,000

Sales Code 12 DEED RESULTING FROM CONTRACT BEING PAID

Grantor:

HAYES,DUANE
1145 NW CUMBERLAND AVE
BEND OR 97701

Grantee:

BLANDFORD,THOMAS G
1145 NW CUMBERLAND AVE
BEND OR 97701

***
Site Address: 19845 J W BROWN RD BEND 97701

Acct 132457 Map/TL: R 2-007 161218 00 00700
MA: 6 VA: 19 Class: 551

---

Vol Page 1990-2021957 Sales Date 02/12/90 Adjusted Sales Price $155,000

Sales Code 30 UNCONFIRMED SALE

Grantor: Grantee:

***
Site Address: 19845 J W BROWN RD BEND 97701

Acct 132457 Map/TL: R 2-007 161218 00 00700
MA: 6 VA: 19 Class: 551

- - - -

## * * * I N S P E C T I O N S * * *

Insp By: WURST, J 12/11/03 Intr Insp

Card 1 of 5

| | | | ROOMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | LR | K | DR | FAM | BD | BATH | OTH | FP | UTL |
| Sq Ft: | 720 | 1st Fl | 1 | 1 | 1 | | | 1\1 | | 1 | 1 |
| | 720 | 2nd Fl | | | | | 2 | | | | |
| | 320 | Garage | | | | | | | | | |

Factor Book: 143 Year Built: 1976 Percent Good: 55

### * * * I N T E R I O R C O M P O N E N T S * * *

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| VINYL FLOOR | | CARPET | |
| GARBAGE DISPOSAL | 1 | SELF EXHAUST RANGE/GRILL | 1 |
| KITCHEN SINK | 1 | WATER HEATER | 1 |
| LAVATORY | 2 | BATHTUB W/FIBRGL SHWR | 1 |
| BSBRD/WALL | 1440 | WOOD STOVE | 1 |
| FOUNDATION - CONCRETE | | DRYWALL | |
| TOILET | 2 | WINDOWS - METAL | |
| WINDOWS - DOUBLE/THERMAL PANE | | ROOF - GABLE | |
| ROOF CVR - SHAKE MED. | 720 | DISHWASHER | 1 |
| AUTOMATIC DOOR OPENER | 1 | SHAKE MED. - ROOF COVER | 320 |

### * * * O T H E R I M P R O V E M E N T C O M P O N E N T S * * *

Factor Book: 143 Year Built: 1976 Percent Good: 55

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| | 1440 | PORCHES ENCLOSED | 96 |
| SWIMMING POOL | 540 | GARDEN GREENHOUSE | 84 |

**********

Card 2 of 5

| | | | ROOMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | LR | K | DR | FAM | BD | BATH | OTH | FP | UTL |
| Sq Ft: | 2177 | 1st Fl | 1 | 1 | | | 1 | 1\1 | | 2 | 1 |
| | 1664 | 2nd Fl | | | | | 4 | 3 | | | |
| | 1184 | Garage | | | | | | | | | |
| | 253 | Carport | | | | | | | | | |

Factor Book: 153 Year Built: 2002 Percent Good: 100

### * * * I N T E R I O R C O M P O N E N T S * * *

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| BATHTUB | 1 | SELF EXHAUST CKTP/GRILL | 1 |
| ROOF - GABLE | | BACKED FIREPLACE | 1 |
| SHOWER WDOOR, TILE | 2 | BATHTUB W/TILE SHWR | 1 |
| TOILET | 5 | HARDWOOD FLOOR | 1 |
| TILE FLOOR | 1 | CARPET | 1 |
| HEAT PUMP | 3841 | ROOF CVR - COMP | |
| FOUNDATION - CONCRETE | | SIDING - LAP | |

| | | | |
|---|---|---|---|
| WINDOWS - METAL | | WINDOWS - DOUBLE/THERMAL PANE | |
| DRYWALL | | RECESSED LIGHTING | |
| DISHWASHER | 1 | GARBAGE DISPOSAL | 1 |
| DOUBLE OVEN | 1 | KITCHEN SINK | 2 |
| WATER HEATER | 1 | LAVATORY | 6 |
| BAR SINK | 1 | LAUNDRY TUB | 1 |
| COMP - ROOF COVER | 253 | COMP - ROOF COVER | 1184 |

* * * O T H E R I M P R O V E M E N T C O M P O N E N T S * * *

Factor Book: 153 Year Built: 2002 Percent Good: 100

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| | 3841 | DECKS-GOOD | 824 |
| DECK COVER - AVERAGE | 632 | | |

**********

Card 3 of 5

* * * O T H E R I M P R O V E M E N T C O M P O N E N T S * * *

Factor Book: 300 Percent Good: 80

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| GP BUILDING | 640 | | |

**********

Card 4 of 5

* * * O T H E R I M P R O V E M E N T C O M P O N E N T S * * *

Factor Book: 300 Percent Good: 80

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| LEAN-TO | 320 | | |

**********

Card 5 of 5

* * * O T H E R I M P R O V E M E N T C O M P O N E N T S * * *

Factor Book: 300 Percent Good: 98

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| GP BUILDING | 1152 | | |

**********

| AT/Class | | Desc | Adj Factor#1 | Adj Factor#2 | Adj Factor#3 |
|---|---|---|---|---|---|
| FARM SITE | A | 1.00 | | | |
| W2 EXCLUSIVE FARM USE ZONED | A | 9.00 | | | |
| W3 EXCLUSIVE FARM USE ZONED | A | 5.00 | | | |
| FARM SITE | A | 5.00 | | | |
| OSD | | | | | |

OSD

* * * TAX PAYMENTS * * *

For current balance due information on this account select the following button **(Please note that this link will provide current balance information, including interest & fees, EXCEPT FOR ACCOUNTS IN FORECLOSURE, please call the tax office @ 388-6540 for payoff information on foreclosure accounts)**

Get real-time tax summary for this property

This web site uses the FREE Adobe® Acrobat® Reader™ plug-in. If you do not have this plug-in, click the icon to get it.

| | | | | |
|---|---|---|---|---|
| 2007 Balance Due | Adval Tax | | | |
| 0.00 | 6,522.65 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-07 1507 | -6,326.97 | -195.68 | 631359 | |
| 2006 Balance Due | Adval Tax | | | |
| 0.00 | 6,158.55 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-17-06 7067 | -5,973.79 | -184.76 | 472219 | |
| 2005 Balance Due | Adval Tax | | | |
| 0.00 | 6,144.88 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-18-05 8057 | -5,960.53 | -184.35 | 340712 | |
| 2004 Balance Due | Adval Tax | | | |
| 0.00 | 6,007.52 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-18-04 1804 | -5,827.29 | -180.23 | 204099 | |
| 2003 Balance Due | Adval Tax | | | |
| 0.00 | 4,736.70 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-21-03 2103 | -4,594.60 | -142.10 | 71977 | |
| 2002 Balance Due | Adval Tax | | | |
| 0.00 | 3,805.85 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-02 7484 | -3,691.67 | -114.18 C 90 | 1312795 | |
| 2001 Balance Due | Adval Tax | | | |
| 0.00 | 1,561.56 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-01 6819 | -1,514.71 | -46.85 C 90 | 1213204 | |
| 2000 Balance Due | Adval Tax | | | |
| 0.00 | 1,513.00 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-00 6172 | -1,467.61 | -45.39 C 90 | 1109502 | |
| 1999 Balance Due | Adval Tax | | | |
| 0.00 | 1,525.28 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-99 5602 | -1,479.52 | -45.76 C 90 | 1003175 | |

LUBA # 2008-203
01384

| 1998 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 1,458.52 | | | |
| Trn Date Btch | Received | Int/Disc | Jrnl | Rcpt# Description |
| 11-13-98 5116 | -1,414.76 | -43.76 | C 90 | 879677 |

| 1997 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 1,437.43 | | | |
| Trn Date Btch | Received | Int/Disc | Jrnl | Rcpt# Description |
| 12-15-97 4605 | -1,394.31 | -43.12 | C 90 | 815020 |

| 1996 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 1,339.31 | | | |
| Trn Date Btch | Received | Int/Disc | Jrnl | Rcpt# Description |
| 11-15-96 4096 | -1,299.13 | -40.18 | C 90 | 709052 |

Building Permit: 16490 on Account number: 132457

OLD BUILDING#.....: B76-305
Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: EXPIRED
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW
STRUCTURE TYPE.....: BUILDING
PERMIT ZONING.....: EFUTRBýSMIA
BUILDING USE.....: RESIDENCE
STRUCTURE TYPE.....: N/A
ON SEWER?.....: NOT LISTED
SOLAR APPROVED? .....: UNKNOWN
PERMIT NAME.....: HAYES DUANE
CONTRACTOR NAME.....: UNKNOWN
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
STORIES.....:
SQ FEET.....:
PERMIT VALUATION.....:
APPLICATION DATE.....: 04/14/76
PERMIT ISSUE DATE.....: 04/14/76
EXPIRED DATE.....: 09/28/79

| Inspection | Initial | Comments |
|---|---|---|
| 09/28/79 | OLD | FINAL - NO ONE HOME - OCCUPIED WITHOUT FINAL. |
| 01/07/77 | OLD | FRAMING & ROUGH PLUMBING OK. |
| 04/28/76 | OLD | OK TO COVER ROUGH PLUMBING. |
| 04/14/76 | OLD | OK TO POUR. |

Building Permit: 46885 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW
STRUCTURE TYPE.....: BUILDING
PERMIT ZONING.....: EFUTRBýSMIA
BUILDING USE.....: RESIDENCE
STRUCTURE TYPE.....: WOOD FRAME
ON SEWER?.....: NO
SEPTIC PERMIT NUMBER....: 46566
FRONT SETBACK IN FEET...: 178
RIGHT SETBACK IN FEET...: 700
LEFT SETBACK IN FEET....: 139
REAR SETBACK IN FEET....: 330

SOLAR APPROVED? .....: YES
PERMIT NAME.....: GOULD,NUNZIE
CONTRACTOR NAME.....: GUILD,JAMES S
ARCHITECT.....: THE REED ARCHITECTS
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
STORIES.....: 2
SQ FEET.....: 3828
BEDROOMS.....: 4
PERMIT VALUATION.....: 483,835
APPLICATION DATE.....: 12/06/00
PERMIT ISSUE DATE.....: 01/04/01
FINAL DATE.....: 07/31/03

| Inspection | Initial | Comments |
|---|---|---|
| 07/31/03 | SEF | *FINAL APPROVED* |
| 02/21/03 | RGK | PROGRESS APPROVED |
| 09/04/02 | DKP | APPROVED WORK IN PROGRESS |
| 11/20/01 | DKP | APPROVED WALL INSULATION |
| 10/18/01 | DKP | FRAME APPROVED |
| 03/05/01 | DEB | U/F APPROVED |
| 02/01/01 | DEB | HOLD DOWNS OK |
| 01/24/01 | DKP | FOOTING APPROVED/UFER OK |
| 01/02/01 | DAN | GC-- R-3, 3828 SQ.FT. X $120.00 = $459,360.00/ R-3N, 1135 SQ.FT. X $21.00 = $23,835.00/ R-3N, 80 SQ.FT. X $8.00 = $640.00/ TOTAL $483,835.00 . |
| 12/21/00 | JJR | ADDITIONAL STAMPED PLANS & TRUSS DRAWINGS SUBMITTED. |
| 12/06/00 | JMM | WILL NEED PLANNING SIGN OFF. PER RGK WILL NEED ARCH STAMPED COPIES FOR PLAN CHECK. OWNER FAXING IN MFR TRUSSES |
| 12/06/00 | JMM | VALUE IS 3737 X 120 =448440 |

Building Permit: 46991 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW
STRUCTURE TYPE.....: ACCESSORY
PERMIT ZONING.....: EFUTRBýSMIA
BUILDING USE.....: DETACHED GARAGE
STRUCTURE TYPE.....: WOOD FRAME
ON SEWER?.....: NO
SEPTIC PERMIT NUMBER....: N
FRONT SETBACK IN FEET...: 315
RIGHT SETBACK IN FEET...: 692
LEFT SETBACK IN FEET....: 160
REAR SETBACK IN FEET....: 315
SOLAR APPROVED? .....: YES
PERMIT NAME.....: GOULD,JIM & NUNZIE
CONTRACTOR NAME.....: GUILD,JAMES S
ARCHITECT.....: BAXTER LAND SURVEYING
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
STORIES.....: 1
SQ FEET.....: 1184
PERMIT VALUATION.....: 24,864
APPLICATION DATE.....: 01/16/01
PERMIT ISSUE DATE.....: 01/24/01
FINAL DATE.....: 04/30/02

| Inspection | Initial | Comments |
|---|---|---|
| 04/30/02 | SEF | *FINAL APPROVED |
| 04/29/02 | SYS | GC Permit expired by system |
| 10/30/01 | DEB | INSUL INSPECT FOR GARAGE NOT REQ'D. |

| | | |
|---|---|---|
| 10/18/01 | DKP | ROUGH FRAMING APPROVED |
| 09/07/01 | DRC | APPROVED PROGRESS, OK TO CONTINUE |
| 09/06/01 | SYS | GC Permit expired by system |
| 02/01/01 | DEB | HOLD DOWNS OK |
| 01/26/01 | DKP | GARAGE FOOTINGS APPROVED. UFER OK |
| 01/19/01 | DAN | GC-- U-1, 1184 SQ.FT. X $21.00 = $24,864.00 . |
| 01/16/01 | JJR | STEVE SIGNED OFF ON GARAGE IN EFU. |
| 01/16/01 | JJR | PLANNER TO SIGN OFF EFU ZONING. |
| 01/16/01 | JJR | 1184X21=24864 |

Electrical Permit: 57364 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW SERVICE
BUILDING USE.....: SERVICE CHANGES
SERVICE DESCRIPTION.....: 200 AMPS OR LESS/SERVICES/FEEDERS: INSTALLATION,
: ALTERATION OR RELOCATION (3)
PERMIT NAME.....: GOULD,ANUNZIATA
CONTRACTOR NAME.....: B&C SMITH
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
APPLICATION DATE.....: 12/11/00
PERMIT ISSUE DATE.....: 12/11/00
FINAL DATE.....: 09/27/01

| Inspection | Initial | Comments |
|---|---|---|
| 09/27/01 | JCM | *FINAL APPROVED |
| 06/22/01 | JJR | PERMIT UPGRADED TO TO 3 SEPARATE PERMITS. E59339 PUMP HOUSE/E59340 BARN & E59341 ACCESSOR BLDG & IRR. CIR. |
| 06/05/01 | JCM | NOTE: 3-#4 (SERVICE) PURCHASED ON e57364 1-WELL HOUSE A-1 METER MAIN - APP TO FINAL B-FEEDER TO SUB. PANEL - PERMIT #? C-PUMP INSTALLED - PERMIT #? 1-FUSE PROTECT WIRING FROM PUMP CONTROLLER TO PRESSURE SW. D-100 AMP CIRCUIT TO PUMP PANEL - PERMIT # 2-200 AMP ON POLE A-1 METERED MAIN APP TO FINAL. B-FEEDER TO SUB-PANEL - PERMIT #?. C-SUB-PANEL NOT TOGETHER NOR RISER UP THE POLE. D-FEEDER UP POLE TO BLDG ACCROSS IRRIGATION DITCH - PERMIT #? 3-OUTLET BELOW PANEL - NOT COMP. 3-HOUSE A-1 METER/MAIN APPR TO FINAL. B-FEEDER TO SUB-PANEL INSIDE GARAGE - PERMIT #? C-BRANCH CIRC IN NEW PANEL TO OLD PANEL NOW - J-BOX. C-CONT-21 NEW BREAKERS IN PANEL PERMIT? 1-DERATING OF WIRE WITH THIS MANY CIRCUITS IN 2" PVC. D-CIRCUIT TO IRRIGATION PUMP AT HOUSE PERMIT? |
| 12/19/00 | RED | CORRECTIONS 1) BOND BUILDING WATER PPIPE TO ELECTRODE SYSTEM WITH #4 COPPER AT HOUSE 2) UPGRADE PERMIT FOR FEEDERS AT HOUSE SHOP AND PUMP HOUSE AND ANY BRANCH CIRCUITS INSTALLED 3) 3 SERVICES APPROVED |
| 12/11/00 | STS | GOING FROM OVERHEAD TO UNDERGROUND/NEW METER AT EXISTING RESIDENCE, NEW METER AT EXISTING SHOP, NEW METER AT EXISTING POND. SEE SEPARATE PERMIT FOR TEMP ELECT FOR FUTURE REPLACEMENT DWELLING |

Electrical Permit: 57365 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW SERVICE
BUILDING USE.....: REPLACEMENT DWELLING

```
SERVICE DESCRIPTION.....: TEMPORARY SERVICE - INSTALLATION, ALTERATIONS OR
                        : RELOCATIONS (1)
PERMIT NAME.............: GOULD,ANUNZIATA
CONTRACTOR NAME.........: B&C SMITH
SITE ADDRESS............: 19845 J W BROWN RD, BEND 01
APPLICATION DATE........: 12/11/00
PERMIT ISSUE DATE.......: 12/11/00
FINAL DATE..............: 12/19/00

Inspection  Initial   Comments
12/19/00      RED      *FINAL APPROVED


Electrical Permit: 57509 on Account number: 132457

Map/TL..................: 161218 00 00700
ACCOUNT.................: 132457
STATUS..................: FINAL
BUILDING CLASS..........: RESIDENTIAL
PERMIT CLASS............: NEW SERVICE
BUILDING USE............: RESIDENCE
SERVICE DESCRIPTION.....: RESIDENTIAL - SINGLE OR MULTI-FAMILY PER DWELLING
                        : UNIT.  SERVICE INCLUDED.  1,000 SQ FT OR LESS.  (1)
                        :
LINKED BUILDING PERMIT..: 46885
PERMIT NAME.............: GOULD,NUNZIE
CONTRACTOR NAME.........: SMITH,BARRY LEE
SITE ADDRESS............: 19845 J W BROWN RD, BEND 01
APPLICATION DATE........: 12/06/00
PERMIT ISSUE DATE.......: 01/04/01
FINAL DATE..............: 08/04/03

Inspection  Initial   Comments
08/04/03      JCM      *FINAL APPROVED*
07/31/03      JCM      CN:DENIED FINAL.  1)CLOSET OR STORAGE UPSTAIRS MASTER.
                       LIGHTS.2)W.P.  SW ON OUTSIDE OF HOUSE.
02/21/03      JCM      PROGRESS APPROVED
10/17/01      JCM      ROUGH APPROVED


Electrical Permit: 57510 on Account number: 132457

Map/TL..................: 161218 00 00700
ACCOUNT.................: 132457
STATUS..................: FINAL
BUILDING CLASS..........: RESIDENTIAL
PERMIT CLASS............: NEW SERVICE
BUILDING USE............: RESIDENCE
SERVICE DESCRIPTION.....: LIMITED ELECTRICAL ENERGY - 1 & 2 FAMILY DWELLING (1)
                        :
                        :
                        : CONDITIONING SYSTEMS (1)
                        :
                        :
                        :
LINKED BUILDING PERMIT..: 46885
PERMIT NAME.............: GOULD,NUNZIE
CONTRACTOR NAME.........: OWNER
SITE ADDRESS............: 19845 J W BROWN RD, BEND 01
APPLICATION DATE........: 12/06/00
PERMIT ISSUE DATE.......: 01/04/01
FINAL DATE..............: 08/04/03

Inspection  Initial   Comments
08/04/03      JCM      *FINAL APPROVED*
```

| | | |
|---|---|---|
| 07/31/03 | JCM | *FINAL APPROVED* |
| 02/21/03 | JCM | PROGRESS APPROVED |
| 10/17/01 | JCM | ROUGH APPROVED |

Electrical Permit: 57666 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW SERVICE
BUILDING USE.....: DETACHED GARAGE
SERVICE DESCRIPTION.....: 201 AMPS TO 400 AMPS/SERVICE/FEEDERS: INSTALLATION,
: ALTERATION OR RELOCATION (1)
: FEEDER (12)
: FEEDER (12)
:
: ALTERATION OR RELOCATION (1)
LINKED BUILDING PERMIT..: 46991
PERMIT NAME.....: GOULD,JIM & NUNZIE
CONTRACTOR NAME.....: B&C SMITH
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
APPLICATION DATE.....: 01/16/01
PERMIT ISSUE DATE.....: 01/24/01
FINAL DATE.....: 05/17/02

| Inspection | Initial | Comments |
|---|---|---|
| 05/17/02 | JCM | *FINAL APPROVED |
| 05/17/02 | NIC | INSPECT NOTICE SIGNED & RETURNED BY CONTRACTOR. |
| 04/29/02 | JCM | INSPECT NOTICE: FINAL. 1. IN PANEL - WHICH HEAT PUM IS WHICH. 2. SECURE FLEX AS PER CODE AS DISC FOR HEAT PUMPS OUT BY UNITS. FINAL W/RETURN OF NIC. |
| 04/29/02 | SYS | GC Permit expired by system |
| 10/17/01 | JCM | NIC: ROUGH APPROVED. 1) PLUG UN-USED OPENINGS 2) SECURE CABLE 3) BOND WIRE FOR SATELLITE DISH. 4) UPGRADE PERMIT #4 - FEEDER TO SUBPANEL. 11 BRANCH USED. #15 - 7 MORE BRANCH (APPROVAL TO CONTINUE AFTER CORRECTIONS MADE) |
| 09/06/01 | SYS | GC Permit expired by system |
| 03/08/01 | RED | SERVICE APPROVED |

Electrical Permit: 59339 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW SERVICE
BUILDING USE.....: PUMP HOUSE
SERVICE DESCRIPTION.....: 200 AMPS OR LESS/SERVICES/FEEDERS: INSTALLATION,
: ALTERATION OR RELOCATION (1)
:
:
: FEEDER (1)
PERMIT NAME.....: GOULD,ANUNZIATA
CONTRACTOR NAME.....: B&C SMITH
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
APPLICATION DATE.....: 06/22/01
PERMIT ISSUE DATE.....: 06/22/01
FINAL DATE.....: 09/27/01

| Inspection | Initial | Comments |
|---|---|---|
| 09/27/01 | JCM | *FINAL APPROVED |

06/22/01 JJR SEE E57364 FOR SERVICE PERMIT (APPROVED 12-19-00)

Electrical Permit: 59340 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW SERVICE
BUILDING USE.....: BARN
SERVICE DESCRIPTION.....: 200 AMPS OR LESS/SERVICES/FEEDERS: INSTALLATION,
: ALTERATION OR RELOCATION (1)
: FEEDER (2)
: FEEDER (2)
PERMIT NAME.....: GOULD,ANUNZIATA
CONTRACTOR NAME.....: B&C SMITH
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
APPLICATION DATE.....: 06/22/01
PERMIT ISSUE DATE.....: 06/22/01
FINAL DATE.....: 09/27/01

| Inspection | Initial | Comments |
|---|---|---|
| 09/27/01 | JCM | *FINAL APPROVED |
| 06/22/01 | JJR | SEE E57364 FOR SERVICE PERMIT (APPROVED 12-19-00). |
| 06/22/01 | JJR | EXISTING BARN APPROX 40-50 YRS OLD. |

Electrical Permit: 59341 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW SERVICE
BUILDING USE.....: ASSESSORY BLDG & CIRCUIT FOR IRRIGATION LINES
SERVICE DESCRIPTION.....: 200 AMPS OR LESS/SERVICES/FEEDERS: INSTALLATION,
: ALTERATION OR RELOCATION (1)
: FEEDER (22)
: FEEDER (22)
PERMIT NAME.....: GOULD,ANUNZIATA
CONTRACTOR NAME.....: B&C SMITH
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
APPLICATION DATE.....: 06/22/01
PERMIT ISSUE DATE.....: 06/22/01
FINAL DATE.....: 09/27/01

| Inspection | Initial | Comments |
|---|---|---|
| 09/27/01 | JCM | *FINAL APPROVED |
| 06/22/01 | JJR | SEE E57364 FOR SERVICE PERMIT (APPROVED 12-19-00) |

Site Evaluation: 19930 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
LAST REVIEW DATE.....:
NEXT.REVIEW DATE.....:
PERMIT CLASS.....: SITE EVALUATION
BUILDING USE.....: PROPOSED RESIDENCE
APPROVED FOR SYSTEM.....: PRESSURE DISTRIBUTION, NO ADDED PUMP FEE
BEDROOMS.....: 4
BODIES OF WATER ON PROP?: YES

WELLS ON PROPERTY?.....: YES
SEWAGE ENCUMBRANCES?....: NO
LENGTH OF SYSTEM.....: 300
TRENCH DEPTH INCHES.....: 18
FIELD WORK DONE?.....:
PERMIT NAME.....: HAYES,DUANE
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
APPLICATION DATE.....: 10/23/00
PERMIT ISSUE DATE.....: 10/23/00
FINAL DATE.....: 10/30/00

| Inspection | Initial | Comments |
|---|---|---|
| 10/30/00 | GDC | FLN An alternative initial and/or reserve system is 400' of capping fill drainline at a 12"-18" trench depth with a 1,000 gallon septic tank. Important: Capping fill drainfields are generally not allowed to be installed between October through May. To convert the existing house to a storage building with restroom will require a septic authorization notice permit. |
| 10/26/00 | GDC | GC A SEPTIC A.N. IS REQUIRED TO USE THE EXISTING SEPTIC SYSTEM IN CONJUNCTION WITH A CHANGE OF USE SUCH AS CONVERTING THE EXISTING RESIDENCE TO STORAGE WITH RESTROOM FACILITIES. THIS SITE EVALUATION IS FOR A NEW SEPTIC SYSTEM TO BE USED IN CONJUCTION WITH A NEW HOUSE. |

Mechanical Permit: 21384 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW
SERVICE DESCRIPTION.....: ISSUANCE FEE (1)
: PERMIT (1)
: HEATING OR AIR-CONDITIONING SYSTEM AUTHORIZED BY A
: PERMIT (1)
: EXHAUST, INCLUDING DUCT FOR HOOD (1)
: INCINERATOR OR WOOD STOVE (1)
: BUT NOT CLASSIFIED IN OTHER APPLIANCE CATEGORIES (1)
: OUTLET (1)
: TYPE FURNACE OR BURNER, INCLUDING DUCTS AND VENTS
: ATTACHED TO SUCH APPLIANCE UP TO AND INCLUDING
: 100,000 BTU/H (1)
: VENT INSTALLED AND NOT INCLUDED IN AN APPLIANCE
: PERMIT. (2)
LINKED BUILDING PERMIT..: 46885
PERMIT NAME.....: GOULD,NUNZIE
CONTRACTOR NAME.....: CASCADE HEATING & SPECIALTIES INC
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
APPLICATION DATE.....: 12/06/00
PERMIT ISSUE DATE.....: 01/04/01
FINAL DATE.....: 07/31/03

| Inspection | Initial | Comments |
|---|---|---|
| 07/31/03 | SEF | *FINAL APPROVED* |
| 02/21/03 | RGK | PROGRESS APPROVED |
| 03/15/02 | SEF | APPROVED PRESSURE TEST FOR RADIANT HEAT |

| | | |
|---|---|---|
| 10/18/01 | DKP | ROUGH APPROVED |
| 03/05/01 | DEB | U/F APPROVED |

Plumbing Permit: 18695 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW
SERVICE DESCRIPTION.....: ONE & TWO FAMILY/4 BATH (1)
:
:
: (12)
LINKED BUILDING PERMIT..: 46885
PERMIT NAME.....: GOULD,NUNZIE
CONTRACTOR NAME.....: NOE PLUMBING INC
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
APPLICATION DATE.....: 12/06/00
PERMIT ISSUE DATE.....: 01/04/01
FINAL DATE.....: 07/31/03

| Inspection | Initial | Comments |
|---|---|---|
| 07/31/03 | SEF | *FINAL APPROVED* |
| 02/21/03 | RGK | PROGRESS APPROVED |
| 02/15/02 | DEB | SHOWER PANS APPROVED |
| 10/18/01 | DKP | ROUGH APPROVED |
| 03/05/01 | DEB | U/F APPROVED |
| 02/15/01 | SEF | WATERLINE APPROVED |

Plumbing Permit: 18746 on Account number: 132457

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: EXPIRED
***NOTE: This permit has not received final inspection. Therefore,
final verification that this structure complies with
applicable safety codes has not been determined.
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW
SERVICE DESCRIPTION.....: WATER SERVICE (FIRST 100FT OR FRACTION THEREOF) (1)
LINKED BUILDING PERMIT..: 46991
PERMIT NAME.....: GOULD,JIM & NUNZIE
CONTRACTOR NAME.....: UNKNOWN
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
APPLICATION DATE.....: 01/16/01
PERMIT ISSUE DATE.....: 01/24/01
EXPIRED DATE.....: 04/29/02

| Inspection | Initial | Comments |
|---|---|---|
| 04/29/02 | SYS | GC Permit expired by system |
| 09/06/01 | SYS | GC Permit expired by system |

Septic Permit: 46566 on Account number: 132457

OLD SEPTIC#.....:
Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW
PERMIT ZONING.....: EFUTRBýSMIA

BUILDING USE.....: RESIDENCE
WATER SOURCE.....: WELL
SEPTIC PERMIT TYPE.....: CAPPING FILL
SPECIAL INSTRUCTIONS....: FOLLOW PLOT PLANS REVISED BY, AND APPROVED BY, GARTH
: D. COOK AS INITILAED GDC AND DATED 12.13.00 FOR
: SEPTIC PURPOSES ONLY. USE SERIAL DISTRIBUTION
: INSTALLATION WITH DROP BOXES. INSTALL THE
: DRAINLINES ALONG THE LAND'S NATURAL CONTOURS IN
: ORDER TO ADHERE TO THE TRENCH DEPTH REQUIREMENTS.
: MAINTAIN A MINIMUM 10' SEPARATION BETWEEN ALL
: DRAINLINES AND THE DRIVEWAY. AT LEAST ONE
: APPROVABLE RISER IS REQUIRED ON THE SEPTIC TANK.
: IMPORTANT: CAPPING FILL SYSTEMS ARE GENERALLY NOT
: ALLOWED TO BE INSTALLED BETWEEN THE MONTHS OF
: OCTOBER THROUGH MAY WITHOUT SANITARIAN APPROVAL.
: THE FOLLOWING INSPECTIONS ARE REQUIRED: #1--
: DRAINFIELD SCARIFICATION. #2--DRAINFIELD PRECAP +
: TANK IN THE FIELD WATERTIGHTNESS TEST + TANK
: PRECOVER + CAP MATERIAL SAMPLE (LEAVE A MINIMUM ONE
: POUND SAMPLE IN A SEALED AND LABELED CONTAINER ON
: THE SEPTIC TANK. THE CAP MATERIAL IS TO BE OF SANDY
: LOAM TEXTURE WITH LESS THAN 15 % GRAVELS--NO ROCK).
: #3--FINAL CAP INSPECTION (USE CAUTION WHEN
: INSTALLING THE CAP TO AVOID COMPACTION. IF THE CAP
: BECOMES COMPACTED, THEN LOOSEN IT TO 12" DEEP WITH A
: ROTOTILLER OR SIMILAR IMPLEMENT. A COMPACTED CAP
: MAY RESULT IN PREMATURE DRAINFIELD FAILURE).
: SCHEDULE THESE INSPECTIONS AS FOLLOWS: #1 & #3--CALL
: THE AUTOMATED SCHEDULING SYSTEM AT 317-3181.
: SCHEDULE INSPECTION #2 BY SUBMITTING A COMPLETED AND
: SIGNED AS-BUILT FORM. THIS IS A STATE OF OREGON DEQ
: PERMIT ISSUED THROUGH ITS AGENT IN DESCHUTES COUNTY.
: FOLLOW ALL STATE OF OREGON DEQ AND DESCHUTES COUNTY
: ON-SITE SEWAGE DISPOSAL PROGRAM RULES IN EFFECT AT
: TIME OF SYSTEM INSTALLATION.
FEASIBILITY NUMBER.....: 19930
LINKED BUILDING PERMIT..: 46885
MIN SEPTIC GAL CAPACITY.: 1000
SERVICE DESCRIPTION.....: CAPPING FILL
SEPTIC TRENCH LENGTH....: 400
TRENCH DEPTH INCHES.....: 18
FIELD WORK DONE?.....:
BEDROOMS.....: 4
PERMIT NAME.....: GOULD,NUNZIE
CONTRACTOR NAME.....: OWNER
SITE ADDRESS.....: 19845 J W BROWN RD, BEND 01
APPLICATION DATE.....: 12/06/00
PERMIT ISSUE DATE.....: 01/02/01
FINAL DATE.....: 05/07/01

| Inspection | Initial | Comments |
|---|---|---|
| 05/07/01 | GDC | SEPTIC FINAL CAP INSPECTION CONDITIONALLY APPROVED--OWNER TO LOOSEN CAP TO 12" DEEP AS IT IS ABOUT 75 % COMPACTED. |
| 04/30/01 | GDC | SEPTIC PRECOVER, TANK WATERTIGHTNESS TEST, AND CAP MATERIAL SAMPLE APPROVED. |
| 04/24/01 | LEL | AS BUILT SUBMITTED |
| 04/18/01 | GDC | SEPTIC SCARIFICATION INSP APPROVED. |
| 12/13/00 | GDC | AWAITING PLANNING DECISION SO THAT THE SEPTIC PERMIT MAY BE ISSUED. |
| 12/13/00 | JMM | ELEVATIONS AND NEW PP'S BROUGHT IN AND ROUTED WITH F |
| 12/06/00 | JMM | GC: OWNER IS CHOOSING TO HAVE A CF SYSTEM IN PLACE OF PRESSURE PER F19930. WILL FAX IN ELEVATIONS. HAS BEEN ADVISED CF SYSTEM CAN NOT BE INSTALLED DURING CERTAIN MONTHS. |

***Land use application: TU899 on Account number: 132457***

Map/TL.....: 161213 00 00101
ACCOUNT.....: 132457
REQUEST.....: CONDITIOAL USE
DATE SUBMITTED.....: 03/02/89
DATE ACCEPTED.....: 03/06/89
STATUS.....: APPROVED
APPLICANT.....: KIESOW DANIEL K
SITE ADDRESS.....: 9020 S HWY 97,REDMOND

***Land use application: CU8935 on Account number: 132457***

Map/TL.....: 161213 00 00101
ACCOUNT.....: 132457
REQUEST.....: CONDITIOAL USE
DATE SUBMITTED.....: 03/02/89
DATE ACCEPTED.....: 03/06/89
STATUS.....: APPROVED
APPLICANT.....: KIESOW DANIEL K
SITE ADDRESS.....: 9020 S HWY 97,REDMOND

***Land use application: SMA0036 on Account number: 132457***

Map/TL.....: 161218 00 00700
ACCOUNT.....: 132457
REQUEST.....: ABBREVIATED SMIA REVIEW FOR EFU REPLACEMENT DWELLING
DATE SUBMITTED.....: 09/08/00
DATE ACCEPTED.....: 09/11/00
STATUS.....: FINAL
STATUS DATE.....: 09/14/00
APPLICANT.....: ANNUNZIATA GOULD
SITE ADDRESS.....: 19845 J W BROWN RD,BEND

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**********
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RC20001530 09/01/00 |
| Posted on 09/01/00 by EILEENW

| | |
|---|---|
| | ** Text:<br>REF -<br>GRANTOR: HAYES,DUANE & HAYES,ANNA V (H&W)<br>GRANTEE: HAYES,J DUANE AND HAYES,ANNA V CO-<br>TRUSTEES OF J DUANE AND ANNA V HAYES JOINT TRUST<br><br>Source: VENDOR ASSIGN 2000-33154 REC 8-18-00 |
| 2002-72108 12/23/02 | Deed<br>Posted on 02/05/03 by EILEENW<br><br>Clerk Recording Grantor:<br>HAYES,DUANE<br>HAYES,ANNE V<br><br>Clerk Recording Grantee:<br>BLANDFORD,THOMAS G<br>BLANDFORD,WINIFRED E<br><br>** Text:<br>TRANSFERS FEE TITLE TO GRANTEES (H&W)<br>CONTRACT REMAINS IN: GOULD,ANNUNZIATA O |
| 2002-72109 12/23/02 | Deed<br>Posted on 02/05/03 by EILEENW<br><br>Clerk Recording Grantor:<br>GOULD,ANNUNZIATA O<br><br>Clerk Recording Grantee:<br>GOULD,ANNUNZIATA O<br>GUILD,JAMES S<br><br>** Text:<br>TRANSFERS CONTRACT INTEREST TO GRANTEES (W&H)<br>TITLE REMAINS: BLANDFORD,THOMAS G &WINIFRED E (HW) |
| RC20030267 03/06/03 | Posted on 03/06/03 by EILEENW<br><br>** Text:<br>WORKED AGAIN FOR FEE TITLE -<br>GRANTOR: BLANDFORD,THOMAS G & WINIFRED E<br>GRANTEE: GOULD,ANNUNZIATA O<br><br>UNCLEARED CONTR INT REMAINS IN: GUILD,JAMES S<br><br>Source: B&S 225/2506 (90-38461) REC 12-27-90 |
| RC20030268 03/06/03 | Posted on 03/06/03 by EILEENW<br><br>** Text:<br>WORKED AGAIN FOR FEE TITLE -<br>GRANTOR: GOULD,ANNUNZIATA O<br>GRANTEE: GOULD,ANNUNZIATA O & GUILD,JAMES S (W&H)<br><br>Source: B&S 2002-72109 REC 12-23-02 |

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Account: 134739 Map/TL: R 6-001 151009 BA 06200

* * * CURRENT Ownership Information ONLY

GOULD,ANNUNZIATA O
GUILD,JAMES S
19845 J W BROWN RD
BEND OR 97701

Site Address: 361 S SPRUCE ST SISTERS 97759

Assessor Property Description
DAVIDSON ADDITION TO SISTERS Lot: 12 +PT 11 Block: 20

Prop Cls:101 MA:6 VA:01 NH 002 Vol-Page: 2007-26881
Asmt Zone:R-MFSD CDD Zone:SISTERS (CITY OF SISTERS)

*** Land Values ***

| Asmt type |
|---|
| URBAN LOT |
| SD |
| *Total |

*** Improvement Values ***

| FB | | BLT | %GD |
|---|---|---|---|
| 110 | | 1919 | 40 |
| 138 | | 1940 | 53 |
| *Total | 0 | | |

Room Grid for 138 Total SqFt: 928

| | | ROOMS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | LR | K | DR | FAM | BD | BATH | OTH | FP | UTL |
| Sq Ft: 928 | 1st Fl | 1 | 1 | 1 | | 2 | 1 | | 1 | |

***** Values shown below are as of the Assessment Date, January 1 of each year *****

| *** | 2007 | | 2006 | | 2005 | |
|---|---|---|---|---|---|---|
| | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. |
| LND: | 134,150 | | 87,770 | | 63,690 | |
| IMP: | 2,100 | | 1,960 | | 33,930 | |
| TOT: | 136,250 | 54,880 | 89,730 | 53,290 | 97,620 | 51,740 |

| SALES: | --- 1 --- | --- 2 --- |
|---|---|---|
| Date | 05-10-07 | 10-01-04 |
| Sale $ | 200000 | 130000 |
| Cndtn | 30 | 27 |
| Class | 101 | 101 |
| Inst # | 2007-26881 | 2004-59822 |

Sales Detail Information

---

Vol Page 2007-26881 Sales Date 05/10/07 Adjusted Sales Price $200,000

Sales Code 30 UNCONFIRMED SALE

Grantor:

DARAMI LTD,

LEBANON OR 97355

Grantee:

GOULD, ANNUNZIATA O & JAMES S
19845 J W BROWN RD
BEND OR 97701

***
Site Address: 361 S SPRUCE ST SISTERS 97759
Assessor Property Description
DAVIDSON ADD TO SISTERS Lot: 12 +PT 11 Block: 20

Acct 134739 Map/TL: R 6-001 151009 BA 06200
MA: 6 VA: 01 Class: 101

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Vol Page 2004-59822 Sales Date 10/01/04 Adjusted Sales Price $130,000

Sales Code 27 TRANSACTION MUST BE CONFIRMED

Grantor:

ROWE,DONALD L ETUX

SISTERS OR 97759

Grantee:

DARAMI LTD,

LEBANON OR 97355

***
Site Address: 361 S SPRUCE ST SISTERS 97759
Assessor Property Description
DAVIDSON ADD TO SISTERS Lot: 12 +PT 11 Block: 20

Acct 134739 Map/TL: R 6-001 151009 BA 06200
MA: 6 VA: 01 Class: 101

R 6001 151009-BA-06200 134739 Prop Class 101 Value Area 01
Maint Area 6 Neighborhood 002
Asmt Zone R-MFSD

GOULD, ANNUNZIATA O & JAMES S
19845 J W BROWN RD
BEND, OR 97701

361 S SPRUCE ST

* * * I N S P E C T I O N S * * *

Insp By: BAILEY, L 11/30/07 Intr Insp No, Owner

Card 1 of 1

* * * O T H E R I M P R O V E M E N T C O M P O N E N T S * * *

Factor Book: 110 Year Built: 1919 Percent Good: 40

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| | 0 | GARDEN SHED - STICK BUILT | 80 |
| GARDEN SHED - STICK BUILT | 90 | | |

* * * * L A N D * * * *

| Description | Description | Description |
|---|---|---|
| ACCESS PUBLIC | ELECTRICITY | WATER PUBLIC |
| SEPTIC SYSTEM | CORNER LOT | VIEW - AVERAGE |
| TRAFFIC - MEDIUM | | |

| AT/Class | | Desc | Adj Factor#1 | Adj Factor#2 | Adj Factor#3 |
|---|---|---|---|---|---|
| URBAN LOT | A | 0.16 | | | |
| SD | | | | | |

* * * T A X P A Y M E N T S * * *

For current balance due information on this account select the following button **(Please note that this link will provide current balance information, including interest & fees, EXCEPT FOR ACCOUNTS IN FORECLOSURE, please call the tax office @ 388-6540 for payoff information on foreclosure accounts)**

Get real-time tax summary for this property

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| 2007 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 900.33 | | | |
| Trn Date | Btch | Received | Int/Disc | Jrnl | Rcpt# | Description |
| 11-15-07 | 1507 | -873.32 | -27.01 | | 631362 | |

| 2006 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 862.33 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-27-06 2706 | -836.46 | -25.87 | 488578 | |

| 2005 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 844.02 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-07-05 4059 | -818.70 | -25.32 | 286482 | |

| 2004 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 820.51 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-10-04 1004 | -795.89 | -24.62 | 169561 | |

| 2003 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 794.59 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 10-31-03 3103 | -770.75 | -23.84 | 13096 | |

| 2002 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 773.96 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 10-29-02 7415 | -750.74 | -23.22 C 90 | 1257156 | |

| 2001 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 761.25 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 10-31-01 6744 | -738.41 | -22.84 C 90 | 1152971 | |

| 2000 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 657.34 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 10-27-00 6097 | -637.62 | -19.72 C 90 | 1053163 | |

| 1999 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 632.98 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-12-99 5587 | -613.99 | -18.99 C 90 | 974186 | |

| 1998 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 609.96 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-13-98 5116 | -398.51 | -8.13 C 90 | 880731 | |
| 03-29-99 5319 | -203.32 | 0.00 C 90 | 933566 | |

| 1997 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 609.14 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 12-11-97 4557 | -590.87 | -18.27 C 90 | 773265 | |

| 1996 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 637.03 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-08-96 4075 | -617.92 | -19.11 C 90 | 675515 | |

134739 has no permits or Environmental Health site evalutions

and has no land use applications or Agricultural Permits.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**********
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**********

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**Tax Lot Record prior to July 2003**

For Tax Lot Records prior to 1995 please call our office at (541)388-6508

15 10 09 B A 06200 Code 6-001

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DAVIDSON ADD TO SISTERS Lot: 12 +PT 11 Block: 20

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Account: 150825 Map/TL: R 2-007 161218 00 00300

* * * CURRENT Ownership Information ONLY

GOULD,ANNUNZIATA O
19845 J W BROWN RD
BEND OR 97701

POTENTIAL ADDITIONAL TAX LIABILITY
Type: EXCLUSIVE FARM USE POTENTIAL ADDITIONAL TAX LIABILITY

Site Address: 65950 GERKING MARKET RD BEND 97701

Assessor Property Description
Lot: Block:

Prop Cls:550 MA:6 VA:19 NH 000 Vol-Page: 2002-13061
Asmt Zone:EFU CDD Zone:EFUTRB (EXCLUSIVE FARM USE - TUMALO/REDMOND/BEND)

*** Land Values ***

| Asmt type | Acres | |
|---|---|---|
| D5 EXCLUSIVE FARM USE ZONED | 34.08 | DEFERRED |

***** Values shown below are as of the Assessment Date, January 1 of each year *****

| *** | 2007 | | 2006 | | 2005 | |
|---|---|---|---|---|---|---|
| | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. |
| LND: | 603,620 | 3,690 | 416,290 | 3,583 | 295,240 | 3,476 |

SALES: --- 1 ---
Date 03-06-02
Sale $ 230500
Cndtn 03
Class 550
Inst # 2002-13061

Sales Detail Information

Vol Page 2002-13061 Sales Date 03/06/02 Adjusted Sales Price $230,500

Sales Code 03 GRANTEE/GRANTOR IS A POLITICAL SUBDIVISION

| Grantor: | Grantee: |
|---|---|
| DESCHUTES COUNTY | GOULD,ANNUNZIATA O<br>1145 NW CUMBERLAND AVE<br>BEND OR 97701 |

***
Site Address: 65950 GERKING MARKET RD BEND 97701

Acct 150825 Map/TL: R 2-007 161218 00 00300
MA: 6 VA: 19 Class: 550

R 2007 161218-00-00300 150825 Prop Class 550 Value Area 19
Maint Area 6 Neighborhood 000
Asmt Zone EFU

GOULD,ANNUNZIATA O
19845 J W BROWN RD
BEND, OR 97701

65950 GERKING MARKET RD

* * * I N S P E C T I O N S * * *

Insp By: WURST, J 07/02/02 Intr Insp

| AT/Class | Desc | Adj Factor#1 | Adj Factor#2 | Adj Factor#3 |
|---|---|---|---|---|
| D5 EXCLUSIVE FARM USE ZONED A | 34.08 | | | |

* * * T A X P A Y M E N T S * * *

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| 2007 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 48.20 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-07 1507 | -46.75 | -1.45 | 631360 | |

| 2006 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 45.46 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-17-06 7067 | -44.10 | -1.36 | 472221 | |

| 2005 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 42.73 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-18-05 8057 | -41.45 | -1.28 | 340714 | |

| 2004 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 42.99 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-18-04 1804 | -41.70 | -1.29 | 204095 | |

| 2003 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 41.12 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-21-03 2103 | -39.89 | -1.23 | 71992 | |

| 2002 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 40.04 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-02 7484 | -38.84 | -1.20 C 90 | 1312800 | |

Site Evaluation: 20480 on Account number: 150825

Map/TL.....: 161218 00 00300
ACCOUNT.....: 150825
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
LAST REVIEW DATE.....:
NEXT.REVIEW DATE.....:
PERMIT CLASS.....: SITE EVALUATION
BUILDING USE.....: FUTURE
APPROVED FOR SYSTEM.....: CAPPING FILL
BEDROOMS.....: 4
BODIES OF WATER ON PROP?: YES
WELLS ON PROPERTY?.....: NO
SEWAGE ENCUMBRANCES?....: NO
LENGTH OF SYSTEM.....: 450
TRENCH DEPTH INCHES.....: 14
FIELD WORK DONE?.....:
PERMIT NAME.....: DESCHUTES COUNTY
SITE ADDRESS.....: 65950 GERKING MARKET RD, BEND 01
APPLICATION DATE.....: 09/27/01
PERMIT ISSUE DATE.....: 09/27/01
FINAL DATE.....: 09/28/01

| Inspection | Initial | Comments |
|---|---|---|
| 10/05/01 | DRK | GC OLD SITUS= 00000 GERKING MARKET RD,BEND |
| 10/02/01 | EAM | FLN Pit #3 is not in the septic system approval area. |

Do not exceed trench depths as restrictive soils are shallow in approval area. Fill material must be approved prior to placing over drain media.

09/27/01 DRK REP IS ANNUNZIATA GOULD 317-5829

***Land use application: CU024 on Account number: 150825***

Map/TL.....: 161218 00 00300
ACCOUNT.....: 150825
REQUEST.....: LOT OF RECORD DWELLING IN EFU ZONE
DATE SUBMITTED.....: 01/22/02
DATE ACCEPTED.....: 01/28/02
STATUS.....: FINAL
STATUS DATE.....: 02/27/02
APPLICANT.....: ANNUNZIATA GOULD
SITE ADDRESS.....: 65950 GERKING MARKET RD,BEND

***Land use application: LR9957 on Account number: 150825***

Map/TL.....: 161218 00 00300
ACCOUNT.....: 150825
REQUEST.....: LOT OF RECORD
DATE SUBMITTED.....: 10/27/99
DATE ACCEPTED.....: 12/20/99
STATUS.....: FINAL
STATUS DATE.....: 02/01/00
APPLICANT.....: DESCHUTES COUNTY
SITE ADDRESS.....: 65950 GERKING MARKET RD,BEND

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**********
********** Real Property Tax Lot Record **********
**********

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**Tax Lot Record prior to July 2003**

For Tax Lot Records prior to 1995 please call our office at (541)388-6508

16 12 18 0 0 00300 Code 2-007 Current Acres 34.08

This description is for tax purposes ONLY and can not be attached to any legal document.

Assessor Property Description:

SEC 18 - GOV LOT 1
EXCEPT:RD 34.08 AC

RC951339 09/26/95 | Posted on 09/26/95 by JUDYM |

| ** Text:
| REMOVE LESSEE SHOWING ON OWNERSHIP RECORDS FOR
| THIS COUNTY OWNED PROPERTY - LEASE NO LONGER IN
| EFFECT
|
| Source: LEASE RECORDS OF DESCHUTES CO
| PROPERTY MNGMNT

2002-13061 03/07/02

| Deed
| Posted on 03/14/02 by JUDYM
|
| Clerk Recording Grantor:
| DESCHUTES COUNTY OREGON
|
| Clerk Recording Grantee:
| GOULD,ANNUNZIATA O
|
| ** Text:
| COPY DEBI

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Account: 208875 Map/TL: R 2-004 161316 DA 00400

* * * CURRENT Ownership Information ONLY

GOULD,ANNUNZIATA O
GUILD,JAMES S
19845 J W BROWN RD
BEND OR 97701

THRU: Sterling Savings Assn.
AGENT: FAT (P)

Site Address: 65785 PRONGHORN ESTATES DR BEND 97701

Assessor Property Description
ESTATES AT PRONGHORN PHASE 1 Lot: 26

Prop Cls:808 MA:2 VA:53 NH 001 Vol-Page: 2003-38325
Asmt Zone:EFU CDD Zone:EFUAL (EXCLUSIVE FARM USE - ALFALFA SUBZONE)
" :DR (DESTINATION RESORT - COMBINING ZONE)

*** Land Values ***

| Asmt type | Acres |
|---|---|
| SUBURBAN LOT | 0.56 |

***** Values shown below are as of the Assessment Date, January 1 of each year *****

| *** | 2007 | | 2006 | | 2005 | |
|---|---|---|---|---|---|---|
| | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. |
| LND: | 623,040 | 381,640 | 623,040 | 370,530 | 472,000 | 359,740 |

SALES: --- 1 ---
Date 06-04-03
Sale $ 532000
Cndtn 26
Class 999
Inst # 2003-38325

Sales Detail Information

Vol Page 2003-38325 Sales Date 06/04/03 Adjusted Sales Price $532,000

Sales Code 26 NEW CONSTRUCTION OR NEW PROPERTY

| Grantor: | Grantee: |
|---|---|
| HIGH DESERT DEVELOPMENT COMPANY LLC<br>851 FREMONT AVE STE 103<br>LOS ALTOS CA 94024 | GOULD,ANNUNZIATA O & JAMES S<br>1145 NW CUMBERLAND AVE<br>BEND OR 97701 |

***
Site Address: 65785 PRONGHORN ESTATES DR BEND 97701
Assessor Property Description
ESTATES AT PRONGHORN PHASE 1 Lot: 26

Acct 208875 Map/TL: R 2-004 161316 DA 00400
MA: 2 VA: 53 Class: 999

R 2004 161316-DA-00400 208875 Prop Class 808 Value Area 53
Maint Area 2 Neighborhood 001
Asmt Zone EFU

GOULD,ANNUNZIATA O & GUILD,JAMES S
19845 J W BROWN RD
BEND, OR 97701

65785 PRONGHORN ESTATES DR

| AT/Class | | Desc | Adj Factor#1 | Adj Factor#2 | Adj Factor#3 |
|---|---|---|---|---|---|
| SUBURBAN LOT | A | 0.56 | | | |

* * * TAX PAYMENTS * * *

For current balance due information on this account select the following button **(Please note that this link will provide current balance information, including interest & fees, EXCEPT FOR ACCOUNTS IN FORECLOSURE, please call the tax office @ 388-6540 for payoff information on foreclosure accounts)**

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RC20030086 01/28/03

Posted on 01/28/03 by GREGBA

Source: RC2003-85; JV13359

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Account: 209491 Map/TL: R 2-007 161220 AA 00112

* * * CURRENT Ownership Information ONLY

GOULD,ANNUNZIATA O
GUILD,JAMES S
19845 J W BROWN RD
BEND OR 97701

Site Address: 20330 ROCK CANYON RD BEND 97701

Assessor Property Description
DESCHUTES RIVER RANCH Lot: 5

Prop Cls:401 MA:3 VA:63 NH 001 Vol-Page: 2003-29363
Asmt Zone:EFU CDD Zone:EFUTRB (EXCLUSIVE FARM USE - TUMALO/REDMOND/BEND)
" :SMIA (SURFACE MINING IMPACT AREA COMBINING)
" :LM (LANDSCAPE MANAGEMENT COMBINING ZONE)

*** Land Values ***

| Asmt type | Acres |
|---|---|
| RURAL LOT | 0.56 |
| LE | |
| SD | |
| *Total | 0.56 |

*** Improvement Values ***

| FB | BLT | %GD |
|---|---|---|
| 164 | 2005 | 100 |

Room Grid for 164 Total SqFt: 4118

| | | | ROOMS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | LR | K | DR | FAM | BD | BATH | OTH | FP | UTL |
| Sq Ft: | 1761 | 1st Fl | 1 | 1 | 1 | 1 | | \1 | | 2 | 1 |
| | 1154 | 2nd Fl | | | | | 3 | 2 | | | |
| | 1203 | Basemt | | | | 1 | 1 | 1 | | 1 | |
| | 636 | Garage | | | | | | | | | |

***** Values shown below are as of the Assessment Date, January 1 of each year *****

| *** | 2007 | | 2006 | | 2005 | |
|---|---|---|---|---|---|---|
| | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. | Total RMV | Taxable A.V. |
| LND: | 450,520 | | 520,260 | | 327,210 | |
| IMP: | 550,980 | | 208,670 | | | |
| TOT: | 1,001,500 | 414,490 | 728,930 | 278,690 | 327,210 | 180,220 |

| SALES: | --- 1 --- | --- 2 --- |
|---|---|---|
| Date | 05-01-03 | |
| Sale $ | 242500 | 0* |
| Cndtn | 26 | 06 |
| Class | 999 | 999 |
| Inst # | 2003-29363 | 2003-14916* |
| OthPcl | 209480 | |
| | 209481 | |
| | 209483 | |
| | 209484 | |
| | 209485 | |
| | 209487 | |
| | 209488 | |
| | 209489 | |
| | 209490 | |
| | 209492 | |
| | 209493 | |
| | 209494 | |
| | 209495 | |
| | 209496 | |
| | 209498 | |
| | 209499 | |
| | 209500 | |
| | 209501 | |
| | 209502 | |
| | 209503 | |
| | 209504 | |
| | 209505 | |

Sales Detail Information

Vol Page 2003-29363 Sales Date 05/01/03 Adjusted Sales Price $242,500

Sales Code 26 NEW CONSTRUCTION OR NEW PROPERTY

Grantor:

DESCHUTES RIVER RANCH GROUP LLC
20210 SWALLEY RD
BEND OR 97701

Grantee:

GOULD,ANNUNZIATA O & GUILD,JAMES S
1145 NW CUMBERLAND
BEND OR 97701

***
Site Address: 20330 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 5

Acct 209491 Map/TL: R 2-007 161220 AA 00112
MA: 3 VA: 63 Class: 999

---

Vol Page 2003-14916 Sales Date 03/04/03 Adjusted Sales Price $0

Sales Code 06 GRANTEE IS RELATED OR BUSINESS ASSOCIATES

| Grantor: | Grantee: |
|---|---|
| BLAKE,GARY B | DESCHUTES RIVER RANCH GROUP LLC |
| 20210 SWALLEY RD | 20210 SWALLEY RD |
| BEND OR 97701 | BEND OR 97701 |

****** Multiple Accounts on this Sale ******

***
Site Address: 20361 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 9

Acct 209480 Map/TL: R 2-007 161220 AA 00101
MA: 3 VA: 63 Class: 999

***
Site Address: 20367 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 10

Acct 209481 Map/TL: R 2-007 161220 AA 00102
MA: 3 VA: 63 Class: 999

***
Site Address: 20372 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 12

Acct 209483 Map/TL: R 2-007 161220 AA 00104
MA: 3 VA: 63 Class: 999

***
Site Address: 20355 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 19

Acct 209484 Map/TL: R 2-007 161220 AA 00105
MA: 3 VA: 63 Class: 999

***
Site Address: 20366 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 13

Acct 209485 Map/TL: R 2-007 161220 AA 00106
MA: 3 VA: 63 Class: 999

***
Site Address: 20350 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 7

Acct 209487 Map/TL: R 2-007 161220 AA 00108
MA: 3 VA: 63 Class: 999

***
Site Address: 20345 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 18

Acct 209488 Map/TL: R 2-007 161220 AA 00109
MA: 3 VA: 63 Class: 999

***
Site Address: 20340 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 6

Acct 209489 Map/TL: R 2-007 161220 AA 00110
MA: 3 VA: 63 Class: 999

***
Site Address: 20335 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 17

Acct 209490 Map/TL: R 2-007 161220 AA 00111
MA: 3 VA: 63 Class: 999

***
Site Address: 20330 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 5

Acct 209491 Map/TL: R 2-007 161220 AA 00112
MA: 3 VA: 63 Class: 999

***
Site Address: 20324 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 4

Acct 209492 Map/TL: R 2-007 161220 AA 00113
MA: 3 VA: 63 Class: 999

***
Site Address: 20325 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 16

Acct 209493 Map/TL: R 2-007 161220 AA 00114
MA: 3 VA: 63 Class: 999

***
Site Address: 20318 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 3

Acct 209494 Map/TL: R 2-007 161220 AA 00115
MA: 3 VA: 63 Class: 999

***
Site Address: 20315 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 15

Acct 209495 Map/TL: R 2-007 161220 AA 00116
MA: 3 VA: 63 Class: 999

***
Site Address: 20310 ROCK CANYON RD BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 2

Acct 209496 Map/TL: R 2-007 161220 AA 00117
MA: 3 VA: 63 Class: 999

***
Site Address: 20305 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 14

Acct 209498 Map/TL: R 2-007 161220 AA 00119
MA: 3 VA: 63 Class: 999

***
Site Address: 20312 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 20

Acct 209499 Map/TL: R 2-007 161220 AA 00120
MA: 3 VA: 63 Class: 999

***
Site Address: 20316 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 21

Acct 209500 Map/TL: R 2-007 161220 AA 00121
MA: 3 VA: 63 Class: 999

***
Site Address: 20320 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 22

Acct 209501 Map/TL: R 2-007 161220 AA 00122
MA: 3 VA: 63 Class: 999

***
Site Address: 20320 ARROWHEAD DR BEND 97701

Assessor Property Description
DESCHUTES RIVER RANCH Lot: 22

Acct 209502 Map/TL: R 2-008 161220 AA 00122
MA: 3 VA: 63 Class: 999

***
Site Address: 20326 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 23

Acct 209503 Map/TL: R 2-008 161220 AA 00123
MA: 3 VA: 63 Class: 999

***
Site Address: 20326 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 23

Acct 209504 Map/TL: R 2-007 161220 AA 00123
MA: 3 VA: 63 Class: 999

***
Site Address: 20334 ARROWHEAD DR BEND 97701
Assessor Property Description
DESCHUTES RIVER RANCH Lot: 24

Acct 209505 Map/TL: R 2-007 161220 AA 00124
MA: 3 VA: 63 Class: 999

- - - -

| | | | |
|---|---|---|---|
| LAVATORY | 2 | HEAT PUMP | 497 |
| SIDING - STONE | 1 | HEAT PUMP | 1761 |
| HEAT PUMP | 577 | SHOWER WDOOR, TILE | 1 |
| TILE FLOOR | 1 | COMP HVY - ROOF COVER | 636 |
| DRYWALL | 1 | VAULTED CEILING | 1 |
| BEAMED CEILING | 1 | RECESSED LIGHTING | 1 |
| COOKTOP | 1 | DOUBLE OVEN | 1 |
| DISHWASHER | 1 | B.I. REFRIGERATOR | 1 |
| GARBAGE DISPOSAL | 1 | HOOD-FAN | 1 |
| TRASH COMPACTOR | 1 | FULL BATH | 2 |
| HALF BATH | 1 | SINGLE FIREPLACE | 2 |
| 2 STORY OUTSIDE BRICK | 2 | WATER HEATER | 1 |
| LAUNDRY TUB | 1 | FOUNDATION - CONCRETE | 1761 |
| SIDING - BOARD & BAT | 1 | SIDING - STONE TRIM | 1 |
| WINDOWS - DOUBLE/THERMAL PANE | 1 | WINDOWS - WOOD | 1 |
| ROOF - GABLE | | ROOF CVR - COMP HEAVY | 1761 |
| AUTOMATIC DOOR OPENER | 2 | HARDWOOD FLOOR | 1 |

* * * OTHER IMPROVEMENT COMPONENTS * * *

Factor Book: 164 Year Built: 2005 Percent Good: 100

| Description | Qty/Area | Description | Qty/Area |
|---|---|---|---|
| | 3908 | DECKS-EXCELLENT | 640 |
| ASPHALT-PAVING | 1510 | PAVERS | 1000 |

| AT/Class | | Desc | Adj Factor#1 | Adj Factor#2 | Adj Factor#3 |
|---|---|---|---|---|---|
| RURAL LOT | A | 0.56 | | | |
| LE | | | | | |
| SD | | | | | |

* * * TAX PAYMENTS * * *

For current balance due information on this account select the following button **(Please note that this link will provide current balance information, including interest & fees, EXCEPT FOR ACCOUNTS IN FORECLOSURE, please call the tax office @ 388-6540 for payoff information on foreclosure accounts)**

Get real-time tax summary for this property

This web site uses the FREE Adobe® Acrobat® Reader™ plug-in. If you do not have this plug-in, click the icon to get it.

| 2007 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 5,411.71 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-15-07 1507 | -5,249.36 | -162.35 | 631358 | |

| 2006 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 3,536.88 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-17-06 7067 | -3,430.77 | -106.11 | 472223 | |

| 2005 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 2,349.30 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-18-05 8057 | -2,278.82 | -70.48 | 340713 | |

| 2004 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 2,295.13 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 02-09-05 0905 | -1,530.09 | 0.00 | 231347 | |
| 11-18-04 1804 | -765.04 | 0.00 | 204087 | |

| 2003 Balance Due | Adval Tax | | | |
|---|---|---|---|---|
| 0.00 | 616.64 | | | |
| Trn Date Btch | Received | Int/Disc Jrnl | Rcpt# | Description |
| 11-21-03 2103 | -598.14 | -18.50 | 72002 | |

Building Permit: 56630 on Account number: 209491

Map/TL.....: 161220 AA 00112
ACCOUNT.....: 209491
SUBDIVISION/TRAILER PARK: DESCHUTES RIVER RANCH
LOT.....: 5
BLOCK.....: 0
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW
STRUCTURE TYPE.....: BUILDING
PERMIT ZONING.....: EFUTRBýSMIAýLM
BUILDING USE.....: RESIDENCE & GARAGE
STRUCTURE TYPE.....: WOOD FRAME
ON SEWER?.....: YES
FRONT SETBACK IN FEET...: 38
RIGHT SETBACK IN FEET...: 25
LEFT SETBACK IN FEET....: 15
REAR SETBACK IN FEET....: 64
SOLAR APPROVED? .....: YES
PERMIT NAME.....: GOULD,ANNUNZIATA O
CONTRACTOR NAME.....: GUILD,JAMES S
ARCHITECT.....: RONALD B REED
SITE ADDRESS.....: 20330 ROCK CANYON RD, BEND 01
STORIES.....: 2
SQ FEET.....: 4710
BEDROOMS.....: 4
PERMIT VALUATION.....: 648,990
APPLICATION DATE.....: 09/23/04
PERMIT ISSUE DATE.....: 10/28/04
FINAL DATE.....: 04/04/08

| Inspection | Initial | Comments |
|---|---|---|
| 11/07/07 | MAS | 180 DAY EXTENSION GRANTED |
| 11/13/06 | LAM | CALCS SUBMITTED BY CONTRACTOR. INSPECTION SCHEDULED. |
| 08/22/06 | SFJ | PROGRESS APPROVED |
| 05/09/06 | RRN | INSULATION IN GARAGE APPROVED |
| 04/10/06 | SFJ | DECK LEDGER LAGS APPROVED |
| 03/17/06 | RRN | INSULATION APPR. |
| 03/08/06 | SFJ | CORRECTIONS 1) INSTALL 6 MIL BLACK VAPER BARRIER AT UNDERFLOOR BY FINAL *FRAMING APPROVED |
| 11/08/05 | SFJ | EXTERIOR SHEARWALLS APPROVED, ADD STRAP AT 2ND FLOOR PER PLANS. |
| 10/14/05 | DKP | APPROVEC PROGRESS |
| 04/20/05 | RGK | U/F APPROVED |
| 02/01/05 | RRN | FTG IN BASEMENT SLAB APPROVED |
| 01/25/05 | RGK | APPROVED U/SLAB INSULATION AND VAPOR BARRIER AND EXT. WATER PROOFING. |

LUBA # 2008-203
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| | | |
|---|---|---|
| 01/13/05 | RRN | HOLD DOWNS & WALL STEEL APPROVED |
| 12/08/04 | RGK | APPROVED FOOTING. |
| 09/29/04 | DAN | GC-- R-3, 4710 SQ.FT. X $133.00 = $626,430.00/ U-1, 630 SQ.FT. X $24.50 = $15,435.00/ R-3N, 750 SQ.FT. X $9.50 = $7,125.00/ TOTAL $648,990.00 . |
| 09/28/04 | JJR | TRUSS DRAWINGS SUBMITTED |
| 09/23/04 | MAS | PER APPLICANT THIS IS A REPLACEMENT DWELLING OF B-49148. MATT TO SIGN ON LM-04-189, SETBACKS, HEIGHT, SOLAR. THIS ON A WPCF PERMIT. NO DWA PERMIT AS IT'S A REPLACEMENT DWELLING |
| 05/03/07 | CEG | 180**PROGRESS INSPECTION APPROVED |
| 04/02/08 | SEF | 161**FINAL BUILDING CORRECTIONS 1)**1000 - INSPECTION COMMENTS: FINAL DENIED. 1. POST ADDRESS 2. PROVIDE REQ'D HEADROOM AT STAIRS. |
| 04/04/08 | SEF | 161**FINAL BUILDING FINALED |

Electrical Permit: 76576 on Account number: 209491

Map/TL.....: 161220 AA 00112
ACCOUNT.....: 209491
SUBDIVISION/TRAILER PARK: DESCHUTES RIVER RANCH
LOT.....: 5
BLOCK.....: 0
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW SERVICE
BUILDING USE.....: TEMP
SERVICE DESCRIPTION.....: TEMPORARY SERVICE - INSTALLATION, ALTERATIONS OR : RELOCATIONS
PERMIT NAME.....: GOULD,ANNUNZIATA O
CONTRACTOR NAME.....: B AND C SMITH CONTRACTING LLC
SITE ADDRESS.....: 20330 ROCK CANYON RD, BEND 01
APPLICATION DATE.....: 09/03/04
PERMIT ISSUE DATE.....: 09/03/04
FINAL DATE.....: 10/25/04

| Inspection | Initial | Comments |
|---|---|---|
| 10/25/04 | JCM | *FINAL APPROVED* |

Electrical Permit: 77694 on Account number: 209491

Map/TL.....: 161220 AA 00112
ACCOUNT.....: 209491
SUBDIVISION/TRAILER PARK: DESCHUTES RIVER RANCH
LOT.....: 5
BLOCK.....: 0
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW SERVICE
BUILDING USE.....: RESIDENCE & GARAGE
SERVICE DESCRIPTION.....: RESIDENTIAL - SINGLE OR MULTI-FAMILY PER DWELLING : UNIT. SERVICE INCLUDED. 1,000 SQ FT OR LESS. :
LINKED BUILDING PERMIT..: 56630
PERMIT NAME.....: GOULD,ANNUNZIATA O
CONTRACTOR NAME.....: B AND C SMITH CONTRACTING LLC
SITE ADDRESS.....: 20330 ROCK CANYON RD, BEND 01
APPLICATION DATE.....: 09/23/04
PERMIT ISSUE DATE.....: 10/28/04
FINAL DATE.....: 05/05/08

| Inspection | Initial | Comments |
|---|---|---|
| 05/05/08 | NIC | *FINAL. SIGNED NIC RECEIVED BY JCM |

| | | |
|---|---|---|
| 03/07/06 | JCM | CN 1.SHEATH OUT OF BOX. 2.EXCESS OPENINGS - MANY. 3.UN-USED OPENING - MANY. 4.ROMEX CONN NOT IN PANEL. 5.GAS LINE BONDED TWICE? REINSP REQ |
| 12/22/05 | RJR | SERVICE ONLY APPROVED |
| 04/02/08 | JCM | 520**FINAL ELECTRICAL CORRECTIONS 1)**1103 - WORK NOT READY FOR INSPECTION AS PER ORSC SECTION R109.3 OR OSSC SECTION 109.5 |
| 05/02/08 | JCM | 520**FINAL ELECTRICAL APPROVED WITH CORRECTIONS 1)**1000 - INSPECTION COMMENTS: OUTSIDE OUTLETS. FINAL WITH NIC |

Electrical Permit: 87768 on Account number: 209491

Map/TL.....: 161220 AA 00112
ACCOUNT.....: 209491
SUBDIVISION/TRAILER PARK: DESCHUTES RIVER RANCH
LOT.....: 5
BLOCK.....: 0
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW SERVICE
BUILDING USE.....: LE - RESIDENCE-GAR
SERVICE DESCRIPTION.....: LIMITED ELECTRICAL ENERGY - 1 & 2 FAMILY DWELLING
:
:
:
:
:
: CONDITIONING SYSTEMS
:
LINKED BUILDING PERMIT..: 56630
PERMIT NAME.....: GOULD,ANNUNZIATA O
CONTRACTOR NAME.....: OWNER
SITE ADDRESS.....: 20330 ROCK CANYON RD, BEND 01
APPLICATION DATE.....: 02/22/06
PERMIT ISSUE DATE.....: 02/22/06
FINAL DATE.....: 05/02/08

| Inspection | Initial | Comments |
|---|---|---|
| 03/07/06 | JCM | ROUGH APPROVED |
| 05/02/08 | JCM | 520**FINAL ELECTRICAL FINALED |

Mechanical Permit: 30676 on Account number: 209491

Map/TL.....: 161220 AA 00112
ACCOUNT.....: 209491
SUBDIVISION/TRAILER PARK: DESCHUTES RIVER RANCH
LOT.....: 5
BLOCK.....: 0
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW
SERVICE DESCRIPTION.....: ISSUANCE FEE
:
: PERMIT
: HEATING OR AIR-CONDITIONING SYSTEM AUTHORIZED BY A
: PERMIT
:
: EXHAUST, INCLUDING DUCT FOR HOOD
:
: TYPE FURNACE OR BURNER, INCLUDING DUCTS AND VENTS
: ATTACHED TO SUCH APPLIANCE OVER 100,000 BTU/H
LINKED BUILDING PERMIT..: 56630

PERMIT NAME.....: GOULD,ANNUNZIATA O
CONTRACTOR NAME.....: MOUNTAIN VIEW HEATING INC
SITE ADDRESS.....: 20330 ROCK CANYON RD, BEND 01
APPLICATION DATE.....: 09/23/04
PERMIT ISSUE DATE.....: 10/28/04
FINAL DATE.....: 04/04/08

| Inspection | Initial | Comments |
|---|---|---|
| 05/02/06 | DBS | GAS LINE APPROVED. F/P'S (3) GAS LINE WRAPS OK |
| 03/08/06 | SFJ | ROUGH AND GAS TEST APPROVED WITH CORRECTION 1) WRAP ALL GAS PIPING WITH 10 MIL TAPE AT FIRE PLACES *OK TO INSULATE |
| 04/20/05 | RGK | U/F APPROVED |
| 02/03/05 | RGK | RADIANT HEATING UNDERSLAB APPROVED |
| 01/27/05 | RGK | APPROVED U/SLAB MECH. DUCT. |
| 04/02/08 | SEF | 215**FINAL MECHANICAL CORRECTIONS 1)**1000 - INSPECTION COMMENTS: FINAL DENIED. 1. SEAL GAS LINES AT F/P'S. |
| 04/04/08 | SEF | 215**FINAL MECHANICAL FINALED |

Plumbing Permit: 26101 on Account number: 209491

Map/TL.....: 161220 AA 00112
ACCOUNT.....: 209491
SUBDIVISION/TRAILER PARK: DESCHUTES RIVER RANCH
LOT.....: 5
BLOCK.....: 0
STATUS.....: FINAL
BUILDING CLASS.....: RESIDENTIAL
PERMIT CLASS.....: NEW
SERVICE DESCRIPTION.....: ONE & TWO FAMILY/4 BATH
:
LINKED BUILDING PERMIT..: 56630
PERMIT NAME.....: GOULD,ANNUNZIATA O
CONTRACTOR NAME.....: NOE PLUMBING INC
SITE ADDRESS.....: 20330 ROCK CANYON RD, BEND 01
APPLICATION DATE.....: 09/23/04
PERMIT ISSUE DATE.....: 10/28/04
FINAL DATE.....: 04/04/08

| Inspection | Initial | Comments |
|---|---|---|
| 04/10/06 | SFJ | SHOWER PAN APPROVED |
| 03/17/06 | RRN | TOPOUT CORRECTION MADE. |
| 03/08/06 | SFJ | ROUGH PLUMBING APPROVED WITH CORRECTION 1) INSTALL RISER CLAMPS AT BASE OF CI RISER |
| 04/20/05 | RGK | U/F APPROVED |
| 02/23/05 | RRN | SEWERLINE APPROVED |
| 02/02/05 | RRN | WATERLINE, PARTIAL SEWERLINE FROM PUMP TO STREET APPROVED |
| 01/25/05 | RGK | UNDERSLAB APPROVED |
| 04/02/08 | SEF | 313**FINAL PLUMBING CORRECTIONS 1)**1000 - INSPECTION COMMENTS: FINAL DENIED. 1. WTR HTR T&P PIPE REQ'D TO TERMINATE AT FLOOR DRAIN. |
| 04/04/08 | SEF | 313**FINAL PLUMBING FINALED |

***Land use application: LM04189 on Account number: 209491***

Map/TL.....: 161220 AA 00112
ACCOUNT.....: 209491
REQUEST.....: LANDSCAPE MGT SITE PLAN REVIEW
DATE SUBMITTED.....: 09/23/04
DATE ACCEPTED.....: 09/27/04
STATUS.....: FINAL

STATUS DATE.....: 10/25/04
APPLICANT.....: ANNUNZIATA GOULD
SITE ADDRESS.....: 20330 ROCK CANYON RD,BE

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**********
**********  Real Property Tax Lot Record  **********
**********

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**Tax Lot Record prior to July 2003**

For Tax Lot Records prior to 1995 please call our office at (541)388-6508

Prior Tax Lot Card is 161220AA00100
**********

16 12 20 A A 00112  Code 2-007

***  Filed Tax Lot Card has been REVIEWED ***

This description is for tax purposes ONLY and can not be
attached to any legal document.

DESCHUTES RIVER RANCH Lot: 5

RC20030368 03/20/03
| Posted on 03/20/03  by GREGBA
| Source:  RC2003-366; JV13620

2003-14916 03/05/03
| Deed
| Posted on 04/02/03  by JUDYM
| Clerk Recording Grantor:
| BLAKE,GARY B
| BLAKE,LYNETTE
| MORTON,CRAIG S
| MORTON,REBECCA A
| MORTON,DEAN O
| Clerk Recording Grantee:
| DESCHUTES RIVER RANCH GROUP LLC

**BEFORE THE HEARINGS OFFICER**
**OF DESCHUTES COUNTY**

| | |
|---|---|
| In the Matter of the Application for a Final Master Plan for a Destination Resort | M-07-2; MA-08-6<br><br>Thornburgh Destination Resort |

**SUPPLEMENTAL MEMORANDUM OF NUNZIE GOULD IN OPPOSITION TO THE PROPOSED DEVELOPMENT (7/15/08)**

## I. INTRODUCTION.

This supplemental memorandum is presented to respond to questions of the Hearings Officer of July 7, 2008, and to respond to arguments made by the Applicant at the hearing on June 17, 2008.

## II. QUESTIONS BY THE HEARINGS OFFICER.

### A. General.

1. This question by the Hearings Officer addresses the issue of consistency between the Final Master Plan ("FMP") and the Conceptual Master Plan ("CMP"). There are actually two separate issues we raised at the hearing relevant to this question, 1) that the Applicant had not shown that the FMP is consistent with the CMP, and 2) that the Applicant had not provided sufficient information in its FMP (as not only required by the provisions of DCC 18.113, but also after the Applicant failed to provide this information at the CMP stage and claimed that it would provide the information at the FMP stage).

Items a., b., and c. of the Hearings Officer's question on which the Hearings Officer has asked for additional information from the Applicant actually concern the latter issue. The Hearings Officer also asked the Applicant to respond to the question of inconsistencies with the CMP.

The following elaborates on these two issues and we can respond further once we see the Applicant's answers to the Hearings Officer's questions.

#### a. Inconsistencies with the CMP.

The Applicant at the hearing contended that it was not required to identify all of the differences between the CMP and FMP, arguing that an applicant does not usually have to identify changes it makes in its application and that given the scale of this project that any changes are minimal.

What the Applicant is ignoring here is that the County Code and the Court of Appeals' decision in *Gould v Deschutes County*, 216 Or App 150, 154 (2007), require FMP compliance with the CMP, utilizing the CMP as an approval criterion.

An additional requirement is that any significant change in a destination resort must be processed as a modification of the CMP. DCC 18.113.080.



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EXHIBIT 1 PAGE

As a result, it is incumbent on the Applicant to explain what it has changed and to show that the FMP is consistent with the CMP. There is no basis for the Hearings Officer to make the required finding on consistency where the Applicant has not made an initial showing of consistency or even identified all of its changes. This is particularly the case where opponents have shown that there are in fact inconsistencies. Given that clear inconsistencies have been established, the Applicant should be required to identify all other changes.

The apparent inconsistencies between the FMP and the CMP which have been identified by the opponents include:

1) the location of open space;
2) the location of visitor lodging;
3) traffic numbers;
4) the sewer system;
5) evacuation routes; and
6) the residential development plan.

The traffic numbers are explained further below in response to another question by the Hearings Officer. With regard to the sewer system, the FMP application presents a WPCF permit (FMP Ex. 10 or Ex. J1) for treatment of 326,000 gallons per day (gpd) which does not correspond with the capacity of the system described in the CMP which was for 625,000 gpd. See an excerpt from the CMP proposal, attached as Ex. A.

**b. Insufficient information in the FMP.**

Examples of incompleteness already identified by the opponents include:

1. Use and design of various types of open space.
2. Use and design of common areas.
3. Use and general location of all buildings.
4. Density of residential development by location.
5. All roads and equestrian trails.
6. Methods to buffer and mitigate impacts.
7. Building elevations of recreational facilities and commercial services.
8. All commercial uses with approximate size and floor area.
9. Distance to emergency medical and public safety facilities.
10. Off-site impacts.
11. Traffic demand management.
12. The lack of a reclaimed water use plan.
13. The OWRD permit.
14. Specification of all recreation facilities.
15. Coordination of Fire Plan.
16. Compliance with ODOT MOU.
17. First phase of 150-overnight units.
18. New phasing plan.

2. The Hearings Officer states that the standard for determining whether a criterion can be satisfied is whether the evidence shows that a proposal is "possible, likely and reasonably certain to succeed," citing the *Meyer* case. Where the proposed fish and wildlife mitigation is to happen in the future, the question is what proof of eventual compliance is needed for the FMP. The Hearings Officer mentions alternatives of showing that other entities are reasonably likely to follow through with their programs or showing that the plan overall is reasonably likely to succeed.

The standard cited by the Hearings Officer is actually the standard for a deferral of a finding of compliance with an approval criterion. The standard was recently elaborated upon in the case of *Gould, supra.*

There is no basis in the Record for a finding of compliance or feasibility under either alternative mentioned by the Hearings Officer. There is no assurance that ODFW, BLM and the County will follow through or will even have the budgets to do so. As emphasized in the 6/13/08 ODFW letter, some of the mitigation will need to be maintained "in perpetuity." The BLM will also need to do a public review process under the National Environmental Policy Act (NEPA) for any work proposed for BLM land.[1]

Additionally, there is no showing that Thornburgh or any subsequent developer will supply the funding or otherwise follow through. This is a particular concern given ODFW's experience with non-compliance of resorts in following through with mitigation plans. See the attached ODFW letter[2] to Governor Kulongoski (Ex. B), dated November 2, 2007, where the Director states at page 3:

> "There have been a number of problems with implementation of mitigation requirements for destination resorts. These issues include lack of follow through by developers to implement agreed-upon mitigation actions; lack of county oversight to ensure agreed-upon mitigation measures are implemented; wildlife impacts are only assessed on site (adjacent off-site impacts are not included in any wildlife habitat impact analysis); and lack of cumulative impact assessment. The result has been a net loss of fish and wildlife habitat from all destination resorts in the state."

Further, there is no provision for any effectiveness monitoring. Compliance monitoring is to prove that what was said to be done was in fact done and effectiveness monitoring is to prove that what was done actually achieved the desired results. No effectiveness monitoring whatsoever is provided in the fish and wildlife mitigation plan and thus no contingency for additional mitigation work to achieve the "fully mitigate" standard is provided.

There is also no basis in the Record for a finding of compliance or feasibility where the wildlife plan is so vague. Not only is it not clear what is being mitigated since the necessary field work

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[1] Condition of approval #28 requires BLM approval of mitigation plans but there is no evidence of BLM assessment of the fish and wildlife plans.

[2] This letter is one of three sent by ODFW, DEQ and OWRD in response to the Governor's query on resort groundwater withdrawals affecting the Headwaters of the Metolius and the Metolius River. The Governor's letter is attached as Ex. C, the OWRD letter is Ex. D and the DEQ letter is Ex. E.

hasn't been done to find out, but the offsite location for mitigation hasn't been identified and only generic habitat "improvements" are suggested.

The water mitigation plan relies on Central Oregon Irrigation District and in part on future expansion of the Bend Urban Growth Boundary taking COID lands into the City and making the irrigation water available for mitigation. There is no basis to assume these lands will be included in the UGB or when, and being irrigated land they are the lowest priority of lands for UGB expansion.

**B. Wildlife Mitigation Plan.**

1. The Hearings Officer asked for information regarding the USGS methodology and the Applicant's formula for a better understanding of the relative advantages/disadvantages of each approach. See the July 15, 2008, letter of Mark Yinger explaining the advantages of the USGS model as well as the e-mail from the USGS indicating that this situation is an appropriate one for use of the model.

2. The Hearings Officer asked for a response from the Applicant to the arguments that the wildlife mitigation plan does not provide an accurate assessment of the existing habitat values on the property and does not provide a baseline for assessing the success of the plan in the long term. The Hearings Officer further asked why loss of Golden Eagle habitat was identified but not quantified in the HEP analysis.

We will await the Applicant's answer to these questions before providing any further information.

3. The Hearings Officer asked how she can evaluate the broader impacts of development ascribed to the proposal, asking for an explanation of how cumulative impacts can be quantified or measured against the proposed mitigation.

Clearly cumulative effects are an issue. See the Ex. B ODFW letter, p. 3, quoted above. Newton also notes the ODFW cumulative effects concern at the bottom of page 7 of his report.

One possible means of assessment of cumulative impacts would be similar to the process used to assess traffic impacts where all other approved but as yet undeveloped projects in an area are included in a determination of the cumulative impacts of a development on transportation infrastructure. For water and fisheries issues, an assessment could be done of other approved water rights which are not yet being totally utilized. For wildlife habitat, other projects in the area which could impact wildlife could be assessed. The BLM's Upper Deschutes Resource Management Plan and the Cline Butte Recreation Area Plan should be utilized in a cumulative effects analysis.

4. The Hearings Officer asked how mitigation payments/fees assure that the "no net loss" standard is satisfied and asked how the Applicant reached the estimated value of the habitat in order to establish a fee-based system to address those impacts.

We will await the Applicant's response to this question before providing additional information.

5. The Hearings Officer asked how compliance with the "Firewise" development standards encourage/inhibit maintenance or restoration of on-site habitat. Again, we will await the Applicant's response to this question. Obviously, alteration of the environment to reduce fire hazard will substantially affect habitat.

**C. Transportation Issues.**

The Hearings Officer asked whether it is enough to conclude that the Applicant has satisfied the condition of approval that it enter into an MOU with ODOT to address traffic mitigation or whether she must evaluate compliance with the CMP standard that requires those impacts to be addressed, namely DCC 18.113.050(B)(2).

As an initial matter, we wish to emphasize the Applicant's comment at the hearing that the MOU is not binding on the Applicant. The fact that it is not considered binding renders this condition of approval ineffective.

Additionally, there are strong indications that traffic numbers have changed for the resort and for the area, requiring that a new traffic impact analysis and a finding of compliance with the CMP standard be made. As indicated by Ex. F from the records of ODFW, there is an acknowledgement by Thornburgh of apparently higher traffic counts. It is not exactly clear what increase in traffic counts the Applicant is referring to here, but it should be noted that the Average Daily Trips (ADT) shown on Ex. G and which was used for the wildlife analysis shows significantly different ADTs than the traffic impact analysis done by the Applicant at the CMP stage. See Ex. H which is the information provided by the Applicant at the CMP stage, which shows ADTs significantly less than the ADT numbers utilized for the wildlife analysis.

| | **CMP ADT Nos.** | **FMP ADT Nos.** |
|---|---|---|
| Cline Falls Rd., just south of Hwy 126 | 5291 | 6250 |
| Cline Falls Rd., just south of SW 83rd St. | 3081 | 4120 |
| Cline Falls Rd., just north of White Rock Lp. | 3234 | 3980 |

This difference between the late 2005 ADT numbers and the late 2007-early 2008 ADT numbers is substantial. The difference in the first location along Cline Falls Rd. is about 20%, the second location is about 35% and the third location is over 20%. This suggests that the 2005 numbers are incorrect or that the assumption of a 3.5% annual growth rate (see the Applicant's TIA report, p. 8 at Ex. H) is grossly wrong.

All traffic analyses done by Thornburgh for the wildlife mitigation plan should be revealed so that consistencies with its CMP analysis can be made.

In addition, there is substantially new development in the south part of the destination resort and potential differences in phasing which would make a difference in the traffic impact analyses. As reflected in Ex. H, the TIA assessment done by the Applicant at the CMP stage showed traffic impacts for the northern and southern areas of the resort separately. To the extent that

development is altered between these northern and southern areas, then the traffic numbers and impacts along the respective roads would obviously change.

The bottom line is that an updated TIA is necessary for the FMP.

## III. OTHER ISSUES

### A. Response to Tetra Tech Report and Pagel 6/17/08 Letter.

Just prior to the hearing on June 17, the Applicant submitted a lengthy report by Tetra Tech on fish and water mitigation, plus a June 17 letter by Martha Pagel. There are a number of problems and inadequacies with this report and letter which result in a failure of the Applicant to sustain its burden of proof on completely mitigating any impacts on fish resources.

The following issues are particularly germane.

#### 1. Applicant's consumptive use numbers are wrong.

Based on the assumption that a substantial amount of the groundwater it pumps will not be "consumed" but will find its way back into the aquifer (around 40%), Thornburgh concludes that it only needs to mitigate for 1.87 cfs. As justification for this assumption, Thornburgh cites an OWRD determination that this amount is sufficient to mitigate for impacts to flows in the Deschutes River. (Tetra Tech, p. 13)

That calculation by OWRD, however, is not determinative here. The OWRD process is a separate administrative proceeding from this land use proceeding and the fact-finding is separate in the two forums. At issue here is whether there is any negative impact to fish resources and whether it will be completely mitigated so that there is no net loss or net degradation of the resource. Just because OWRD made a determination of the amount of consumption for its purposes does not make that determination controlling here.

This is particularly the case where OWRD was apparently not given accurate or complete information by Thornburgh on its proposed use of the water. While OWRD was apparently assuming that a substantial amount of sewage treatment water was going to be the major source of recharge to the aquifer, DEQ was issuing a WPCF permit premised on the water not getting back into the groundwater system. Just one month before OWRD issued its final order for the groundwater permit, DEQ issued its WPCF permit in which it specified that reclaimed water will be dissipated by evapotranspiration and controlled seepage so as to prevent impairment of groundwater. See FMP Ex. 10 or Ex. J1, p. 3. Note that prior to the development of the sewage treatment plant there is a provision for subsurface soil absorption. However, such application is limited to the resort's use of septic systems and that is to be replaced with the sewage treatment plant. (See Ex. J1, p. 2)

Additionally, there is no evidence in the record supporting any finding of an amount of non-consumptive use of the groundwater Thornburgh will be pumping. There is also no showing of any evidence on which OWRD relied in making its calculations of non-consumptive use. Accordingly, it should be assumed that Thornburgh will be consuming what it pumps from the groundwater.

**2. Mitigation must be for each fish resource.**

In many respects, Thornburgh's mitigation proposal is aimed at benefiting certain species over others, namely resident redband in the Middle Deschutes over bull trout in Whychus Creek and the lower part of the Middle Deschutes. This is not permissible under or consistent with DCC 18.113.070(D) which calls for "no net loss or net degradation of the resource." (Emphasis added.) Mitigation should be for what is being lost.

**3. Failure to address Whychus Creek.**

Thornburgh apparently attempts to justify its failure to address impacts to Whychus Creek by stating that OWRD did not designate it as a target area for mitigation. (Newton Report, p. 4) The reality is that OWRD didn't target any particular sub-basin and instead found a general zone of impact. Just because Thornburgh is electing to mitigate only in the Middle Deschutes sub-basin does not mean there aren't impacts in the Whychus sub-basin. Nothing OWRD did in identifying a general impact zone can remove consideration of impacts to Whychus fish resources from this land use proceeding.

**4. ODFW's determination under OAR 635-415 is not controlling.**

ODFW in its letter of June 13 stated that it was following the direction of its Fish and Wildlife Habitat Mitigation Policy in OAR 635-415-0000 to 0025 to further state policy of "application of consistent goals and standards" to mitigate impacts to fish and wildlife habitat. It also stated at page 2 that springs and seeps are usually classified as Category 1 habitat because they are considered irreplaceable. In this instance, though, ODFW determined impacts "will likely be mitigated" by restoration of spring flows at Deep Canyon Creek (6/13 ODFW letter, p. 2).

Thornburgh argues as if those determinations are legally binding. That is not the case, as pointed out by ODFW in its November 2, 2007, letter to the Governor where it explains at p. 3 that the rules aren't binding unless the activity is regulated directly by ODFW.

Likewise, ODFW's conclusion that Thornburgh's proposed mitigation efforts will result in a net benefit under its Mitigation Policy is not controlling as to compliance with DCC 18.113.070(D).

All documents relied upon by ODFW should be in the Record to determine consistency between the CMP and FMP.

**5. Deep Canyon Creek is not a flowing river.**

There is simply not enough information on Deep Canyon Creek provided by the Applicant. What are its flows and what are its temperatures? What is the irrigation priority date? The Tetra Tech maps of Deep Canyon Creek in Figures 1 and 2 are misleading in suggesting a size comparable to Whychus. There is simply no water in the "Creek" until possibly near the confluence with the Deschutes.

**6. COID's proposed contribution is not explained.**

As discussed above the potential contribution of water by COID seems speculative if it is connected to the Bend UGB expansion. Also, it does not appear that Thornburgh has factored in the fact that irrigation canals can "lose" 30-35% of their water – which recharges the aquifer. To the extent water would be reduced in COID canals, there would be a reduction in this recharge, negatively impacting the aquifer.

**7. State scenic waterway protections also apply here.**

ORS 390.835(9) prohibits groundwater withdrawals from measurably reducing the surface water flows of a state scenic waterway. The Deschutes River in this area is both a state scenic waterway and a federal Wild and Scenic River. The Thornburgh groundwater withdrawal will meet the threshold of "measurably reduce" which is one cfs. ORS 390.835(12). The reality of any true mitigation and its adequacy is also relevant to this statute.

**B. Wildlife Mitigation Plan.**

**1. Mitigation must be for each wildlife resource.**

As discussed above with regard to fish resources, there must be mitigation for what is being lost, not just for wildlife habitat in general. There has been no impact assessment and mitigation plan development adequately focusing on the particular resources affected.

**2. The wildlife plan fails to adequately consider a number of factors.**

Apparently not addressed in the wildlife plan are impacts associated with:

a. There are multiple road barriers here, not just Cline Falls Highway which is considered in the Plan. Many miles of new roads are planned in the Resort and will connect the Resort to Cline Falls Highway and Highway 126.

b. The Resort is apparently fencing its entire perimeter, which will also impact migrations.

c. A new proposed road on DSL land will run near and will impact a water guzzler placed there as part of the Eagle Crest destination resort wildlife mitigation. No assessment is made of how this development will impact mitigation done by the nearby Eagle Crest.

d. Thornburgh is closing its lands to ORV use. The impact of displaced ORVs which will now go on BLM lands is not addressed.

e. There is nothing prohibiting residents and guests from using BLM lands to run their dogs.

**C. Impact on Whychus Wilderness Study Area.**

Not only would flow and temperature degradation cause harm to native fish and wildlife, it would also impair wilderness values in the Whychus area. The Deschutes Canyon-Steelhead Falls Wilderness Study Area includes the confluence of Whychus Creek and the Deschutes

River. Wilderness Study Areas have interim protection to acres recognized by BLM as having wilderness character. Local citizens have determined that an additional 15,000 acres of surrounding public land also qualify for wilderness and have proposed this area for permanent protection as Wilderness. These characteristics include naturalness, outstanding opportunities for primitive recreation (such as fishing, wildlife viewing, hiking, kayaking, camping, etc.), and supplemental values.

In the very heart of the proposal is Alder Springs. The area also includes several miles each of Whychus Creek and Deschutes River (see map as Ex. I). Additional water quality impairment of the currently impaired Whychus Creek will necessarily impair the wilderness values of the area, including negative impacts on fish, birds, other wildlife, and vegetation. The public needs assurance that the water quality and wilderness character found in the vicinity of lower Whychus Creek will not be impaired.

## IV. CONCLUSION.

The Applicant has not sustained its burden of proof and the FMP should be denied.

DATED this 17th day of June, 2008.

Respectfully submitted,

PAUL D. DEWEY

# THORNBURG DESTINATION RESORT
## SANITARY SEWER COLLECTION AND DISPOSAL
## MASTER PLAN
## FEBRUARY 2005

### I. INTRODUCTION

PROJECT DESCRIPTION AND LOCATION

Thornburg Destination Resort is located in Deschutes County south of Highway 126 between Cline Falls Highway and Barr Road approximately seven miles west of Redmond, Oregon. The project includes approximately 1941 acres of land in Township 15 South, Range 12 East in sections 17, 20, 21, 28, 29, and 30. The project site includes tax lot numbers 5000, 5001, 5002, 7700, 7701, 7800, 7801, and 8000. The project is located on EFU zoned land that is included in the Deschutes County destination resort overlay, which allows for the uses proposed by the project. The project is adjacent to large tract rural residential home sites and is surrounded primarily by US Government or State of Oregon public lands. There are no known waterways on the project property or within ½ mile of the proposed treatment and dispersal facilities.

Exhibit B-13 shows the tax lot boundary for the subject property and the parcel numbers of surrounding parcels. Exhibit B-13 also shows locations, latitudes, and longitudes for all known existing wastewater UICs in the project vicinity.

The project will include approximately 1000 single-family homes, 400 time-share condos or homes, three golf courses, two clubhouses, a community center, two resort hotels, and various resort commercial developments. The project will be divided by natural topography into two distinct basins for development (public side and private side). A significant natural ridge that bisects the property separates the basins.

### II. ON-SITE SEWER SYSTEM DESCRIPTION

Exhibit B-13 in Appendix A shows the master-planned on-site sewer system proposed for Thornburgh Resort. The project is divided into two sewer basins, the north basin and the south basin. The on-site system includes approximately 15 miles of pipe, 1430 septic tanks, an effluent lift station, and at least two treatment and dispersal facilities.

At full build-out, peak daily sewage flows are expected to be 625,000 gallons per day based on DEQ Table 2-OAR 340-71-220, with 249,300-gpd flowing to the north basin treatment facility and 375,700-gpd flowing to the south basin treatment facility. Locations of the on-site treatment /dispersals facilities will be selected based on topography, soil conditions, and proximity to project amenities.

The sewage collection, conveyance, treatment and dispersal system will be entirely owned by one entity in charge of operating and maintaining the system.

Ex. A

Oregon
Theodore R. Kulongoski, Governor

Department of Fish and Wildlife
Office of the Director
3406 Cherry Avenue, NE
Salem, OR 97303
503.947.6044
FAX 503.947.6042
TTY 503.947.6339
www.dfw.state.or.us

November 2, 2007

Mr. Tim Nesbitt
Governor's Office
900 Court Street NE
Salem, OR 97301

Dear Mr. Nesbitt:

This letter is in response to Governor Kulongoski's request that ODFW evaluate whether existing laws are adequate to ensure that new destination resorts in or near the Metolius River Basin avoid any adverse effects on fish or wildlife resources, particularly threatened or endangered species.

Existing laws that may address the fish and wildlife resource effects of destination resorts include the following:

- State Endangered Species Act (ORS 496.171)
- ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-000)
- Federal Endangered Species Act (USFWS)
- Jefferson County plan and ordinances (County)
- State Land Use Laws (Department of Land Conservation and Development) (ORS 92, 193, 197, and 215)
- Forest Practices Act (Department of Forestry) (ORS 527.610 – 527.992)
- Water Laws (Water Resources Department (WRD))
  - Instream Water Rights (ORS 537.332 – 537.360; OAR 690-077 and OAR 635-400)
  - Mitigation Credits for Projects in the Deschutes River Basin (ORS 537.746; OAR 690-505-0500 to 690-505-0630)
  - Additional Public Interest Standards For New Appropriations OAR 690-033

- Water Quality Regulations (Department of Environmental Quality (DEQ)). Numerous regulations would apply depending on the proposed project design and operation. Most water quality laws can be found under Chapter 468B — Water Quality.
  - Groundwater Quality Protection (OAR 340-040)
  - NPDES or WPCF (OAR 340-045)
  - Land Application of Wastewater (OAR 340-50)

- Reclaimed Water from Sewage Treatment Plants (OAR 340-55)
- Instream Water Rights (OAR 340-56)
- On Site Sewage Disposal (OAR 340-71)
- Stormwater (handled under OAR 340-045 and 340-044)
- TMDL's (OAR 340-042)
- Underground Injection Control (OAR 340-044)

Of the above regulations, only the State Endangered Species Act (ESA), the Fish and Wildlife Habitat Mitigation Policy and the ODFW Instream Water Rights rule are implemented by ODFW. There are limitations to ODFW's regulations.

- The State ESA applies primarily to state land and waters of the state. A state incidental take permit (ITP) is required for take of a state-listed species, but there is no state regulation of listed species habitat on private land. If a federal incidental take permit is required, a state ITP is not required.
- The ODFW Fish and Wildlife Habitat Mitigation Policy is required to be followed for ODFW activities and when providing ODFW recommendations for fish and wildlife mitigation. However, ODFW's recommendations are usually only advisory to other state and local agencies and these agencies take ODFW's advice into account along with other factors.
- ODFW's Instream Water Right (IWR) rule provides directions for how ODFW will determine flows necessary for fish and other aquatic life. Based on these flow determinations, ODFW can make application to WRD for an instream water right. WRD is responsible for making the final determination on the amount of the water right and holds the issued IWR in trust for the state.

**State Endangered Species Act**

- State listed threatened species that occur in the Metolius Basin are the bald eagle and the northern spotted owl. Other bird species in the basin that are listed on the state sensitive species list are the northern goshawk, olive-sided flycatcher, yellow-breasted chat, Lewis' woodpecker, black-backed woodpecker, Williamson's sapsucker, flammulated owl, ferruginous hawk, mountain quail, white-headed woodpecker, willow flycatcher, western bluebird, bufflehead, Swainsons hawk, northern pygmy owl and pileated woodpecker.
- The two state-listed sensitive fish species that occur in the Metolius Basin are the bull trout and redband trout.
- State-listed sensitive amphibians in the basin are the spotted frog, Cascades frog, western toad, and tailed frog.
- Mammal species on the state sensitive species list that occur in the Metolius Basin are the silver-haired bat, small-footed myotis, Townsend's big-eared bat, and American marten.

- Not listed, but other important species of concern in the basin include sockeye salmon (including kokanee), the peregrine falcon, the golden eagle, mule deer and elk. In addition, chinook salmon have recently been released in the upper basin as part of the re-introduction of anadromous fish populations.
- The bald eagle is no longer federally listed, so in the event of a take of an eagle through a development action, a state incidental take permit would be required.

ODFW would not have direct regulatory authority over the habitat of any of the above listed species. ODFW would request that any proponent of a destination resort in the Metolius Basin address potential impacts to all of the above species. ODFW would also request mitigation to offset unavoidable losses to essential or important wildlife habitat.

**Fish and Wildlife Habitat Mitigation Policy**

The Oregon Fish and Wildlife Commission adopted a Fish and Wildlife Habitat Mitigation Policy that guides ODFW's mitigation recommendations for development actions. The rules are not binding unless the activity is regulated directly by ODFW. ODFW uses the Mitigation Policy to guide recommendations for avoiding, minimizing and compensating adverse effects of development on fish and wildlife habitats. These recommendations are provided by ODFW when requested by a government or municipality with jurisdiction or oversight authority over the particular development project. ODFW has used the policy in making recommendations for numerous destination resorts throughout the state.

There have been a number of problems with implementation of mitigation requirements for destination resorts. These issues include lack of follow through by developers to implement agreed-upon mitigation actions; lack of county oversight to ensure agreed-upon mitigation measures are implemented; wildlife impacts are only assessed on site (adjacent off-site impacts are not included in any wildlife habitat impact analysis); and lack of cumulative impact assessment. The result has been a net loss of fish and wildlife habitat from all destination resorts in the state.

**Federal Endangered Species Act**

Federally listed species that occur in the Metolius Basin include bull trout, and the northern spotted owl. The Metolius Basin is a critical spawning and rearing area for bull trout. Bull trout are limited by their requirement for cold water temperatures for spawning and juvenile rearing. They are extremely sensitive to potential development effects including increased water temperatures and sedimentation changes. Some of the most productive spawning and rearing habitat for bull trout in the basin occurs in the spring-originated tributaries to the Metolius River such as Jack Creek and Roaring Springs. If a proposed destination resort would result in take of a listed species, the project proponent would be required to either obtain an incidental take permit from the US Fish and

Wildlife Service, (USFWS) or develop a Habitat Conservation Plan for USFWS approval that addressed the listed species concerns.

**Jefferson County Plan**

In December 2006, Jefferson County adopted a map indicating what areas in the county would be eligible for destination resort siting under Goal 8, Recreational Needs. The map identified two areas in the county that are eligible for destination resorts. Both of the areas that are eligible for destination resorts are within the Metolius Basin (see attached map).

The Jefferson County plan excludes areas from destination resorts that are designated winter range or other Goal 5 resources. Goal 5 resources are natural resources that are inventoried and addressed in the county plan. There are no identified Goal 5 resources in the areas that are designated for destination resorts. However, areas that are planned and zoned for forestry are not addressed under county Goal 5 elements. This means that important natural resources such as northern spotted owl and bald eagle nest trees or significant forested wetlands are not protected by the county plan or excluded from destination resort siting. In addition, there is important wildlife habitat such as big game summer range that is not addressed by the county plan. The county plan also does not address the issue of bears and cougars which are quite numerous in the areas proposed for destination resorts.

One of the unintended consequences of destination resorts is that the area around them is managed substantially differently by federal land management agencies. For example, federal land managers are in the process of significantly altering wildlife habitat adjacent to destination resorts to protect them from wildfire. This dramatically increases the effective footprint of the destination resort.

**State Land Use Laws**

The Department of Land Conservation and Development implements the Goal 8 rule that addresses destination resorts as well as the state statute that governs destination resorts. Neither of these provisions would apply directly to a destination resort in Jefferson County, as the county's destination resort plan element is the controlling document and is intended to carry out the land use statutes and rules.

**Forest Practices Act**

The Oregon Forest Practices Act has provisions for sensitive bird sites, significant wetlands and threatened and endangered species. These protection measures are intended to limit the adverse effects of timber harvest activities on sensitive fish and wildlife habitat. These provisions would apply to timber harvest activities within a proposed destination resort, but once the land use conversion to a destination resort takes place, the FPA would no longer apply.

**Instream Flows**

ODFW applied for instream flows in the Metolius River and nine tributaries within the basin for fish migration, spawning, egg incubation, fry emergence and juvenile rearing. WRD has issued water right certificates and holds them in trust for the state. There are a few cfs of other water uses in the basin mostly domestic and irrigation use, but the majority of the flow is protected by the IWR. There is also a tribal treaty water right that needs to be satisfied. WRD's water availability tables show that water is not available from the Metolius River for further appropriation for all months except April.

Most likely a destination resort would need to rely on groundwater which would require mitigation for water use through the Deschutes River Basin Groundwater Mitigation program. WRD indicates that a proposed groundwater development for the current proposed destination resort developments would impact the Metolius River, but the impact would be below that required to mitigate within the Metolius basin. Therefore the development could mitigate their water use elsewhere in the Deschutes basin (if the development needed to mitigate within the Metolius Basin there would be insufficient mitigation water available for mitigation). Groundwater extraction for development use would likely have some effect on instream flows and fish habitat which could affect bull trout (a listed species), redband trout, kokanee salmon and other aquatic life.

Decreases in stream flows have the potential to translate into negative impacts on fish populations. ODFW has tracked fish spawning through good and bad water years and has observed that reductions in spring flows brought on by dry climatic conditions have translated into reduced spawning rates. ODFW would expect that reductions in stream flows from springs through groundwater withdrawal would have similar effects on spawning and fish populations only it would be a more permanent reduction because of the continuing nature of the groundwater withdrawals.

**Water Quality**

Most of DEQ's rules are designed to minimize pollution, maintain water quality above water quality standards and in some cases prevent decreases in water quality in high quality streams. Major concerns for fish (specifically bull trout) for the Metolius River would be water quality concerns associated with:

- Stormwater runoff - would likely increase with the increase in impervious surfaces which may have direct impacts by increasing potential pollution loads through runoff to local tributaries and the river; increasing the likelihood of spills; and delivering pollution to streams through groundwater discharge contaminated by stormwater.
- Sewage Treatment – Most likely the density and number of homes envisioned would require a municipal sewage treatment system of some kind. The effects on fish will depend on how the effluent from such a system is handled. DEQ would require either a NPDES or WPCF permit and would either discharge directly to a surface water

body after treatment or be applied to the land where groundwater could be affected. If the development relies on septic systems there would likely be an impact to groundwater quality which in turn could affect surface water quality through groundwater discharge to surface water.

All of the local, state, and federal regulations that apply to destination resorts are intended to avoid or minimize adverse effects of these developments on fish and wildlife habitat and other resources. However, none of the regulations are intended to avoid all adverse effects on fish or wildlife resources. Even with the best mitigation actions there will be loss of fish and wildlife habitat through habitat fragmentation, incremental reductions in stream flow, increased human interaction, road development, etc.

Thank you for the opportunity to comment on this important issue. Please contact me if you have any questions on our response.

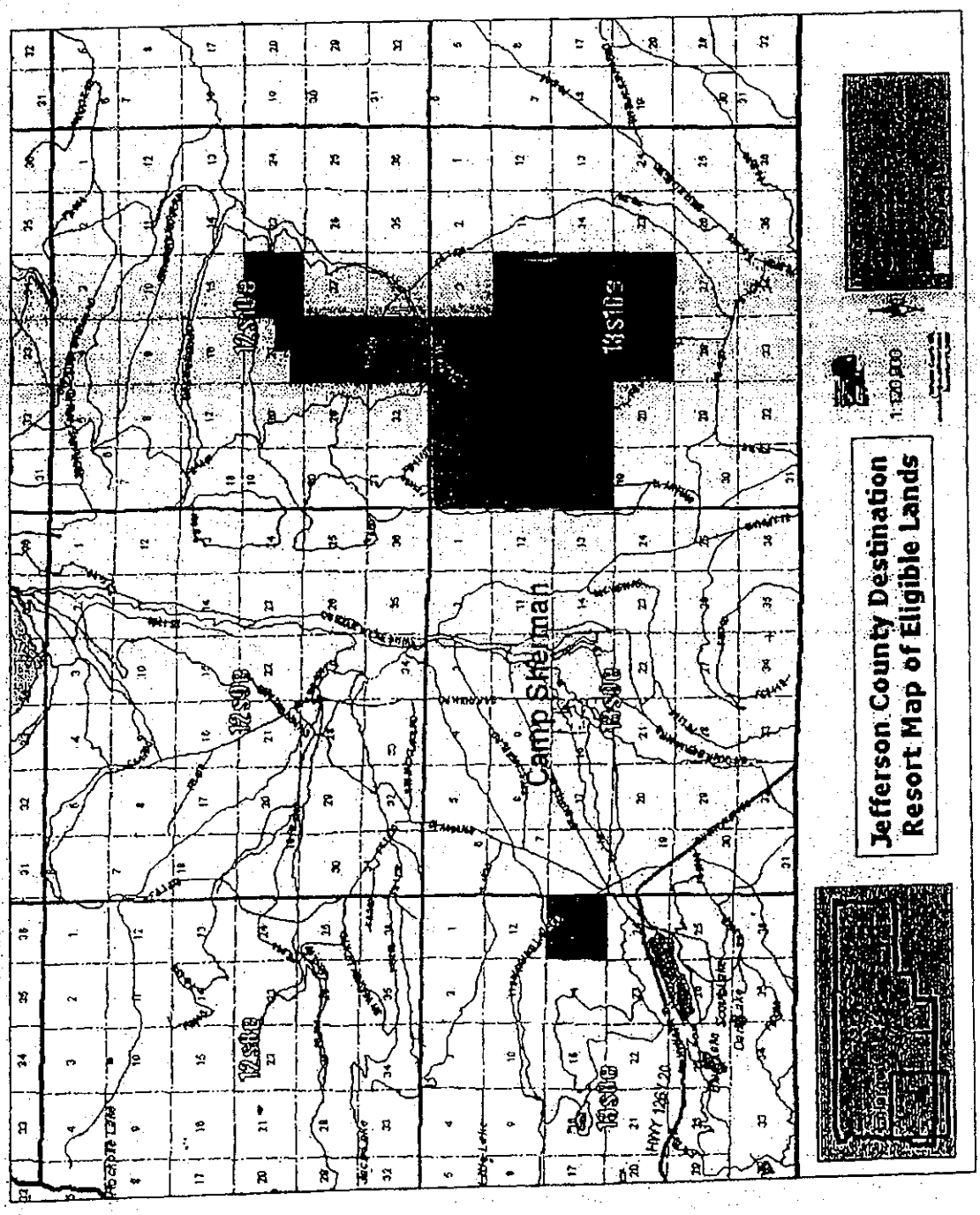
Sincerely,

Curtis E. Melcher

Curt Melcher
Deputy Director for Fish and Wildlife Programs

Attachment

C: Mike Carrier, Governor's Office
Suzanne Knapp, Governor's Office
Jeannie Kelso, Governor's Office


Jefferson County Destination
Resort Map of Eligible Lands
12s10e
13s10e
12s09e
Camp Sherman
13s09e
12s08e
13s08e



Ex B, p.7

[illegible]
[illegible]

June 23, 2009

The Honorable Diane Rosenbaum, Chair
House Rules Committee
State Capitol, H-380
Salem, OR 97301

***Re: Senate Bill 30 and Destination Resorts in the Metolius River Basin***

Dear Representative Rosenbaum:

Senate Bill 30-B, now before your committee, addresses a critical issue related to the protection and preservation of one of Oregon's natural treasures, the Metolius River basin.

The Metolius is a federally-designated wild and scenic river and a state-designated scenic waterway. Its headwaters, where the river bursts from the ground, are a wonder of nature. The river basin is one of our state's most pristine places.

I believe the Metolius basin is a special place that deserves special protection.

Also, I believe Jefferson County's "re-mapping" to allow the county to evaluate particular proposals to site destination resorts in the Metolius Basin should be assessed on the basis of its compliance with the legal standards and procedures set forth in state and local law. I understand there are several challenges to the county's decision now before the Land Use Board of Appeals. I support following the established processes for resolving those challenges as they relate to land use decisions. For this reason, I do not support Senate Bill 30.

However, I remain greatly concerned about the future of the Metolius. I salute Senator Ben Westlund and Senator Betsy Johnson, as sponsors and supporters of Senate Bill 30, for raising this issue. They are true champions for the preservation of the Metolius.

Further, I share the senators' concerns about the impact of large-scale destination resorts on this unique state treasure. Their concerns are timely and appropriate.

Already, an initial application for water rights filed by one of the destination resort developers suggests a project whose scope may not be compatible with preservation of the Metolius as we know it today. That application seeks an annual average of 2.5 million gallons of

STATE CAPITOL, SALEM 97301-4047 (503) 378-3111 FAX (503) 378-4863 TTY (503) 378-4859
WWW.GOVERNOR.OREGON.GOV

Ex. C, p.1

LUBA # 2008-203
01438

water per day from ten wells to serve a projected population of 9,000. There are also reports of two golf courses envisioned for that project. These residences and golf courses would comprise a development several times the size of Sunriver.

The land use decisions related to the siting of destination resorts in the Metolius Basin will not be the final word on development in that area, nor are they designed to be. The state and the county must also address issues related to the size and scope of specific development projects and their impact on groundwater supplies, surface water flows, water quality and fish and wildlife habitat in the river and its basin. These issues will require further study and assessment to determine the size and scope of development that is consistent with the preservation of the Metolius as a state treasure.

To these ends, I am taking the following actions:

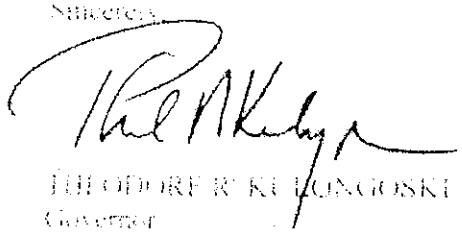
1. I am asking the Oregon Department of Water Resources (ODWR) to examine whether existing laws are adequate to ensure that any new destination resort development in or near the Metolius basin will result in no reduction in stream flows in the Metolius River.

2. I am asking the Oregon Department of Fish and Wildlife (ODFW) to undertake a similar evaluation of whether existing laws are adequate to ensure that new destination resorts in or near the basin avoid any adverse effect on fish or wildlife resources, particularly threatened or endangered species. The Metolius is designated as spawning and rearing habitat for bull trout.

3. Finally, the Oregon Department of Environmental Quality (DEQ) is nearing completion of its Total Maximum Daily Load (TMDL) for the Lower Deschutes sub-basin. As with OWRD and ODFW, I am asking DEQ to evaluate whether its existing laws are adequate to protect the outstanding resource represented by the Metolius.

If the agencies advise me that additional laws are necessary or desirable to achieve these objectives, I will work with the legislature to develop those legislative changes so that we protect the natural treasure of the Metolius basin for generations to come.

Sincerely,



THEODORE R. KULONGOSKI
Governor

cc: See attached
Senator Metsa Johnson
Senator Ben Westlund
Speaker Jeff Merkley

Ex C, p. 2

LUBA # 2008-203
01439

Oregon
Theodore R. Kulongoski, Governor

Water Resources Department
North Mall Office Building
725 Summer Street NE, Suite A
Salem, OR 97301-1266
503-986-0900
FAX 503-986-0904

October 31, 2007

Governor Theodore Kulongoski
State Capital
Salem, OR 97301-4047

Dear Governor Kulongoski:

Thank you for your July 13, 2007 letter directing the Water Resources Department (WRD) to evaluate whether the existing laws and rules that it administers are adequate to ensure that new destination resort development in or near the Metolius Basin would result in no reduction of stream flows in the Metolius River. We have completed that evaluation and offer the following for your consideration.

WRD has a number of programs in place to administer laws that ensure existing water rights and public values are protected, while allowing for new development. In the Deschutes Basin, of which the Metolius is a part, the Deschutes Mitigation Program is the strongest program available to the department to address protection of streamflow in the Metolius River.

The Deschutes Mitigation Program was established in 2002 as a result of a multi-year ground water research study conducted by WRD and the United States Geological Survey (USGS). The study confirmed that ground and surface water are directly connected within the Deschutes study area, including the Metolius sub-basin. This means any new ground water use would impact stream flow that is already fully appropriated in the Deschutes Basin.

The mitigation program divides the Upper Deschutes Basin into seven sub-basins or "zones of impact" and requires bucket for bucket mitigation for any new ground water use to protect streamflow in the primary zone of impact. Water right applicants purchase credits from a mitigation bank as needed to balance their new use. The credits are generally derived from existing out-of-stream water rights that are left instream. The program has been successful at protecting streamflow in the Deschutes Basin and at the same time allowing for economic growth in the region. While mitigation credits are available for most sub-basins, there are no credits currently available for the Metolius zone due to the lack of historic water development in that area.

Any new development would likely rely on ground water to meet its water supply needs. The study found that ground water is connected to surface water beyond the sub-basin boundary where the wells are constructed. This means that ground water withdrawal outside of the Metolius sub-basin could have an impact on stream flow in the Metolius River.

Ex D, p.1

The Deschutes Mitigation Program will ensure no diminishment of flow in the Metolius River when the primary zone of impact of the new development is the Metolius sub-basin. The mitigation program, as currently administered, does not provide that same level of protection of the Metolius River when the Metolius sub-basin is not the primary zone of impact.

One option to strengthen these protections would be to require mitigation for new ground water use in all zones where state scenic waterways are impacted. The Metolius River is a designated state scenic waterway from its source at river mile 41.2 downstream to Candle Creek at river mile 29. We've been advised by the Attorney General's office that mitigation could be required for impacts to multiple zones involving state scenic waterways. This option however, could have far reaching effects that could potentially eliminate most new ground water development in portions of the Deschutes Basin. For example, using this broader "mitigate everywhere" approach could seriously constrict the economic growth in the Sisters area, since withdrawal from wells near Sisters could affect flows in the Metolius sub-basin and require mitigation where credits are not available.

A second option would be to close the Metolius Basin to new appropriations of water. This could be done by Water Resource Commission (WRC) or legislative action, however this option would not provide protection against ground water use by proposed development located outside of the Metolius sub-basin.

A third option would be for the WRC to withdraw designated areas from particular ground water uses. This would limit where new development could withdraw ground water. The difficulty with this option would be hydrologically justifying the withdrawal boundaries.

If implemented, option one could have significant consequences on economic development in the region. Option two does not provide additional protection beyond what the existing mitigation program provides. Option three would limit the development of ground water in designated areas, but without a strong hydrologic basis for delineating those areas, actions under this option would likely be subject to legal challenge.

It is the department's view that the Deschutes Mitigation Program has been successful at balancing streamflow protection with economic development in the Deschutes Basin. For this reason, we recommend this program continue to operate as it is currently administered.

Sincerely,

Phillip C. Ward
Director

Ex. D, p. 2

Oregon
Theodore R. Kulongoski, Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
503-229-5696
TTY: 503-229-6993

November 2, 2007

Governor Theodore Kulongoski
160 State Capitol
900 Court Street NE
Salem, OR 97301-4047

Dear Governor Kulongoski:

Thank you for your letter regarding the Metolius River Basin, and potential impacts of local development on water quality. As your letter made clear, the Metolius River is an unparalleled natural feature of Oregon's Cascade Mountains, worthy of the best protection available. You requested an assessment of the adequacy of existing state regulations to specifically protect water quality in the Metolius River.

The Metolius River rises from springs fed by snowmelt filtering through porous volcanic rock. Water in the river today fell as snow in the cascades many years ago. This process results in some of the clearest, coldest, and purest surface waters in the state. In the upper Metolius River Basin, water is fairly close to the surface, and is somewhat more vulnerable to human activity or development than areas to the north and east, where ground water lies much farther below the surface. Although there have been proposals for developments already, I am addressing the issue of environmental protection in the basin in a more general sense, rather than any specific development.

The Department of Environmental Quality (DEQ) has authorities to protect the benefits that air and water provide to people and the environment. Specifically, the water quality authorities that apply in the Metolius River Basin include anti-degradation rules, wastewater treatment including onsite and septic systems, controlling stormwater from construction activities, post-construction stormwater controls, and total maximum daily loads (TMDLs).

Large destination resort developments are densely constructed communities requiring collection, treatment and disposal of domestic wastewater and stormwater. During development, construction activities have the potential to deliver sediments and associated pollutants to flowing waters. In a community the size of a destination resort, stormwater runoff from roofs, streets, and some types of irrigated land, must be managed to minimize environmental impacts. DEQ has varying degrees of regulatory control over these sources of pollutants, and little to no authority over water use that may diminish flows in streams. Reduced flows may subsequently reduce water quality.

Anti-degradation rules: Water quality standards are designed to ensure that basic uses of water are available now and are protected from degradation in the future. Such uses include drinking,

Ex E, p. 1

fishing and contact recreation. The water quality standards do not necessarily ensure there is no degradation, only that degradation will not hamper or eliminate the use. In general, I believe that our rules are protective of human health and the environment to ensure that the beneficial uses are protected, though there are some gaps in stormwater regulation that are relevant to increased development in the Metolius River Basin, as described below.

Wastewater treatment, including septic systems: The treatment of wastewater is tightly regulated but there will be constituents, such as nutrients, that are still released to the environment. There is little likelihood that a development would be allowed to discharge treated wastewater directly to the Metolius River or a tributary because of existing water quality problems, and because developments outside urban growth boundaries are subject to restrictions on wastewater under land use laws. Subsurface discharge to shallow soils or land application to the surface of soils may be allowed. Even with substantial removal of nutrients and other constituents from this wastewater prior to discharge, small amounts of nutrients may reach the Metolius River or its tributaries through runoff or seepage to groundwater that flows into the Metolius. The river is sensitive to nutrients, and small increases in nutrients could result in some degradation of water quality, such as decreased dissolved oxygen, increased aquatic plant growth, and changes in pH, among others. These effects would be more significant in the western part of the basin, where the relative depth to groundwater is shallower than east of Green Ridge.

Stormwater impacts from construction activities: Construction activities that disturb the land surface are regulated through construction stormwater permits. These permits require use of practices and control technologies to keep sediments out of stormwater, but do not always result in complete control.

Post-construction stormwater control: In general, DEQ does not have a regulatory framework for controlling stormwater from these developments once they are constructed. Local governments may exercise control or, in some cases, DEQ's Underground Injection Control rules may apply to stormwater. If wetlands are impacted, there DEQ and DSL regulations would apply.

Total Maximum Daily Load: You also asked that we consider the potential effects of these types of developments as we complete a Total Maximum Daily Load (TMDL) for this area. DEQ considers both current development and potential growth as best we can during TMDL studies. It is very difficult to estimate the potential effects of wastewater and stormwater in basins where the developments have not been proposed, but are likely to occur. The majority of pollutant discharges in the Metolius River Basin will be from nonpoint sources, which, like stormwater have less stringent regulatory control. Likely authorities from the TMDLs may include stricter wastewater discharge requirements and additional stormwater controls for existing and proposed developments, depending on the outcomes of the TMDLs.

The Deschutes Basin TMDLs that will include the Metolius River Basin are currently on hold. The Water Quality Program reprioritized its schedule over the last two years in light of resource constraints, and the need to complete work in other priority basins, such as the Willamette, Umpqua, Rogue and John Day. As you've requested, we will give the Metolius River special consideration when we return to work on the Deschutes Basin TMDLs. Though we have

Ex E, p. 2

collected a considerable amount of data in the Deschutes Basin, we do not anticipate returning to work on these TMDLs in this biennium.

In summary, DEQ has considerable authority over the discharge of pollutants to waters of the state. Despite this, there are significant sources of pollutants that are comparatively uncontrolled, and the potential effects of these discharges, along with potential decreases in instream flow from development could have a measurable impact on an outstanding water such as the Metolius River. Because DEQ does not have a regulatory framework for stormwater management after construction, we believe these developments could pose a significant risk to water quality. The level of risk is dependent on the size and proposed location within the Metolius River Basin.

If there is anything contained in this letter you have questions about, or if you'd like additional information about this or any other aspects of the Metolius River Basin, please call me.

Sincerely,

Stephanie Hallock

Stephanie Hallock
Director

cc: Mike Carrier, GNRO
Tim Nesbitt, Governor's Office
Dick Pedersen, DEQ

Council Exhibit 6-17-08 TB FMP Hearing

TB

From: Lynn.Sharp@tteci.com
Sent: Wednesday, March 26, 2008 12:37 PM
To: ARDT Glen T
Subject: Fw: Traffic Information

4407_001.pdf

Lynn Sharp | Senior Ecologist and Project Manager
Direct: 503.222.4546 | Main: 503.221.8636 | Fax: 503.227.1287 | Cell: 503.702.3198
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| | | |
|---|---|---|
| "Livingston, Peter" <plivingston@SCHWABE.com> | | To |
| | <Lynn.Sharp@tteci.com>, <kameron@bendcable.com> | |
| 03/20/2008 07:08 PM | | cc |
| | | Subject |
| | Traffic Information | |

Lynn and Kam:

Here is the information Group MacKenzie provided about the increased traffic resulting from the resort development. Keep this confidential until after we have discussed its import.

Thanks, Peter

> > <<4407_001.pdf>>
>

PETER LIVINGSTON | Attorney
SCHWABE, WILLIAMSON & WYATT
1211 SW 5th Ave., Ste. 1900 Portland, OR 97204
Direct: 503-796-2892 | Fax: 503-796-2900 | Cell: 503-314-1050 | Email: plivingston@schwabe.com
Assistant: Melissa Albrecht | Direct: 503-796-3770 | malbrecht@schwabe.com
www.schwabe.com

Ex. F

Received
3/26/08

| ESTIMATED AVERAGE DAILY TRAFFIC (ADT) COMPARISON ALONG CLINE FALLS ROAD | | | | |
|---|---|---|---|---|
| Location | Pre-Development Estimated ADT | Post-Development Estimated ADT | Percent Increase | |
| Cline Falls Rd, just South of Hwy 126 | 6,250 | 8,520 | ~~26.6%~~ | 36.3% |
| Cline Falls Rd, just South of SW 83rd St | 4,120 | 6,390 | 35.5% | 55% |
| Cline Falls Rd, just North of White Rock Lp | 3,980 | 5,270 | 24.5% | 32.4% |

FROM ODFW File

Ex. G

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# TRANSPORTATION IMPACT ANALYSIS

**(REVISION II)**

**THORNBURGH RESORT DEVELOPMENT**

Deschutes County, Oregon

**Prepared For**
Thornburgh Resort Company LLC

**Completed On**
December 8, 2004

***Revised***
*September 28, 2005*

**Submittal To**
Deschutes County

**Project Number**
2040342.01

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Since 1960

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Ex. H, p. 1

3384

**B-1.22a**

LUBA # 2008-203
01447

## III. PRE-DEVELOPMENT CONDITIONS

### BACKGROUND GROWTH

Background growth is general traffic growth not related to specific projects. Background traffic growth projections in the project vicinity were made based on ODOT historical traffic volume tables from 2001 to 2003. Using this data, a growth rate of 3.5% was used to project future traffic volumes.

### IN-PROCESS TRAFFIC

Assumptions contained in the Eagle Crest III TIA indicate 1,334 (70%) of Eagle Crest I and II housing units remained to be constructed in 1999. A review of building permits, and 2005 field observations, indicate approximately 15% of the housing still remain to be constructed.

Eagle Crest III proposed 900 housing units. A review of building permits, and 2005 field observations, indicate approximately 65% of the housing units still remain to be constructed.

All Eagle Crest housing units are assumed constructed in 2015. Further, all Eagle Crest development assumptions were agreed to by Deschutes County and ODOT staff. For purposes of this analysis, all trip generation resulting from Eagle Crest housing units remaining to be constructed are considered "in-process" traffic. This traffic has been assigned to the roadway system consistent with assumptions presented in the Eagle Crest III TIA. Figures 6a and 6b present in-process traffic assignment.

### PRE-DEVELOPMENT TRAFFIC VOLUMES

Pre-Development traffic is estimated future traffic volumes without the proposed development. 2015 Pre-Development traffic is the sum of existing traffic, background growth, and in-process traffic and is illustrated in Figures 7a and 7b for the weekday PM peak hour.

## TOTAL GOLF COURSE TRIP GENERATION

Total trip generation for the Tribute and Pinnacle courses is the sum of golfer and employee/service trips and is presented in the following table.

**TABLE 8 - GOLF COURSE TRIP GENERATION PM PEAK HOUR**

| Golf Course | Trip Type | Weekday PM Peak Hour Enter | Exit | Total |
|---|---|---|---|---|
| Tribute – 2 Courses 36 Holes | Golfer *(Less Internal)* | 0 *(0)* | 22 *(14)* | 22 *(14)* |
| | Employee/Service | 4 | 6 | 10 |
| **Total External Trips** | | **4** | **14** | **18** |
| Pinnacle – 1 Course 18 Holes | Golfer *(Less Internal)* | 0 *(0)* | 19 *(14)* | 19 *(14)* |
| | Employee/Service | 2 | 3 | 5 |
| **Total External Trips** | | **2** | **8** | **10** |

The following tables present anticipated resort trip generation for all land uses.

**TABLE 9A – PM PEAK HOUR TRIP GENERATION – TRIBUTE**

| Description | Land Use (ITE Code) | Units | Quantity | Rate | Weekday PM Peak Hour Enter | Exit | Total |
|---|---|---|---|---|---|---|---|
| Single Family Homes to CFH *Recreation Use* | 260 | Dwellings | 433 | 0.26 | 46 | 67 | 113 |
| Single Family Homes to CFH *Owner Occupied* | 270 | Dwellings | 67 | 0.62 | 27 | 15 | 42 |
| Ownership Cottages | 260 | Dwellings | 50 | 0.26 | 5 | 8 | 13 |
| Golf Courses (36 Holes) | Data from surveyed golf courses | | | | 4 | 14 | 18 |
| Restaurant *(Less 95% internal)* | 931 | Seats | 200 | 0.26 | 35 *(33)* | 17 *(16)* | 52 *(49)* |
| Sports/Community Facilities *(Less 60% internal)* | 491 | SQ FT | 21,500 | 0.84 | 13 *(3)* | 5 *(3)* | 18 *(11)* |
| Single Family Homes to Hwy 126 *Recreation Use* | 260 | Dwellings | 78 | 0.26 | 8 | 12 | 20 |
| Single Family Homes to Hwy 126 *Owner Occupied* | 270 | Dwellings | 23 | 0.62 | 9 | 5 | 14 |
| **Total External Trips - Tribute** | | | | | **106** | **124** | **230** |

| TABLE 9B – PM PEAK HOUR TRIP GENERATION – PINNACLE | | | | | | | |
|---|---|---|---|---|---|---|---|
| Description | Land Use (ITE Code) | Units | Quantity | Rate | Weekday PM Peak Hour | | |
| | | | | | Enter | Exit | Total |
| Single Family Homes *Recreation Use* | 260 | Dwellings | 280 | 0.26 | 30 | 43 | 73 |
| Single Family Homes *Owner Occupied* | 270 | Dwellings | 70 | 0.62 | 28 | 15 | 43 |
| Ownership Cottages | 260 | Dwellings | 200 | 0.26 | 21 | 31 | 52 |
| Condos/Timeshares | 260 | Dwellings | 175 | 0.26 | 19 | 27 | 46 |
| Hotel *(Less 15% Shuttle)* | 330 | Rooms | 50 | 0.42 | 9 *(1)* | 12 *(2)* | 21 *(3)* |
| Golf Courses (18 Holes) | Data from surveyed golf courses | | | | 2 | 8 | 10 |
| Restaurant *(Less 25% internal)* | 931 | Seats | 200 | 0.26 | 35 *(9)* | 17 *(4)* | 52 *(13)* |
| Sports/Community Facilities *(Less 60% internal)* | 491 | SQ FT | 15,000 | 0.84 | 9 *(5)* | 4 *(2)* | 13 *(7)* |
| **Total External Trips - Pinnacle** | | | | | **138** | **149** | **287** |
| **Total External Trips – Tribute and Pinnacle** | | | | | **243** | **273** | **517** |

## INTERNAL TRIP CAPTURE

The residential elements of the project are based on data collected specifically at recreational and resort areas. The trip generation rates are indicative of vacation, leisure, and retirement living, and are somewhat lower than residential trip-making values in urban areas. Trip generation rates for other land uses within the project are not similarly derived from typical recreational areas.

Because the project is reliant on visitors and residents for a high percentage of amenity support, the internal trip capture of the golf courses, restaurants, and sports facilities are expected to be high. This capture for each specific use is shown in the previous tables, identified by the numbers in *italics*.

## TRIP DISTRIBUTION AND TRAFFIC ASSIGNMENT

The distribution of project-generated trips was prepared based on existing directional patterns, proximity to services and employment patterns, and primary origins/routes for visitors to the development. Trips were also distributed based on anticipated origins and destinations within the Tribute and Pinnacle areas in Thornburgh.

Project-generated trips were assigned to the proposed access points based on Tribute and Pinnacle trip distribution. Trip distribution and traffic assignment are shown in Figures 8a and 8b for Tribute, and Figures 9a and 9b for Pinnacle.

Ex H, p. 4

3997



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01450

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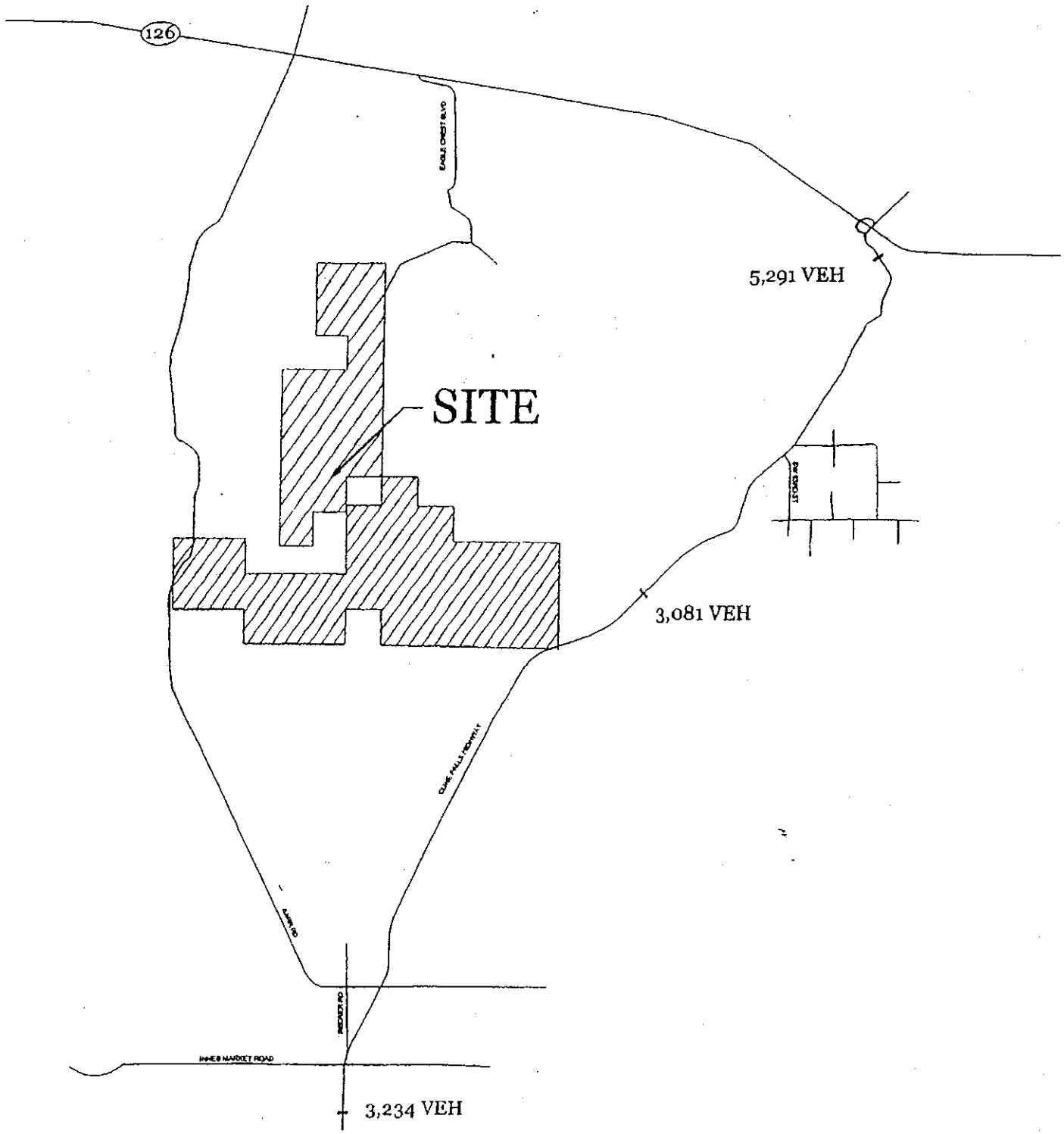


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**2005 Exisitng ADT Volumes and Locations** Ex H, p. 5

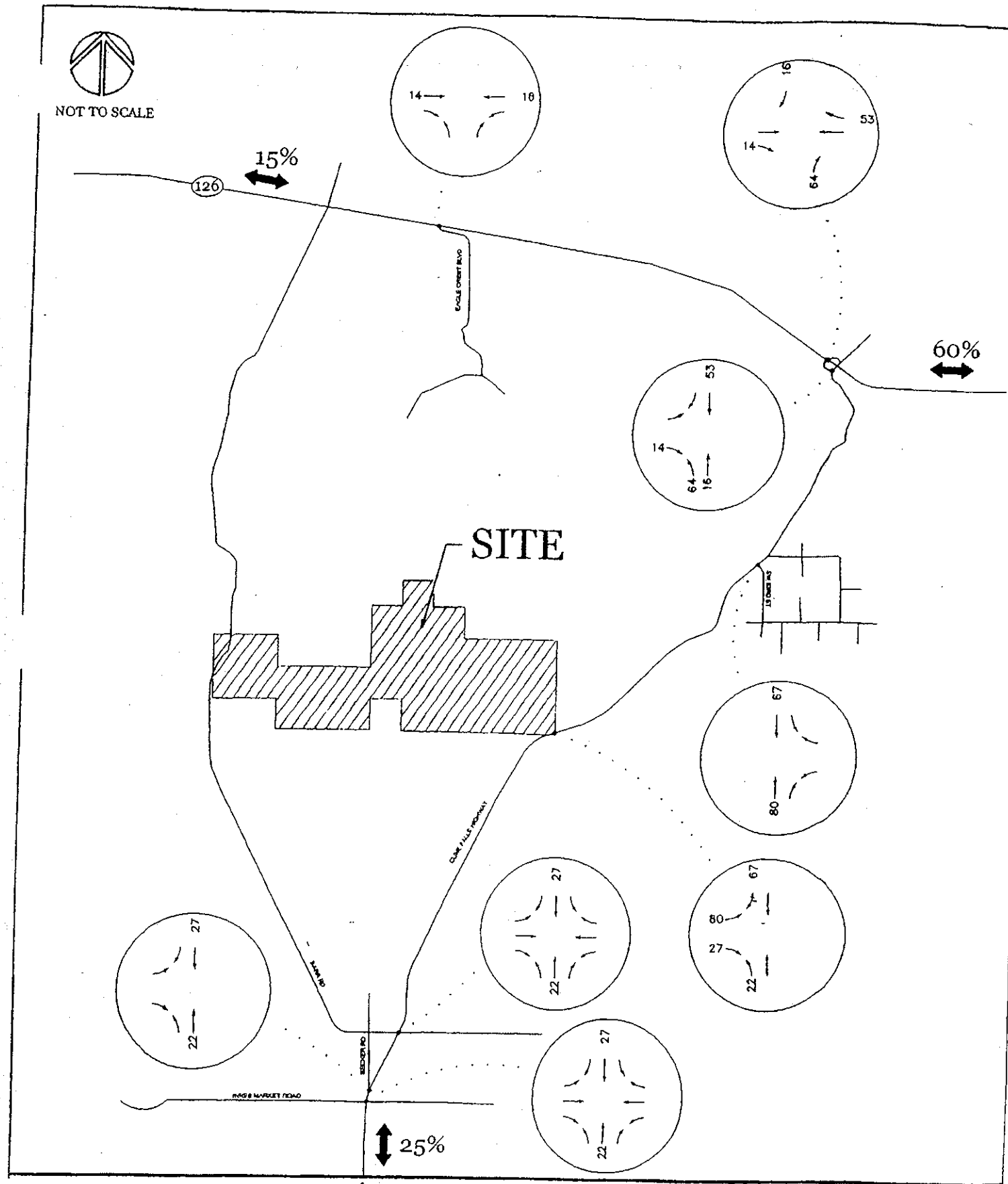
Thornburgh Resort Company
Deschutes County, Oregon

FIGURE **4a**

4010

SUBA # 2008-203

01451

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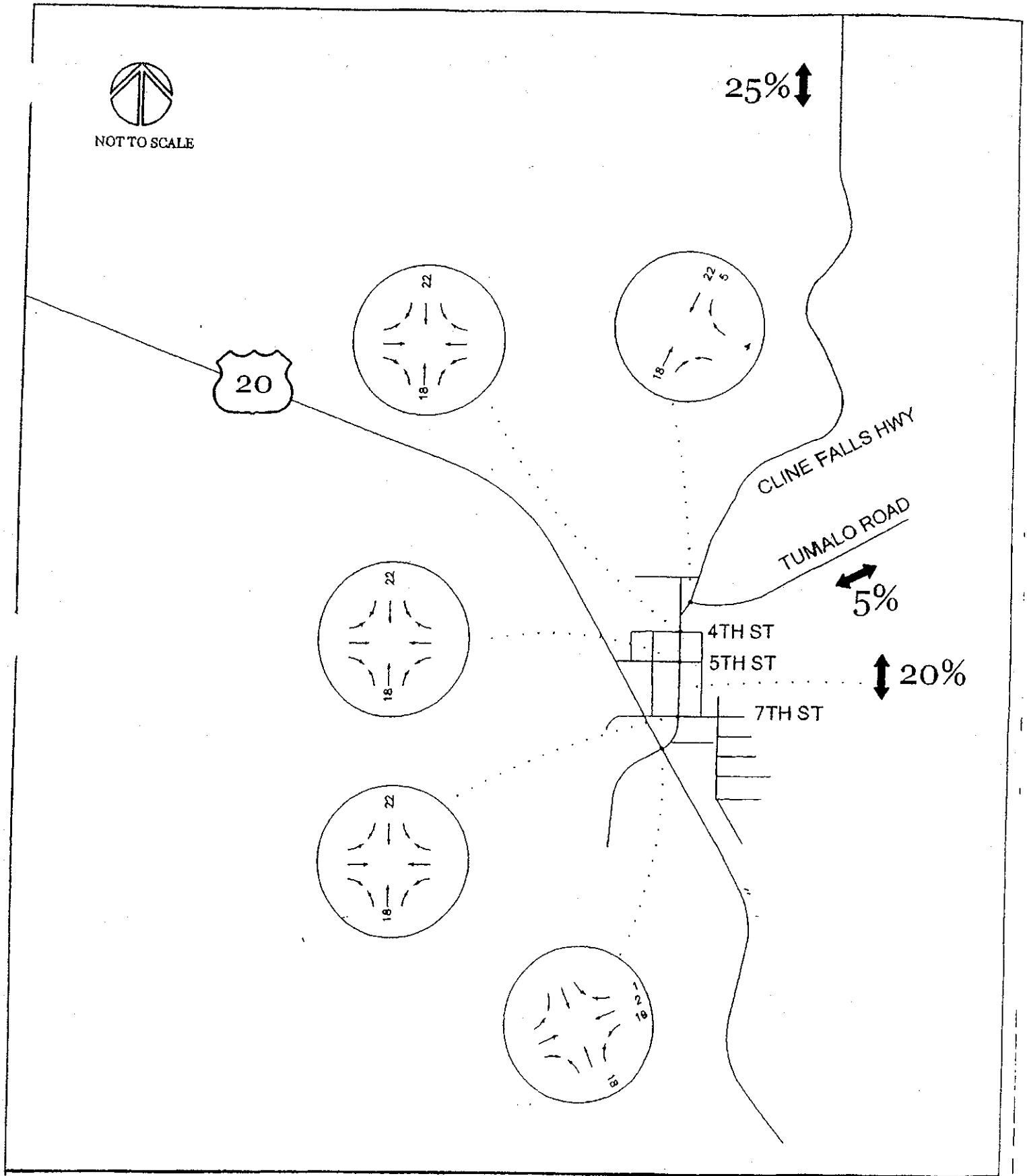
**Trip Distribution and Traffic Assignment - Tribute** Ex H, p. 6

Thornburgh Resort Company
Deschutes County, Oregon

FIGURE **8a**

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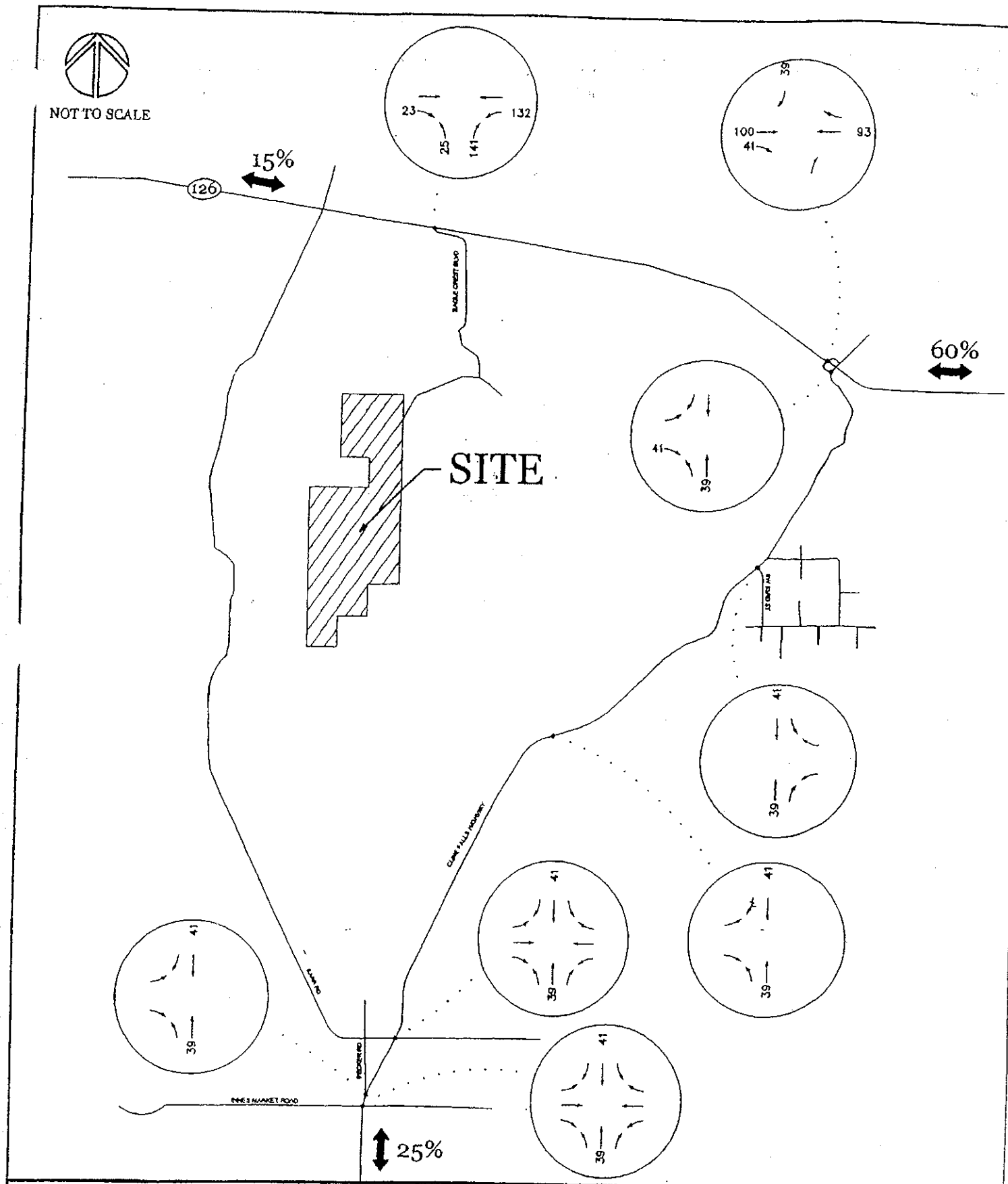
**Trip Distribution and Traffic Assignment - Tribute** Ex 4, p. 2

Thornburgh Resort Company
Deschutes County, Oregon

FIGURE 8b

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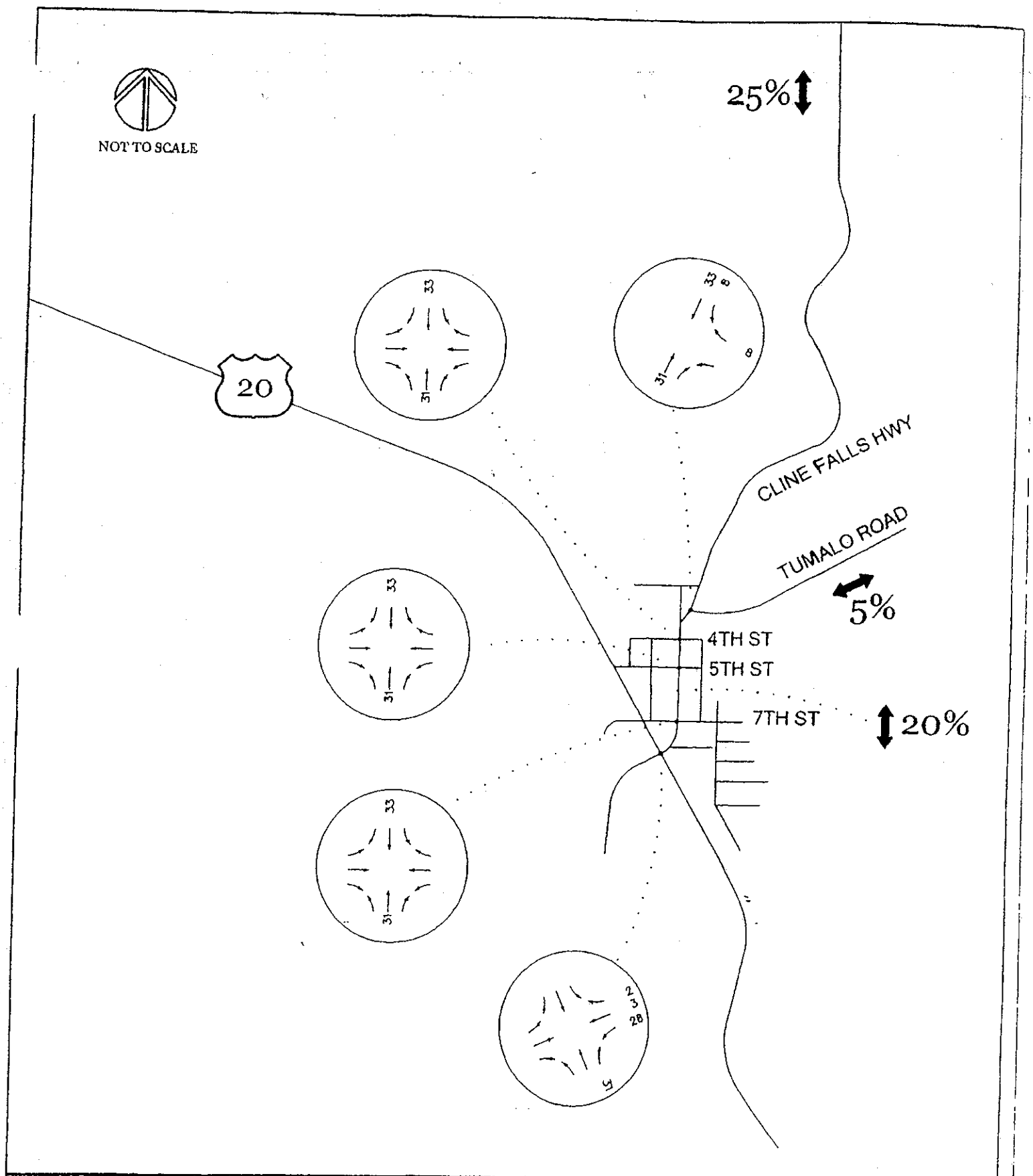
**Trip Distribution and Traffic Assignment - Pinnacle** Ex H, p. 8

Thornburgh Resort Company
Deschutes County, Oregon

FIGURE **9a**

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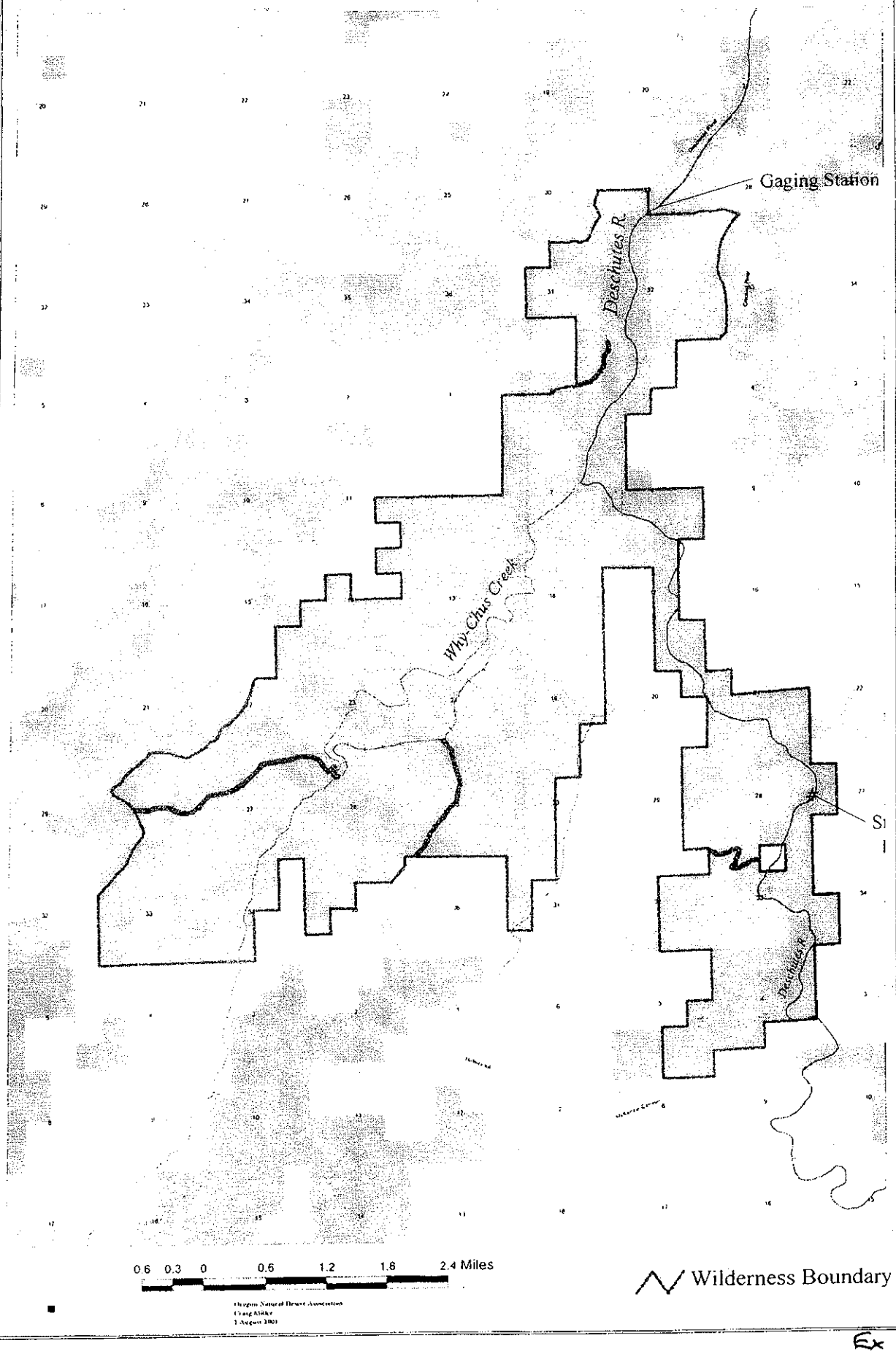
# Trip Distribution and Traffic Assignment - Pinnacle Ex H, p. 9

Thornburgh Resort Company
Deschutes County, Oregon

FIGURE 9b

# WY-CHUS WILDERNESS PROPOSAL

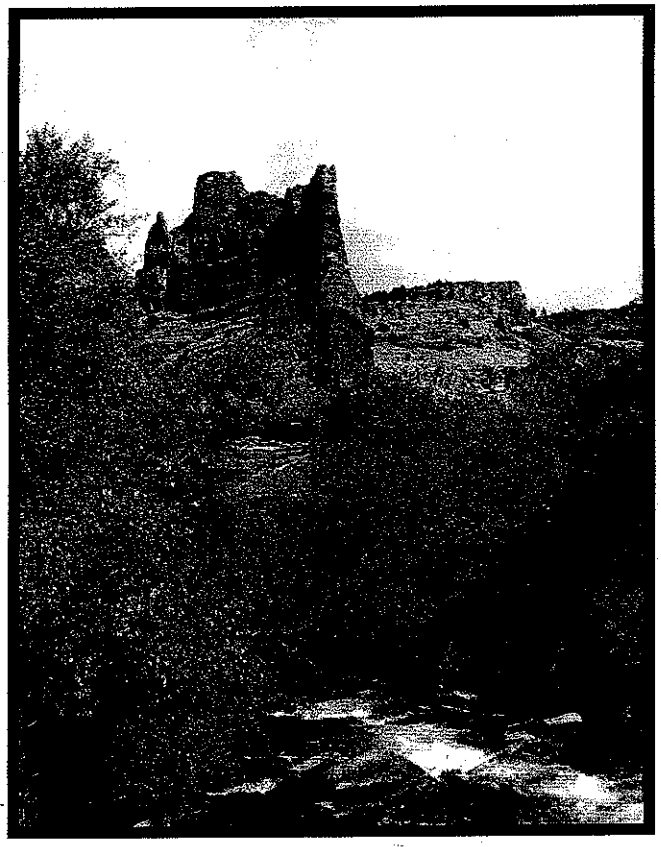



Ex I

LUBA # 2008-203
01456

# A Case Study: Thornburgh Resort Water Resources Impact Evaluation

## Upper Deschutes Basin, Oregon



Whychus Creek at the confluence with the Deschutes River.

**Mark Yinger Associates**
and
**Northwest Land & Water, Inc.**

February 2008

NORTHWEST Land & Water, INC.

Mark Yinger ASSOCIATES

EXHIBIT 1 LUBA # 2008-203
0145 PAGE

**Case Study:**
**Thornburgh Resort Water Resources Impact Evaluation**
**Upper Deschutes Basin, Oregon**

Prepared for:
Steve Munson, President
Sandy Lonsdale, Director
Native Restoration Fund
Vulcan Power Company
Bend, OR

Prepared by:
Mark Yinger, R.G.
Mark Yinger Associates
69860 Camp Polk Rd.
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541-549-3030

and

Laura Strauss, Principal Hydrogeologist, LG, LHg
Northwest Land & Water, Inc.
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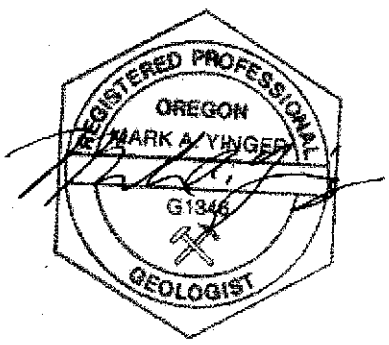
206-525-0049

February 2008



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# 1.0 Executive Summary

This report details the results of an investigation conducted to assess the potential impacts of pumping 3.25 cubic feet per second (cfs) of water from six new wells in the Upper Deschutes Basin (UDB). These wells are part of the proposed Thornburgh destination resort, which is located near important ecological resources. The proposed Thornburgh development will exacerbate rising trends in water use, which has increased consistently since 1998. Likewise, water right permits and applications have also increased significantly since 1998. They reflect the history of water rights policy in the UDB.

To assess the potential impacts to ecological resources, we analyzed geologic, water level, climate, streamflow, water use, water quality, temperature, seepage, and habitat data. We also ran a model developed by the U.S. Geological Survey (USGS). Our modeling and hydraulic analyses identified reaches of the middle Deschutes River and lower Whychus Creek that will be impacted by pumping from the proposed Thornburgh wells. Listed critical bull trout, core populations of redband trout, and unique plant communities live within these reaches.

- **Groundwater level impacts.** Declines in groundwater levels are important because they impact not only other water users but also streamflows. Hydraulic and well deepening data indicate that groundwater levels are already declining in parts of the UDB. A concentration of wells has been deepened near the Eagle Crest Resort, which is located a short distance east of Thornburgh, indicating declines. Recent hydrogeologic information for the Cline Buttes area also indicates that impacts to groundwater levels in the Thornburg area will exceed the predictions of the USGS model. The Thornburgh wells will accelerate water level declines, impact existing water wells and reduce streamflows.
- **Water quality impacts.** The temperature in UDB streams currently exceeds the recommended quality for bull trout and general stream health. Cold groundwater discharges are essential to reducing stream temperatures. Pumping from the Thornburgh and other future wells will cumulatively reduce these groundwater discharges if not properly mitigated. More specifically, modeling indicates that pumping from proposed Thornburgh wells would reduce cold spring discharges to the middle Deschutes River and Whychus Creek reaches that have federally listed critical bull trout habitat, core populations of redband trout, and important ecological resources for reintroducing Chinook salmon and summer steelhead. As cold groundwater discharges decline in response to new pumping, warm water will migrate downstream, negatively impacting these resources.


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- **Streamflow impacts**. Our analysis indicates that impacts will occur to the middle Deschutes River above RM 125, lower Whychus Creek, and Tumalo Creek. Seepage does not occur consistently along the Deschutes River; rather, it is strong in some places and weak in others, indicating significant preferred groundwater flow paths. River sections with small gains are most vulnerable to small changes in groundwater level. Water temperature in these sections is at great risk of increasing as cool groundwater inflow declines.

Mitigation must be within this zone of impact. The water permit for Thornburgh allows mitigation in the general zone, anywhere in the basin above the Madras gauge. This will result in an unmitigated new groundwater permit. In addition, current mitigation strategies rely on current streamflow measurements to evaluate the effectiveness of the water rights banking system. Streamflows will undoubtedly change in response to declines in precipitation and increased pumping.

Success of the mitigation program must be measured against the goal of moving toward a more natural hydrograph, not by comparing streamflow to the historically lowest streamflow, when diversions were at their maximum.

# 2.0 Introduction

Development in the Upper Deschutes Basin (UDB) has increased dramatically over the past 20 years. However, land use authorities and regulatory agencies have not required developers to comprehensively evaluate impacts to hydrological (streamflows, aquifer levels) and ecological resources due to new groundwater development. Although the USGS has characterized the hydrogeology of the UDB, the potential impacts to hydrological and ecological resources have not been adequately evaluated. Furthermore, recent data suggests declining trends in both precipitation and groundwater levels. These trends would not only impact streamflows, groundwater levels, and ecological resources of the upper and middle Deschutes River, but they would also be aggravated by future groundwater pumpage if not correctly mitigated.

Key ecological resources along the upper and middle Deschutes River include habitat for native bull and Redband trout; in addition, some reaches contain critical spawning and rearing habitat. Reduced streamflow and discharges from cold springs would impact fisheries. The middle Deschutes canyon is also home to unique riparian habitat.

This study focuses on impacts that a 1,970 acre destination resort planned in Deschutes County will have on water resources and water dependant ecology. In addition to this resort there are fourteen other destination resorts that are either under construction or in some stage of planning in Deschutes, Jefferson and Crook Counties. The total acreage of these resorts may range from 20,000 to 25,000. These destination resorts will rely almost entirely on groundwater. Their impact on water resources will be significant. The impact of each resort and the cumulative impact of all the resorts should be evaluated.

## 2.1 Proposed Development

Legislation passed in 2005 authorized the allocation of water from the Deschutes River and from the aquifers that feed it during seasons when instream flows are unmet. The legislation allows further groundwater development, which may diminish both quantity and quality of water in the Deschutes River and its tributaries.

A recent case of this legislation in action is the destination resort proposed by the Thornburgh Resort Company, LLC. This resort would cover about 1,970 acres west of the City of Redmond and would require new groundwater supplies to sup-


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port 1,425 dwelling units, three golf courses, two clubhouses, a community center, shops, and meeting / dining facilities.

As part of the review process, Thornburgh hired David Newton and Associates to prepare a hydrology report to inform and support Deschutes County land-use decisions about the resort. This report was released in 2005. Unfortunately, it falls far short of evaluating the impacts that pumping six proposed wells will have not only on valuable hydrological and ecological resources but also on existing wells.

## 2.2 Purpose

We have undertaken this study for two reasons. The first is to evaluate the impacts of the Thornburgh resort's use of groundwater. The work summarized in this report represents an effort to better understand the current hydrogeologic conditions in the UDB and to evaluate impacts to the hydrogeologic system from the proposed resort. However, an additional—equally important—goal is to demonstrate an appropriate level of evaluation that regulators should apply to any proposed developments involving new groundwater withdrawals (pumpage from new wells). We see the Thornburgh project as a case study that has a potential to establish new standards for reviewing current and future projects in the UDB. We hope these results help establish mitigation and water use strategies that sustain the Deschutes' high habitat and recreational values.

This study was authorized by Steve Munson, long-time resident of the UDB, out of his concern for the region's resources.

## 2.3 Scope of Investigations

Work for this study was conducted under two separate phases, by Mark Yinger Associates (MYA) and Northwest Land & Water, Inc. (NLW). MYA, the project manager, was responsible for evaluating the regional and local geology and hydrogeology. NLW analyzed water resource data and conducted groundwater flow modeling.

### 2.3.1 Phase I

Phase I of this study was outlined in a scope of work our team prepared to evaluate the impacts resulting from pumping large amounts of groundwater for the Thornburgh Resort. It entailed using a U.S. Geological Survey (USGS) ground-

water flow model (McDonald and Harbaugh, 1988) to predict impacts to the Deschutes River and its tributaries from the proposed pumping. The proposed Thornburgh wells were incorporated into the USGS model so we could simulate conditions under a range of steady-state scenarios.

### 2.3.2 Phase II

The scope of work was revised under Phase II to review and assess recent hydrologic data, and to compare this data to the data used by the USGS for its 1993–1997 study. Major components of Phase II included:

- Summarizing information about water use, policy, and legislation pertinent to the UDB.
- Compiling and summarizing hydrologic data collected since 1997.
- Evaluating trends in hydrologic data—specifically, trends in parameters that can profoundly affect fish habitat: water levels, stream temperature, streamflows, climate, seepage, and groundwater use, among others.
- Using the steady-state USGS flow model "as is" to predict the effects of pumping the proposed Thornburgh wells on streamflows and groundwater levels.
- Evaluating the ecological impacts resulting from reduced streamflows and groundwater levels predicted by the modeling.

## 2.4 Study Area

The study area for this report, shown in **Figure 2-1**, covers the same area as the USGS modeling investigation but focuses on the geology and hydrogeology near the proposed Thornburgh resort. The USGS study area encompasses approximately 4,500 square miles of the Deschutes River drainage basin in central Oregon, which includes several major tributaries: the Little Deschutes River, Tumalo and Whychus Creeks, and the Metolius River from the west, and the Crooked River from the east.

Land-surface elevation ranges from less than 1,300 feet near Gateway in the northern part of the study area to more than 10,000 feet in the Cascades. The study area also includes the basin's major population centers, where groundwater development is most intense and resource-management questions are most urgent. These communities include Bend, Redmond, Sisters, Madras, Prineville, and La


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Pine. **Figure 2-2** shows the location of the Thornburgh resort property, the proposed wells, and public and private lands.

## 2.5 Warranty

This work was requested by Steve Munson and completed by MYA and NLW. It was performed, and this report was prepared, in accordance with hydrogeologic practices generally accepted at this time, in this area, for the exclusive use of Steve Munson. No other warranty, express, or implied, is made.

# 3.0 Background Information

The UDB is presently one of the fastest growing areas in Oregon. The number of people in Deschutes County, the most populous in the basin, quadrupled between 1970 and 2001 (Gannett and Lite, 2004), and grew by about 29 percent from 2001 to 2006. Approximately 160,000 people lived in the UDB as of 2001. Growth is expected to continue, and residents and government agencies are concerned about supplying water to the growing population while protecting the rights and resources of existing water users. Surface-water resources in the area have been closed to additional appropriation for many years. Therefore, virtually all new development in the region must rely on groundwater sources.

## 3.1 USGS Investigation

In response to this concern, the USGS conducted an investigation of the hydrogeology of the UDB, collecting data from 1993 to 1997. Prior to the USGS study, researchers had insufficient data to quantitatively evaluate the connection between groundwater and streamflow—or even the behavior of the regional groundwater flow system in general. At the time of the USGS investigation, and prior to 2005, Oregon water law required those applying for new groundwater rights to evaluate the potential effects of groundwater development on streamflow.

The USGS investigation was born out of the hydrologic information void. The objectives of the study were to quantitatively assess the regional groundwater system and to provide analytical tools for making sound resource-management decisions. It has helped State and local government agencies, geologists, hydrologists, and residents when considering applications for new groundwater rights.

## 3.2 Regulatory Framework

### 3.2.1 Scenic Waterways Act

The *Scenic Waterways Act* was voted into law in November, 1970 to protect the free-flowing character of designated rivers for fish, wildlife and recreation and protect and enhance scenic, aesthetic, natural, recreation, scientific and fish and wildlife qualities along scenic waterways. Under this law, the portion of the Deschutes River below the Pelton Reregulation Dam to the Columbia River is

classified as a Recreational River Area under the Scenic Waterway Act (OAR 736-040-0070).

In accordance with a 1988 Supreme Court Decision (Diack vs. City of Portland) the Water Resources Commission must find that scenic waterway flows will not be impaired before issuing new water rights. As originally enacted, the Oregon Scenic Waterway Act prohibited new allocation of water from scenic waterways unless the Water Resources Commission determined the use was consistent with the scenic waterway law.

### 3.2.2 Instream Flows Established

In 1991 the Oregon Water Resources Department (OWRD), Oregon Parks and Recreation Department, and Oregon Department of Fish and Wildlife (ODFW) established the specific flow levels needed for fish, wildlife, and recreation in the Deschutes Scenic Waterway. The State also established instream water rights to protect flows in the river system for fish and recreational values. According to the 2006 Water Summit report on instream flows (Golden and Aylward, 2006) these protected flows are already not met many months of the year for reaches in the study area. In general, irrigation storage and diversions are the primary reasons. Streamflow in the Little Deschutes River and upper Deschutes River is primarily affected by reservoir storage operations. Conversely, streamflow in the middle Deschutes River, Tumalo Creek, and Whychus Creek is affected by irrigation diversions (Golden and Aylward, 2006).

### 3.2.3 SB 1033 & Appeals

In 1995, the State legislature approved Senate Bill 1033, which amended Oregon's *Scenic Waterways Act*, allowing new groundwater uses that measurably reduce streamflows of scenic waterways—if mitigated. A measurable reduction is defined as 1 percent or 1 cubic foot per second (cfs), whichever is less. All new rights would be subject to the proviso that groundwater use would be curtailed if data demonstrated a negative impact to scenic waterways. A public process to develop mitigation rules was started in 1998. Based on preliminary results of the USGS study, OWRD determined there was significant potential that new groundwater use would result in reduced streamflow on scenic waterways, and therefore, in 1998, a moratorium was placed on granting new groundwater permits. Issuance of final mitigation rules occurred in September 2002.

In November 2002, WaterWatch, an advocacy group for Oregon rivers, filed a case against OWRD arguing that the mitigation rules violated the *Scenic Waterways Act* and over allocated surface water in the UDB—thus failing to protect in-

stream water rights. In May 2005, the Court of Appeals found in favor of WaterWatch. The mitigation rules were rejected because the Court found that they allow a lessening of impact even though the law requires maintaining current flow. The Court in its opinion recognized that the legislature could choose to alter water resource policy established in statutes, opening the door for House Bill 3494.

### 3.2.4 House Bill 3494

In 2005, House Bill 3494 passed, authorizing allocation of groundwater whether or not it impacts the Deschutes River, regardless of the instream flows already established under the *Instream Water Rights Act*. The potential effects of groundwater development on streamflow did not need to be evaluated when considering applications for new groundwater rights. House Bill 3494 undermines Oregon's *Scenic Waterways Act*, passed in 1970 to protect flows needed for fish, wildlife, and recreation in the Deschutes and other world-class rivers in Oregon.

HB 3494 passed with a "sunset provision" of January 2, 2014. After HB 3494 sunsets, the rules found illegal by the Oregon Court of Appeals in 2005—but which became legal under HB 3494—will be terminated, precipitating the development of a new mitigation and water use strategy for the Deschutes basin.

### 3.2.5 Current Concerns

The sunset provision raises a number of concerns related to the long-term ecological health of the UDB. Developers now have an incentive to rush projects requiring new groundwater sources before the sunset date. Developments and associated water rights may be approved without adequate scientific investigation to quantify hydrogeologic impacts. Because development is essentially unchecked, the current and future health of the Deschutes hydrogeologic system is threatened by declining groundwater levels, spring flows, and streamflows, along with increased river water temperatures.

Although the USGS did much to characterize the hydrogeologic system of the UDB in the 1990s, development has been significant since then. As a result, trends in water use, streamflows, and groundwater levels have changed, potentially affecting the region's ecological resources.

# 4.0 Previous Work

Many researchers have studied water resources in the UDB. This section identifies much of the work conducted, the agency responsible for the work, and how it was used in this report. Rather than listing all work done in the UDB, we have focused on investigations that provided the most pertinent information for understanding the general history and technical hydrogeology of water resources in the UDB. A complete list of references used to prepare this report is included in Section 14.

## 4.1 Geology & Hydrogeology

The USGS has published many reports on different aspects of water resources in the UDB. A complete list of this work can be obtained online[1]. The work described below was the basis of the geology and hydrogeology summary in Section 5, the comparison of recent and previously available hydrologic data presented in Section 6, and the modeling efforts detailed in Section 7.

- *Groundwater and Water Chemistry Data for the Upper Deschutes Basin* (Caldwell and Truini, 1997). Presents basic data collected and compiled for the UDB, such as well log records, water levels, and water chemistry data for selected well, spring, and surface water sites.

- *Groundwater Hydrology of the Upper Deschutes Basin, Oregon* (Gannett et al., 2001). Provides a comprehensive, qualitative description of regional groundwater flow in the UDB and an analysis of the data compiled or collected for the study.

- *Geologic Framework of the Regional Groundwater Flow System in the Upper Deschutes Basin, Oregon* (Lite and Gannett, 2002). Describes the geologic structures and stratigraphic units that form the framework for the groundwater flow system in the UDB. The geology has a direct effect on the occurrence and movement of groundwater.

- *Hydrogeology of the Upper Deschutes Basin, Central Oregon: A Young Basin Adjacent to the Cascade Volcanic Arc* (Sherrod, Gannett, and Lite, 2002). Explores the visible and conceptual aspects of the regional groundwater hydrology of the UDB, including the interaction between groundwater and streams.

[1] *http://or.water.usgs.gov/proj/deschutes_gw/pubs.html*


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- *Simulation of Regional Groundwater Flow in the Upper Deschutes Basin, Oregon* (Gannett and Lite, 2004). Describes the mathematical simulation of regional groundwater flow in the UDB. It includes a description of the hydrology of the UDB and the methodology for representing the hydrologic system in the numerical model. It also includes hydrologic data used for the model calibration and a description of the calibration procedures.

## 4.2 Other Technical Work

Other technical work has been conducted to quantify seepage in the gaining and losing reaches of the streams in the UDB, to document stream temperature, to identify critical habitat for listed fish, and to survey and document flora and fauna. This report does not discuss the flora and fauna surveys, but the reports are listed here because they comprise important technical work that has been done in the UDB.

**Seepage Data** (McSwain, pers. comm., 2008). Seepage measurements were made for OWRD and Bureau of Land Management (BLM). These data were used to quantify seepage in gaining and losing stream reaches as reported in Section 6.

**Stream Temperature** (Watershed Sciences, 2002). Continuous temperature measurements and aerial visible and infrared photographs were collected and reported for the Oregon Department of Environmental Quality (ODEQ) by Watershed Sciences. Temperature measurements were used in Section 6.

**Critical Fish Habitat** (USFW, 2005) and (Fies et al., 1996). Identifies critical habitat for bull trout and native redband trout; also, identifies and discusses the reintroduction of salmon and steelhead. These data were used for Section 10.

**Botanical Surveys** (WPN, 2006). A botanical inventory on the Middle Deschutes from Odin Falls to Culver gauge that was prepared for the BLM.

**Aquatic Invertebrate Survey**. A macroinvertebrate study was conducted for BLM to establish baseline conditions for comparison to data collected in the future. Invertebrate populations and diversity are indicators of stream health.

## 4.3 Management & Mitigation

Much work has been done towards managing water resources in the UDB. Although there is a large body of information about the legislative history of water


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resources in Oregon and the UDB, it is beyond the scope of this report to compile that information. However, a few crucial documents describe water resource management, and, in particular, mitigation of diminished streamflow in the UDB. They are described below.

*Hydrology Report, Water Supply Development Feasibility: Proposed Thornburgh resort, Deschutes County, Oregon* (Newton, 2005). Prepared for the Thornburgh destination resort, this documents reports on the feasibility of groundwater development. The Deschutes County Board of Commissioners accepted this report as an adequate demonstration of sufficient groundwater supply for the proposed project, deeming that the potential impact to groundwater levels and nearby streams is acceptable.

*Deschutes Groundwater Mitigation Program, 5-Year Program Evaluation Report Draft* (OWRD, 2008). Evaluates the first 5 years of the groundwater mitigation program. We used this information in Section 12.

Deschutes Basin Water Summit 2006. This conference brought together stakeholders to enroll them in a consensus process for developing a comprehensive water management plan. It communicated the findings of a number of comprehensive studies on the following topics: instream flows; growth, urbanization, and land use changes; water management scenarios; groundwater demand; irrigation district water efficiency; and reservoir management. All of these reports can be viewed from the Deschutes River Conservancy website[2]. While most of these reports were not used directly in the report, they comprise an important body of work on management strategy in the UDB. The report on instream flow was used in Section 12.

[2] *http://www.deschutesriver.org*

# 5.0 Geology & Hydrogeology

This section summarizes the geology and hydrogeology of the UDB and the Thornburgh resort area. This information largely based on publications of the USGS, OWRD, and the Oregon Department of Geology and Mineral Industries (DOGAMI). For additional information, consult the following references:

- *Geologic Map of the Bend 30- x 60-Minute Quadrangle, Central Oregon, USGS Geologic Investigations Series I-2683* (Sherrod et al., 2004)
- *Geologic Framework Of The Regional Groundwater Flow System In The Upper Deschutes Basin, Oregon, USGS Water Resources Investigations Report 02-4015* (Lite and Gannett, 2002)
- *Groundwater Hydrology of the Upper Deschutes Basin, Oregon, USGS Investigations Report 02-4162* (Gannett et al., 2001)
- *Hydrogeology of the Upper Deschutes Basin, Central Oregon: A Young Basin Adjacent to the Cascade Volcanic Arc, DOGAMI Special Paper 36* (Sherrod et al., 2002)
- *Groundwater Hydrology of the Upper Deschutes Basin and Its Influence on Streamflow* (Gannett et al., 2003)

A limited amount of field work was done for this study in the vicinity of Thornburgh resort.

## 5.1 Physiographic Setting

The UDB is the portion of the Deschutes River drainage basin upstream of Trout Creek. Trout Creek enters the Deschutes near Warm Springs, Oregon. The basin stretches from the crest of the Cascade Mountain Range east approximately 100 miles and from Trout Creek south to just north of Chemult, Oregon, a distance of approximately 100 miles. The cities of Bend and Redmond are the major population centers and are located 25 to 30 miles east of the crest of the Cascade Mountain Range and near the center of basin, north to south. The combined population of the rapidly growing cities of Bend and Redmond is approximately 102,000. The smaller cities of Prineville and Madras are located 18 miles to the east and 25 miles to the north of Redmond respectively. Their combined population is approximately 16,000. The small city of Sisters is located about 20 miles west of Redmond. The small community of Tumalo is located about 5 miles south of the Thornburgh property.

The Thornburgh resort lies approximately 6 miles west of Redmond and 2 miles west of the north-flowing Deschutes River (**Figure 2-2**). It is located on and adjacent to the Cline Buttes, which consist of three prominent buttes and a lower ridge. These features have a northeasterly trend. The buttes rise 1,000 feet above the surrounding plain. The surrounding plain generally slopes gently to the north-northeast. The Deschutes River enters a narrow, steep wall canyon just north of the community of Tumalo. East of the Cline Buttes, the river canyon is 100 to 150 feet deep.

The major tributaries of the Deschutes River are the Little Deschutes River, Metolius River, Crooked River, Fall River, Tumalo Creek, and Whychus Creek[3]. The Deschutes is dammed twice near the northern boundary of UDB, forming Lake Billy Chinook and Lake Simtustus. The mean annual flow of the Deschutes River at Bend is 378 cfs; just above Lake Billy Chinook, it is 928 cfs (Gannett et al., 2003).

Portions of three major physiographic provinces occur within the UDB. The High Cascades physiographic province along the western edge of the basin is dominated by large stratovolcanoes with summit elevations of just over 10,000 feet. The northeastern portion of the UDB includes the western end of the Blue Mountain physiographic province. This area includes the Mutton, Ochoco, and Maury Mountains and most of the Crooked River drainage basin. The southeastern portion of the UDB includes the western end of the High Lava Plains physiographic province, where the dominant feature is the large Newberry shield volcano. The central crater of this shield volcano is about 20 miles south of Bend.

## 5.2 Climate

Moist marine air moving eastward from the Pacific Ocean has a dominant and moderating influence on the climate of the UDB. The winters are cool and wet and the summers are warm and dry. The great majority of the annual precipitation in the UDB occurs as snow and rain along its western margin; as moisture-laden marine air rises to flow eastward up and over the crest of the Cascades, it cools, leading to large amounts precipitation. The amount of precipitation varies dramatically across the UDB—from 100 plus inches per year along the Cascade crest to less than 1 foot over much of the basin (Taylor, 1993). The 30-year average annual precipitation at Redmond is 8.6 inches (Taylor, 1993).

[3] *Whychus Creek is the new name of Squaw Creek.*

# 5.3 Geologic Setting

The following discussion of the regional geology is based on our literature review and on well logs. The discussion of local geology focuses on the Thornburgh destination resort area and includes observations made during field reconnaissance conducted for this study. A more detailed description of the regional geology is contained in **Appendix A** and selected water well logs for the Thornburgh area are included in **Appendix B**.

## 5.3.1 Regional Geology

The region has a long and complex history dominated by volcanic activity that stretches from the Eocene through the Holocene Epochs. The UDB is a depositional basin filled with lava flows and volcaniclastic material known as the Deschutes Formation, derived primarily from the Cascade Mountain range, which flanks the basin on the west. To the north and east, the volcaniclastic material of the basin fill lapped onto uplands composed of older Oligocene to Miocene volcanic material of the John Day and Clarno Formations. The John Day Formation likely underlies most of the UDB. Much of the southern portion of the basin is filled with Pleistocene to Holocene basalt lava flows of the Newberry volcano and alluvial and glacial outwash deposits of silt, sand, and gravel.

**Figure 5-1** is a generalized geologic map taken from a USGS study (Gannett and Lite, 2004). The following table summarizes the stratigraphy of the region.

| Geologic unit | Age | Description | Generalized Geologic Units of Figure 5-1 |
|---|---|---|---|
| Sediments | Pleistocene to Holocene | Alluvium and glacial outwash silt, sand and gravel, and sands and gravels of present day streams | Quaternary sedimentary deposits |
| Volcanic deposits | Pleistocene | Andesite and basaltic-andesite lava flows, basalt lava flows, ash flows, | Volcanic deposits, of the Quaternary Cascades and Newberry volcano |
| Deschutes Formation | Late Miocene to Pliocene | Mudflows, debris flows, sandstone, conglomerate, basaltic and andesitic lavas flows, ash flows, air-fall ash and cinder cones | Volcanic and sedimentary deposits, late Tertiary and Quaternary |
| Volcanic and sedimentary rocks | Pliocene | Basaltic-andesite and basalt lava flows and alluvial fan deposits | |
| Prineville basalt | Miocene | Basalt lava flows | Prineville basalt |
| John Day Formation | Oligocene to late Miocene | Altered andesitic ash flows, air-fall tuffs, tuffaceous sediments, rhyolite domes, and andesite and basalt lava flows | Early Tertiary volcanic deposits |
| Clarno Formation | Eocene | Altered andesitic lava flows, ash flows, mudflows, tuffaceous sediments, mudstone, claystone, siltstone and conglomerate | |


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## 5.3.2 Local Geology

The Thornburgh property is located on, and in the immediate vicinity of, Cline Buttes, a rhyolite dome complex that rises approximately 1,000 feet above the surrounding plain, which consists of basalt and basaltic-andesite lava flows of the Deschutes Formation (**Figure 5-2**). These flows overlie sandstones and conglomerates of the Deschutes Formation. The thickness of the overlying lava flows is quite variable, ranging from 40 feet to as much as 300 feet.

The bulk of Cline Buttes consists of devitrified, light-tan, sparsely porphyritic rhyolite with very faint to no discernible flow banding, a sugary texture with brownish clots of iron oxides, and an irregular tight fracture. Other textures include spherulitic in combination with faint flow banding. The rhyolite dome complex and contemporaneous basalt lava flows suggest a strongly bimodal basalt-rhyolite magma (Streck and Grunder, 2007).

A low ridge extending to the southwest of the highest butte is likely a rhyolite lava flow or flows that may have buried older vents. The ridge consists of tan to light-gray rhyolite with distinct, fine, and generally planar flow banding having a platy fracture coincident with flow bands. The platy fractures are generally tight. Two linear zones of intense siliceous alteration were observed. They appear to be associated with southwest-trending fracture zones. Here the flow-banded rhyolite is completely replaced with massive, pure white, very-fine-grained silica.

A large rock quarry on the east side of the northern butte cuts into the flank of the butte, exposing distinct zones of rhyolite breccia. A long bulldozer-cut near the top of the quarry exposes at least four distinct zones of autoclastic breccia. The breccia and hydrothermal alteration zones dip steeply away from the dome summit. The intensity of brecciation and degree of alteration increases outward from the dome core. Each zone likely represents an episode of movement and hydrothermal alteration associated with a pulse of magma moving into the vent and pushing upward and outward. The outer breccia zones of the dome have undergone repeated episodes of fracturing and fracture surfaces are commonly coated with brown clay or silica, the products of hydrothermal alteration. The lower portion of the quarry, at the base of the slope, cuts across an apron of rubble. The material comprising the apron is a complex assemblage of angular, broken rhyolite shed off the steep upper slopes the dome, tephra, agglomerate, and lavas. The lavas are discontinuous and very broken, consisting of flow-banded gray and reddish-gray rhyolite and flow-banded obsidian. The volcanic rubble of the apron is loose to weakly cemented with silica and very porous. Locally, the material has undergone intense siliceous alteration, a process that has greatly reduced its permeability. The debris apron of the dome complex is, to a large extent, buried beneath Quaternary colluvium and alluvial fan deposits. Paleo-tributaries of the


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Deschutes River that flowed northeast may have eroded away significant portions of the debris apron along both the southeast and northwest sides of the buttes.

In the rock quarry, three areas of loose or very weakly cemented spherulites (4–10 mm) were observed in areas near the contact between the debris apron and rhyolite breccia. The spherulites may be the residual of intense and localized hydrothermal alteration of the chilled glassy margin of the rhyolite.

Relatively little is known about the subsurface in the vicinity of the Cline Buttes rhyolite dome complex. The rhyolite has an isotopic age of 6.14±0.20 Ma (million years ago; Sherrod et al., 2004). The complex is generally contemporaneous with the surrounding Deschutes Formation, which consists of basalt and basaltic-andesite lava flows and volcaniclastic sedimentary rocks. Driller's logs for the six water wells located nearest the dome complex (DESC 756, 952, 1198, 3666, 3669 and 54485) were examined (**Appendix B, Figure 5-2**). Well DESC 756, located on the south slope of the highest butte at about 3,350 feet in elevation, may intersect as much as 830 feet of rhyolite. The driller describes a hard, brown sandstone, possibly misidentifying devitrified rhyolite as sandstone because of its sandy or grainy texture and flow banding. The driller of well DESC 3669, located about a half mile to the south at approximately 3,160 feet in elevation, describes hard brown and gray rock and sandstone to 496 feet beneath the surface and then water-bearing sand and gravel from 496 feet to 535 feet beneath the surface. The other four wells do not appear to intersect the rhyolite based on the well logs. A well (DESC 1198) just north of the dome complex may intersect the dome debris apron.

## 5.4 Hydrogeologic Setting

The discussion the regional hydrogeologic setting is largely based on the USGS study *Geologic Framework of the Regional Groundwater Flow System in the Upper Deschutes Basin* (Lite and Gannett, 2002).

### 5.4.1 Regional Hydrogeology

The USGS study identified several hydrogeologic units, as shown on **Figure 5-3**. A hydrogeologic unit may consist of a single geologic unit with distinct hydraulic properties or portions of one or more geologic units grouped together because of similar hydraulic properties.

The following table summarizes the hydrogeologic units of the UDB. Additional description of the regional hydrogeology is included in **Appendix A**.


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| Hydrogeologic Unit | Description |
|---|---|
| Quaternary sediments | Unconsolidated silt, sand and gravel, low to moderately permeability |
| Cascade and Newberry volcanic deposits | Fractured lava flows and tephra, moderately to very permeable |
| Inactive margin deposits | Fine grained sediment facies of the Deschutes Formation deposited along the eastern edge of the basin, low permeability |
| Ancestral Deschutes River channel deposits | Coarse sand, gravels and intra-canyon lava flows, ancient Deschutes River channel deposit facies of the Deschutes Formation, very permeable |
| Proximal deposits | Fractured lava flows, flow breccias and coarse tephra facies of the Deschutes Formation, moderately permeable |
| Arc-adjacent alluvial plain deposits | Fractured lava flows, sandstone and conglomerate facies of the Deschutes Formation, moderately to very permeable |
| Pre- Deschutes Formation deposits | Pervasively altered volcanic and volcaniclastic deposits of the John Day Formation, includes hydrothermally altered rock at depth beneath the Cascades and Newberry volcano, very low permeability |

The Deschutes Formation is the primary aquifer in the UDB. It has been subdivided into four hydrogeologic units. These units generally relate to the source of material deposited and the depositional environment.

## 5.4.2 Local Hydrogeology

The Deschutes Formation is also the primary aquifer in the Cline Buttes and Thornburgh resort area. The nearest large-capacity wells are those of the Eagle Crest destination resort, located about 1 mile east of Cline Buttes. They appear to produce water from Deschutes Formation sandstone beneath basalt flows—reportedly 300 to 500 gallons per minute (gpm). One Eagle Crest well (DESC 54485, **Appendix B**) located about a half mile north of the northern butte penetrates, starting at the surface, 242 feet of basalt, then 360 feet of "multi-colored rock," and then confined water in sandstone (**Figure 5-2**). The multicolored rock that varies from soft to hard may be material of the rhyolite dome's debris apron. Wells (DESC 9358 and 9359) in the Crest Ridge development, about 2 miles northeast of the northern butte, produce over 100 gpm from Deschutes Formation sandstone.

Few wells appear to intersect the rhyolite dome complex. DESC 756, located up the south slope of the tallest butte, is the highest elevation well in the area (**Figure 5-2**). This well appears to penetrate 550 to 830 feet of rhyolite and produces 10 gpm from a fractured lava at 830 to 880 feet beneath the surface. The water in the fractured lava is confined, rising 100 feet above the top of the fractured lava, indicating that the rhyolite is impermeable. An Eagle Crest well (DESC 1083), located along Cline Falls Highway about a mile east the summit of the buttes, penetrates lavas and "rock" to 460 feet and then from 460 to 800 feet brown and gray "andesite" variably described as soft, hard, and weathered. The andesite described by the driller may be rhyolite. This well produced only 30 gpm. Wells one-half

mile farther east encounter water-bearing Deschutes Formation sandstone at shallower depths.

The permeability of the Cline Butte rhyolite is likely significantly lower than that of surrounding volcaniclastic sedimentary rocks. Repeated episodes of argillic and siliceous hydrothermal alteration have filled fractures, reducing its initial fracture-dependent porosity and permeability. A zone of argillic and siliceous alteration is also likely to extend into the surrounding volcaniclastic sedimentary rocks, reducing their original permeability. It has been stated that the rhyolite of Cline Butte and the rhyodacite lava flows near Steelhead Falls (approximately 8 miles north) are more permeable than the surrounding material (Sherrod et al., 2002; Gannett et al., 2001). There is good evidence to support this statement for the rhyodacite lava flows of Steelhead Falls, but not for the hydrothermally altered rhyolite of Cline Buttes. Water levels in wells that penetrate the sandstones and conglomerates around Cline Buttes are higher on the south/southeast side (the upgradient side of the buttes), and lower by approximately 100 feet on the northwest side. This is what would be expected if the rhyolite represented a zone of significantly lower hydraulic conductivity. If the rhyolite of Cline Buttes were much more permeable than the surrounding volcaniclastic sedimentary rocks, the groundwater gradient would be much flatter across the dome complex; however, this is not the case.

In contrast, what remains of the debris apron around the dome complex will have a much higher permeability than the rhyolite and, to a lesser degree, than the sandstone and conglomerate. Because of the very sparse subsurface data in the area, it is impossible to reliably estimate the extent of the debris apron and its extent of saturation. We suspect the debris apron is limited in its lateral extent.

### 5.4.3 Hydrogeologic Units & Hydraulic Properties

In this study, we use the USGS groundwater flow model for the UDB to simulate the stress of the pumping of the wells proposed for the Thornburgh destination resort. The USGS defined a set of hydrogeologic units and used them to inform the distribution of hydraulic properties within the flow model (Gannett and Lite, 2004). **Figures 5-1** and **5-3** show the USGS units, which include:

- Quaternary sediments
- Quaternary volcanic deposits of the High Cascades and Newberry Volcano
- The four facies of the Deschutes Formation consisting of arc-adjacent alluvial plain deposits
- Inactive margin deposits

- Ancestral Deschutes River channel deposits
- Proximal deposits
- Pre – Deschutes Formation rocks

Because of the lack of subsurface geologic data and the heterogeneous character of the hydrogeologic units, hydraulic properties were not assigned to each unit. Rather, the modelers considered the characteristics of the units in combination with other data to define the distribution of hydraulic properties. This data included aquifer tests, drillers' logs, specific-capacity tests, groundwater level measurements, and published data specific to the basin or considered typical or representative of the lithologies present in the basin. Gannet and Lite (2004) describe how they derived the horizontal and vertical hydraulic conductivities and storage coefficients for the model.

### 5.4.4 Spatial Variability

The Deschutes Formation is a complex hydrogeologic unit consisting of many rock types; therefore, its hydraulic properties are expected to vary significantly, both laterally and vertically. Preferred groundwater flow paths are formed by the lava flows and coarse sand-and-gravel channel deposits that filled paleochannels and canyons that crossed the depositional basin. These coarse sandstones, conglomerates, and fractured intra-canyon lava flows have very high permeabilities. The Pelton basalt and the Opal Springs basalt of the Deschutes Formation are very permeable lava flows that filled paleocanyons cut by the ancestral Deschutes River (Lite and Gannett, 2002).

## 5.5 Groundwater Flow System

### 5.5.1 Regional Recharge & Discharge Patterns

Groundwater flow patterns in the UDB are well documented in USGS studies (Gannett et al., 2001; Lite and Gannett, 2002; Gannett and Lite, 2004). Groundwater flows from the region's primary recharge areas — the High Cascades and Newberry volcano — in a northeasterly to northerly direction. These recharge areas receive the great majority of precipitation in the UDB, and the young, relatively unweathered volcanic deposits of these areas are very permeable, allowing rapid infiltration. The average annual recharge for the basin from 1993 to 1995 was approximately 3,500 cfs (Gannett et al., 2001).


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The first large discharges of groundwater occur along the lower slopes of the Cascades to spring-fed streams. These include the upper Deschutes River, above Wickiup Reservoir, Fall River, Spring River, and the upper Metolius River. Some segments of the Deschutes River between Sunriver and Bend gain water from groundwater discharges; others lose water. However, gains significantly exceed losses. In the Bend area, water is diverted from the Deschutes River into unlined irrigation canals that extend to north of Madras. The canals that leak at the greatest rate are located in the Bend area and to the north and east of Bend. For the year 1994, leakage from canals was estimated at 490 cfs—about 46 percent of the water diverted into the canals (Gannett et al., 2001).

From Bend downstream to the Lower Bridge area the Deschutes River has both reaches with small gains and small losses, and the flows varied from 29 to 44 cfs (Gannett, 2001). Between Lower Bridge and Whychus Creek, the river begins to gain from spring discharges, however there are reaches with small gains and reaches with small losses (McSwain, 2007). Seepage along this section of the Deschutes is discussed in more detail in Section 6. From approximately Lower Bridge north to Lake Billy Chinook, the Deschutes gains about 390 cfs from groundwater discharge. The lower Crooked River gains about 1,100 cfs. Groundwater discharge to Lake Billy Chinook is estimated at 420 cfs. This large discharge of groundwater in the confluence area occurs because the permeable Deschutes Formation thins against the relatively impermeable John Day Formation as it nears the surface and eventually outcrops in the Deschutes canyon 10 miles north of Lake Billy Chinook (Gannett et al., 2001).

### 5.5.2 Proposed Resort Area

In the Thornburgh resort area, groundwater flows in a northwesterly direction. The groundwater elevation in Deschutes Formation wells is generally 2,700 to 2,750 feet on the southeast side of Cline Buttes and about 2,600 feet on the northwest side (**Figure 5-2**). This drop of 100 to 130 feet over a distance of about 3.5 miles is significantly steeper than the regional gradient indicated by the USGS study (Gannett and Lite, 2004).

Hydrothermal alteration associated with the rhyolite dome complex and its volcanic conduits likely has reduced the permeability of the rhyolite and adjacent Deschutes Formation volcaniclastic sedimentary rocks. In contrast, a debris apron around the dome complex consisting of broken rock shed off the steep flanks of the domes, tephra, and very broken lavas and agglomerate is likely significantly more permeable than the either the rhyolite or the rocks of the Deschutes Formation.


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There are extensive irrigation canal networks approximately 2.5 miles south of the Cline Buttes and along the east side of the Deschutes River from Bend to about six miles north of Redmond. In these areas, leakage from canals and irrigation water lost to deep percolation recharges groundwater. A very small portion of the canal leakage discharges to the middle Deschutes River. From just north of Bend to Odin Falls, approximately 4 miles north of Cline Buttes, the estimated gain to the Deschutes River is only 6.5 cfs and this gain has been attributed to return flow from leaky irrigation canals (Gannett et al., 2001).

# 6.0 Recent Hydrologic Data

The USGS study reported precipitation, groundwater level, streamflow, and water use data. For this study, we compiled recent data and compared it to the USGS data. This section describes the result of this comparison and summarizes stream temperature and habitat data. Discussion of how trends in recent hydrologic data may impact water resources is discussed in Section 12.

## 6.1 Precipitation

Precipitation is the source of groundwater recharge. Since groundwater feeds parts of the Deschutes River, any reductions in recharge eventually translate to reduced streamflows, which can affect stream temperature and fish habitat. Recharge can be profoundly affected by climate change, which can decrease either the amount or duration of snow pack or the amount of precipitation that infiltrates into aquifers.

The USGS used precipitation data for the years 1993 to 1995 to calculate groundwater recharge for its regional model. This data was obtained from six sites in the UDB. For this study, we examined precipitation data from water year 1990 through 2007 for the same six sites.

### 6.1.1 Data Source

Precipitation data is maintained by the Western Regional Climate Center (WRCC) at the Desert Research Institute in Las Vegas. Data is available for purchase by internet download[4]. Data for the six sites used by the USGS was purchased from the WRCC for the period 1990 to 2007. These sites are shown on **Figure 6-1**.

### 6.1.2 Method

Data include maximum, minimum, and average temperature; total precipitation; precipitation, snowfall, snow depth, and date. Data were compiled in an Access

[4] *http://www.wrcc.dri.edu*

database and a "water year"—the 12-month period from October 1 through September 30—was assigned to each date.[5]

Total precipitation was summarized for water years 1991 through 2007 at each of the six sites. Snowfall data was summarized for Wickiup Dam, the site with highest elevation, to help assess trends in the snow pack that recharges groundwater and provides surface runoff to streams. **Table 6-1** summarizes annual precipitation at the six sites; **Figure 6-2** shows annual precipitation trends. **Figure 6-3** shows the number of days per water year with snow pack greater than 0 inches at Wickiup Dam.

### 6.1.3 Results

In general, the recent data indicate significantly less precipitation than the 1993–1995 data, the period used for the USGS model. The data for Wickiup Dam suggests that climate change may be reducing snow pack, but it is inconclusive.

## 6.2 Groundwater Levels

Groundwater levels were monitored throughout the basin and reported by the USGS for over 85 wells (Caldwell and Truini, 1997). The OWRD continued to monitor groundwater levels in 14 wells throughout the UDB (Gannett and Lite, 2001). Of these, about eight are in the vicinity of the proposed Thornburgh development and were considered in this section; these well locations are shown on **Figure 6-1**. The data was downloaded from the OWRD website and used to prepare water-level hydrographs. The long-term water level hydrographs were then reviewed, and recent trends data were compared to trends discussed by USGS (Gannett et al., 2001).

### 6.2.1 Data Sources & Methods

The locations of OWRD observation wells in the vicinity of the proposed Thornburgh development were identified using GIS data. The shape file, *wells.shp*, was

[5] *The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1992, is the 1992 water year.*


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obtained from the OWRD website[6]. All available water level data for the Deschutes basin was obtained from OWRD[7].

Sixteen observation wells were identified in the vicinity of Thornburgh. Eight of these wells were included in the OWRD water-level database and were evaluated for this report (**Figure 6-1**). Hydrographs for these wells are shown on **Figures 6-4** through **6-12**.

Although each observation well has a different period of record, the same time scale was used for each hydrograph to compare trends. The longest period of record, 1972–present, was used for each hydrograph. Each hydrograph includes the OWRD well name (a number preceded by DESC, the identifier for Deschutes County). The well's depth and its corresponding USGS identifier are noted parenthetically if the data was included in the database.

### 6.2.2 Discussion

The USGS investigation of hydrology of the UDB (Gannett et al., 2001) reports that, in general, large-scale water-level fluctuations reflect responses to weather patterns. Groundwater levels rise after periods of high precipitation and decline in response to drought conditions. The USGS modeling report (Gannett and Lite, 2004) cites the 2001 report:

> *"There is no evidence to suggest that the regional groundwater system in the UDB is not in long-term equilibrium with the natural climate cycles and human activity. For example, no long-term water level declines due to pumping were observed in the data, and (with few exceptions) groundwater discharge measurements show trends that can be related only to climate."*

This conclusion is based on hydrographs presented in the USGS report (Truini, 1997), which show cyclic water-level trends with rising and declining limbs lasting no more than about 5 to 7 years and complete cycle durations lasting about a decade. Although the USGS conclusions may be correct for the observed period, they may not reflect current conditions, which are likely affected by factors other than climate. The hydrographs for the wells near the Thornburgh project have presented an opportunity to revisit old data and to assess recent trends by incorporating new data that has been collected over the last decade.

[6] *http://www.wrd.state.or.us/OWRD/GW/well_data.shtml*

[7] *http://www1.wrd.state.or.us/groundwater/obswells/data/owrd_wls.txt*


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## 6.2.3 Results

Two hydrographs show cyclic trends and five show a declining trend since 1993. Two show a difference between older and recent data that appears inconsistent with cyclic trends, but data between the two periods is missing. These trends are detailed in the next few sections of this report. In addition, data collected since 1997 suggest that some observation wells reflect declining water level trends that are inconsistent with the decadal trends resulting from climate variation.

### 6.2.3.1 Declining Water Level Trends

**Figures 6-4** through **6-8** (wells DESC 3903, 3949, 3581, 8626, 1957) are hydrographs that show consistent declining trends since about 1994. DESC 3903 (**Figure 6-4**) has the longest period of record, from 1972 to about 1994, and shows fluctuating water levels typical of the decadal trends that reflect climate variation until about 1994. During this period, the maximum change in water level is less than about 10 feet. However, after 1994, water levels continue to decline for 12 years, with a slight flattening from 1996 to 2002. This pattern differs from the previous 22 years. **Figure 6-5** (DESC 3949) has limited early data, in about 1979, and then a complete record from about 1993 through 2007. Because of this large hiatus, the trend between 1980 and 1994 is unclear. However, it is clear that there is a consistent downward trend from 1993 through 2006, with a flattening between about 1997 and 2003, similar to DESC 3903.

The declining trend in these observation wells is inconsistent with a cyclic pattern, suggesting that water levels may be responding to other factors. The water level decline is likely a response to not only climate change but also to groundwater pumping at rates in excess of the recharge rate.

### 6.2.3.2 Cyclic Water Level Trends

**Figure 6-9** (DESC 3193), **Figure 6-10** (DESC 3614), and the early parts of **Figures 6-4** and **6-8** show cyclic water level trends. In these wells, water level fluctuates up and down. Each period of rise or fall lasts for 3 to 6 or more years; each cycle lasts approximately 10 years. The maximum and minimum values follow a flat trend, hovering around a consistent water level. This pattern is typical for wells that respond to the cyclic fluctuations of climate, with decreasing trends corresponding to periods of drought and increasing trends corresponding to particularly wet years.

#### 6.2.3.3 Differences between Older & Recent Data

**Figures 6-11** and **6-12** (DESC 53714 and 386) have insufficient data to establish a clear trend. However, recent water levels are significantly lower in both wells than they were during the early period of record. For **Figure 6-11** (DESC 53714), the data from about 1995 to 2005 suggests a cyclic or slight decline, but water levels during the entire 10-year period are more than 16 feet lower than they were from about 1990. Similarly, for DESC 386, the data point from 1995 is more than 10 feet lower than the data point in 1975. **Figures 6-5 and 6-8** also exhibit a significant difference between older data collected from 1978-1980 and recent data; the early data does not fit as part of the trend of the later data, but can only be explained by a declining trend.

## 6.3 Streamflow

The USGS reported streamflow data for the UDB available through 1997 (Gannett et al., 2001) and used the data to develop the groundwater flow model (Gannett and Lite, 2004). For this investigation, we compiled data available through water year 2007 for selected streams. These hydrographs are presented in this section. They provide current information and show the dramatic increase in streamflow between the headwaters of the Deschutes River and locations downgradient near Madras. Stream-gauging sites were selected based on data availability and location.

**Figure 6-13** shows the map of stream-gauging stations from the 2001 USGS report. Stations with data presented in this report are circled. Data from two stations on the Deschutes River— Lower Bridge near Terrebon and Cline Falls—are included in this report but not covered in the USGS report. Although these stations have limited data, we have included them because their locations are important to understanding the groundwater flow system.

### 6.3.1 Data Source & Methods

Tabular electronic streamflow data was provided by either the Oregon Water Resources Department or the USGS[8].

Hydrographs were plotted for the 11 selected gauging stations. **Figures 6-14** through **6-24** are presented in order from upgradient to downgradient. Stations

[8] *http://www1.wrd.state.or.us/cgi-bin/choose_gage.pl?huc=17070301*
*http://waterdata.usgs.gov/nwis/sw*


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were selected to show the change in streamflow of the Deschutes River as distance away from the headwaters increases. Stations on tributaries Whychus Creek and Tumalo Creek were included because they contain important fish resources near the proposed Thornburgh project.

### 6.3.2 Discussion

Hydrographs for all the gauging stations show a dramatic difference between the high flows of winter/spring and low flows of summer/early fall. In general, the low-flow conditions represent summer/early fall *baseflow*, when the stream is fed primarily by groundwater. High flow conditions occur when the stream is fed by groundwater, precipitation runoff, and/or snowmelt. Each hydrograph shows that baseflow dominates total streamflow beginning in about May and reaches its lowest flow in August or September. The relative impact of declining groundwater levels is significantly greater under baseflow conditions than under higher flows; therefore, this discussion focuses on the baseflow conditions shown in the hydrographs.

Gauging stations at Crescent Creek, Deschutes below Wickiup, and Little Deschutes at La Pine (**Figures 6-14, 6-15,** and **6-16**) represent streamflow in the most upgradient portion of the basin. Baseflow at these sites is commonly about 20–30 cfs at Deschutes below Wickiup, 5–10 cfs at Crescent Creek, and 30–60 cfs at Little Deschutes near La Pine. Gauging stations on the Deschutes at Benham Falls, Bend, Cline Falls, Lower Bridge, near Culver, and near Madras illustrate how flows increase with distance in the downgradient direction. Low-flow conditions are commonly about 500 cfs at Benham Falls, 40–85 cfs near Bend, 40–10 cfs near Lower Bridge, 500 cfs near Culver, and 3,500–3,800 cfs near Madras.

This trend shows that the most dramatic increase in groundwater discharge to the Deschutes River—about 3,000 cfs—occurs between Culver and Madras. Although baseflow increases from less than 50 cfs at the most upgradient gauging stations to 500 cfs at Culver, it decreases by about 400 cfs as it moves downgradient from Benham Falls (about 500 cfs) to near Bend (about 100 cfs). Because the data for the Deschutes at Cline Falls is old, no direct comparison to nearby gauging stations is possible. Likewise, the data record for Lower Bridge is relatively short, but its hydrograph is consistent with low baseflow conditions for Deschutes at Bend.

Gannett and Lite (2001) report that the most substantial stream losses measured in the basin occur on the Deschutes River between Benham Falls and Bend. Stage and flow rate in this reach is reported to be controlled by reservoir operations upstream. Gannett and Lite report that streamflow is highest from April to October,

when water is released from reservoirs for canal diversions near Bend. However, Gannett and Lite (2004) acknowledge that there is a losing reach between Benham Falls and Bend, reporting losses of about 90 cfs, based on a long-term data record (1945–1995); this is likely due to irrigation diversions.

The hydrograph for the Deschutes at Benham Falls shows high flows during the typical low-flow season, from about May to early October. At Bend, high flow occurs during the wet season, from late fall through spring. Streamflow at Benham Falls is affected by reservoir operations, while streamflow at Bend is affected by irrigation diversions. Regardless of the reason, baseflow in the Deschutes River from Bend to Lower Bridge is the lowest flow in the middle Deschutes River and is about 100 cfs.

## 6.4 Groundwater Use

Monthly pumping data from both public and large private water supply purveyors was summarized for 1997 through 2006. This data was then compared to usage during the period of record for the USGS groundwater flow model (Gannett and Lite, 2004).

### 6.4.1 Data Sources & Methods

Groundwater use data for public systems from 1997 through 2006 was acquired from an OWRD online database[9]. We also obtained from OWRD water use data for private systems in the central portion of the UDB. Data was provided in electronic format and is generally reported in million gallons (MGals). Some water purveyors report water use in cubic feet; these data were converted to MGals.

Pumping records were entered into an Excel spreadsheet and compiled into an Access database. **Appendix C** summarizes public and private water use data. **Table C-1** lists monthly water use for each year for each public supply well included in this analysis; **Table C-2** lists monthly water use for each private supply well. **Tables 6-2** and **6-3** summarize the total combined monthly and annual water use for public and private wells, respectively. **Tables 6-4** and **6-5** are for public and private wells, respectively, and summarize the annual water use for each well, making it easy to see trends and identify data gaps[10].

[9] *http://www.wrd.state.or.us/OWRD/WR/water_use_report.shtml*

[10] *Although pumpage was reported, it was never entered into OWRD's database because of resource constraints.*


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Because the missing data affects the annual totals, we had to estimate pumpage to assess trends in public water use. For example, **Table 6-2** indicates that pumping from public supply wells was 2,546 MGals in 2006 and 3,533 MGals in 2005. However, **Table 6-4** indicates that data is missing for 12 wells in 2006, even though pumping occurred. If 2005 pumpage values were applied to the missing 2006 data, **Table 6-2** would show 3,891 MGals instead of 2,546. Similarly for 2004, data was not reported for 19 wells. If 2003 values were applied to 2004, annual water use would be 4,796 MGals, instead of the 1,642 shown on **Table 6-2**.

### 6.4.2 Results

**Tables 6-2** and **6-3** show that public and private water use has increased significantly since 1997, and that it differs from the estimates in the USGS model, which used 31 cfs, or 7,369 million gallons per year (MGY) for pumping from public supply and irrigation wells. Trends in public and private water use show a combined increase of as much as 4,000 MGY (17.0 cfs) since 1997.

## 6.5 Seepage Data

Seepage data provides important information about the relationship between a stream and the adjacent groundwater system. In areas where the stream elevation lies above the water table, water seeps from the stream into the aquifer along a "losing" reach. Conversely, where the stream elevation is below the water table, water seeps from the aquifer system into the stream along a "gaining" reach. Consequently, when groundwater levels decline along gaining reaches, streamflow also declines. Along losing stream reaches, seepage to the underlying aquifer increases, provided the stream is not perched above the aquifer.

Seepage can be estimated by measuring streamflows at points located a few to several miles apart over a relatively short period. Other factors are considered in developing seepage estimates, including reach length, diversions, and tributary inflows. Because seepage data is collected over a relatively short period, it represents a snapshot of both the rate and distribution of groundwater inflow to, or leakage from, a stream.

Seepage runs conducted by the OWRD in the UDB are reported by the USGS (Gannett and Lite, 2001). More recently, the OWRD and BLM have measured seepage. This section of the report discusses recent data, which were analyzed and compared to results reported by the USGS in 2001.

### 6.5.1 Data Sources & Method

The results of seepage runs conducted by the OWRD during the period from 1992 to 1994 are reported by the USGS (Gannett and Lite, 2001). The BLM contracted with the USGS to collect seepage data on July 12, 2005, at seven sites from Deschutes River below Bend to near Culver; this data was provided to us on a CD (McSwain, pers. comm., 2008). The OWRD collected seepage data on August 3 and 4, 2005. This preliminary data was provided in the form of an Excel spreadsheet (McSwain, pers. comm., 2008). **Appendix D** contains tabulated seepage data from each of these sources.

The recent BLM and OWRD data were compared and appeared consistent with each other. Because the BLM data does not include tributary discharge measurements, gains at Deschutes below Whychus Creek could not be fairly compared. Therefore, the OWRD data set was analyzed for this study because it was larger. Reach length was calculated as the difference in river miles between measurement locations. Seepage rate along a stream reach between two adjacent measurement sites was calculated by subtracting the upgradient measurement and tributary inflow (if any) from the downgradient measurement. The seepage rate per river mile was calculated by dividing the total reach seepage by the reach length.

We used ArcMap, a geographic information system, to map the seepage measurement points and identify them by river mile (RM), as shown on **Figure 6-25**. The site description that corresponds to the river mile is included in the table in **Appendix D**. **Figure 6-25** shows the calculated seepage rate between each designated river mile using a color-coded gain/loss value; total seepage per stream reach is also noted.

### 6.5.2 Results

**Figure 6-25** indicates that minimal groundwater inflow occurs into the Deschutes River between Bend (RM 164) and Lower Bridge (RM 134). The Deschutes gains flow from Lower Bridge to RM 128.7, and then loses some flow again from RM 128.7 to RM 126.1. Gains are then mild from RM 126.1 to RM 124.9, strong from RM 124.9 to RM 123.3, and mild to RM 120 near Culver. Downgradient from Culver, the Deschutes gains strongly, as shown by the streamflow hydrographs between Culver and Madras. These gains and losses are important to understanding how declining groundwater levels may affect flows to or from a particular reach.

The USGS reports discharge measurements at 19 stations along the Deschutes River from Bend to Culver (Table 5; Gannett and Lite, 2001). These measurements were used to estimate gains or losses for larger stream reaches that extend

over many stations. Color is used to indicate the seepage rate per RM, and a number indicates the total gain or loss along a reach (Table 7 and Figure 12; Gannett and Lite, 2001). Although this map shows general patterns of groundwater inflow to streams in the UDB, it may be misleading because combining the individual measurements results in a loss of important detail. For example, the reach from RM 130.5 to RM 120 combines results for seven sub-reaches and indicates significant inflow of 305 cfs. However, of the seven sub-reaches, two have significant inflow, one is losing, one has zero inflow, and three have mild inflow of less than 20 cfs. This breakdown is similar for the OWRD data, except that two of the sub-reaches were losing in 2005.

**Figure 6-25** shows that the reach sections in the vicinity of Thornburgh, between Bend and Whychus Creek, are characterized by both losing and gaining conditions. Most of these sections have relatively small gains or losses; only a few short sections have significant inflow rate. It is likely that within a river section characterized by a "loss" there are sub-sections within it where gains, or inflow, occurs.

## 6.6 Stream Temperature

Stream temperature, a critical factor in fish viability, provides useful information about seepage into a stream[11]. Groundwater inflow to streams can be identified from a temperature profile. Groundwater has a relatively constant temperature that is cooler than the water in streams—particularly in the summer, during low-flow conditions, when consistent groundwater inflow is critical. Conversely, where groundwater inflow does not occur, stream temperature increases down-gradient.

Thermal infrared (TIR) remote sensing, a reliable method for measuring stream temperature, was used to survey selected streams in the UDB in late July 2001. The survey was conducted for ODEQ, and the TIR results reported in *Aerial Surveys in the Deschutes River Basin — Thermal Infrared and Color Videography* (Watershed Sciences, 2002).

### 6.6.1 Data Source & Method

A complete set of project data and a report was provided by ODEQ. This data was mapped using ArcMap as shown on **Figure 6-26**.

[11] *Stream temperatures below 15°C are required for bull trout habitat.*


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## 6.6.2 Discussion

This discussion describes the general temperature distribution and focuses on Whychus Creek and the part of the Deschutes near the Thornburgh resort.

Stream temperature ranged from 3.5 to 28.0°C during the temperature survey in July 2001. In general, cool stream temperatures—below 14°C—occur mostly at higher elevations along the headwaters of tributaries to the Deschutes, in the uppermost reaches of the Deschutes, and throughout most of the Metolius. The warmest stream temperature, over 26°C, occurs in Whychus Creek and in the Deschutes just downstream from Redmond.

In general, temperatures increase gradually as the stream flows downgradient; abrupt temperature decreases occur periodically. The temperature distribution along the stream reaches shown in **Figure 6-26** is consistent with the seepage data (**Figure 6-25**). Abrupt temperature decreases correspond to locations where stream inflow from groundwater is moderate to significant. From its cool headwaters, the Deschutes increases in temperature as it flows downstream and hovers between 14° and 18°C until a few miles upgradient from Bend. From above Bend, temperature continues to increase to as much as 26°C and exceeds 22°C for most of the reach from Bend to about RM 130. Little change occurs until about RM 134, where temperature starts to decrease slightly but stays above 20°C. This first slight decrease corresponds to the location of the first reach with moderate groundwater inflow. Temperature decreases significantly, to below 16°C, downgradient from RM 130.5, where significant inflow occurs (**Figure 6-25**). Temperature increases again to more than 19°C until about RM 124, and then decreases abruptly, falling to about 15°C at the confluence with Whychus Creek. This decrease corresponds to the reach with the largest groundwater inflow. Stream temperature increases again as the Deschutes flows downstream from Whychus Creek and then stays at about 17°C, until the endpoint of the temperature survey on the Deschutes River, RM 120.

In Whychus Creek, temperature is below 14°C from its headwaters to just upstream from Sisters; temperature continues to increase from Sisters, reaching over 26°C for several miles. Whychus Creek starts to cool significantly at about 2 miles upstream from the confluence with the Deschutes. It is likely that the hydrogeologic conditions that cause strong groundwater inflow to the Deschutes near the confluence with Whychus Creek also cause this significant decrease in temperature.

Temperatures in the Deschutes River, near the Thornburgh resort, and in Whychus Creek upstream of Alder Springs (about two miles above its confluence with the Deschutes) are relatively high, exceeding by more than 10°C the optimal maximum of 15°C for bull and native redband trout. It is apparent from **Figures**

**6-25** and **6-26** that groundwater inflow is critical to maintaining cool stream temperatures.

# 7.0 Groundwater Flow Modeling

The USGS modeling report (Gannett and Lite, 2004) states,

> *"In the Upper Deschutes Basin, the principal source of water to pumped wells once equilibrium has been attained is diminished streamflow."*

We used the USGS model, with a few modifications, to evaluate the magnitude and distribution of impacts resulting from pumping the proposed Thornburgh wells. It predicts affects on streamflow in specific reaches of the Deschutes River and Whychus Creek, and on groundwater levels in the proposed project vicinity. These reaches on the Deschutes River include Bend to RM 149 and Odin Falls to Whychus Creek, and the lower part of Whychus Creek.

This section describes our model simulations and results. Groundwater Vistas™ (version 5) was used to run the MODFLOW simulations conducted to evaluate potential impact of groundwater withdrawal from the proposed Thornburgh wells. Groundwater Vistas, developed by Jim Rumbaugh of Environmental Simulations, Inc., is a graphical user interface for three-dimensional flow- modeling software that allows users to prepare input files, run MODFLOW with a variety of solvers including ModSURFACT™, and process output files. ModSURFACT uses MODFLOW code with a proprietary solver developed by HydroLogic.

## 7.1 Description of the USGS Model

The original USGS groundwater flow model for the UDB is described here briefly. For more details, refer to the modeling report (Gannett and Lite, 2004), which contains detailed descriptions and maps of all the model components.

The USGS model was "constructed" using the modular, three-dimensional, finite-difference, groundwater model MODFLOW, developed by McDonald and Harbaugh (1988). A "constructed" model consists primarily of input files that contain information on the properties of the modeled area. Some properties describe the physical attributes of the area—such as its geometry, boundary conditions, and thickness and hydraulic conductivity of the geologic strata. Other properties describe the "sources" and "sinks" of water to the groundwater flow system—recharge, streams, and pumping wells. Once these files are created, MODFLOW was run to simulate groundwater flow under the conditions described by the input file. Simulation output includes groundwater elevations and streamflows.

### 7.1.1 Grid

The UDB's groundwater flow system is represented by a grid of cells: 87 north-south trending columns and 127 east-west trending rows. The grid cell size is smaller where the most hydrologic data is available and larger where less data is available (the less populated places with fewer wells). Eight layers are used to represent vertical changes in geology and allow simulation of vertical head gradients and groundwater movement. Each layer is of uniform thickness—100 feet for layers 1 through 5; 200, 300, and 800 feet, respectively, for layers 6, 7, and 8. The complex geology is represented by zones of hydraulic conductivity ranging from less than 1 to more than 1,000 feet/day. In the Thornburgh property vicinity, hydraulic conductivity is higher in layers 3 through 7 than in layers 1 and 2.

### 7.1.2 Pumping & Stream Nodes

The pumping well data used in the USGS model (Gannett and Lite, 2004) is discussed in detail in Gannet et al. (2001). The model considers only irrigation and public supply wells. Pumpage for irrigation was reported to be about 20.4 cfs (4,812 MGY) in 1994. Total pumpage for public supply was reported to be about 20.8 cfs (4,906 MGY) in 1996. The total pumping from wells in the input file, *des.wel.all*, is 31.2 cfs (7,369 MGY), using annual averaging for the steady-state model to account for the seasonality of the irrigation pumping.

Grid cells that coincide with the location of significant streams were identified as "stream cells," which occur in the top three model layers (1, 2, and 3). Such a cell is identified in layer 2 at locations where the stream is incised to depths below the bottom of layer 1. Similarly, a stream cell is identified in layer 3 at locations where the stream is incised to depth below the bottom of layer 2. Seepage data (Section 6.5) was used to identify the streamflow in each cell. Streamflow at a given cell is head-dependent; in other words, it changes depending on the groundwater level and the streambed conductance. If groundwater level in a cell decreases, the streamflow component originating from the groundwater would also decrease. Conversely, if groundwater level in a cell increases, streamflow in that cell would also increase. Detailed discussion of the movement of groundwater to and from streams in the model is in Gannett and Lite (2004).

### 7.1.3 Recharge

Recharge to the ground-water system from infiltration of precipitation, canal leakage, and deep percolation of applied irrigation water is simulated as specified flux to the upper-most layer of the model. These recharge values vary from cell to

cell. The methods used to estimate recharge from all sources are described in detail in Gannett and others (2001).

### 7.1.4 Steady State & Transient Simulations

The USGS conducted both steady state and transient simulations. Steady state implies that, except for rates for recharge, discharge, and streamflow, no time variable is incorporated into the input or output files. In other words, wells pump at the same rate the entire time, and the results represent equilibrium conditions. Conversely, transient conditions consider time, so the input data may incorporate wells that are pumping at certain rates for a certain amount of time. Similarly, recharge may occur at one rate during one year, or part of year, and a different rate during a different year, or part of year. The period of the USGS' transient simulation was from 1978 to 1997, using two time periods per year. The results of the transient simulation apply to specific time periods.

### 7.1.5 Calibration

The steady-state model was calibrated to the water-level contour map prepared using measurements made between 1993 and 1997. During calibration, input parameters are adjusted until the model results are consistent with observed measurements. Hydraulic conductivity was the primary parameter adjusted to achieve calibration (Gannett and Lite, 2004).

## 7.2 Data Source for New Runs

The UDB groundwater flow model was obtained from the USGS (Gannett, pers. comm., 2007), along with all data input and output. The six proposed Thornburgh wells were located using a map along with the description included in the draft permit to appropriate waters for application G-16385, issued to Thornburgh Utility Group by OWRD. Each well location is described by a given distance in the east-west and north-south directions from a specified section corner.

The pumping rate for each well was based on the withdrawal amount indicated in the water right application. The draft permit is for an annual withdrawal of 2,355 acre-feet (about 767 MGals) and a maximum instantaneous withdrawal of 9.28 cfs

or 4,165 gpm[12]. For the steady-state model, a constant pumping rate of 3.25 cfs was used, which is equivalent to the annual withdrawal of 2,355 acre-feet if the well is pumped continuously for 1 year. The rate of 3.25 cfs, referred to in this report as Q-average, was divided evenly between the six wells indicated on the draft permit. The rate of 9.26 cfs is referred to as Q-max.

Pumpage was reported to be about 20.4 cfs (4,812 MGY) in 1994 for irrigation and 20.8 cfs (4,906 MGY) in 1996 for public supply use (Gannett et al., 2001). The steady-state model uses annual averaging to account for the seasonality of the irrigation pumping. The total pumpage from wells in the USGS steady-state model is 31.2 cfs (7,369 MGY).

## 7.3 Verification of USGS Steady-State Model

We verified the results of the USGS steady-state model by using the input files from the simulation to run MODFLOW with Groundwater Vistas. We then compared output to confirm that Groundwater Vistas yielded the same results as the USGS MODFLOW software. The groundwater level in each cell/layer combination from the USGS output was subtracted from the corresponding groundwater level we generated; the results indicated essentially no difference between our output and the USGS output.

## 7.4 Steady State versus Transient Conditions

The results of the steady-state and transient simulations are compared in the USGS report (Gannett and Lite, 2004). Most impacts from pumping wells occur on the Deschutes River after about 7 years (transient conditions); about 50 percent of water pumped from the wells comes from storage and about 50 percent comes from the stream. After 10 years, 58 percent is from diminished streamflow, and after 42 years, 90 percent is from diminished streamflow. After about 10 years, the cone of depression will have stabilized even if pumping is greater in the summer and less in the winter. The cone appears stable, with a local-scale contraction and expansion that occurs in response to each pumping cycle. Therefore, steady state is appropriate for evaluating the long-term effects of pumping from the proposed Thornburgh wells on water levels and streamflow.

[12] *The final permit wis issued for 2,129 acre-feet (annual) and 9.97 cfs peak flow.*


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# 7.5 Simulations with Proposed Thornburgh Wells

## 7.5.1 Method

Two simulations were conducted to evaluate the potential impacts of pumping from the six proposed Thornburgh wells. Scenario 1 simulates pumping from shallow wells in layer 2, and Scenario 2 simulates pumping from deep wells in layer 7. The bottom of layer 2 is about 200 feet below land surface. The bottom of layer 7 is more than 700 feet deep. Simulations were conducted using Q-average and Q-max for each scenario. The six proposed wells were added to the well input file, and Q-average or Q-max was divided evenly between them. Even though Q-max is the permitted maximum instantaneous withdrawal rate (presumably for the high-demand water use season), we used it to evaluate the upper limit of instantaneous impact on Deschutes River flow.

The specifics of how water would be pumped, distributed, applied (for domestic and irrigation purposes), and treated (as wastewater) are currently unknown for the proposed Thornburgh project. It is possible that a portion of the proposed project wastewater could be treated and recharged to the groundwater system, potentially offsetting some of the impact to river, and thereby reducing the Q-average and Q-max to values that reflect consumptive water use[13]. However, until a water management plan is developed, we will assume that the Q-average and Q-max are appropriate for our modeling.

The numerical solver, PCG5, was used for the simulations run during our study to evaluate impacts from the proposed Thornburgh wells. To establish baseline conditions, we used PCG5 with the USGS steady-state model. We then compared these baseline results to the results from our simulations incorporating the proposed Thornburgh wells.

Using ArcMap, the stream cells that lie within the reaches of concern on the Deschutes and Whychus Creek were identified. A table with these cells was imported into the database, and the simulation results for these cells were brought into an Access database. For each stream cell, the baseline condition was subtracted from simulation results to calculate diminished streamflow within these reaches. Finally, we used ArcMap to map diminished streamflow for each stream cell.

[13] *Consumptive uses result in a net loss to the hydrologic system. Water that is "lost" to evapotranspiration is considered consumptive use, for example.*

## 7.5.2 Results

### 7.5.2.1 Diminished Streamflow

**Table 7-1** summarizes diminished streamflow for Scenario 1 and 2 within several reaches: Bend to RM 149 on the Deschutes and Odin Falls to Whychus on the Deschutes and lower Whychus Creek. Combined diminished streamflow within these reaches is 2.33 cfs, or 72 percent of total pumping, for Scenario 1 (from shallow layers), and 2.08, or 64 percent or total pumping, for Scenario 2 (from deep layers). Total diminished streamflow for the entire stream system (all the stream cells) is 95.1 percent of total pumping for Scenario 1 and 99.7 percent of total pumping for Scenario 2. The difference in evapotranspiration between baseline conditions and Scenarios 1 and 2 accounts for the 4.9% and 0.3% of total pumping that does not manifest in diminished streamflow.

**Figures 7-1** and **7-2** show diminished streamflow for stream cells. Values less than 0.01 are omitted. Diminished streamflows of 0.01 to 0.02 cfs are shown in pink, and values of 0.02 to 0.1 cfs are shown in dark red. The majority of diminished streamflow occurs within the reach from Odin Falls to Whychus (Squaw) Creek, which has the most cells with values between 0.01 and 0.02 cfs. While diminished streamflow for each cell seems small and insignificant, it adds up to a significant percentage of the total pumping amount.

Under Scenario 1, pumping from layer 2 will have a greater effect on shallow groundwater levels than it will under Scenario 2, where pumping is from Layer 7. Evapotranspiration is modeled as a head-dependent function. Therefore, when the water level in a cell declines below the "extinction depth" of 5 feet, as the USGS model assumes, no evapotranspiration occurs. As water levels decline under Scenario 1, evapotranspiration is less than what occurs under the USGS assumptions, and more water is "available" for the wells. Pumping from layer 7 does not affect shallow groundwater as much, and therefore does not affect evapotranspiration.

### 7.5.2.2 Water Level Change

The change in water level, or the drawdown, due to pumping the proposed Thornburgh wells was calculated for each layer under both scenarios. The new water level elevation in each layer was subtracted from the corresponding baseline water level, yielding results that are consistent with what is expected based on hydraulic conductivity in the vicinity of the Thornburgh wells.

Drawdown contours are shown on **Figures 7-3** through **7-8**. In general, drawdown is similar for the two scenarios, except for layer 2. Contours are, in general, broad,


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and maximum drawdown is less than 1 foot. Drawdown in the pumping layer is significantly larger for Scenario 1 (layer 2, **Figure 7-5**) than for Scenario 2 (layer 7, **Figure 7-8**). Maximum drawdown is 8 feet in the pumping layer in Scenario 1 (**Figure 7-5**) and 0.6 feet in Scenario 2 (**Figure7-8**). Maximum drawdown is 0.5 foot in layer 1. Contours are not shown for each scenario/layer combination because they are similar, but are shown for layer 1 because it is the most shallow, and layers 2 and 7 because they are the layers from which modeled pumping occurs.

Maximum drawdown is larger in layer 2 than layer 7 because hydraulic conductivity is lower in layer 2 in the Thornburgh vicinity. The thicknesses of layers 2 and layer 7 are 100 and 300 feet, respectively. Transmissivity, the ability of an aquifer to transmit water to a well is the product of aquifer thickness and hydraulic conductivity. Therefore, transmissivity is significantly larger for layer 7. While maximum drawdown is only 0.4 feet in layer 2 for Scenario 2, the convoluted nature of the contours illustrates the effect of lateral change in hydraulic conductivity. The large drawdown in layer 2 accounts for the larger impact to streamflow in the selected reaches for Scenario 1 as compared to Scenario 2.

## 7.5.3 Effects of Recent Data on Model Results

### 7.5.3.1 Hydrologic Data

Data presented in Section 6.2 indicates that, locally, groundwater levels have declined since the USGS investigation. Therefore, groundwater discharge to streams will have decreased, resulting in diminished streamflow relative to baseline conditions. Similarly, if climate change results in less precipitation and duration of snow pack, then the groundwater system would receive less recharge—also resulting in diminished streamflow relative to baseline conditions. Although the absolute value of the impact to the stream from the proposed Thornburgh pumping cannot exceed the Q-max (3.25 cfs), the impact as a percentage of streamflow will increase as streamflow diminishes.

### 7.5.3.2 Geologic Data

Hydrothermal alteration associated with Cline Buttes rhyolite dome complex has likely reduced the hydraulic conductivity of the rhyolite and adjacent Deschutes Formation (Section 5.3.2). The reduced hydraulic conductivity likely occurs at depth throughout the entire model-layer sequence. The conductivity of the altered rhyolite and Deschutes Formation is likely to be significantly lower than that assigned in the model.

The USGS model was calibrated by adjusting hydraulic conductivity; as such, the conductivities assigned to the Cline Buttes area may yield the observed water level measurements. However, if the low conductivity Cline Buttes rhyolite complex occurs in the vicinity of the Thornburgh resort, water levels would decline more locally in response to pumping—and the contours might resemble those for layer 2, Scenario 1 (pumping from layer 2, **Figure 7-5**) instead of the broad contours shown in **Figures 7-3**, **7-4**, **7-7**, and **7-8**.

#### 7.5.3.3 Current & Future Water Use

Private water use in the central part of the UDB was 4,093 MGY (17.35 cfs) in 2003 and 2,658 MGY (11.27 cfs) in 2006. Water use for public supply has increased by more than 300 percent since 1997 (**Table 6-2,** Section 6.4). Water right permits since 1998 have granted 44 cfs (Section 8). Considering these trends, current withdrawals are significantly higher than the USGS model assumed. Therefore, the impact to streamflow from pumping the Thornburgh wells at 3.25 cfs becomes a significantly larger percentage of streamflow if the streamflow rate decreases.

In addition, groundwater levels will likely decline as pumping from public and private wells increases. Water rights applications since 1998 (117 cfs; 27,700 MGY) suggest that future use will be even greater. Pumping of this magnitude can lower groundwater levels significantly, affecting streamflow and stream temperature.

The cumulative effect of pumping from both the Thornburgh and other pumping wells will exceed the water level decline predicted by the model (Gannett and Lite, 2004).

# 8.0 Water Rights Activity

This section presents an analysis of water rights activity in the study area. Water rights provide important information about changes in current and future water demands and usage. For this analysis, we examined trends in both recently granted permits and recent applications.

## 8.1 Data Sources

Data was compiled from the OWRD website, which contains a database of all water rights applications and permits[14]. We downloaded all applications and permits in the UDB with a priority of later than 1/1/1998. Information included point of diversions (POD), point of use, and stakeholder data. Point of diversion and stakeholder data was downloaded to two separate tables. Township, range, and section information is included for each water right and application. Data in shape file format was also downloaded[15], along with POD and point-of-use data mapped by OWRD[16].

Each record in the POD table corresponds to a unique water right, point of diversion, and water use combination. Therefore, a single water right can have many records if it covers several wells (points of diversion) and if each well has more than one use. For example, the water right application for the proposed Thornburgh development has six records in the water rights database—one for each proposed well. Each well has only one use, quasi-municipal. If there were two types of use for each well (irrigation and municipal), there would be 12 records in the database for that water right application. The terms of the water right permit or application are given by the Q-average and the Q-max. If a well pumped the Q-max rate 24 hours per day, everyday for the entire year, the volume withdrawn would be significantly larger than the Q-average. Once the Q-average has been met, no further withdrawals are permitted. Note that the Q-average is not shown in the database. For this reason, water rights analysis was conducted on the Q-max information.

For the Thornburgh development, the Q-max for the entire right is 9.28 cfs. The database shows this divided between six wells at 1.546 cfs each[17].

[14] *http://apps2.wrd.state.or.us/apps/wr/wrinfo/Default.aspx*

[15] *http://www1.wrd.state.or.us/files/water_right_data*

[16] *http://www.oregon.gov/OWRD/MAPS/index.shtml#Water_Right_Data_GIS_Themes*

[17] *The final order for Thornburgh now has a 9.97 cfs max.*

## 8.2 Method

The OWRD water rights data were brought into an Access database. Using ArcMap, the township, range, and section information was summarized for the area included within the USGS model area, which is a portion of the larger Deschutes basin. Water rights permits and applications within the model area were extracted. We summarized this data separately and further categorized it by surface water or groundwater. We then calculated the total water use attributed to each right.

**Appendix E** contains a complete list of water right identification numbers, priority dates, Q-max rates, and the stakeholder information; **Table E-1** lists applications and **Table E-2** lists permits. The number of water rights per year and the annual sum of the individual Q-max rates are summarized for groundwater permits and applications, and for surface water permits and applications in **Tables 8-1**, **8-2**, **8-3**, and **8-4**, respectively.

## 8.3 Results & Discussion

The moratorium on granting water rights from 1998 to 2002 (Section 3.2) is somewhat apparent in the number of water right permits and water use rate granted each year (**Table 8-1**) and in the relatively small number of water right applications (Table 8-2) during this time. The passage of HB3494 in 2005 (Section 3.2) is very apparent in the large number of water right applications and water use requests (**Table 8-2**) from 2005 to 2007.

Based on water rights granted since 1998 (**Table 8-1**), Q-max withdrawals have increased by as much as 44.14 cfs (10,414 MGY) since the USGS period of record (1993–1997). The USGS steady-state model assumes that about 31 cfs is pumped from wells. If new water rights indicate additional pumping since then, a more realistic value for current conditions is about 75 cfs—more than twice the rate considered by the model.

**Table 8-2** indicates that the sum of the Q-max withdrawals was about 5.1 cfs (1,203 MGY) for all water rights applications for the 5-year period from 2000 to 2004. In contrast, the corresponding sum was 117.3 cfs (27,200 MGY) for the 3-year period from 2005 through November 2007. This difference indicates that groundwater pumping will increase dramatically if all these water right permits are granted for each application.


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New permits and applications for surface water rights permits are few and for small quantities. One permit (for the U.S. Bureau of Reclamation) is for 2.64 cfs. It seems to be associated with 36 other surface water permits that have priority dates of 1914 and 1917.

# 9.0 Deepened Wells

In general, water wells are deepened when they no longer provide adequate supplies. If the demand has not changed since the well was installed, a decline in production capacity will result in inadequate supplies. Although such declines may be due to lower well efficiencies, they are most commonly caused by declining water levels. It is reasonable to assume that wells are deepened when the pumping water level reaches the pump intake and yields decrease. As water levels decline, the well intercepts less of the aquifer, and therefore produces less water. As part of this investigation, we examined wells that were deepened over a specific period, within a specific area, around the Thornburgh site, to learn more about possible groundwater level declines.

## 9.1 Data Source & Method

OWRD maintains an online database of water well logs filed by drillers[18]. The database identifies wells that have been deepened. We downloaded this database for our analysis.

The database includes information about the type of construction conducted for each well and identifies wells that have been deepened. This database was queried based on township, range, and section. The 198-square-mile search area is shown on the **Figure 9-1**.

## 9.2 Discussion

Since 1980, 210 (of about 3,400) wells have been deepened in the study area[19]. **Table 9-1** summarizes the number of deepened well logs for each 5-year interval since 1980. Well deepening has accelerated since 1980, and 82 wells have been deepened since 2000. This trend is likely to continue in pace with increased groundwater pumping in the area. The increasing rate of well deepening indicates that groundwater levels are declining, likely because of increased pumping by major groundwater users, such as Eagle Crest Resort and the City of Redmond, and, to some degree, by reduced annual precipitation.

[18] *http:// www.wrd.state.or.us*

[19] *The actual number of wells in the study area is somewhat lower because multiple logs have been filed for some.*


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The Cline Buttes and Thornburgh resorts are located near the center of Township 15 South, Range 12 East. Fifteen wells have been deepened within this area (**Appendix B**). Of these, 13 wells were deepened between 2001 and 2007. These wells are located near the Eagle Crest Resort (**Figure 5-2**). Well logs for four of the deepened wells, 56980, 56063, 56877 and 55438, could be matched up with the original well logs to determine the amount of decline in static water level over time. The declines in water levels for these wells are, respectively, 42 feet between 1995 and 2005, 10 feet between 1982 and 2004, 21 feet between 1976 and 2005, and 3 feet 1985 and 2003. It is likely that the pumping of the Eagle Crest Resort wells has caused a decline in the water table.


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# 10.0 Fish Habitat in the UDB

## 10.1 Data Sources

We examined critical fish habitat using data available online from the U.S Fish and Wildlife Service (USFW) in shape file format[20]. The data included locations (streams and lakes) of critical bull trout habitat. We also downloaded data identifying the endpoint of the extent of critical bull trout habitat[21].

## 10.2 Discussion

### 10.2.1 Bull Trout Critical Habitat

Bull trout is listed as a threatened species under the *Endangered Species Act* (ESA). In October 2004, USFW designated critical habitat for bull trout in the Deschutes River basin (USFW, 2005). Bull trout have more specific habitat requirements than other salmonids; very cold water is the first criteria listed. Bull trout can occupy streams with temperatures ranging from 0° to 22°C, but they are found most frequently in temperatures ranging from 2° to 15°C. There are three listed areas of critical bull trout habitat on the Deschutes River between Big Falls (RM 132) and the mouth of Whychus Creek (RM 123; **Figure 10-1**). Based on our modeling, this reach would be impacted by a reduction in cold groundwater discharges to the Deschutes River due to the pumping of the Thornburgh resort wells. The springs discharging into the river in this reach provide the sole source of cold water for the listed habitat. Any reduction in the flow from these springs will lead to temperature increases in the river. The TIR (**Figure 6-26**) shows that the river temperature in the area of the critical habitat is 12° to 14°C, while just upstream the temperature is 24° to 26°C. A botanical and springs survey of the middle Deschutes River conducted in 2005 for the BLM recorded an average spring water temperature in the critical habitat area of about 10.6°C (WPN, 2006).

[20] *http://criticalhabitat.fws.gov*

[21] *http://www.fws.gov/pacific/bulltrout; the publication date for this data is September 26, 2005.*

### 10.2.2 Native Redband Trout

ODFW's *Upper Deschutes River Basin Fish Management Plan* identifies a core redband trout population located mostly within two reaches that would be impacted by the pumping of the Thornburgh destination resort wells (Fies et al., 1996; **Figure 10-1**). These reaches are the Odin Falls to Whychus Creek reach on the Deschutes River and the Alder Springs to Deschutes River reach on Whychus Creek. The native redband trout is an Oregon-listed sensitive species. The cold water springs that discharge to the Deschutes River and the lower end of Whychus Creek are essential to maintaining the excellent habitat for the native redband trout in this core population area.

Our modeling shows that pumping the Thornburgh wells will reduce cold groundwater discharges to the Deschutes River from Bend to just south of Cline Buttes. In this reach, native redband trout production is very limited because of low summer flows and high water temperatures (Fies et al., 1996). Even small reductions of cold groundwater inflows will likely have a negative impact on this stressed redband population.

### 10.2.3 Steelhead & Salmon Reintroduction

A major effort is underway to reintroduce summer steelhead and Chinook salmon to the UDB. This effort focuses on establishing self-sustaining populations in Whychus Creek, where Chinook historically spawned (Fies et al., 1996). The cold water springs that discharge to this creek from Alder Springs down to the mouth of the creek are very important to the success of the reintroduction program (Wise, 2008). Modeling indicates that this reach will see reduced cold groundwater discharges as a result of pumping the Thornburgh wells. The TIR data, plotted on **Figure 6-26**, shows that Whychus Creek water temperature from Alder Springs to its mouth is 12° to 14°C, while just upstream of Alder Springs the temperature is 24° to 26°C.

# 11.0 Mitigation

## 11.1 Current Alternatives

This section briefly describes the mitigation program currently used by OWRD to minimize diminishing streamflows in the UDB and to enhance streamflow on the middle Deschutes River. The program is authorized under *Oregon Revised Statute 537.746* and implemented through *Oregon Administrative Rules Chapter 690, Divisions 505 and 521.*

The mitigation program began in 2002. Mitigation, which is required for all new groundwater permits in the UDB, may be accomplished via a mitigation project or mitigation credits, also referred to as "mitigation water." Mitigation water can be acquired by various methods:

- Instream leases
- Time-limited instream transfers
- Permanent instream transfers
- Allocation of conserved water
- Aquifer recharge
- Releases of stored water

For example, an instream transfer occurs when a water diversion at a specific point on the river is terminated to allow a diversion or impact to the stream at a different location. For each new groundwater permit, OWRD determines the zone of impact. Mitigation credits associated with that zone may then be used for mitigation. The zones of impact are shown on **Figure 11-1**.

The ODFW, Oregon State Parks and Recreation Department (OSPRD), ODEQ, and BLM all have an obligation to evaluate the appropriateness and effectiveness of mitigation for new groundwater permits. These agencies are charged with protecting resources that will be impacted by future groundwater withdrawals that are not properly mitigated. This section addresses elements of the mitigation programs for which we have identified concerns.

# 11.2 Concerns

## 11.2.1 Zone of Impact

The OWRD determined for Thornburgh that the zone of impact is the general river zone **(Figure 11-1)**—that is, the entire Deschutes River basin above the Madras gauge. This means that it could be acceptable to use mitigation water from a stream diversion or impact that currently occurs downstream of the stream reaches shown to be impacted from proposed Thornburgh pumping. Under this condition, the impact would not be mitigated; instead, more water would simply flow downgradient of the point of impact from the mitigation water. Temperature at the reaches impacted by Thornburgh pumping would increase due to pumping. This impact would not be mitigated under the conditions described above.

Our simulation of pumping from the Thornburgh wells indicates that decreased groundwater discharges, and therefore decreased streamflow, to the middle Deschutes River and lower Whychus Creek. These impacts must be mitigated using credits or projects that target the middle Deschutes River Zone and the Whychus Creek zone—specifically, the reaches indicated by our modeling efforts.

## 11.2.2 Canal Lining or Piping / "Conserved" Water

Lining existing canals or conveying water via pipes instead of canals would eliminate losses due to leakage. The mitigation rule allows this so-called "conserved" water to be used to mitigate new groundwater pumping. However, water leaked from canals eventually discharges to streams downgradient and comprises an important part of the local hydrogeologic system. This mitigation scheme would increase streamflow at the canal diversion; however, downstream groundwater discharge into the stream is diminished. In addition, groundwater discharge to streams would be further diminished by the newly permitted groundwater pumping.

Groundwater mitigation based on this so-called "conserved" water would have a long-term, cumulative impact on water quality—specifically temperature—because it reduces cold groundwater discharge into streams.


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## 11.3 OWRD Evaluation

OWRD evaluated the first 5 years of the mitigation program (OWRD, 2008). In general, the report concludes that the mitigation program is successful based primarily on two factors: increased streamflow (which is documented in the Deschutes River at Bend), and the availability of plenty of mitigation water "in the bank."

The OWRD report shows a graph of streamflow at Bend from 4/1/2007 through 9/30/2007 and compares it to monthly average for the period of record at this stream gauge. The graph shows that streamflow was about 100 cfs during low-flow conditions in 2007 and that monthly mean streamflow for the period of record during these months was less, ranging from about 50 to 60 cfs. The graph illustrates that, compared to earlier conditions, the mitigation program has increased streamflow at Bend. However, it is important to note that this graph only monitors the effectiveness of mitigation credits that affect reaches upstream from Bend. The OWRD report indicates that no other gauges are available for evaluating the effectiveness of mitigation in other parts of the basin. Furthermore, there is no data addressing the effect of mitigation on stream temperature—a very important parameter for maintaining a healthy stream.

The Deschutes Water Alliance comprises representatives from major stakeholders in the UDB, including cities, irrigation districts, the Deschutes River Conservancy, and the Confederated Tribes of Warm Springs. The working mission for this group with diverse needs includes the objective of moving streamflow

> *"toward a more natural hydrograph while securing and maintaining improved instream flows and water quality to support fish and wildlife."*

A more natural hydrograph is one that represents conditions before so much water was diverted from streams in the UDB. The Deschutes River has a Wild and Scenic designation; as such, returning to a more natural condition is appropriate. This mission statement reminds us that the success of the mitigation program should be measured by how well streamflow is returning to the natural condition to enhance its wild nature—not just by documenting that flows exceed the lowest, or most impacted, condition ever recorded. The OWRD evaluation fails to consider this mission.

If the Thornburgh Resort is developed and mitigation occurs in the general zone, pumping from the six new wells would likely still impact the river in the vicinity indicated by the model (Section 7)—even if mitigation is allowed anywhere above Madras gauge. Yet, based on the OWRD's method of evaluation, the mitigation program would still be considered successful as long as flows at Bend are


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higher than historic flows. As such, the method used to evaluate the success of the mitigation program needs to be improved.


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# 12.0 Analysis of Projected Impacts

In Section 6 we analyzed data collected over the last 10 years to identify trends that will affect future water and ecological resources in the UDB. In section 7 we conducted modeling to evaluate the effect of pumping Thornburgh wells on the hydrogeologic system. In Sections 8, 9, and 10 we analyzed water rights activity since 1998, deepened wells in the Thornburgh vicinity, and fish habitat, respectively. This section summarizes the results of these analyses with respect to impact to water resources and the current mitigation program (Section 11) and offers a roadmap for evaluating the impacts of future development.

## 12.1 Impacts Related to Thornburgh Case

### 12.1.1 Modeling Results

Our model simulations show that pumping from the new Thornburgh wells will reduce streamflows primarily in two segments of the middle Deschutes River and lower Whychus Creek (**Table 7-1**, **Figures 7-1** and **7-2**). The two reaches on the Deschutes River are from Bend to just south of Cline Buttes (RM 149) and from Odin Falls to the mouth of Whychus Creek. On Whychus Creek, streamflows are reduced from approximately Alder Springs downstream to the Deschutes River.

These streamflow reductions are related to groundwater level declines. Because a significant portion of streamflow originates from groundwater seepage—especially during the low-flow season—these declines mean less groundwater is available to feed the stream. Reaches of the Deschutes River near the proposed Thornburgh development are especially vulnerable to water level declines because baseflows are relatively low. Water level decline could also affect Whychus Creek, which has base flows of about 7 to 15 cfs, and Tumalo Creek, which has baseflows of 10–20 cfs.

All of these reaches are important to fish resources near the proposed development.

### 12.1.2 Related Impacts

The predicted groundwater level declines—and the resulting reductions in streamflow—also have profound impacts on stream temperatures, which in turn can impair fish habitat. The mildly gaining reaches are especially vulnerable to water


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level declines, which can lead to higher water temperatures because less cool groundwater is available to enter the stream.

Groundwater level declines also impact existing wells and water rights. As water levels decline, a well's production may also decline. Many owners in the UDB have already resorted to deepening their wells to obtain the supplies they need.

## 12.2 Climate Change

If future precipitation is less than historic precipitation, this will eventually manifest in reduced streamflow. If impact to streamflow from groundwater pumping is expressed as a percent of streamflow, then relative impact from pumping would be greater under conditions of reduced precipitation and reduced streamflow.

## 12.3 Habitat Resources

Pumping from the six proposed Thornburgh wells will cause water level declines and associated reductions in cold spring discharges. It is reasonable to assume that if mitigation for the Thornburgh wells does not occur at the specific reaches affected by pumping, cold water discharge into the stream will be less at those reaches, causing water temperatures to increase on both the Deschutes River and Whychus Creek. Increased stream temperature negatively impacts not only critical habitat for bull trout, a federally listed species, but also a core redband trout population. In addition, this warming trend will impede the success of the reintroduction of Chinook salmon and summer steelhead.

## 12.4 Considerations for Future Developments

In a region that is growing as rapidly as the UDB, it is imperative to consider impacts in the context of trends in water usage. Although the impacts on streamflow due to pumping the Thornburgh wells alone will never exceed 3.25 cfs (the Q-average), the effect of declining groundwater levels is cumulative. If streamflows decrease, impacts to the Deschutes River from the proposed Thornburgh development would become more significant because they would represent a larger percentage of streamflow.

Furthermore, groundwater development will undoubtedly continue in the UDB, and water level declines will be additive. It is reasonable to assume that pumping the six wells at the Thornburgh destination resort will contribute to the rate of groundwater level decline, perhaps requiring other wells in the area to be deepened. Similarly, while reduction in stream temperature from reduced cool groundwater inflow due to Thornburgh pumping may be relatively small, the cumulative effect from other groundwater developments in the vicinity will be significant.

Section 13, "Recommendations," lists specific actions that planners can take to ensure the long-term health of ecosystems along the Deschutes River.


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# 13.0 Recommendations

Agencies and planners should…

- …consider the cumulative impact of individual proposed groundwater developments rather than considering each one individually.
- …require the use of the best available scientific method to evaluate the impacts of groundwater development on water resources.
- … acknowledge the effects of lining and piping canals on groundwater levels and related groundwater discharges to streams. The "conserved" water may enhance flows at the diversion, but any benefits are subtracted downstream because groundwater discharges to streams are diminished.
- …acknowledge that when pumping is not mitigated at the place of impact, cold groundwater discharges to streams are reduced, resulting in higher water temperatures. A greater emphasis on evaluating and monitoring water quality is needed.
- …target mitigation for Thornburgh pumping to the middle Deschutes River and Whychus Creek zones, which will be impacted the most.
- …monitor stream temperature and use the data to measure the effectiveness of mitigation.
- …address the Endangered Species Act and other laws protecting fish and fish habitat when considering groundwater withdrawals.
- …use the natural hydrograph for Deschutes River as a means by which to evaluate the success of water resource management in the UDB, rather than a comparison to the historic low flow.

The critical habitat listing prohibits federal actions that would adversely modify critical habitat ODFW, ODEQ, OSPRD, and the BLM should develop programs specifically to monitor and evaluate the effectiveness of mitigation for new groundwater development.


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# 14.0 References

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**Table 6-1. Precipitation Summary Statistics, Water Years 1991 Through 2007**
**Upper Deschutes Basin, Oregon**

| Water Year | Annual Precipitation in Inches | | | | | |
|---|---|---|---|---|---|---|
| | Bend | Brothers | Madras | Prineville | Redmond | Wickiup Dam |
| 1991 | | 7.35 | 7.79 | 8.32 | 5.49 | 18.36 |
| 1992 | | 9.37 | 9.26 | 10.32 | 6.47 | 17.5 |
| 1993 | 10.37 | 14.23 | 17.82 | 13.82 | 12.91 | 28.12 |
| 1994 | 4.98 | 6.6 | 6.55 | 5.36 | 5.73 | 10.14 |
| 1995 | 10.63 | 9.52 | 16.64 | 13.06 | 9.66 | 23.3 |
| 1996 | 11.46 | 10.78 | 15.27 | 12.4 | 2.28 | 29.28 |
| 1997 | 16.42 | 12.03 | 19.32 | 13.54 | 4.73 | 24.41 |
| 1998 | 13.06 | 9.23 | 15.66 | 11.86 | 11.34 | 26.32 |
| 1999 | 15.7 | 2.89 | 10.37 | 9.2 | 8.89 | 22.94 |
| 2000 | 8.01 | 2.87 | 10.41 | 8.15 | 6.84 | 14.83 |
| 2001 | 6.81 | 4.08 | 7.38 | 3.82 | 1.03 | 13.19 |
| 2002 | 8.04 | 1.24 | 6.43 | 3.47 | 5.93 | 17.07 |
| 2003 | 7.92 | 2.09 | 8.95 | 2.85 | 7.96 | 14.6 |
| 2004 | 9.69 | 1.06 | 14.13 | 8.93 | 9.88 | 19.16 |
| 2005 | 9.83 | 8.31 | 9.78 | 5.46 | 10.46 | 14.58 |
| 2006 | 16.85 | 7.54 | 13.21 | 4.22 | 11.33 | 26.05 |
| 2007 | 9.66 | 5.11 | 7.82 | 5.79 | 5.56 | 16.15 |
| | | | | | | |
| avg 1993-1995* | 8.66 | 10.12 | 13.67 | 10.75 | 9.43 | 20.52 |
| avg 2001-2007 | 9.83 | 4.20 | 9.67 | 4.93 | 7.45 | 17.26 |
| difference | 1.17 | 5.91 | 4.00 | 5.81 | 1.98 | 3.26 |
| **difference as % of USGS period** | **-13%** | **58%** | **29%** | **54%** | **21%** | **16%** |

* period of study of the USGS groundwater model simulation

## Table 6-2. Summary of Monthly and Annual Water Use, In Million Gallons, For Selected Public Supply Wells 1997-2006, Upper Deschutes Basin, Oregon

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | 48.70 | 45.37 | 48.34 | 74.98 | 150.47 | 173.31 | 277.38 | 156.22 | 134.55 | 88.45 | 52.27 | 48.31 | **1298** |
| 1998 | 110.45 | 89.89 | 130.99 | 177.04 | 193.39 | 293.80 | 477.47 | 482.26 | 351.49 | 172.48 | 171.10 | 108.39 | **2759** |
| 1999 | 185.47 | 138.73 | 123.66 | 201.34 | 330.61 | 450.20 | 564.51 | 432.68 | 376.28 | 191.76 | 181.71 | 209.00 | **3386** |
| 2000 | 171.42 | 171.36 | 201.36 | 280.75 | 367.84 | 462.59 | 488.16 | 505.27 | 381.49 | 238.14 | 172.95 | 168.56 | **3610** |
| 2001 | 145.44 | 136.48 | 116.56 | 177.16 | 457.69 | 533.45 | 582.32 | 708.38 | 500.54 | 285.21 | 177.16 | 155.44 | **3976** |
| 2002 | 89.81 | 77.05 | 97.86 | 285.85 | 443.74 | 606.04 | 676.10 | 637.15 | 467.53 | 227.99 | 111.88 | 97.97 | **3819** |
| 2003 | 151.90 | 142.21 | 148.65 | 203.16 | 411.10 | 664.23 | 840.01 | 722.86 | 512.59 | 205.27 | 196.41 | 159.95 | **4358** |
| 2004 | 129.25 | 126.13 | 118.63 | 127.53 | 138.60 | 141.37 | 156.00 | 157.35 | 174.28 | 138.38 | 117.83 | 116.18 | **1642** |
| 2005 | 109.64 | 75.42 | 136.56 | 110.12 | 297.08 | 429.21 | 683.17 | 776.10 | 503.73 | 216.46 | 81.19 | 114.46 | **3533** |
| 2006 | 76.08 | 66.56 | 78.21 | 113.76 | 299.47 | 295.07 | 478.75 | 506.94 | 321.16 | 147.30 | 80.72 | 81.91 | **2546** |

Note: Years 2004 and 2006 have small totals due to so much missing data
If 2003 data were used in place of the missing 2004 data, 2004 Total would be 4796
If 2005 data were used in place of the missing 2006 data, 2006 Total would be 3891

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## Table 6-3. Summary of Monthly and Annual Water Use, In Million Gallons, For Selected Private Supply Wells 1997-2006, Upper Deschutes Basin, Oregon

| Year | Jan | Feb | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1997** | 31.00 | 17.96 | 15.69 | 14.62 | 16.95 | 19.92 | 30.50 | | 49.80 | 62.64 | 47.51 | **369** |
| **1998** | 151.71 | 63.63 | 52.43 | 69.91 | 60.87 | 61.81 | 92.06 | | 212.14 | 275.85 | 208.69 | **1429** |
| **1999** | 165.93 | 63.49 | 49.62 | 51.94 | 56.60 | 73.26 | 117.91 | 183.71 | 203.01 | 253.09 | 212.55 | **1494** |
| **2000** | 220.84 | 63.65 | 63.25 | 64.26 | 80.84 | 104.00 | 147.87 | 230.17 | 337.11 | 336.95 | 283.47 | **2009** |
| **2001** | 200.86 | 35.78 | 54.95 | 47.51 | 59.50 | 65.27 | 118.88 | 264.46 | 233.66 | 237.35 | 238.19 | **1614** |
| **2002** | 62.76 | 30.47 | 23.93 | 23.75 | 31.00 | 45.59 | 81.74 | 4.35 | 107.52 | 126.87 | 108.74 | **775** |
| **2003** | 382.37 | 175.92 | 162.47 | 154.02 | 149.85 | 172.32 | 282.18 | 305.86 | 550.48 | 686.47 | 604.77 | **4093** |
| **2004** | 128.03 | 93.47 | 89.36 | 215.88 | 202.49 | 332.06 | 367.74 | | 351.22 | 240.12 | 201.60 | **2644** |
| **2005** | 71.67 | 25.10 | 20.28 | 20.78 | 36.04 | 54.00 | 62.18 | 51.96 | 142.51 | 156.11 | 121.62 | **814** |
| **2006** | 374.04 | 84.54 | 63.37 | 97.24 | 77.92 | 102.69 | 181.66 | 338.60 | 376.75 | 425.63 | 468.10 | **2658** |



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## Table 6-4. Summary of Annual Water Use, in Million Gallons, For Select Public Supply Wells, Upper Deschutes Basin, Oregon

| Public Water Supply Well Name | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|
| City Bend Rock Bluff No. 2 | | 111.5 | 111.11 | 80.62 | 186.75 | 119.23 | 2.73 | | 15.13 | |
| City of Bend Airport Well | | | | | | 3.86 | 5.91 | | 13.36 | |
| City of Bend Bear Ck Well 1 | | | | 277.38 | 216.81 | 260.55 | 120.15 | | 247.78 | |
| City of Bend Outback Well 1 | | 72.18 | 52.97 | 33.04 | 76.115 | 169.71 | 140.31 | | 74.21 | |
| City of Bend Outback Well 2 | | 83.25 | 64.5 | 37.46 | 102.16 | 55.74 | 39.22 | | 115.67 | |
| City of Bend Outback Well 3 | | | | | | 146.96 | 248.35 | | 232.51 | |
| City of Bend Pilot Butte 1 Well | | 148.8 | 174.63 | 196.51 | 134.73 | 0 | 0 | | 105.36 | |
| City of Bend Pilot Butte 2 Well | | 124.26 | 131.93 | 156.02 | 186.25 | 208.91 | 168.26 | | 142.56 | |
| City of Bend Pilot Butte 3 Well | | | | | 211.49 | 236.31 | 187.46 | | 153.76 | |
| City of Bend River ! | | 50.64 | 60.74 | | 189.71 | 328.14 | 327.2 | | 152.73 | 274.52 |
| City of Bend River 2 | | 156.84 | 157.84 | | 69.035 | 149.76 | 156.75 | | 63.27 | 154.36 |
| City of Bend Rock Bluff No. 3 | | 66.41 | 80.15 | 222.73 | 37.614 | 219.95 | | | 53.23 | |
| City of Bend Rock Bluff No.1 | | 136.6 | 134.8 | 5.1 | 0 | 111.14 | 42.84 | | 148.67 | |
| City of Bend Westwood Well | | 32.72 | 56.85 | 62.25 | 86.106 | 108.55 | 123.84 | | 42.43 | |
| City of Redmond Well 1 | 164.08 | 149.41 | 168.08 | 101.41 | 129.10 | 111.93 | 133.04 | | 121.78 | 102.763 |
| City of Redmond Golf Course Well | | | | | 1.1834 | | | 1.5123 | 0 | 72.2752 |
| City of Redmond Sewage Effluent Res.. | | 435.22 | 441.84 | 509.02 | 302.1 | | 299.45 | 658.69 | | |
| City of Redmond Sewage WW Treatment | | 0 | 441.84 | 509.02 | 523.8 | | 637.4 | 658.69 | | |
| City of Redmond Well 2 | 198.67 | 186.79 | 132.52 | 80.141 | 161.22 | 116.85 | 162.38 | | 183.96 | 194.795 |
| City of Redmond Well 3 Ind Complex | 474.44 | 504.04 | 479.43 | 241.61 | 560.24 | 257.32 | 405.13 | | 396.69 | 500.454 |
| City of Redmond Well 4 FK Horned Butte | 266.97 | 350.31 | 281.94 | 223.04 | 284.05 | 276.75 | 194.16 | | 537.46 | 483.093 |
| City of Redmond Well 5 | | 0 | 224.41 | 667 | 289.47 | 683.37 | 696.99 | | 430.19 | 463.56 |





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## Table 6-4. Summary of Annual Water Use, in Million Gallons, For Select Public Supply Wells, Upper Deschutes Basin, Oregon

| Public Water Supply Well Name | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|
| City of Sisters City Well Nol 1 | 10.322 | 5.986 | 52.423 | 40.118 | 74.595 | 148.43 | 131.01 | 144.65 | 140.05 | 114.212 |
| City of Sisters H.S. Well No 2 | 164.73 | 101.69 | 93.758 | 123.21 | 100.61 | 50.74 | 87.331 | 126.80 | 91.045 | 117.630 |
| Terrebonne Water Dist. Well 1 | 0 | 22.577 | 24.657 | 21.076 | 23.822 | 32.072 | 9.7633 | 16.972 | 33.526 | 26.5970 |
| Terrebonne Water Dist. Well 3 | | | | | 4.1511 | 14.207 | 38.692 | 34.211 | 37.752 | 41.6671 |
| Terrebonne Water Dist.Well 2 | 19.14 | 19.543 | 19.543 | 23.141 | 24.718 | 8.4843 | 0 | 0 | 0 | 0 |

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01527

## Table 6-5. Summary of Annual Water Use, in Million Gallons, For Select Private Supply Wells, Upper Deschutes Basin, Oregon

| Private Water Supply Well | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|
| Agate--Agate Water Company | | | | 9.99 | 2.92 | 30.00 | 420.19 | | | |
| Avion--Avion Water Company | | | | | | | 1382.14 | 1598.17 | | 1916.98 |
| Chapparral--Avion Water Company | 30.27 | 28.10 | 34.67 | 35.46 | 32.90 | 35.10 | 33.21 | 32.73 | | 30.14 |
| Chocktaw--Agate Water Company | | | | 29.74 | 2.90 | 4.12 | 133.04 | | | |
| Cinder Butte--Avion Water Company | 5.52 | 7.08 | 7.08 | 7.31 | 7.31 | 7.76 | 7.81 | 7.75 | | 9.32 |
| Conestoga-Avion Water Company | | 1068.87 | 1088.28 | 1321.57 | 1280.01 | | 1443.20 | | | |
| Crane Water Wonderland | 46.62 | 39.85 | 47.16 | 64.69 | 66.14 | 71.78 | 71.78 | 87.30 | | 45.98 |
| drw Tuscarora - Avion Water Company | 4.23 | 4.58 | 4.71 | 6.99 | 5.08 | 6.04 | 6.13 | 6.05 | | 4.90 |
| Indian Summer--Agate Water Company | | | | 5.45 | 5.98 | 5.34 | 43.13 | | | |
| Merganser Water Wonderland | 1.35 | | 5.49 | 0.00 | | | 3.18 | 0.00 | | 30.60 |
| Null La Casa Mia Association | 1.28 | 1.21 | 1.25 | 1.38 | 1.35 | 1.41 | 1.67 | | 1.67 | 0.94 |
| Null--Avion Water Company | | | | | 3.27 | | | | | |
| Odin Falls - Avion Water Company | 1.93 | 2.50 | 3.02 | 7.31 | 4.32 | 4.94 | 6.04 | 6.53 | | 10.63 |
| Red Cloud- Avion Water Company | 13.38 | 15.30 | 20.71 | 21.10 | 21.91 | 24.89 | 26.45 | 26.23 | | 0.00 |
| River Bluffs--Agate Water Company | | | | 5.27 | 0.00 | 0.00 | 0.00 | | | |
| School Well Laidlaw Water District | | 1.39 | 1.55 | 0.76 | | 6.87 | | | | |
| SeeversWater Wonderland | 13.95 | 14.26 | 14.65 | 14.51 | 17.92 | 23.14 | 21.45 | 24.28 | | 21.46 |
| Shoshone--Agate Water Company | | | | 7.00 | 0.33 | 0.37 | 4.22 | | | |
| Tetherow Crossing- Avion Water Company | 9.03 | 10.30 | 12.42 | 12.96 | 12.95 | 14.14 | 14.73 | 14.08 | | 13.18 |
| Well 1 Home Roats Water System Inc. | 39.75 | 47.61 | 47.08 | 40.33 | | 48.93 | 29.23 | 24.13 | 31.54 | 0.00 |
| Well 10 Pinebrook Roats Water System | 0.08 | 0.00 | | | | | | | | 0.00 |
| Well 2 Cline Butte Utility Co | | | | | | | | 106.46 | 85.77 | 83.36 |



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## Table 6-5. Summary of Annual Water Use, in Million Gallons, For Select Private Supply Wells, Upper Deschutes Basin, Oregon

| Private Water Supply Well | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|
| Well 2 Home Roats Water System | 15.31 | 16.63 | 17.01 | 19.59 | | 14.67 | 2.52 | 2.88 | 2.62 | 0.00 |
| Well 3 Cline Butte Utility Co | | | | | | | | 61.45 | 63.79 | 82.54 |
| Well 3 Pinebrook Roats Water System | 10.69 | 11.81 | 11.94 | 14.01 | | 17.14 | 14.92 | 15.65 | 14.08 | 0.00 |
| Well 4 Pinebrook Roats Water System | 77.08 | 67.66 | 70.49 | 94.02 | | 100.63 | 115.82 | 114.84 | 112.75 | 0.00 |
| Well 5 Woodside Roats Water System | 45.73 | 35.97 | 40.41 | 35.34 | | 49.30 | 42.48 | 42.25 | 36.97 | 0.00 |
| Well 6 Cline Butte Utility Co | | | | 100.23 | 115.84 | 109.76 | 103.84 | 113.17 | 105.21 | 113.31 |
| Well 6 Woodside Roats Water System | | | | | | | | 0.00 | 0.00 | 0.00 |
| Well 7 Cline Butte Utility Co | | | | 0.00 | 0.00 | 68.02 | | 21.17 | 19.70 | 19.94 |
| Well 7 Woodside Roats Water System | 19.26 | 22.03 | 19.21 | 17.09 | | 9.92 | 7.80 | 28.36 | 28.98 | 0.00 |
| Well 8 Cline Butte Utility Co | | | | 67.84 | 25.57 | 44.81 | 75.98 | 78.58 | 64.57 | 69.15 |
| Well 8 Woodside Roats Water System | 28.72 | 29.00 | 41.51 | 61.90 | | 69.49 | 51.84 | 52.33 | 41.59 | 0.00 |
| Well 9 Cline Butte Utility Co | | | | | | | | 136.81 | 179.17 | 196.51 |
| Well 9 Pinebrook Roats Water System | | | | | | | 22.53 | 35.26 | 25.34 | 0.00 |
| Wild R Avion Water Co | 0.32 | | | | | | | | | |
| Wild R - Avion Water Company | 4.54 | 4.67 | 5.56 | 6.73 | 7.42 | 6.77 | 8.09 | 7.42 | | 8.63 |

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01529

## Table 7-1. Summary of Diminished Streamflow, Model Results for Scenario 1 and Scenario 2

| Reach | Diminished Streamflow, cfs | | | |
|---|---|---|---|---|
| | Scenario 1 | as percent of total pumping | Scenario 2 | as percent of total pumping |
| **Bend to River Mile 149** | 0.68 | 21% | 0.30 | 9% |
| **Odin Falls to Whychus Creek and Lower Whychus Creek** | 1.65 | 51% | 1.78 | 55% |
| **Combined for two reaches** | **2.33** | **72%** | **2.08** | **64%** |
| Total diminished streamflow for stream system | 3.09 | 95.1% | 3.24 | 99.7% |

Notes:

1) Total pumping is 3.25 cfs for both Scenarios

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**Table 8-1.**
**Summary of Ground Water Rights Permits and Granted Water Use Per Year Since 1/1/1998, Within USGS Study Area, Upper Deschutes Basin, Oregon**

| Year Of Right Date | Number of Permits | Sum of Maximum Granted Use, cfs |
|---|---|---|
| 1998 | 14 | 10.70 |
| 1999 | 10 | 1.91 |
| 2000 | 4 | 1.43 |
| 2001 | 3 | 5.37 |
| 2002 | 7 | 9.59 |
| 2003 | 3 | 11.78 |
| 2004 | 16 | 0.78 |
| 2005 | 19 | 2.31 |
| 2006 | 2 | 0.28 |
| | | **Total = 44.13** |

d:\Thornburgh\WaterRights\DeschutesWaterRights.mdb:rptSummary of Permits By Year.rpt

## Table 8-2.
## Summary of Ground Water Rights Applications and Requested Water Use Per Year Since 1/1/1998, Within USGS Study Area, Upper Deschutes Basin, Oregon

| Year Of Priority Date | Number of Applications | Sum of Maximum Requested Use, cfs |
|---|---|---|
| 1998 | 9 | 26.13 |
| 1999 | 7 | 27.47 |
| 2000 | 2 | 0.07 |
| 2001 | 3 | 0.51 |
| 2002 | 2 | 1.40 |
| 2003 | 3 | 0.72 |
| 2004 | 8 | 2.41 |
| 2005 | 7 | 32.67 |
| 2006 | 12 | 13.31 |
| 2007 | 19 | 71.31 |

d:\Thornburgh\WaterRights\DeschutesWaterRights.mdb:rptSummary of Applications By Year.rpt

**Table 8-3.**
**Summary of Surface Water Rights Permits and Granted Water Use Per Year Since 1/1/1998, Within USGS Study Area, Upper Deschutes Basin, Oregon**

| Year Of Right Date | Number of Permits | Sum of Maximum Granted Use, cfs |
|---|---|---|
| 2005 | 2 | 0.14 |
| 2007 | 1 | 2.64 |

## Table 8-4.
## Summary of Surface Water Rights Applications and Requested Water Use Per Year Since 1/1/1998, Within USGS Study Area, Upper Deschutes Basin, Oregon

| Year Of Priority Date | Number of Applications | Sum of Maximum Requested Use, cfs |
|---|---|---|
| 2007 | 10 | 0.07 |

**Table 9-1**

**Summary of Number of Wells Deepened since 1980 in the Vicinity of Thornburgh/Redmond By Township and Range**

| Township - Range | 2000-present | 1995-1999 | 1990-1994 | 1985-1989 | 1980-1984 | Totals |
|---|---|---|---|---|---|---|
| T 14 S – R 12 E | 8 | 6 | 1 | 3 | 4 | 22 |
| T 15 S – R 11 E | 8 | 9 | 15 | 5 | 3 | 40 |
| T 15 S – R 12 E (Eagle Crest) | 17 | 2 | 0 | 4 | 4 | 27 |
| T 15 S – R 13 E (Redmond) | 23 | 11 | 3 | 0 | 7 | 44 |
| T 16 S – R 11 E (East half) | 9 | 6 | 7 | 0 | 4 | 26 |
| T 16 S – R 12 E | 17 | 13 | 9 | 4 | 8 | 51 |
| Totals | 82 | 47 | 35 | 16 | 30 | **210** |

**Source: Oregon Water Resources Department Well Log Database**

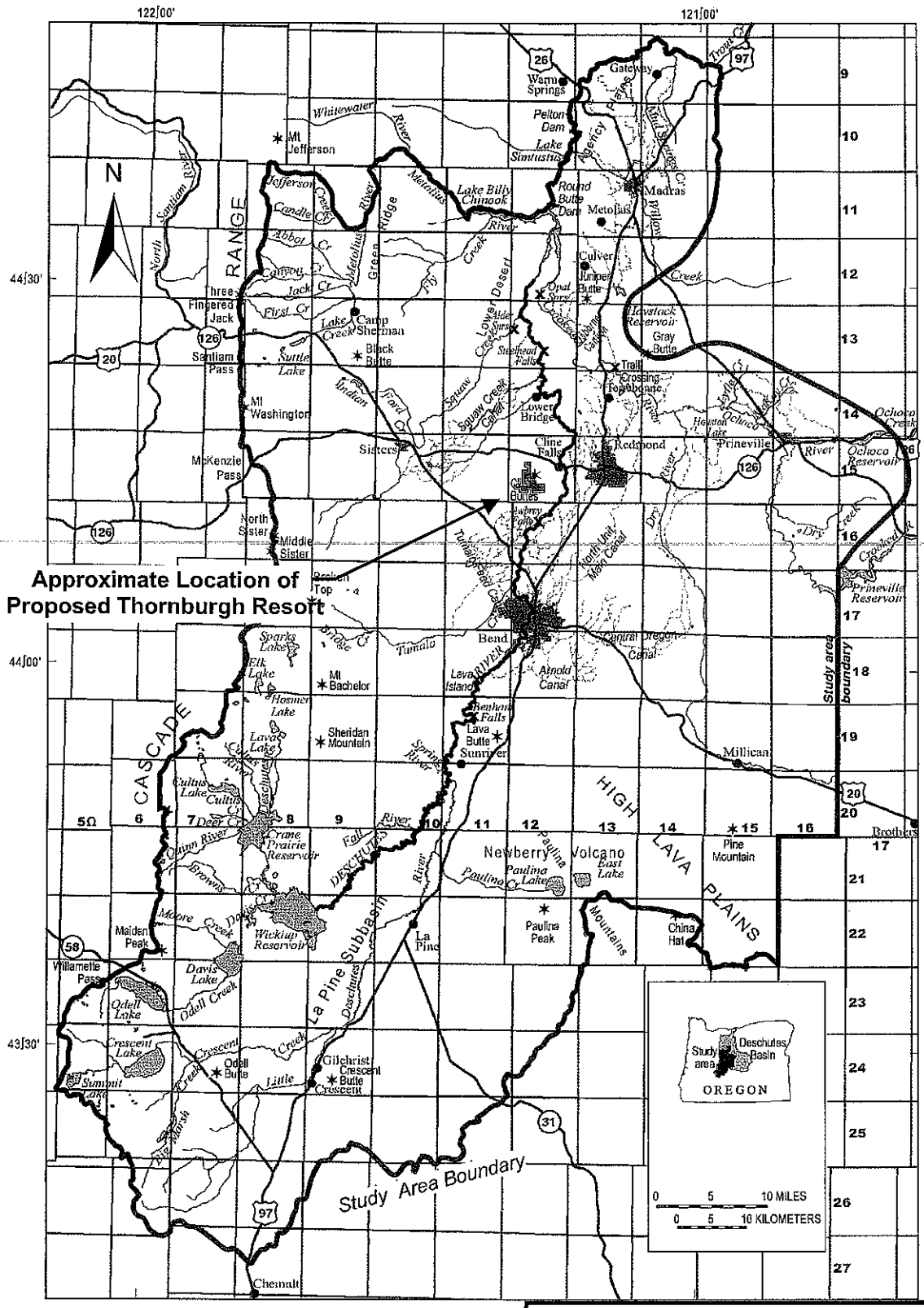


**Figure 2-1**
**USGS Study Area**

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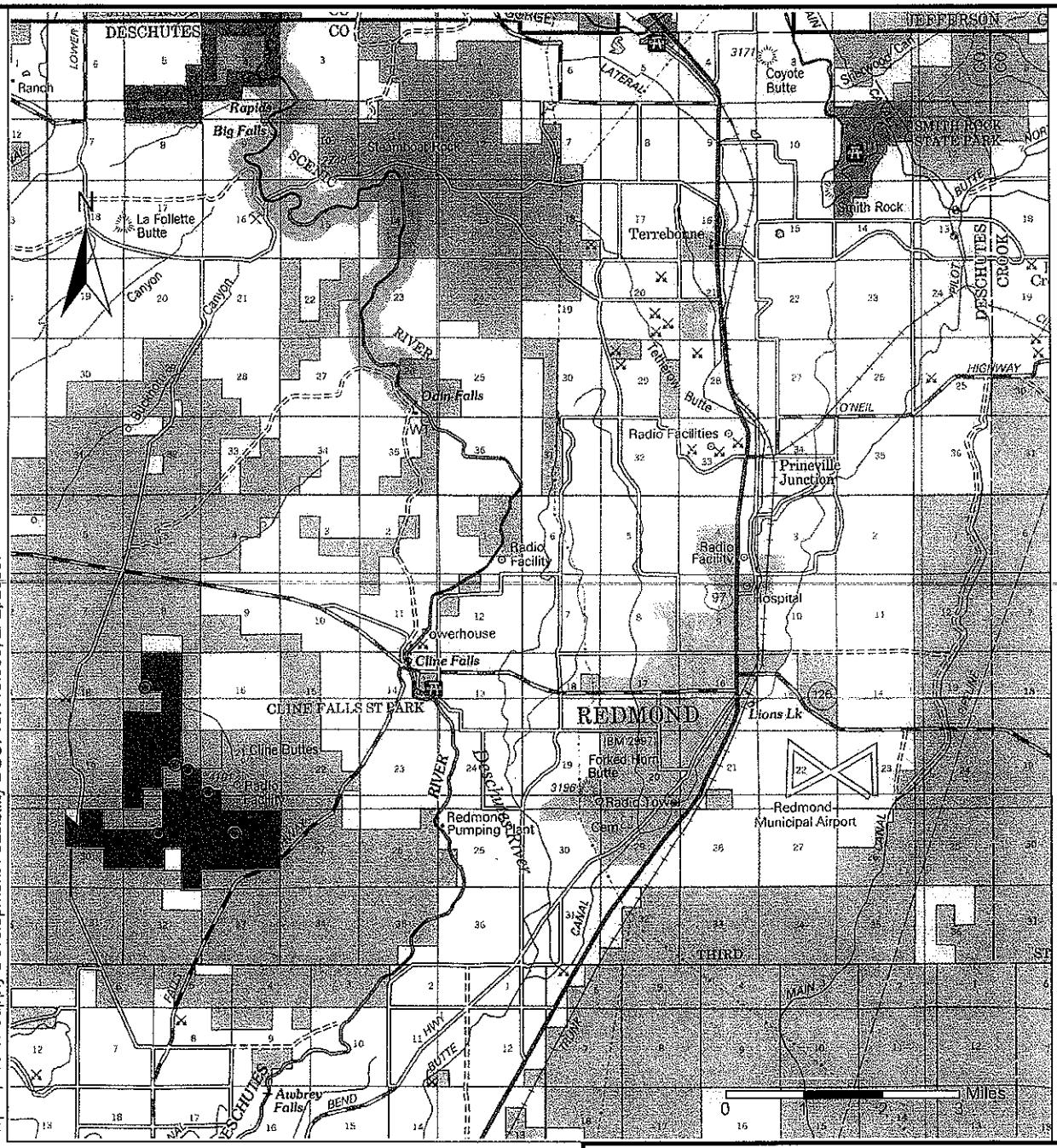
Water Resources Impact Evaluation

Mark Yinger ASSOCIATES




Base map taken from USFS Deschutes National Forest map. Reference: Thornbrugh Resort and proposed wells locations taken from Hydrology Report, Water Supply Development Feasibility DCC. 18.113.050, 2/2/2005.

## Figure 2-2
## Location Map

- Bureau of Land Management
- State Lands
- Private & Other Ownership
- Thornburgh
- Proposed Thornburgh Well Location

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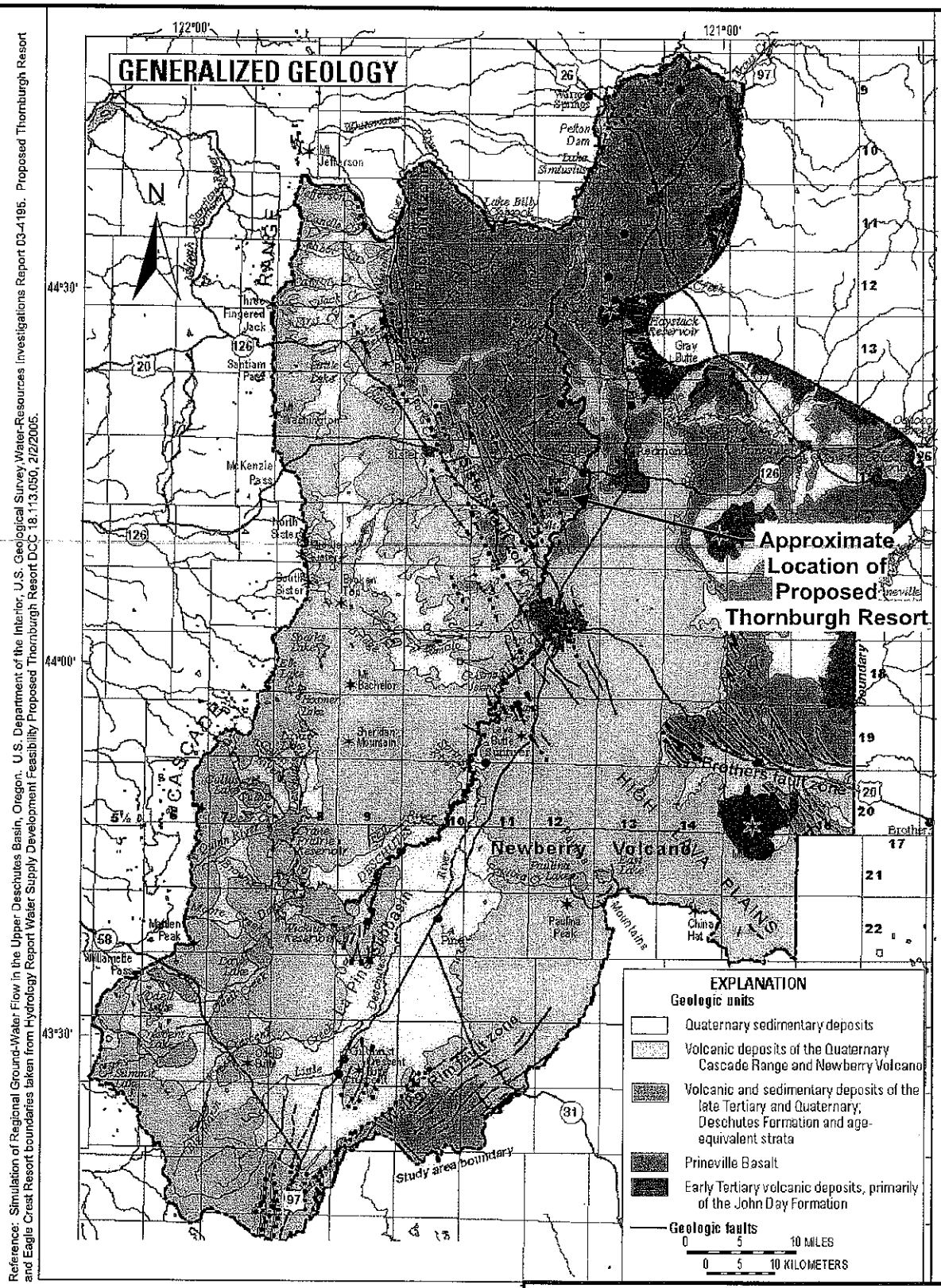
Water Resources Impact Evaluation

Mark Yinger ASSOCIATES




Reference: Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon. U.S. Department of the Interior, U.S. Geological Survey, Water-Resources Investigations Report 03-4196. Proposed Thornburgh Resort and Eagle Crest Resort boundaries taken from Hydrology Report Water Supply Development Feasibility Proposed Thornburgh Resort DCC 18.113.050, 2/2/2005.

**Figure 5-1**
**Generalized Geologic Units of the Upper Deschutes Basin**

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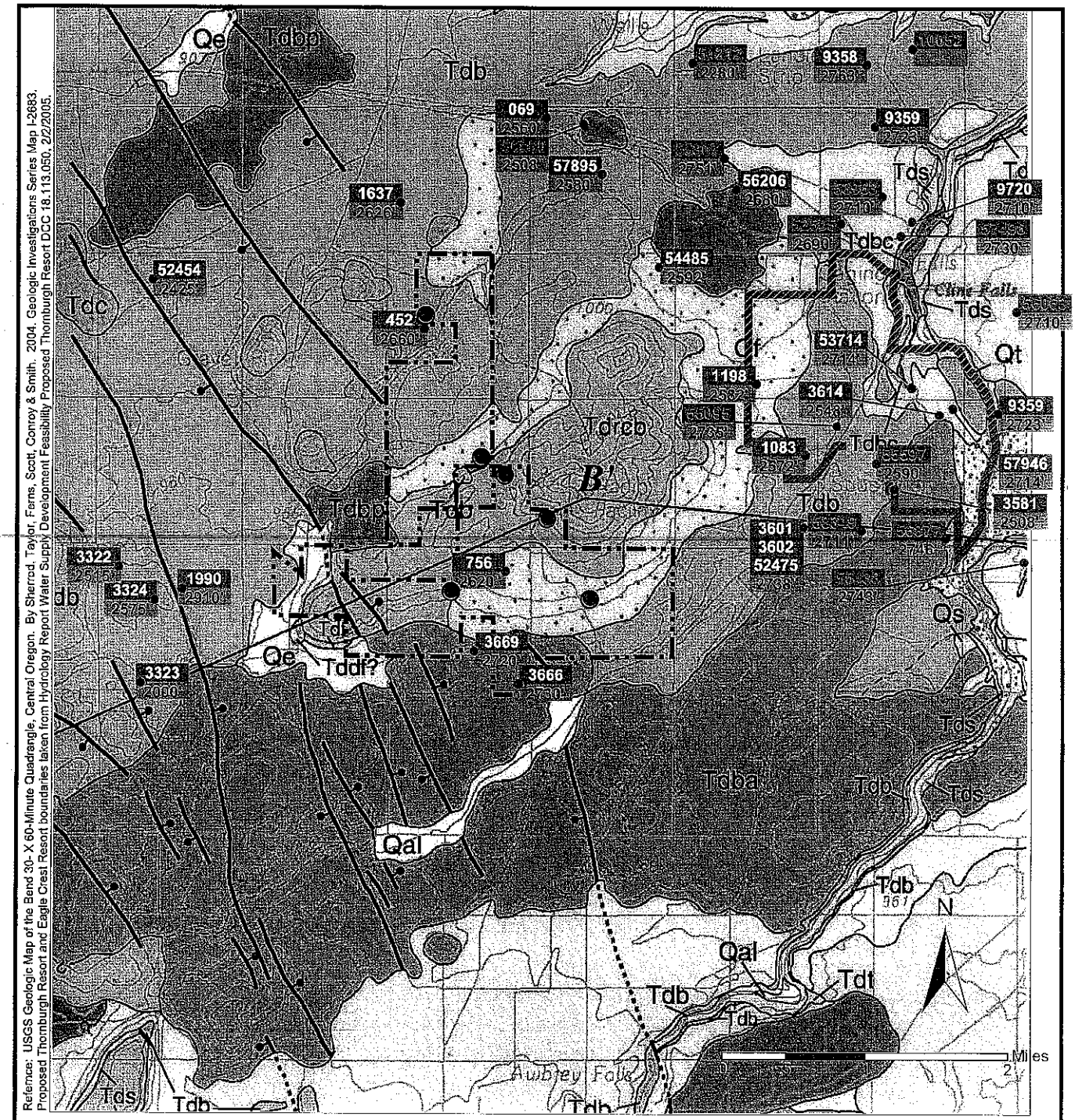
Water Resources Impact Evaluation

Mark Yinger ASSOCIATES




Deschutes Formation

| | | | |
|---|---|---|---|
| Qal | Alluvium | Tds | Sedimentary rocks & deposits |
| Qe | Eolian deposits | Tdb | Basalt |
| Qt | Talus & colluvium | Tdbp | Porphyritic basalt |
| Qs | Sand & gravel | Tdbc | Basalt of Cline Falls |
| Qf | Alluvial sand deposits | Tdba | Basaltic andesite |
| | | Tdt | Ash-flow tuff |
| | Approximate location Thornburgh Resort | Tddf | Debris-flow deposits |
| | Approximate location Eagle Crest Resort | Tdrcb | Rhyolite of Cline Buttes |
| | | Tdc | Cinder deposits |

56877 2746' — Deschutes County well log number & approximate location

Approximate static water level elevation based on well log

Deepened well log number

Approximate location of proposed Thornburgh well

**Figure 5-2**
**Detailed Geologic Map & Well Locations**
**Cline Buttes Area**

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Water Resources Impact Evaluation

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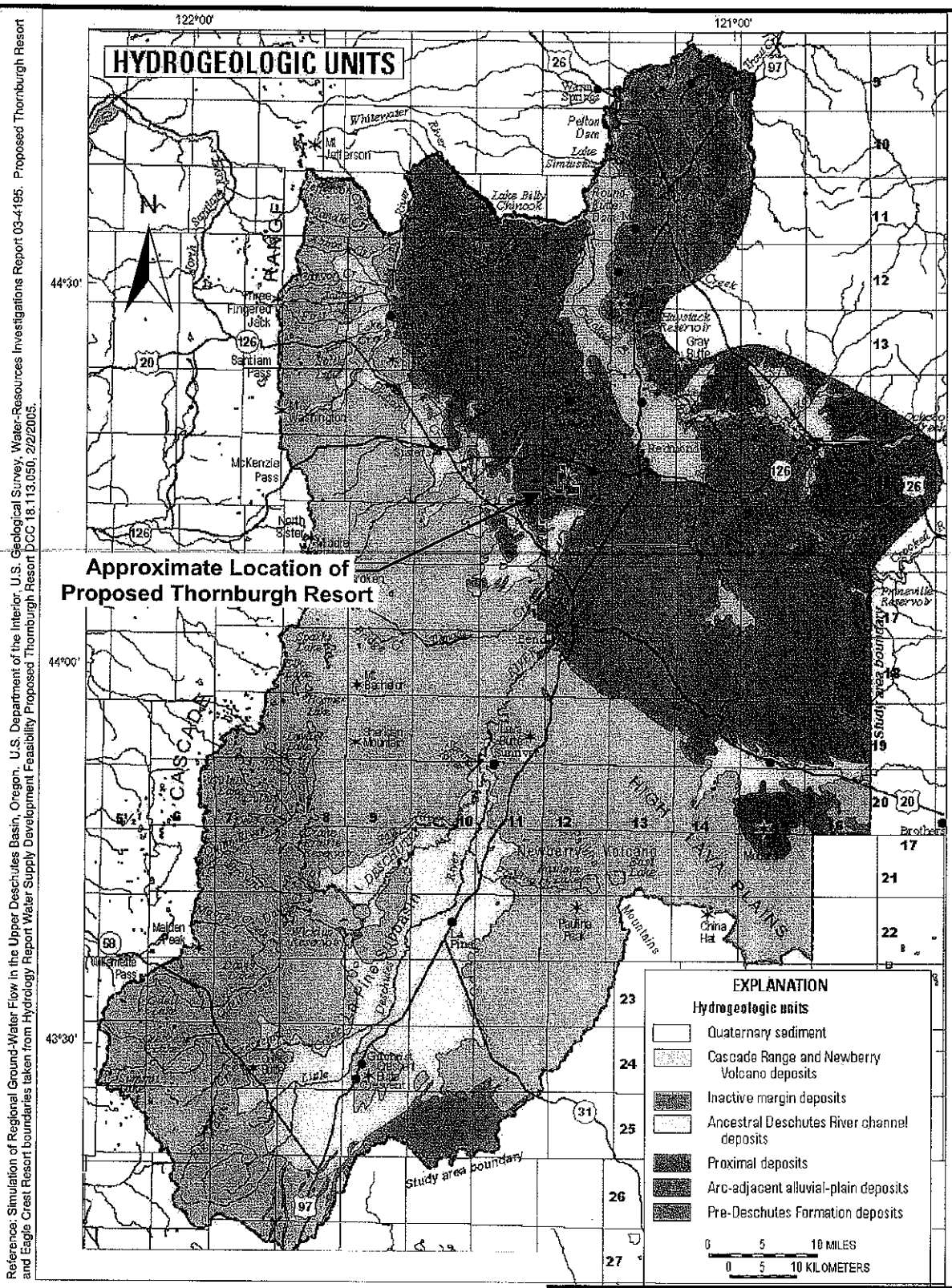


Reference: Simulation of Regional Ground-Water Flow in the Upper Deschutes Basin, Oregon, U.S. Department of the Interior, U.S. Geological Survey, Water-Resources Investigations Report 03-4195. Proposed Thornburgh Resort and Eagle Crest Resort boundaries taken from Hydrology Report Water Supply Development Feasibility Proposed Thornburgh Resort DCC 18.113.050, 2/2/2005.

**Figure 5-3**
**Generalized Hydrogeologic Units of the Upper Deschutes Basin**

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Water Resources Impact Evaluation

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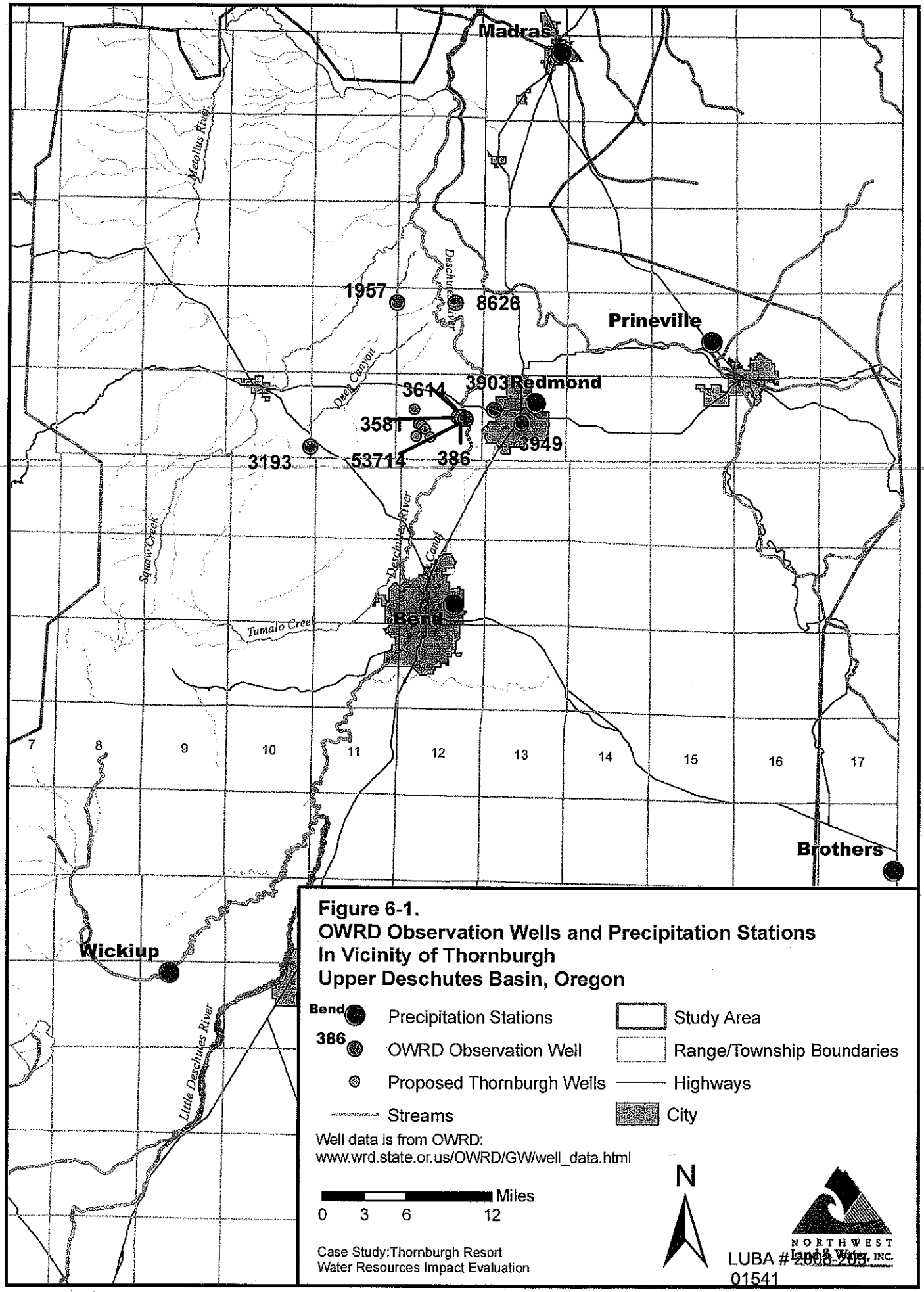


**Figure 6-1.**
**OWRD Observation Wells and Precipitation Stations**
**In Vicinity of Thornburgh**
**Upper Deschutes Basin, Oregon**

Bend ● Precipitation Stations
386 ● OWRD Observation Well
◎ Proposed Thornburgh Wells
Streams
Study Area
Range/Township Boundaries
Highways
City

Well data is from OWRD:
www.wrd.state.or.us/OWRD/GW/well_data.html

Miles
0 3 6 12

N

Case Study:Thornburgh Resort
Water Resources Impact Evaluation

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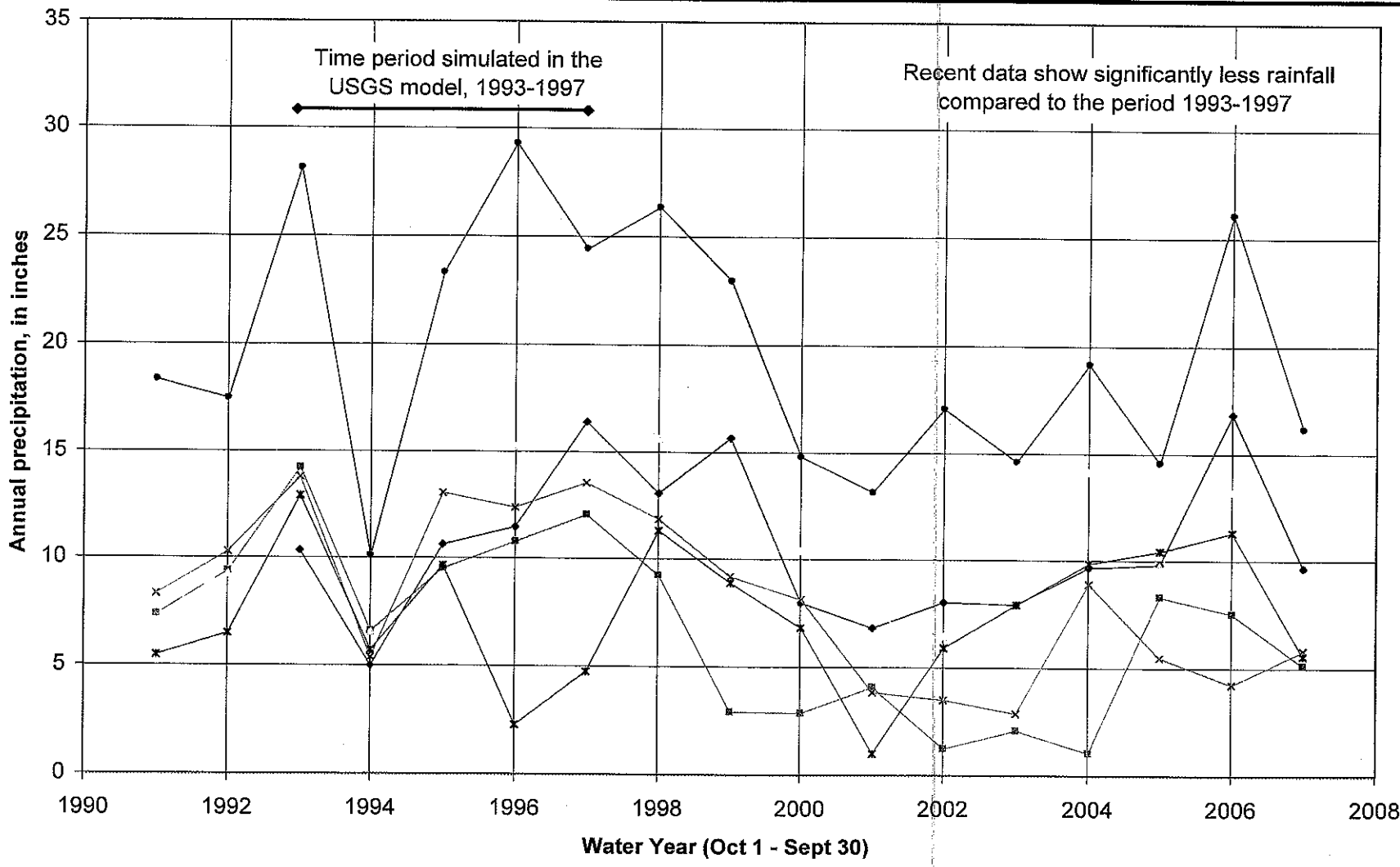


**Figure6-2. Annual Precipitation at Six Sites in Upper Deschutes Basin**

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Case Study: Thornburgh Resort
Water Resources Impact Evaluation

d:\projects\Thornburgh\precipitation\ppt Graph and stats.xls;Fig 6-2 Annual Precipitation

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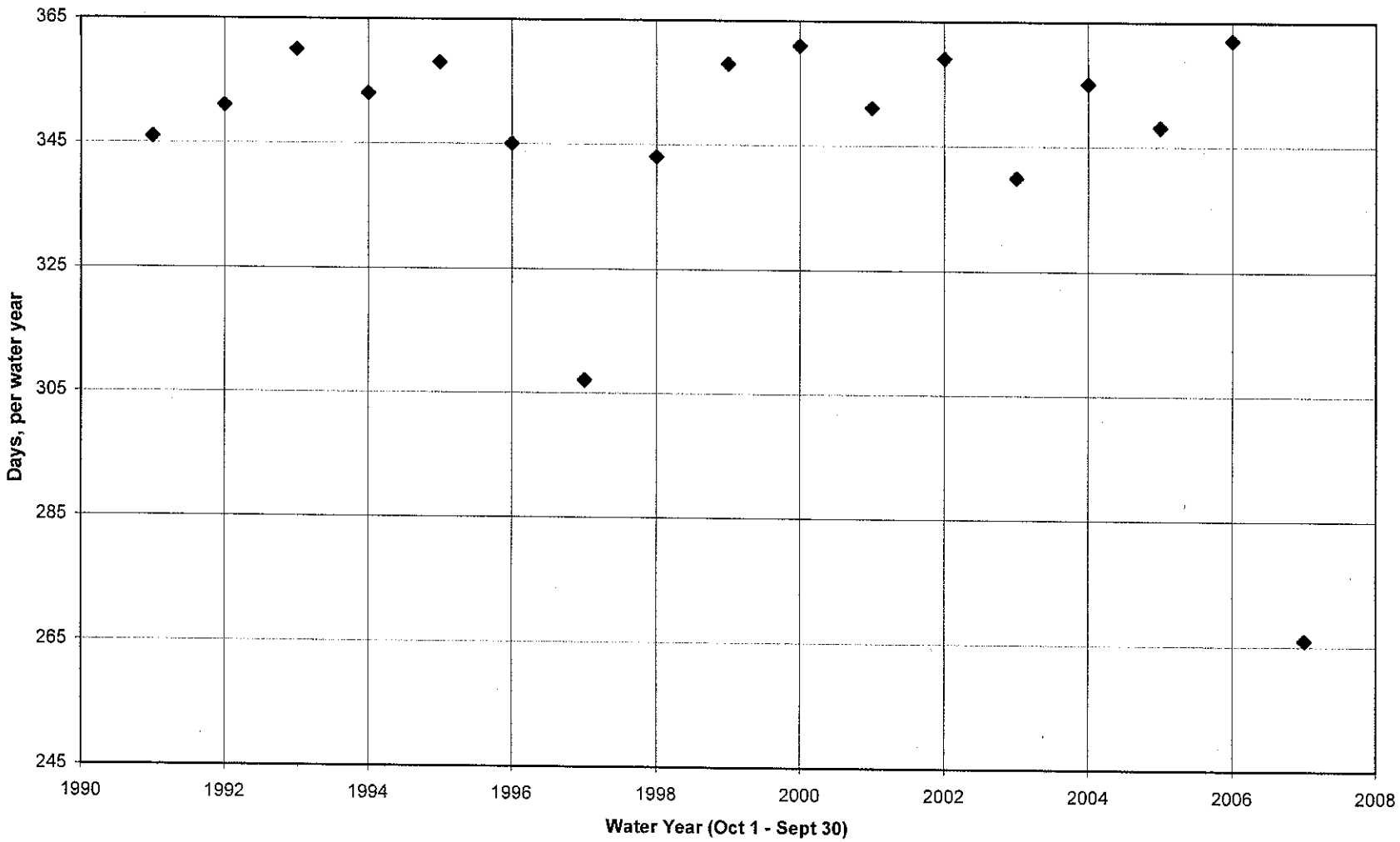


**Figure 6-3. Days of Snow Per Water Year at Wickiup Dam**

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Water Resources Impact Evaluation

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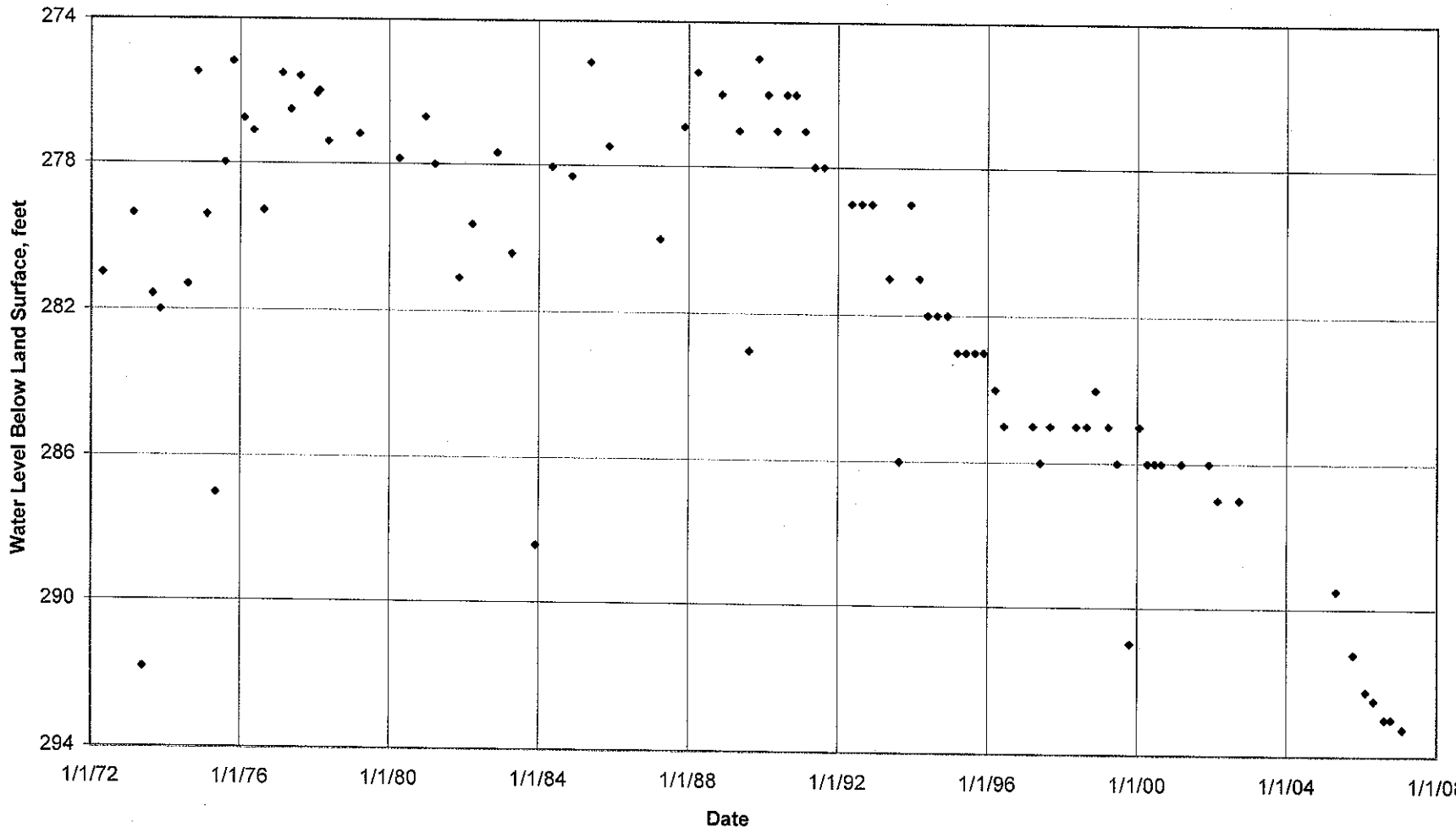


**Figure 6-4.**

**Hydrograph for Upper Deschutes Basin Observation Well DESC 3903**

Max Depth = 440 feet

Data from OWRD website: http://www.wrd.state.or.us/OWRD/GW/well_data.shtml

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01544

D:\projects\Thornburgh\WaterLevelData\USGS_ObsWellData.xls;Fig6-4 DESC 3903

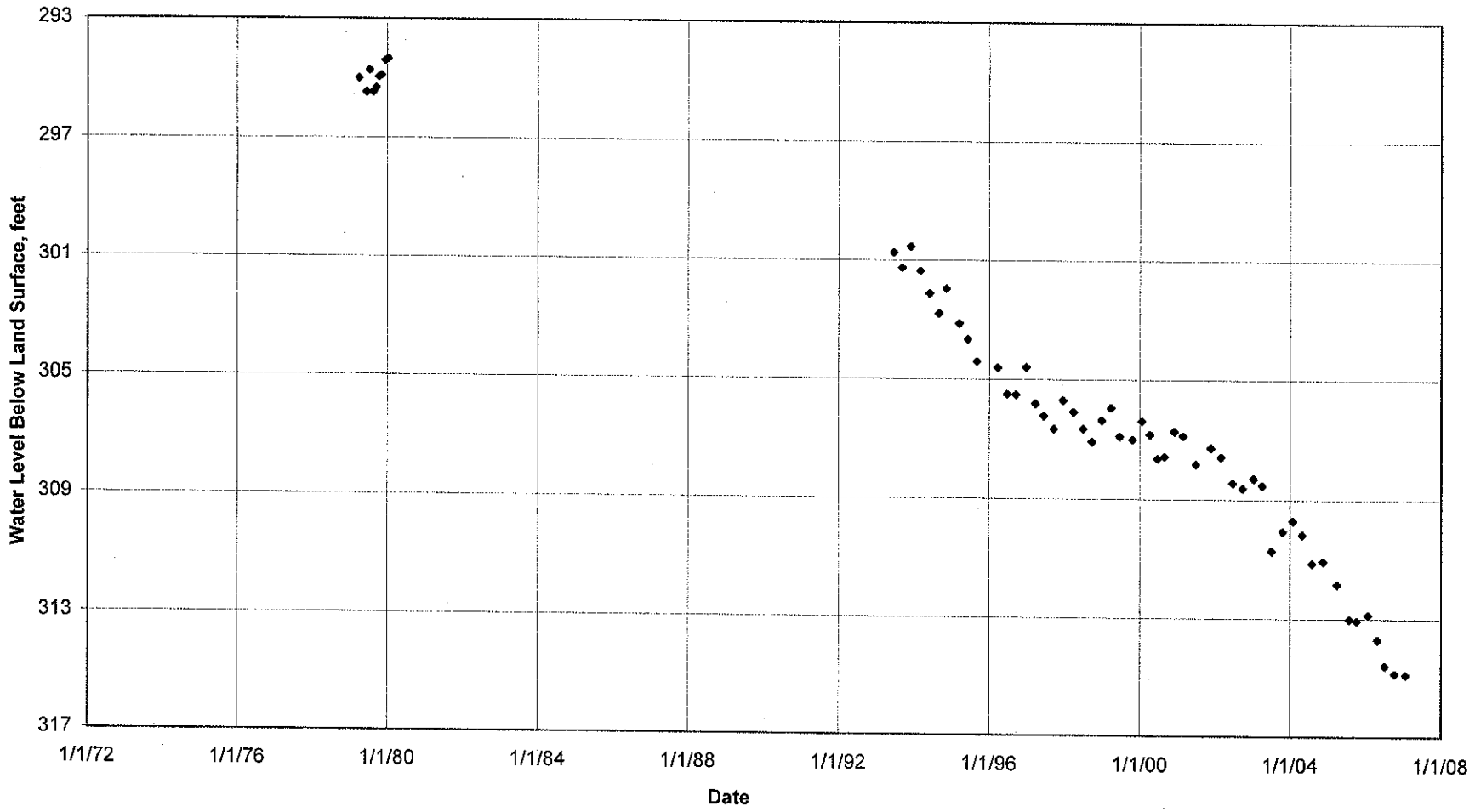


**Figure 6-5.**

**Hydrograph for Upper Deschutes Basin Observation Well DESC 3949 (15S/13E-21ADB1)**

Max Depth = 390 feet

Data from OWRD website: http://www.wrd.state.or.us/OWRD/GW/well_data.shtml

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D:\projects\Thornburgh\WaterLevelData\USGS_ObsWellData.xls; Fig 6-5 DESC 3949

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01545

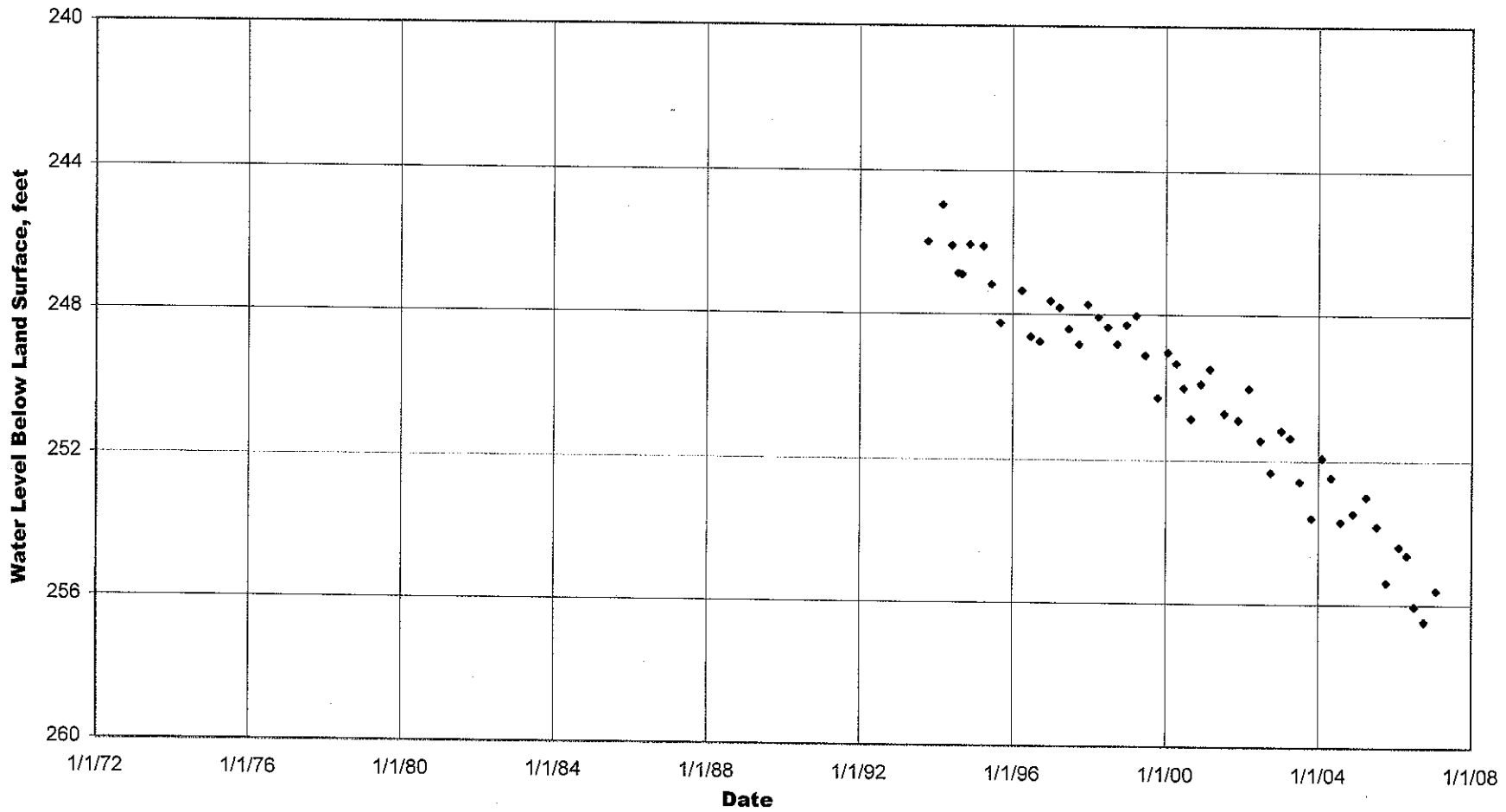


**Figure 6-6.**

**Hydrograph for Upper Deschutes Basin Observation Well DESC 3581 (15S/12E-14CDD)**

**Max Depth = 303 feet**

Data from OWRD website: http://www.wrd.state.or.us/OWRD/GW/well_data.shtml

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D:\projects\Thornburgh\WaterLevelData\USGS_ObsWellData.xls;Fig 6-6 DESC 3581

LUBA # 2008-203
01546

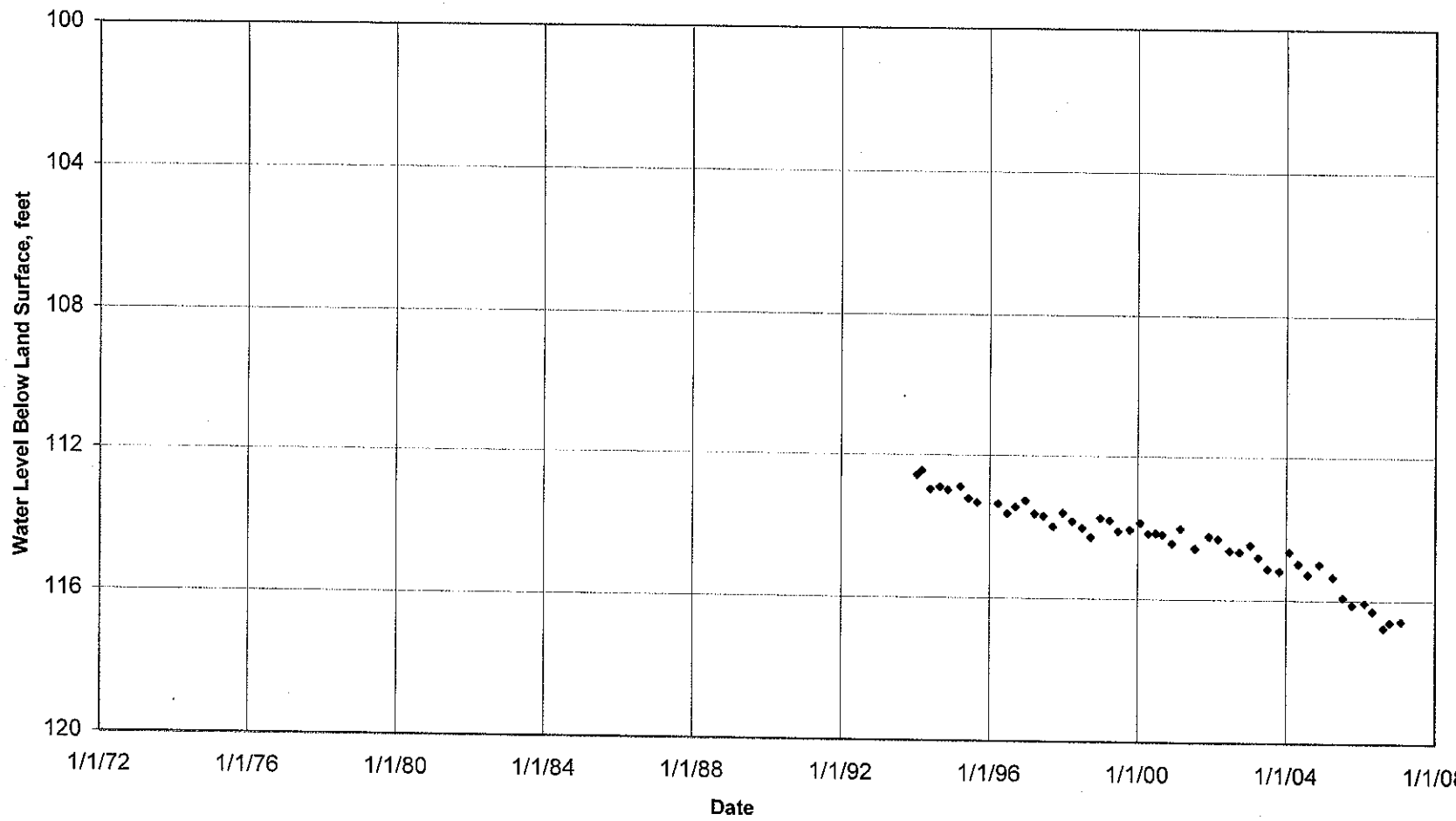


**Figure 6-7.**

**Hydrograph for Upper Deschutes Basin Observation Well DESC 8626 (14S/12E-02CCC)**

Maximum depth = 160 feet

Data from OWRD website: http://www.wrd.state.or.us/OWRD/GW/well_data.shtml

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01547

D:\projects\Thornburgh\WaterLevelData\USGS_ObsWellData.xls;fig 6-7 DESC 8626

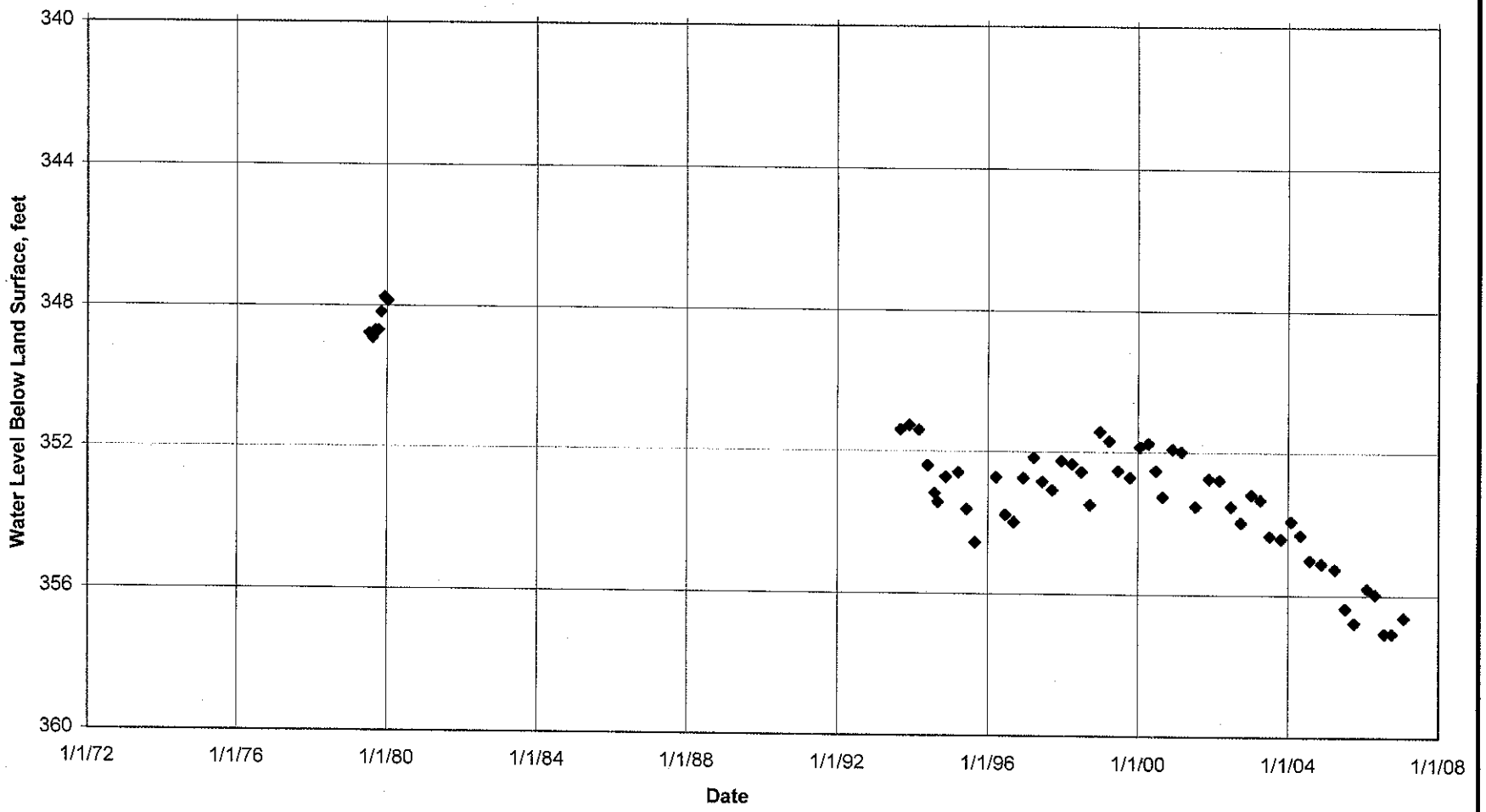


**Figure 6-8.**

**Hydrograph for Upper Deschutes Basin Observation Well DESC 1957 (14S/11E-01DDD1)**

Maximum depth = 410 feet

Data from OWRD website: http://www.wrd.state.or.us/OWRD/GW/well_data.shtml

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D:\projects\Thornburgh\WaterLevelData\USGS_ObsWellData.xls;fig 6-8 DESC 1957

LUBA # 2008-203
01548

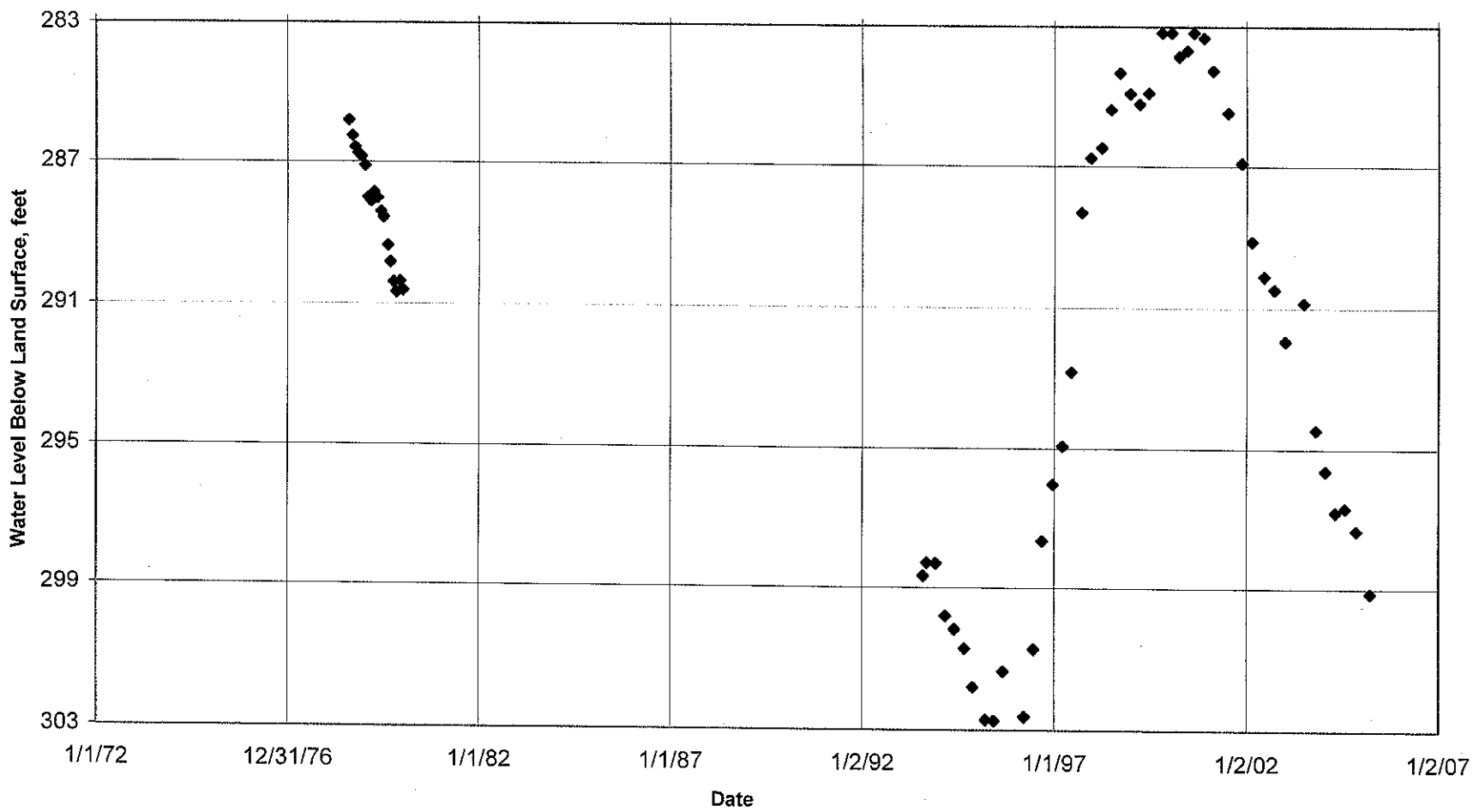


**Figure 6-9.**

**Hydrograph for Upper Deschutes Basin Observation Well DESC 3193 (15S/10E-36AAD2)**

Maximum depth = 365 feet

Data from OWRD website: http://www.wrd.state.or.us/OWRD/GW/well_data.shtml

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01549

D:\projects\Thornburgh\WaterLevelData\USGS_ObsWellData.xls;fig 6-9 DESC 3193

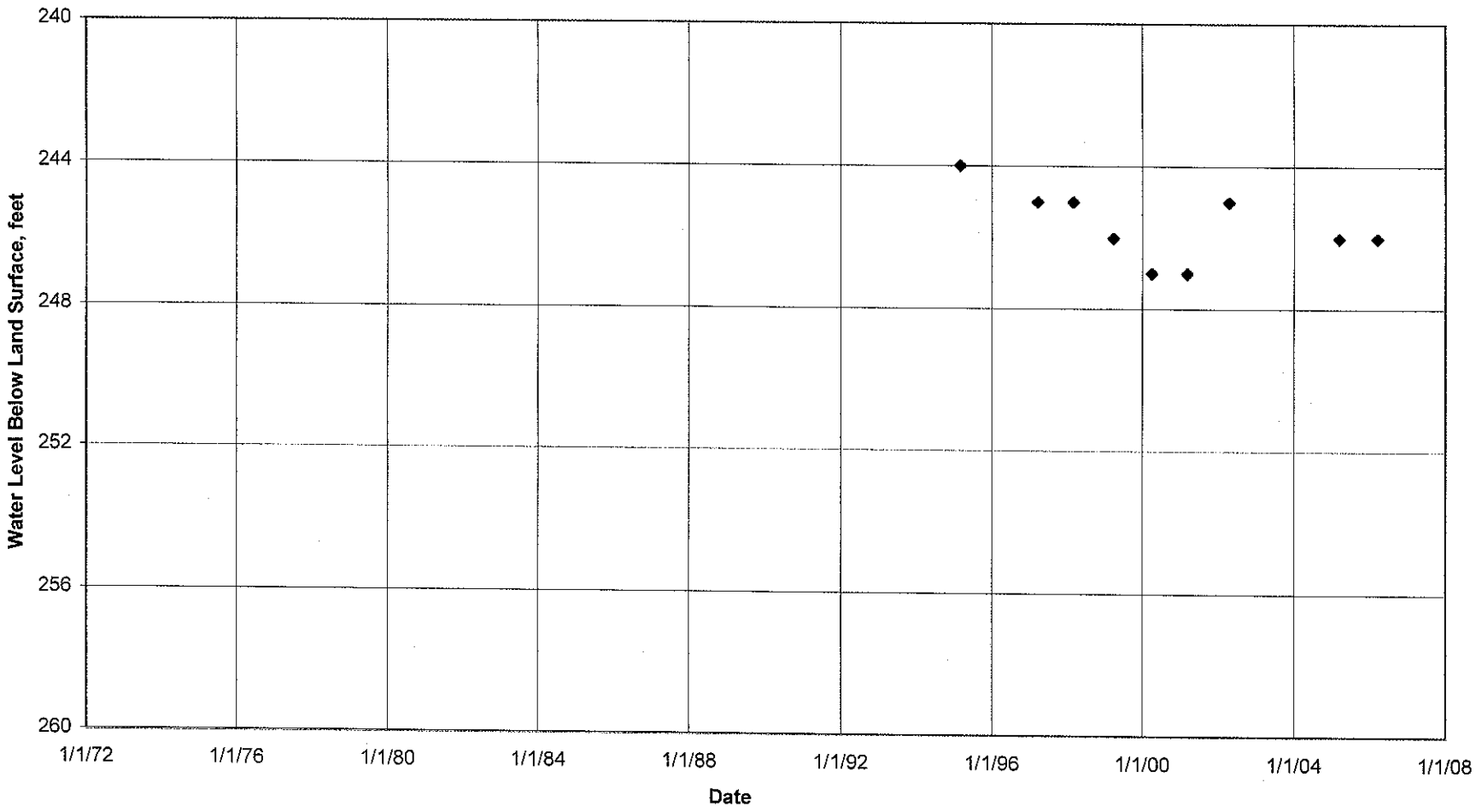


**Figure 6-10.**

**Hydrograph for Upper Deschutes Basin Observation Well DESC 3614 (Eagle Crest Well #2)**

Maximum Depth = 330 feet

Data from OWRD website: http://www.wrd.state.or.us/OWRD/GW/well_data.shtml

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Consulting in Hydrogeology

D:\projects\Thornburgh\WaterLevelData\USGS_ObsWellData.xls;fig 6-10 DESC 3614

LUBA # 2008-203
01550

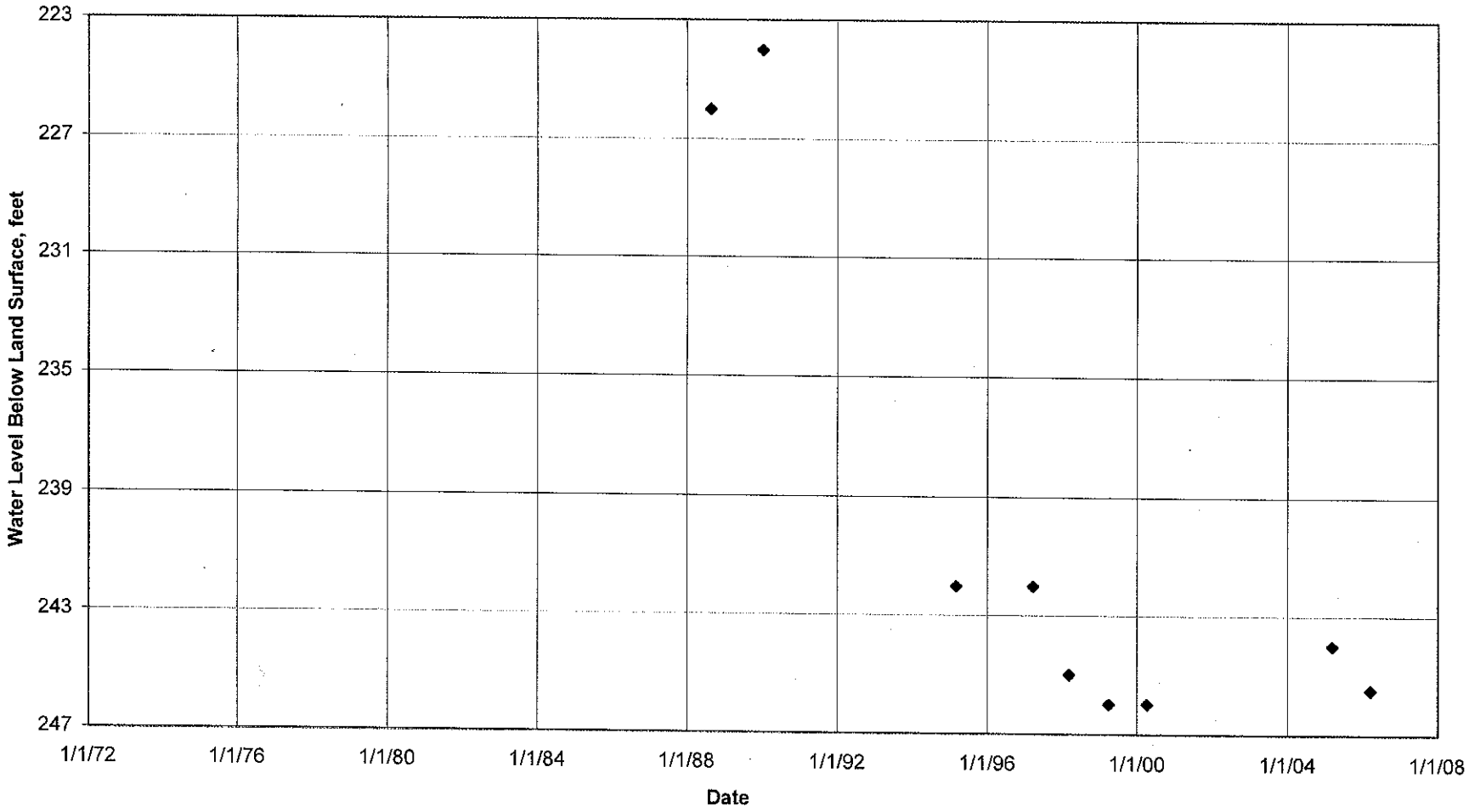


**Figure 6-11.**

**Hydrograph for Upper Deschutes Basin Observation Well DESC 53714 (Eagle Crest #3)**

Max Depth = 290 feet

Data from OWRD website:http://www.wrd.state.or.us/OWRD/GW/well_data.shtml

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Consulting in Hydrogeology

D:\projects\Thornburgh\WaterLevelData\USGS_ObsWellData.xls;fig 6-11 DESC 53714

LUBA # 2008-203
01551

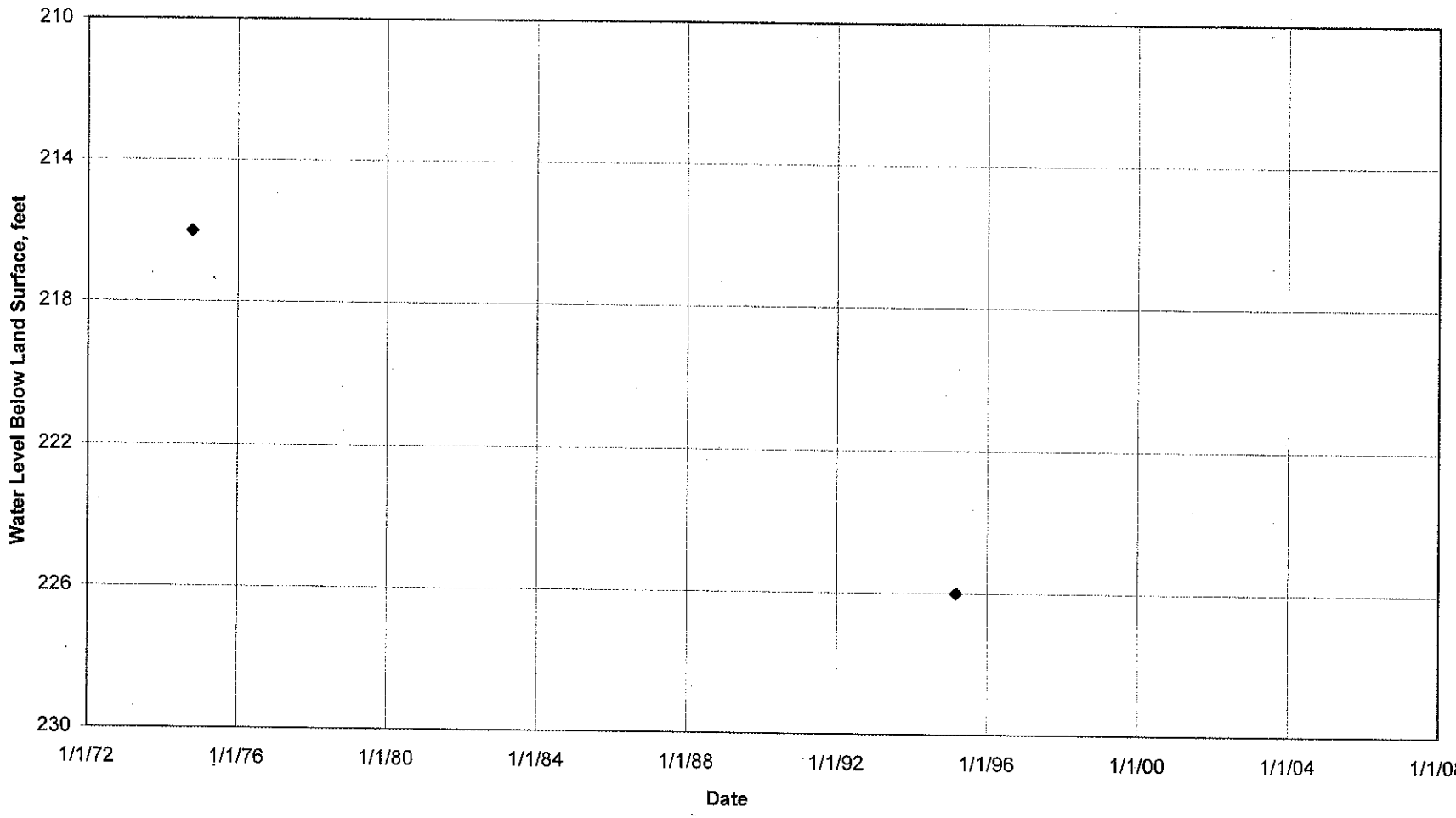


**Figure 6-12.**

**Hydrograph for Upper Deschutes Basin Observation Well DESC 386 (Eagle Crest #1)**

Maximum Depth = 268 feet

Data from OWRD website: http://www.wrd.state.or.us/OWRD/GW/well_data.shtml

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Consulting in Hydrogeology

LUBA # 2008-203
01552

D:\projects\Thornburgh\WaterLevelData\USGS_ObsWellData.xls;fig 6-12 DESC 386

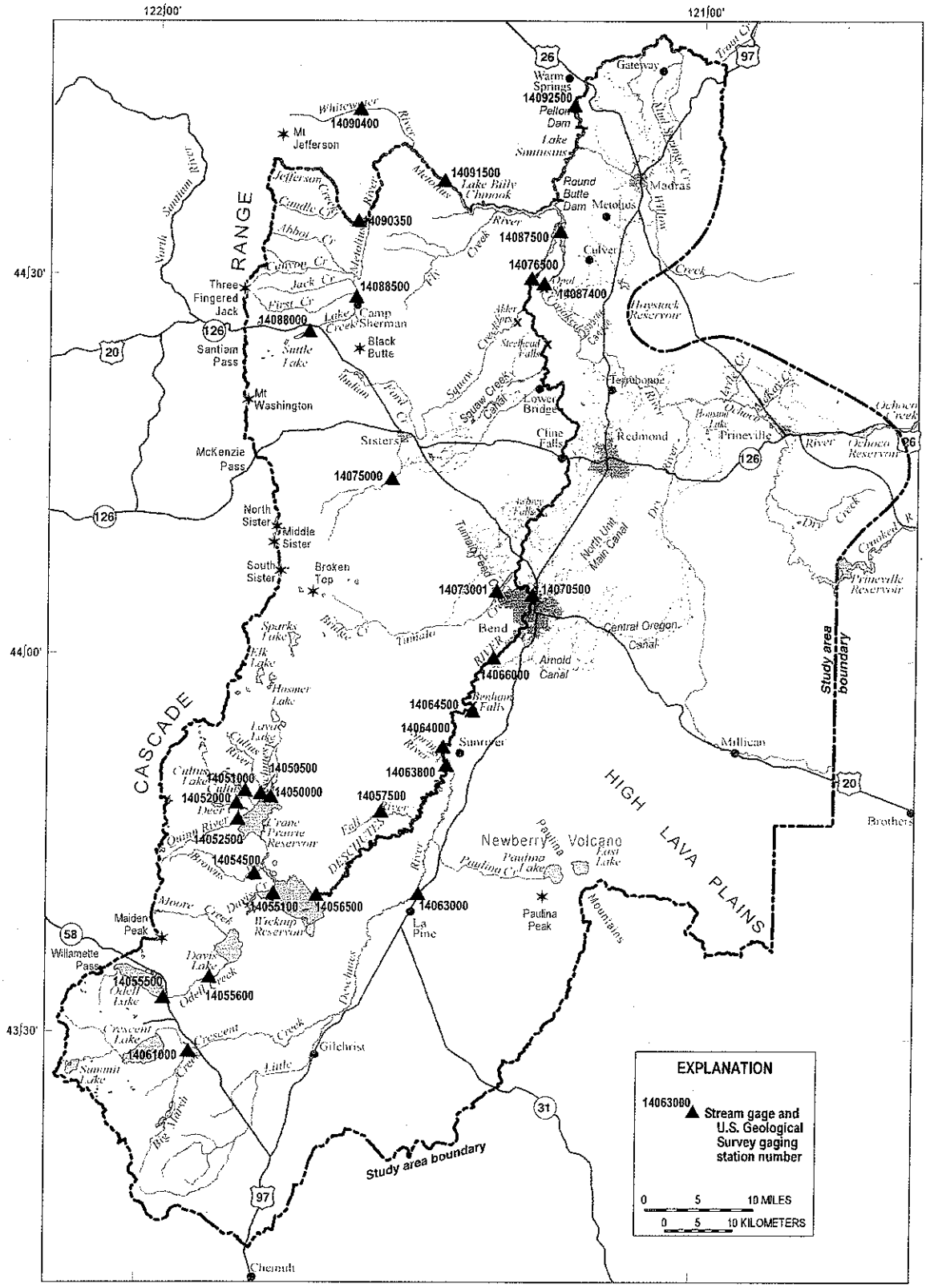


**Figure 11.** Location of selected stream-gaging stations in the upper Deschutes Basin, Oregon.



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01553

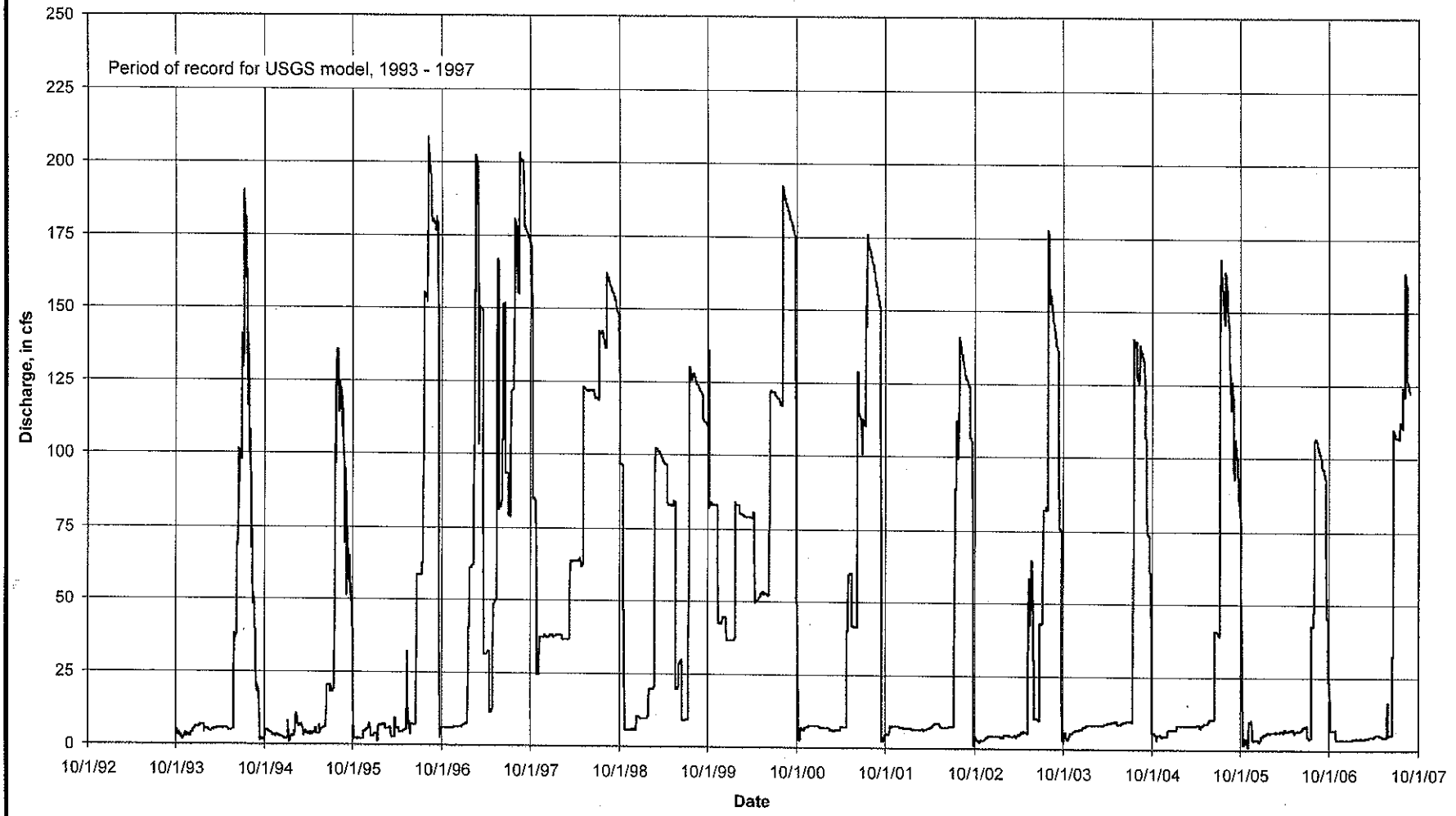


**Figure 6-14. Streamflow Hydrograph for Gaging Station**
**CREO - Crescent Creek at Crescent Lake, OR**

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Case Study: Thornburgh Resort
Water Resources Impact Evaluation

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01554

D:\projects\Thornburgh\Streamflow\DeschutesStreamData.xls;6-14 CREO-plot

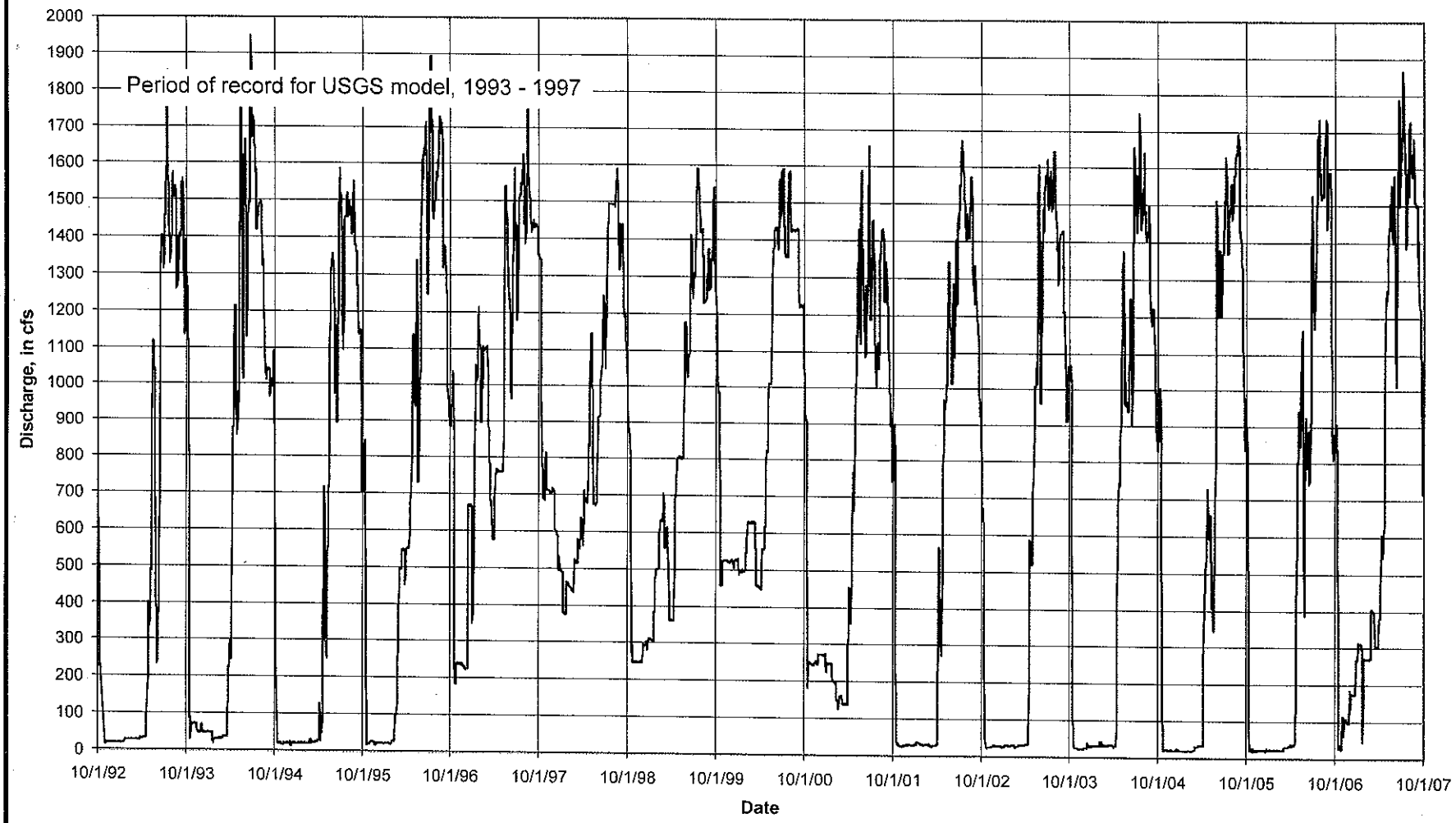


**Figure 6-15. Streamflow Hydrograph for Gaging Station 14056500 - Deschutes River below Wickiup Res., OR**

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D:\projects\Thornburgh\Streamflow\DeschutesStreamData.xls;6-15 Wico-plot

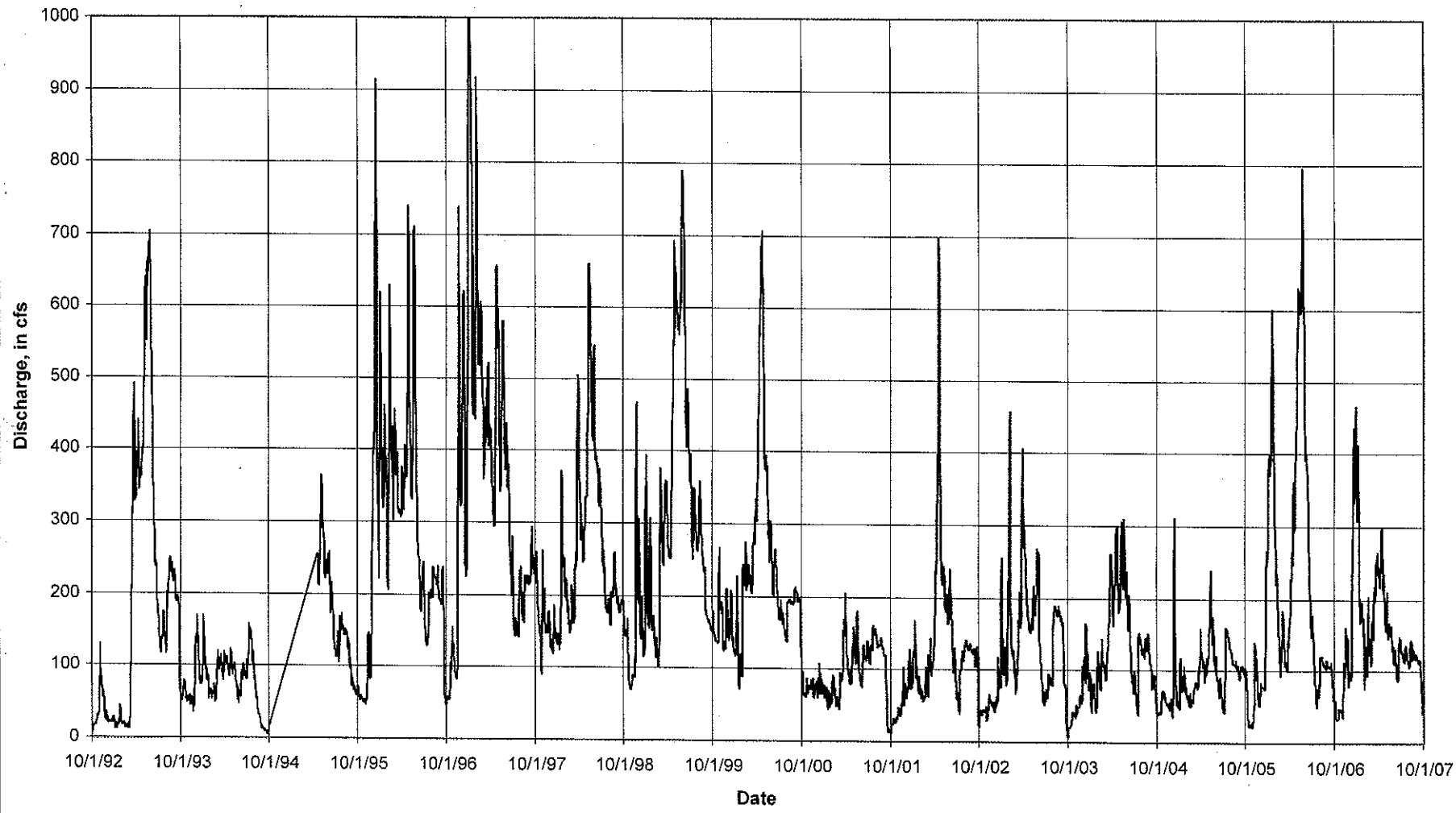


**Figure 6-16. Streamflow Hydrograph for Gaging Station 14063000 - LAPO Little Deschutes River near LaPine, OR**

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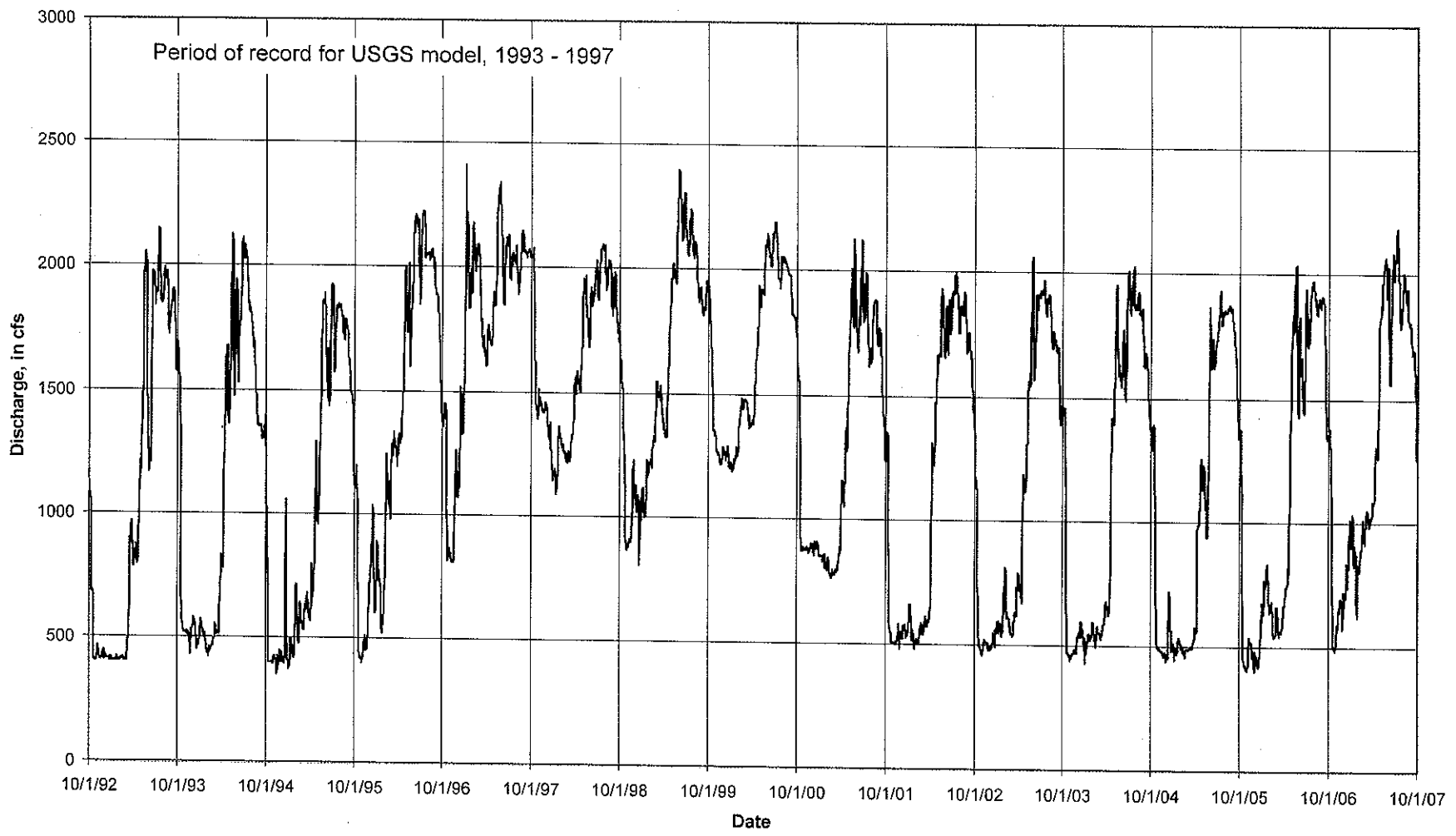


**Figure 6-17. Streamflow Hydrograph for Gaging Station 14064500 BENO - Deschutes River at Benham Falls, OR**

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D:\projects\Thornburgh\Streamflow\DeschutesStreamData.xls;6-17 Beno-plot

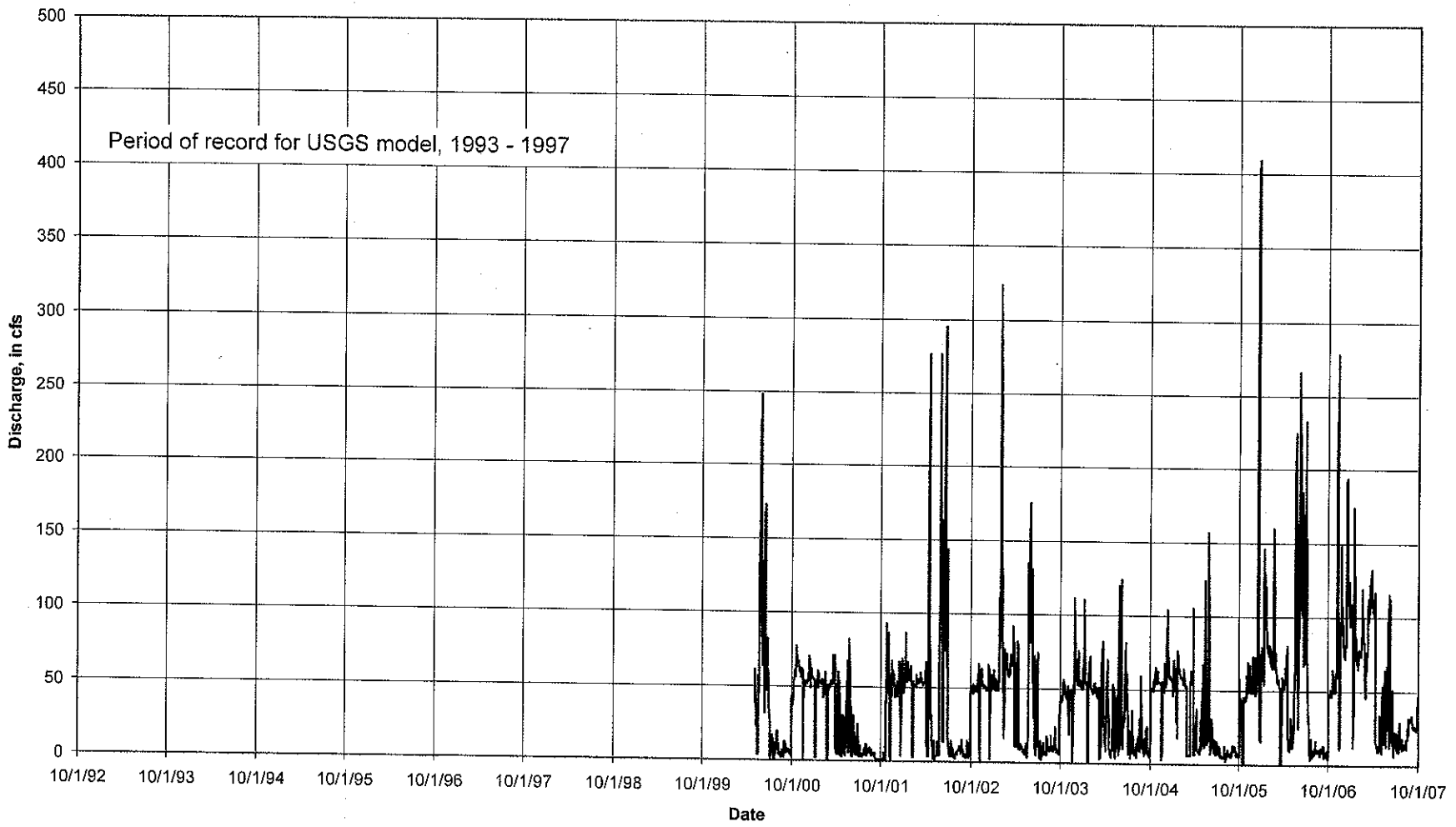


**Figure 6-18. Streamflow Hydrograph for Gaging Station 14073001 TUMO - Tumalo Creek nr Bend, OR**

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D:\projects\Thornburgh\Streamflow\DeschutesStreamData.xls;6-18 TUMO-plot

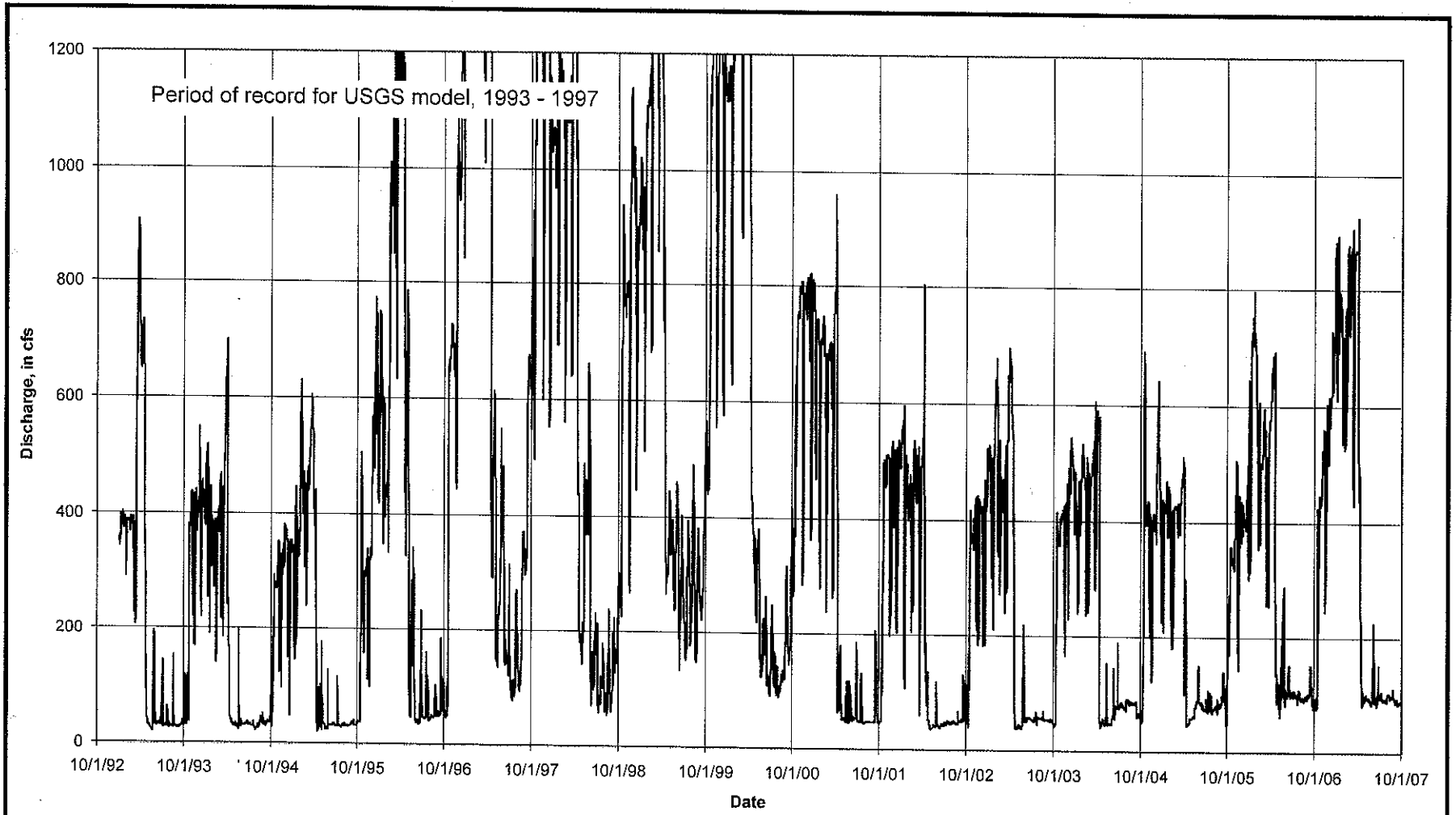


**Figure 6-19. Streamflow Hydrograph for Gaging Station 14070500 Deschutes Nr. Bend**

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D:\projects\Thornburgh\Streamflow\DeschutesStreamData.xls;6-19 Plot-14070500 Bend

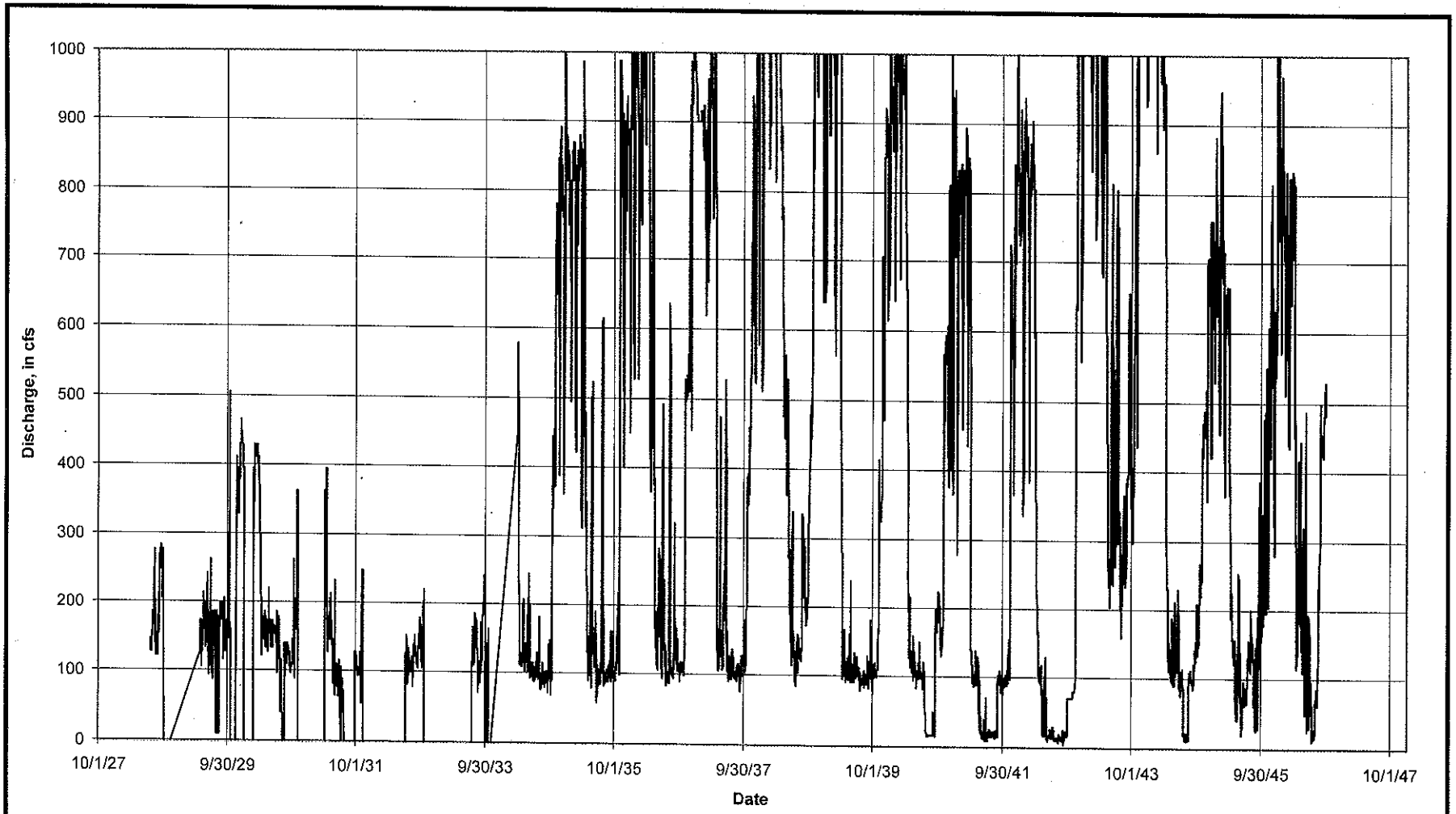


**Figure 6-20. Streamflow Hydrograph for Gaging Station 14074500 Deschutes at Cline Falls Nr Redmond**

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D:\projects\Thornburgh\Streamflow\DeschutesStreamData.xls;6-20 Plot-14074500 cline

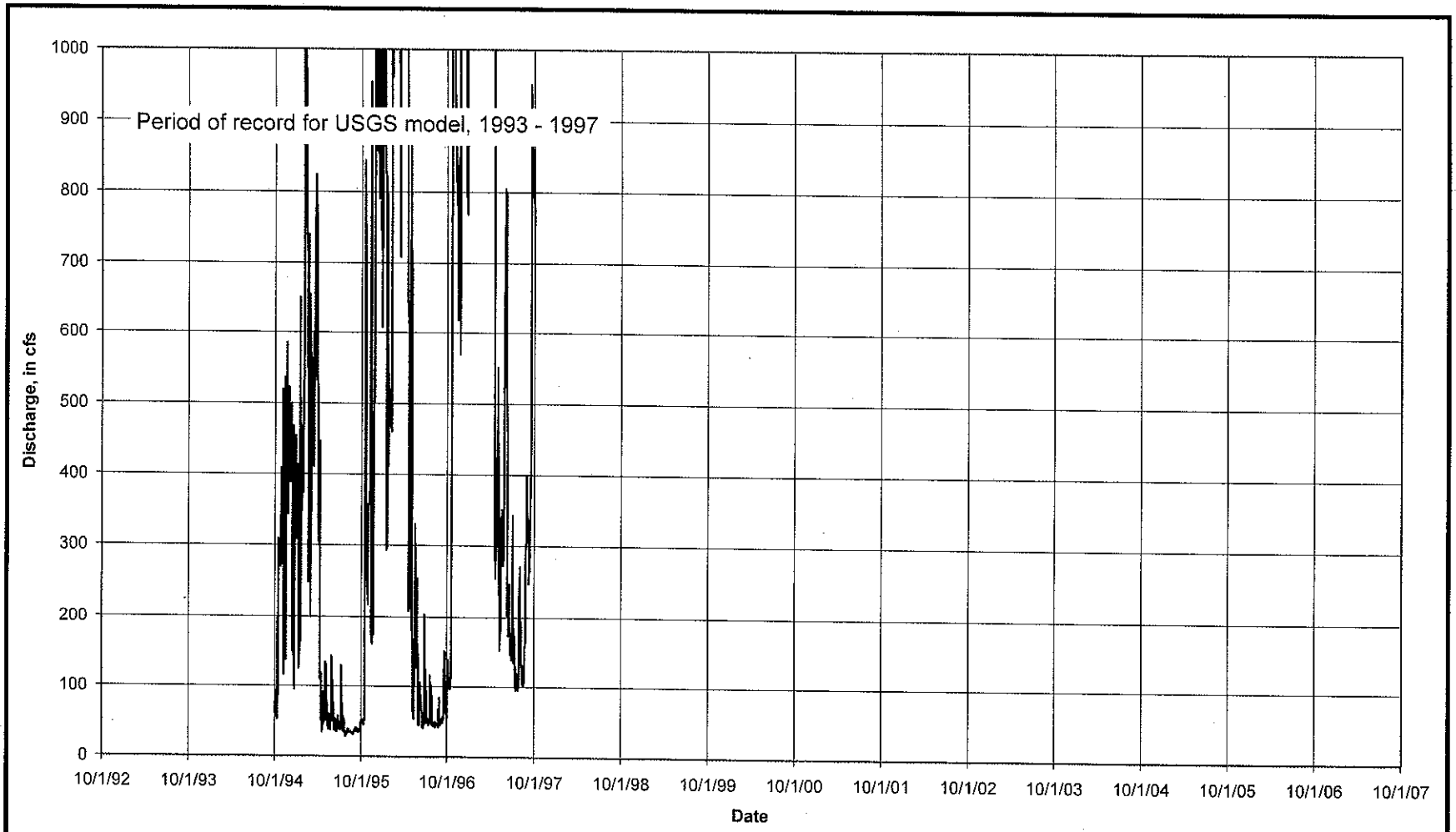


**Figure 21. Streamflow Hydrograph for Gaging Station 14074630 Deschutes at Lower Bridge near Terrebonne**

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D:\projects\Thornburgh\Streamflow\DeschutesStreamData.xls;6-21 Plot-14074630 Terrbon

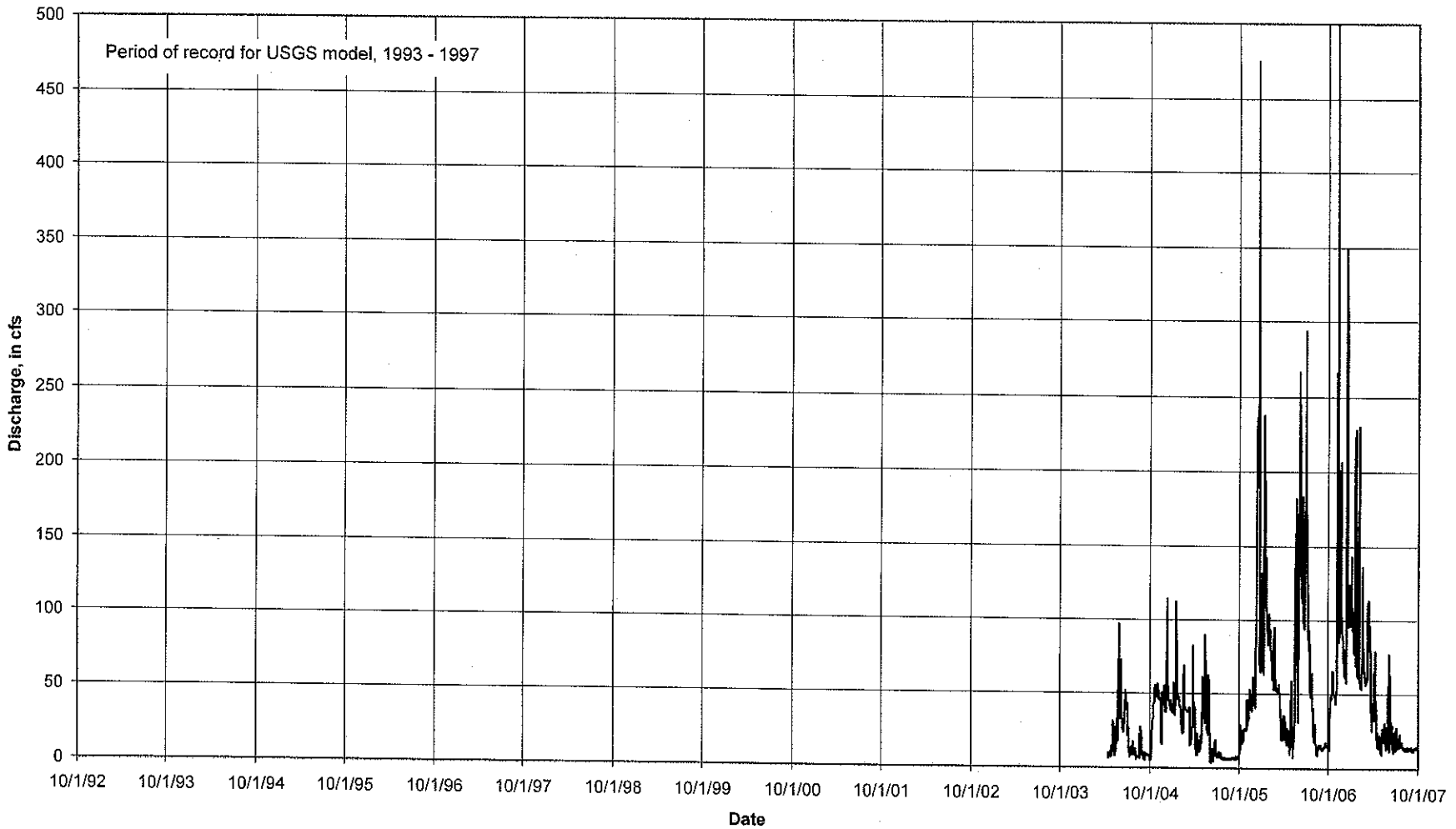


**Figure 6-22. Streamflow Hydrograph for Gaging Station 14075000 SQSO - Whychus (Squaw) Creek at Sisters, OR**

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D:\projects\Thornburgh\Streamflow\DeschutesStreamData.xls;6-22 SQSO-plot

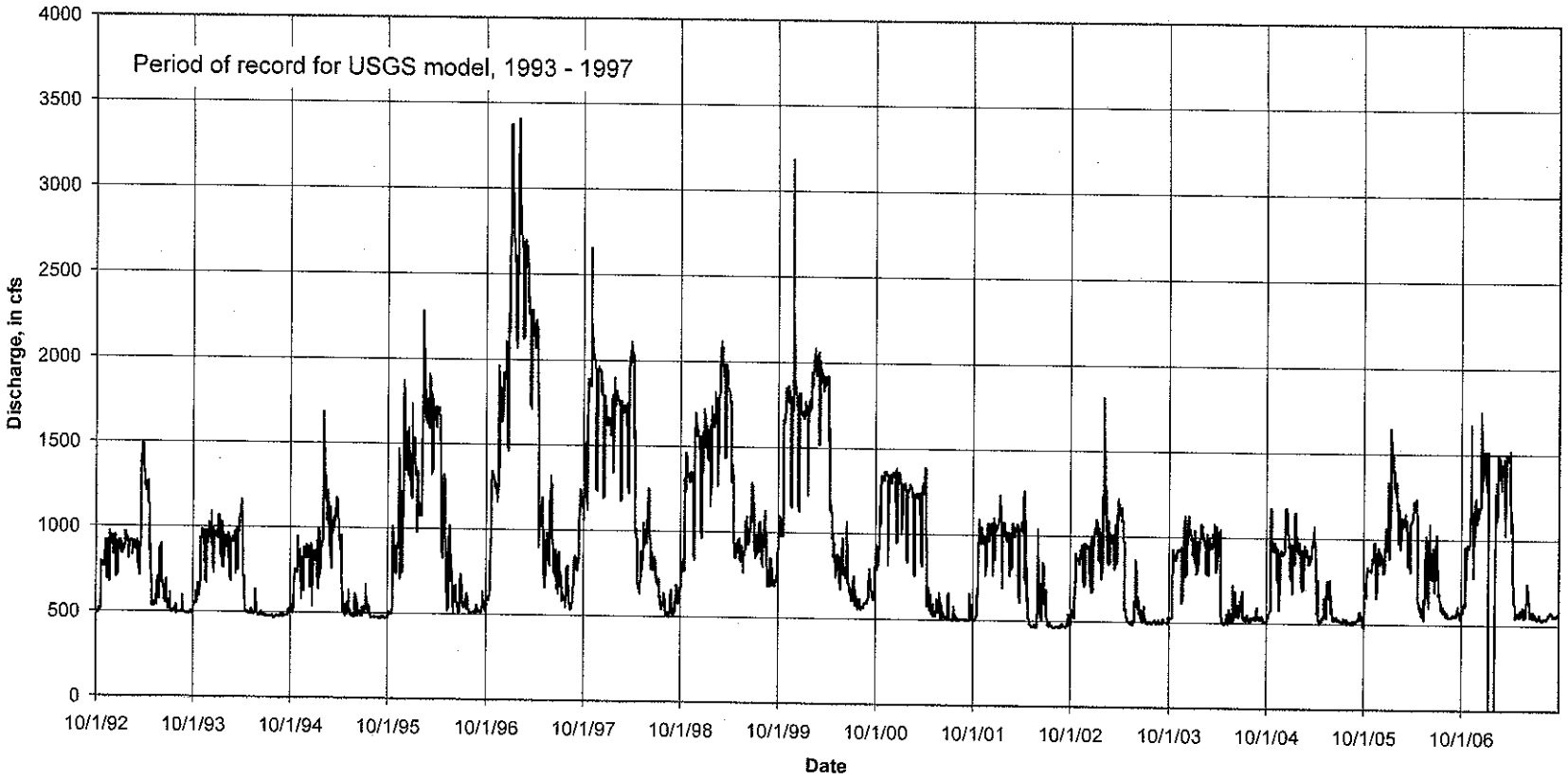


**Figure 6-23. Streamflow Hydrograph for Gaging Station USGS 14076500 Deschutes River near Culver, Oregon**

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D:\projects\Thornburgh\Streamflow\DeschutesStreamData.xls;6-23 Plot-14076500 Cul

LUBA # 2008-203
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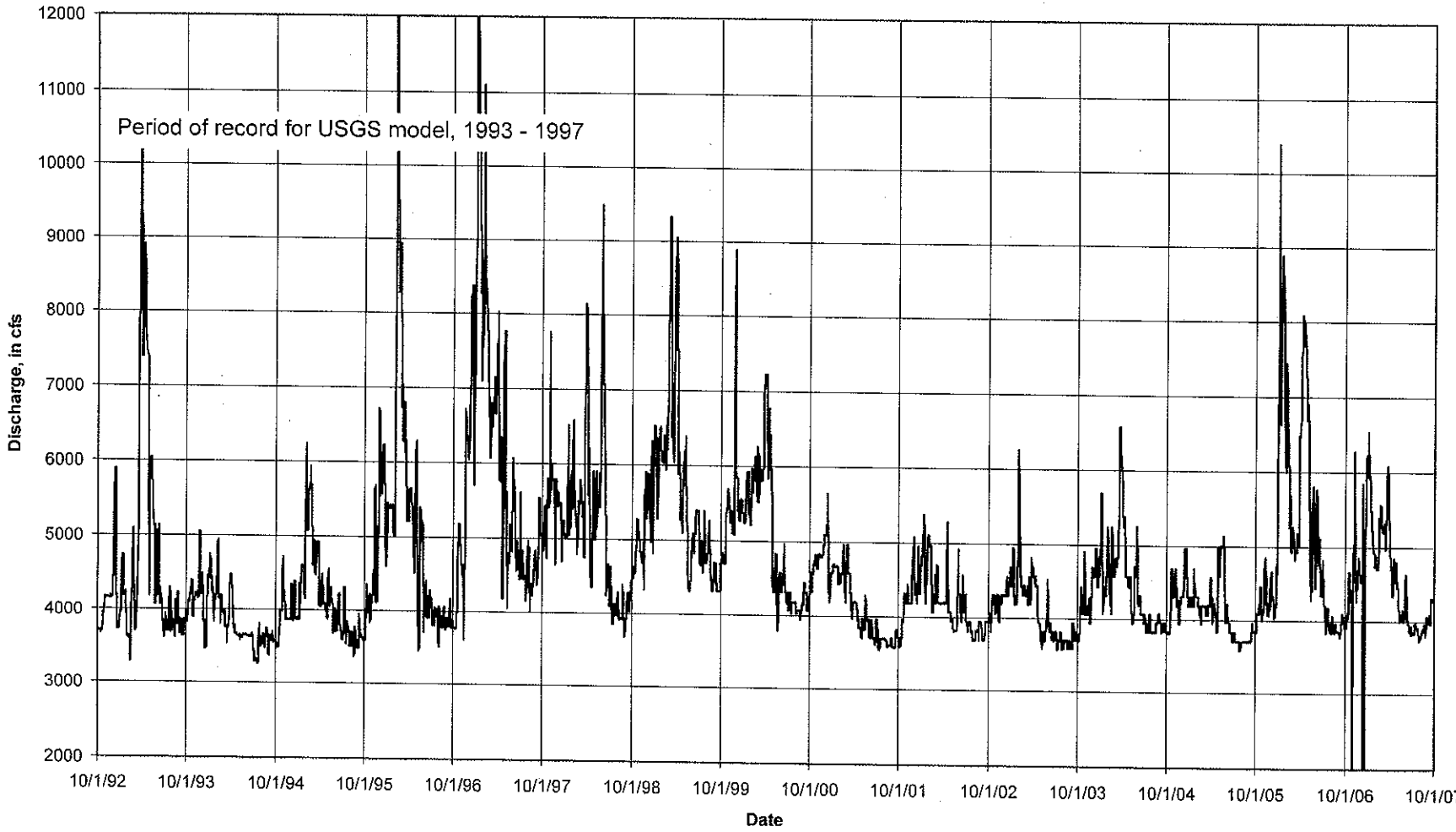


**Figure 6-24. Streamflow Hydrograph for Gaging Station USGS 14092500 Deschutes River near Madras, OR**

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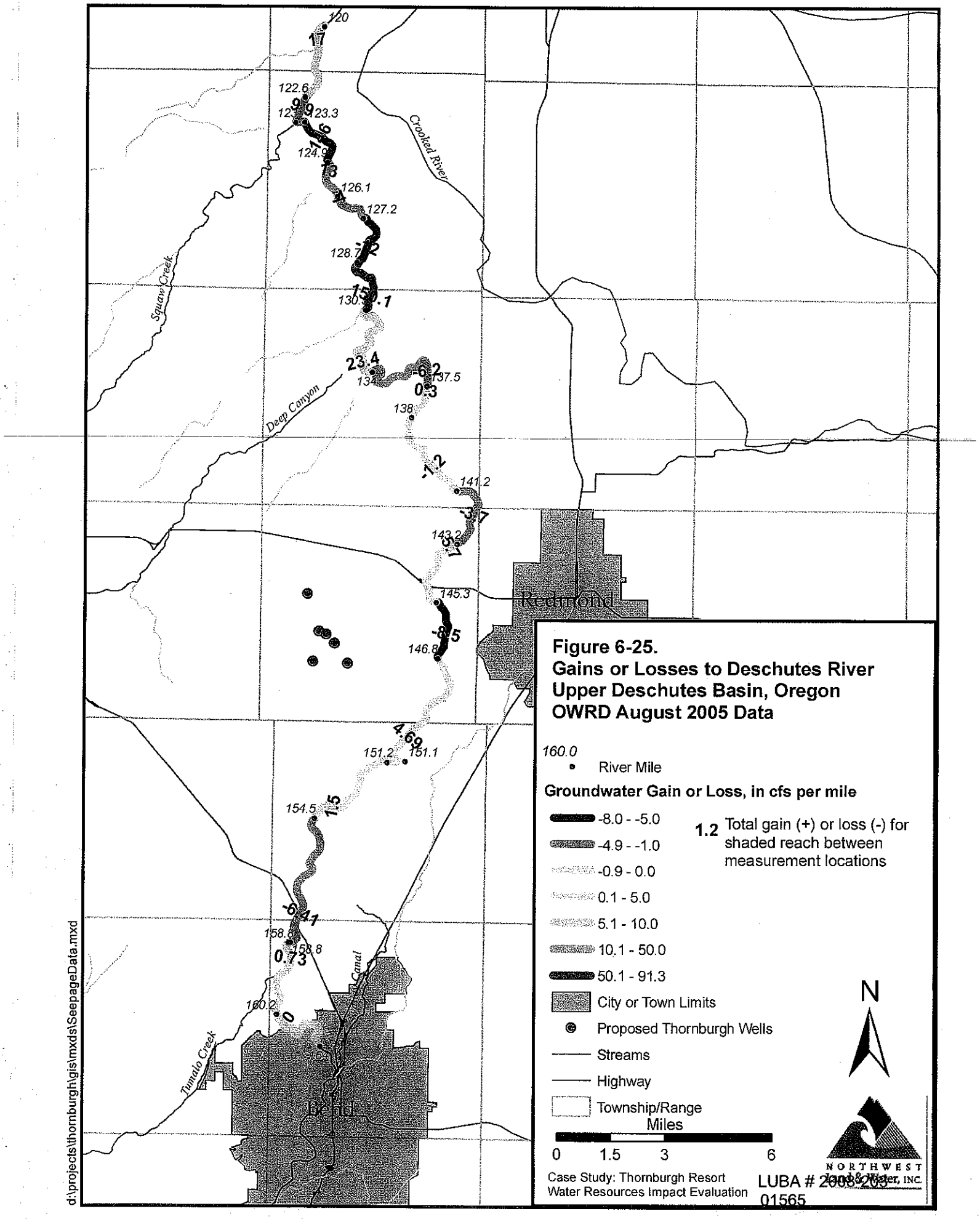
D:\projects\Thornburgh\Streamflow\DeschutesStreamData.xls;6-24 Plot-14092500 madras


120
1.7
122.6
9.9
123.9
23.3
9.9
124.9
1.3
126.1
1.1
127.2
128.7
1.2
1.5
130.1
Squaw Creek
Crooked River
23.4
-6.2
134
137.5
0.3
138
Deep Canyon
1.2
141.2
3.7
143.2
3.1
145.3
Redmond
-8.5
146.8
4.69
151.2
151.1
154.5
1.5
-6.41
158.8
158.8
0.73
Canal
160.2
0
Tumalo Creek
Bend
Figure 6-25.
Gains or Losses to Deschutes River
Upper Deschutes Basin, Oregon
OWRD August 2005 Data
160.0
River Mile
Groundwater Gain or Loss, in cfs per mile
-8.0 - -5.0
-4.9 - -1.0
-0.9 - 0.0
0.1 - 5.0
5.1 - 10.0
10.1 - 50.0
50.1 - 91.3
1.2 Total gain (+) or loss (-) for shaded reach between measurement locations
City or Town Limits
Proposed Thornburgh Wells
Streams
Highway
Township/Range
Miles
0 1.5 3 6
N
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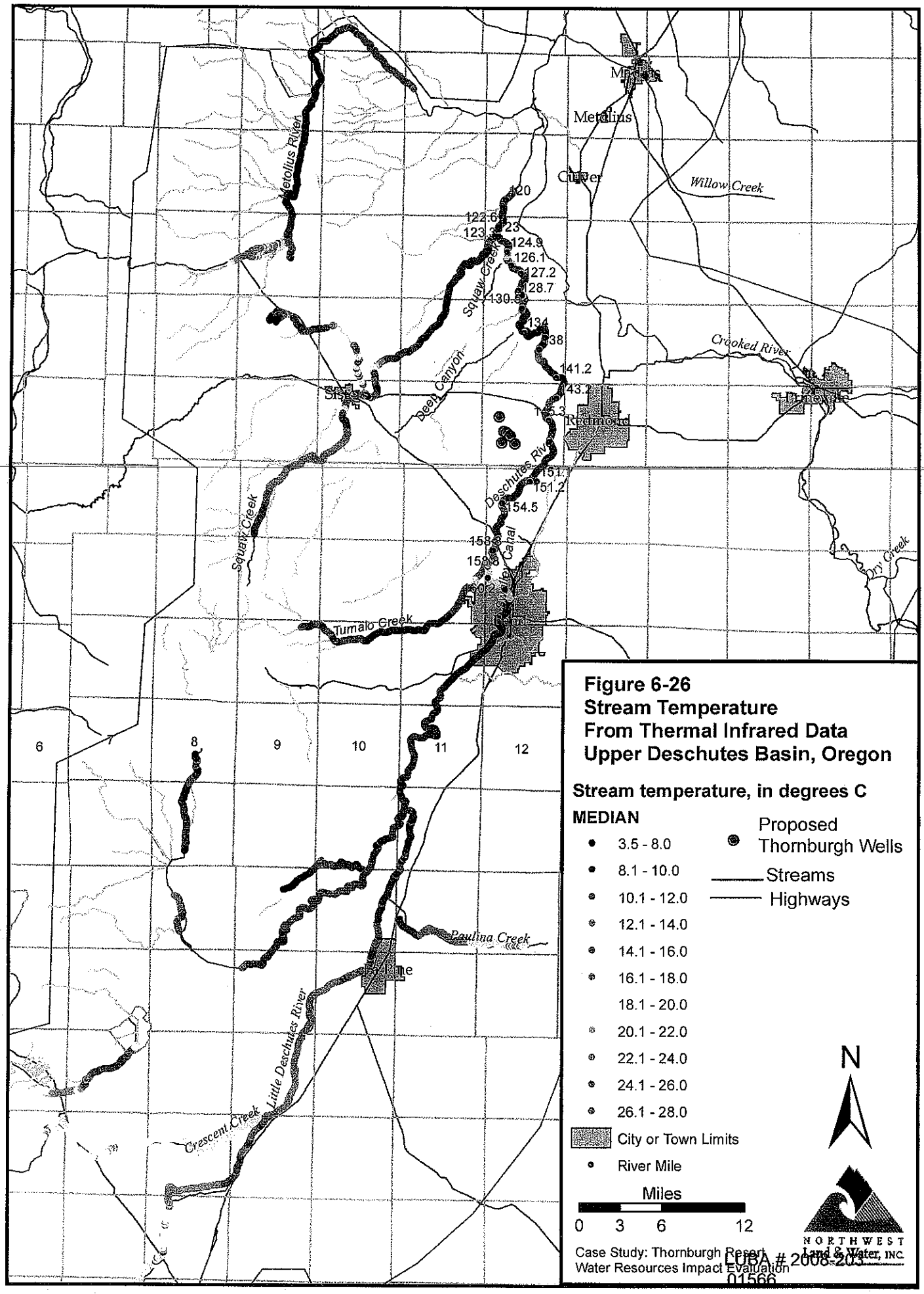
01565
d:\projects\thornburgh\gis\mxds\SeepageData.mxd


Metolius River
Metolius
Culver
Willow Creek
Squaw Creek
Deep Canyon
Sisters
Crooked River
Prineville
Redmond
Deschutes River
Squaw Creek
Tumalo Creek
Bend
Paulina Creek
Prineville
Little Deschutes River
Crescent Creek
120
122.6
123.3
123
124.9
126.1
127.2
128.7
130.5
134
138
141.2
143.2
145.3
151.
151.2
154.5
153
150.8
150.2
6
7
8
9
10
11
12
Figure 6-26
Stream Temperature
From Thermal Infrared Data
Upper Deschutes Basin, Oregon
Stream temperature, in degrees C
MEDIAN
3.5 - 8.0
8.1 - 10.0
10.1 - 12.0
12.1 - 14.0
14.1 - 16.0
16.1 - 18.0
18.1 - 20.0
20.1 - 22.0
22.1 - 24.0
24.1 - 26.0
26.1 - 28.0
Proposed Thornburgh Wells
Streams
Highways
City or Town Limits
River Mile
Miles
0 3 6 12
N
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Water Resources Impact Evaluation
LUBA # 2008-203
01566

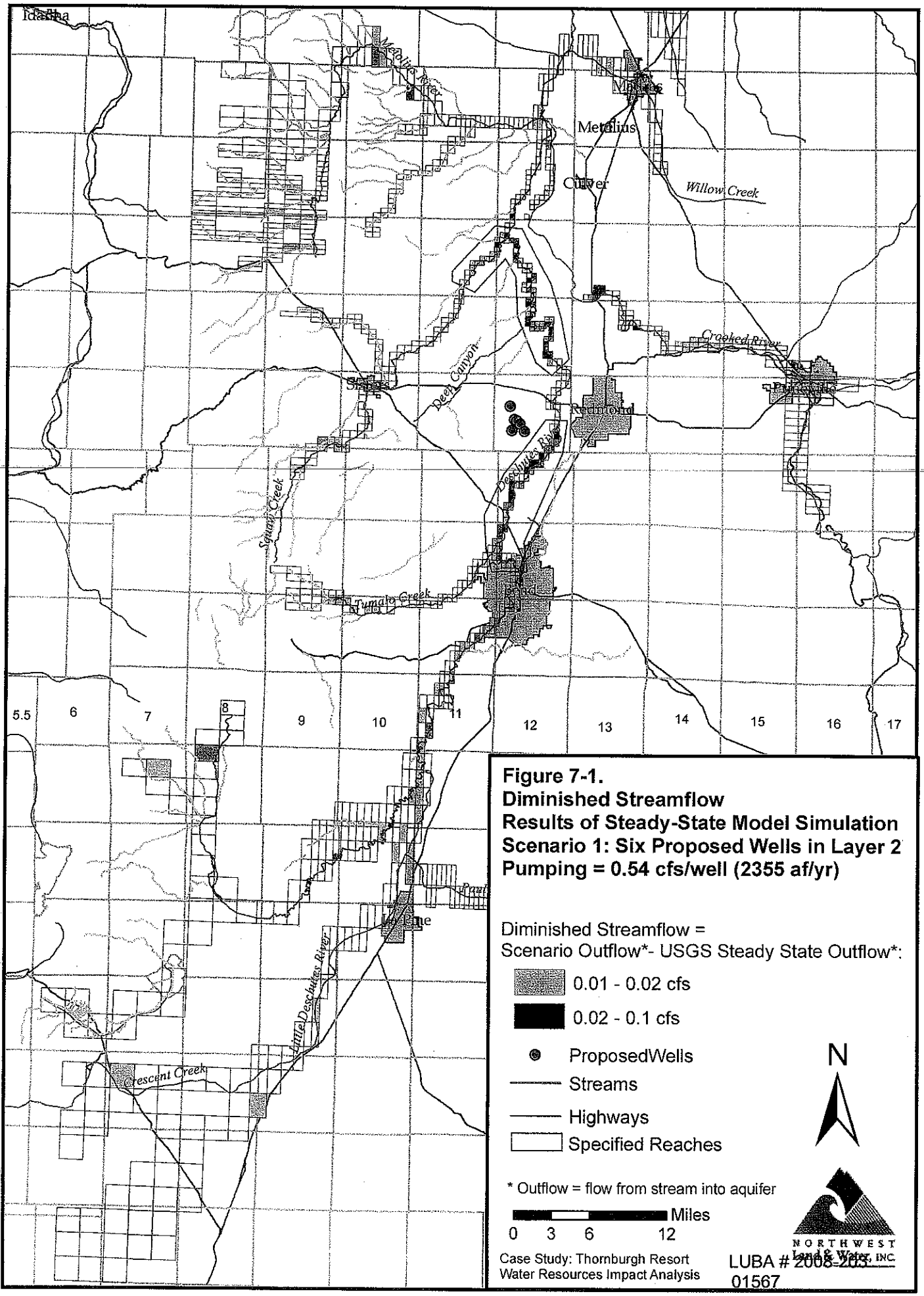


**Figure 7-1.**
**Diminished Streamflow**
**Results of Steady-State Model Simulation**
**Scenario 1: Six Proposed Wells in Layer 2**
**Pumping = 0.54 cfs/well (2355 af/yr)**

Diminished Streamflow =
Scenario Outflow*- USGS Steady State Outflow*:

- 0.01 - 0.02 cfs
- 0.02 - 0.1 cfs
- ProposedWells
- Streams
- Highways
- Specified Reaches

* Outflow = flow from stream into aquifer

Miles
0 3 6 12

N

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01567

Scenario1Qavg-newsolver.mxd

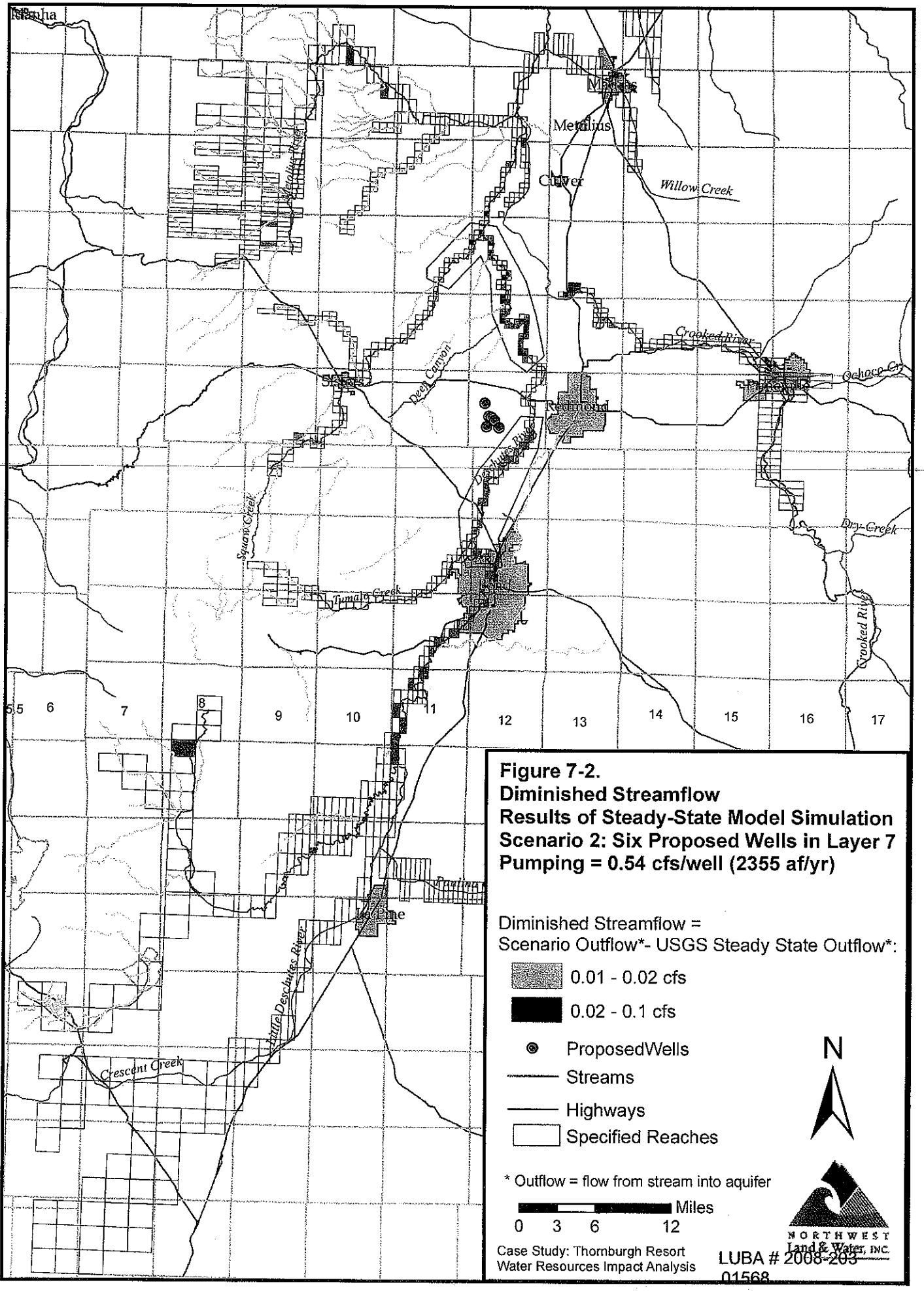


**Figure 7-2.**
**Diminished Streamflow**
**Results of Steady-State Model Simulation**
**Scenario 2: Six Proposed Wells in Layer 7**
**Pumping = 0.54 cfs/well (2355 af/yr)**

Diminished Streamflow =
Scenario Outflow*- USGS Steady State Outflow*:

- 0.01 - 0.02 cfs
- 0.02 - 0.1 cfs
- ProposedWells
- Streams
- Highways
- Specified Reaches

N

* Outflow = flow from stream into aquifer

Miles
0 3 6 12

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Scenario2Qavg-newsolver.mxd

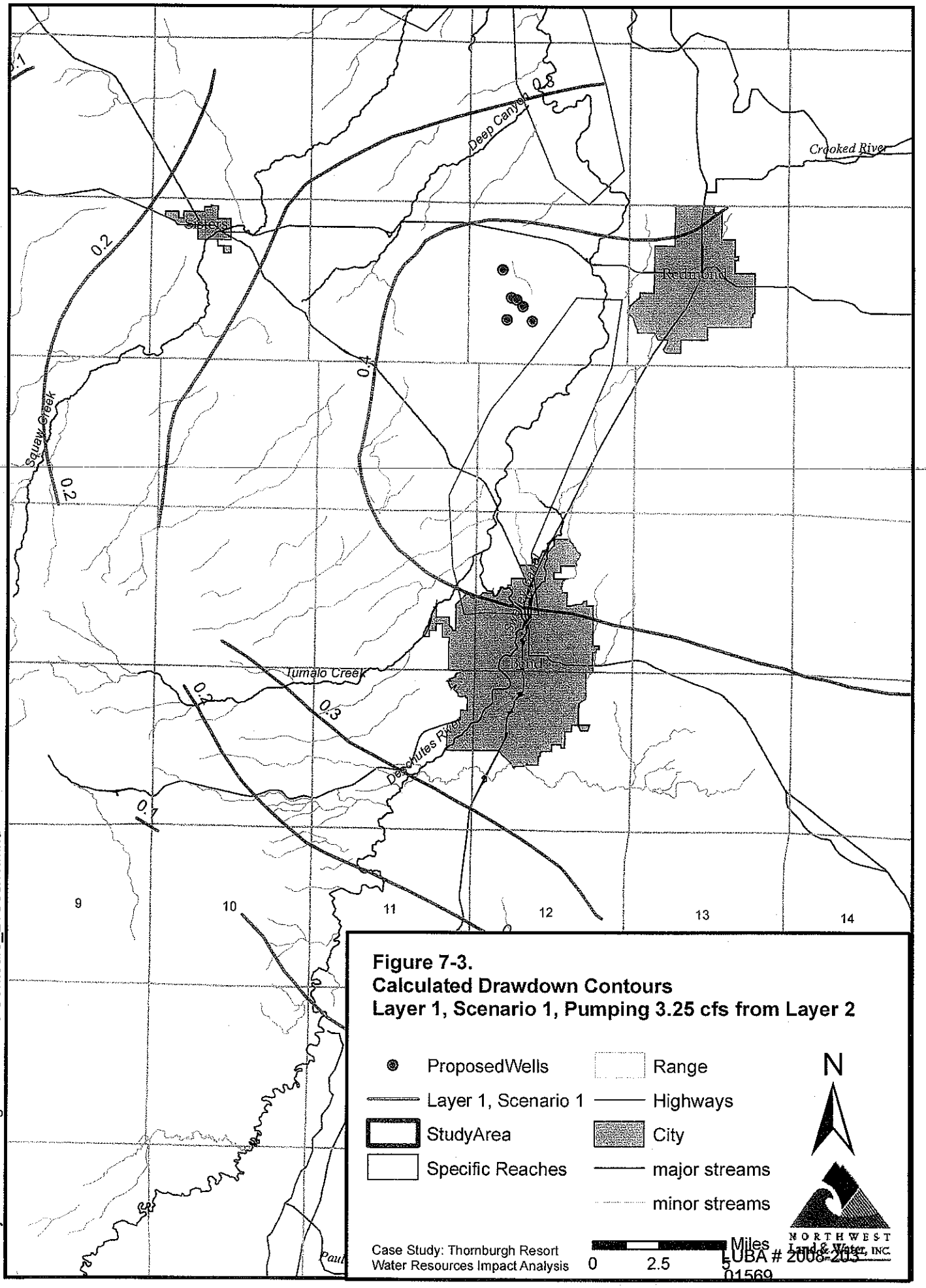


**Figure 7-3.**
**Calculated Drawdown Contours**
**Layer 1, Scenario 1, Pumping 3.25 cfs from Layer 2**

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Water Resources Impact Analysis

D:\Projects\Thornburgh\GIS\MXDs\Contours_L1Scen1.mxd

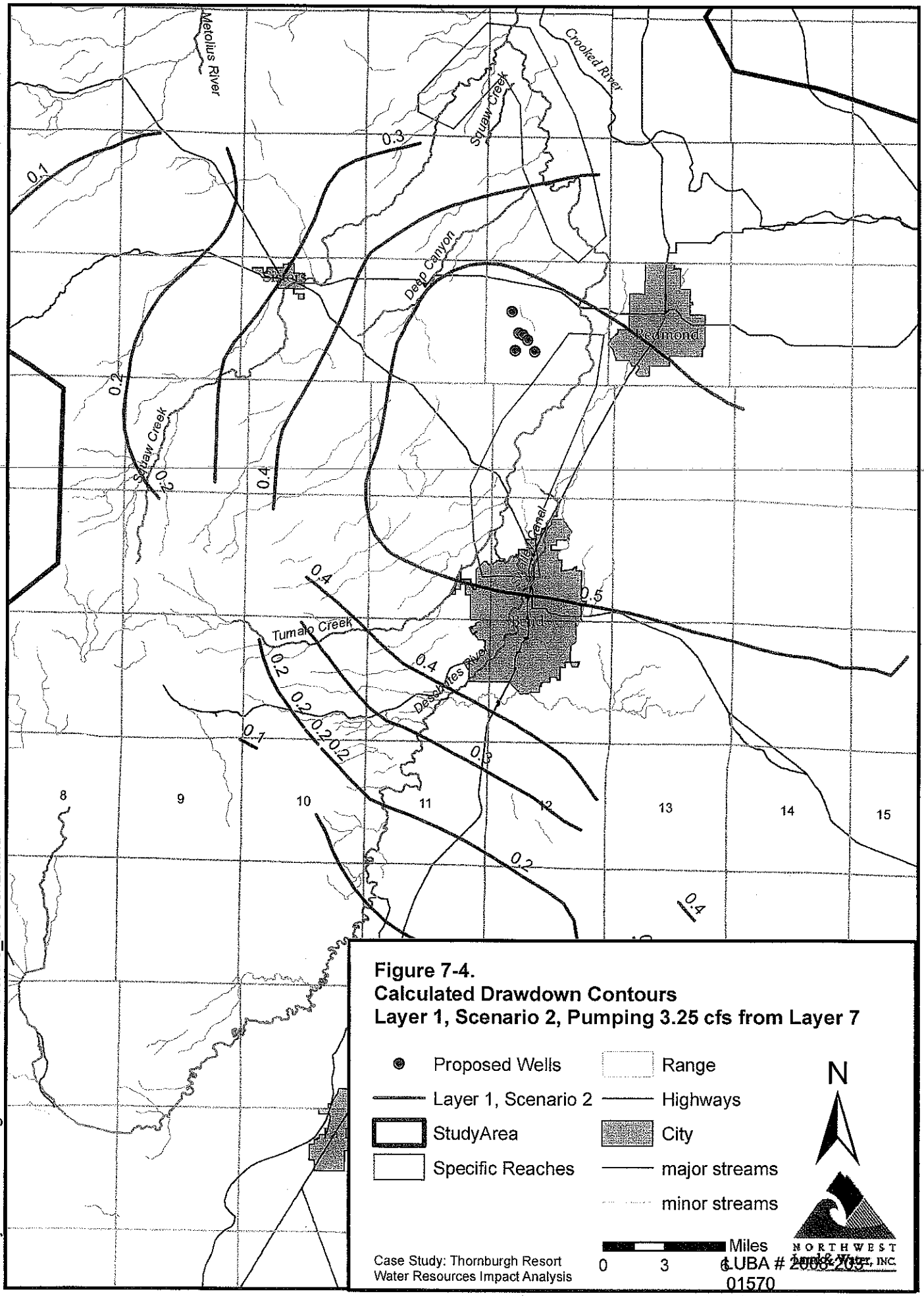


**Figure 7-4.**
**Calculated Drawdown Contours**
**Layer 1, Scenario 2, Pumping 3.25 cfs from Layer 7**

- Proposed Wells
- Layer 1, Scenario 2
- StudyArea
- Specific Reaches
- Range
- Highways
- City
- major streams
- minor streams

N

Miles
0 3 6

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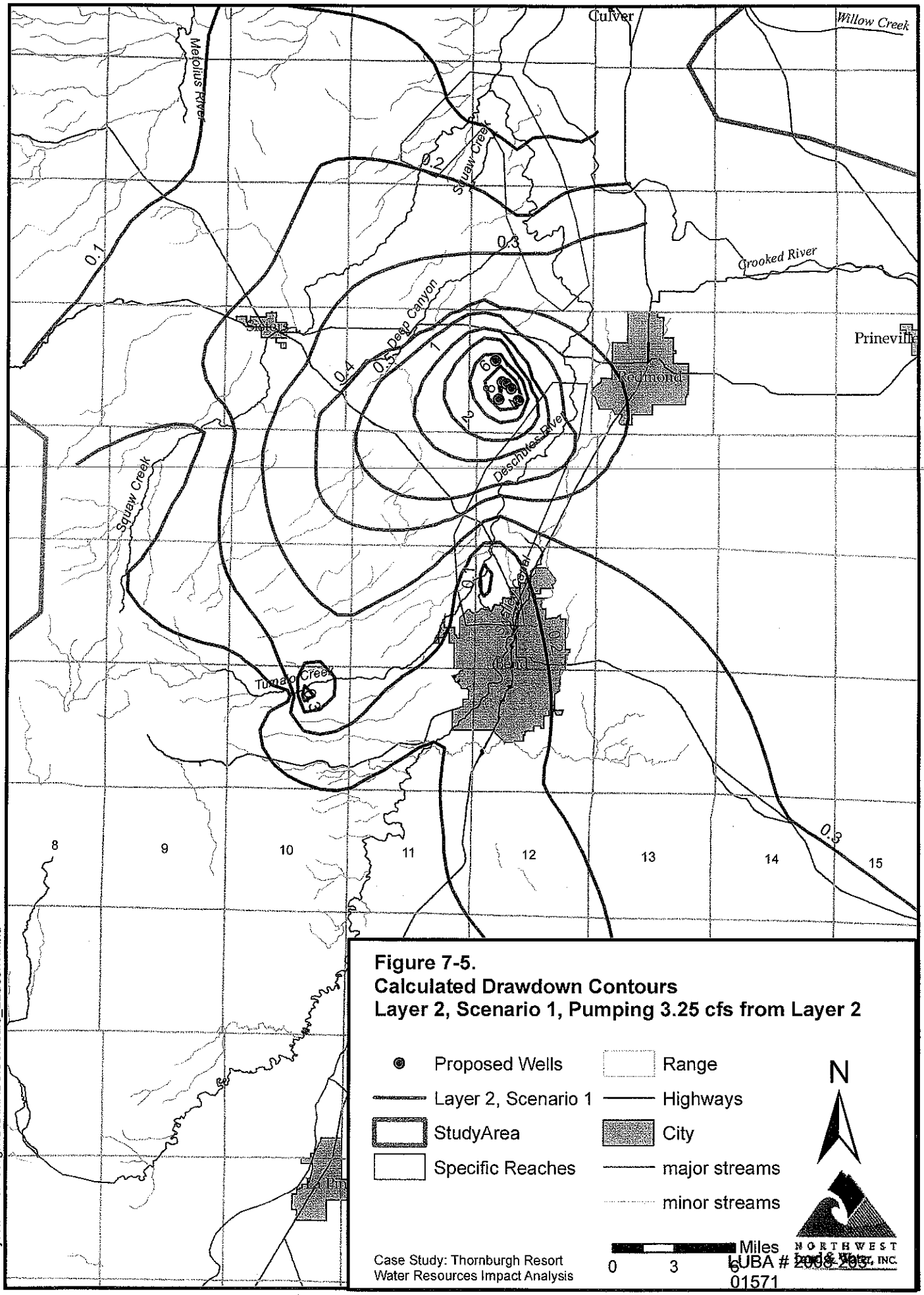
01570




LUBA # 2008-203
01571

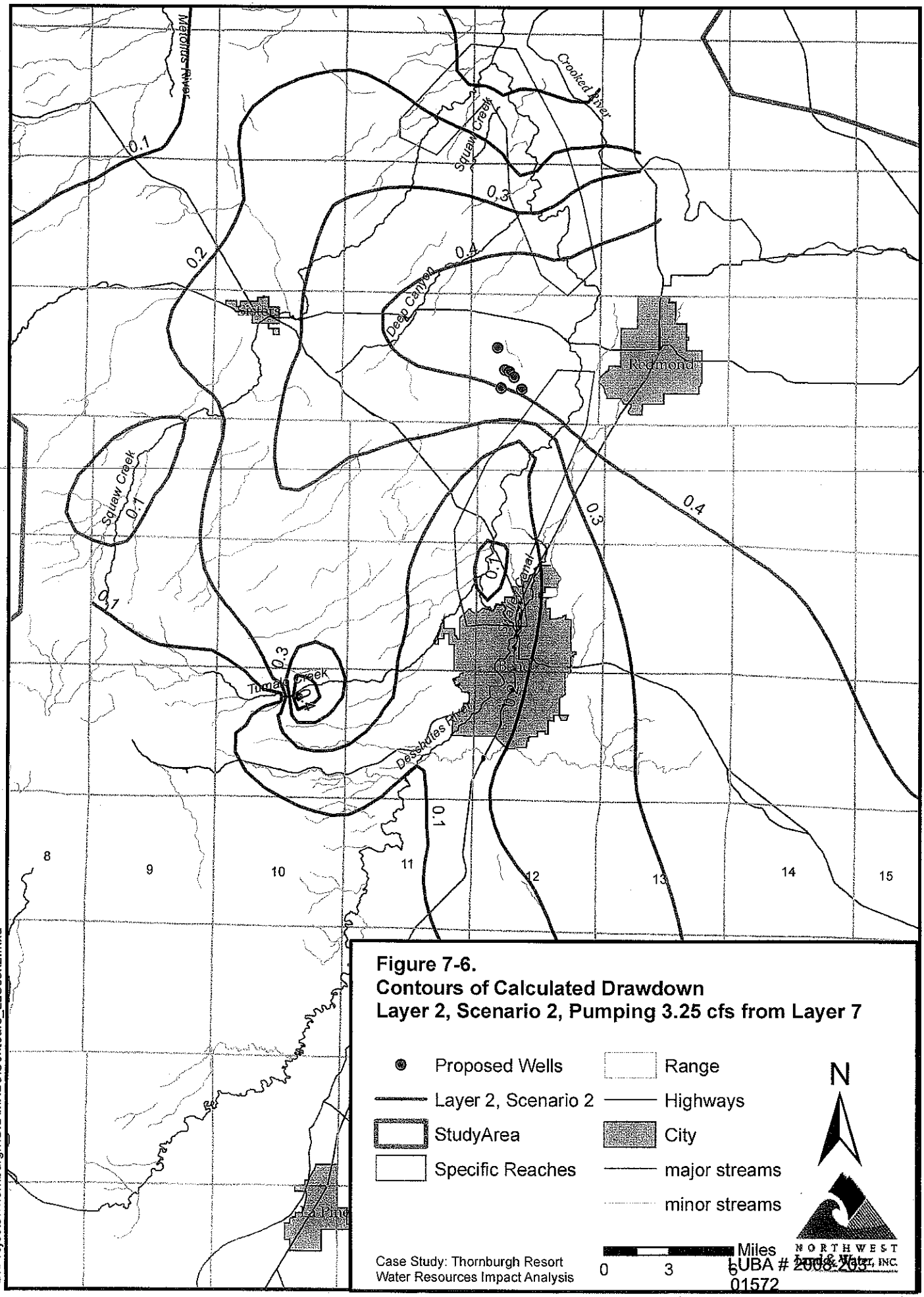



**Figure 7-6.**
**Contours of Calculated Drawdown**
**Layer 2, Scenario 2, Pumping 3.25 cfs from Layer 7**

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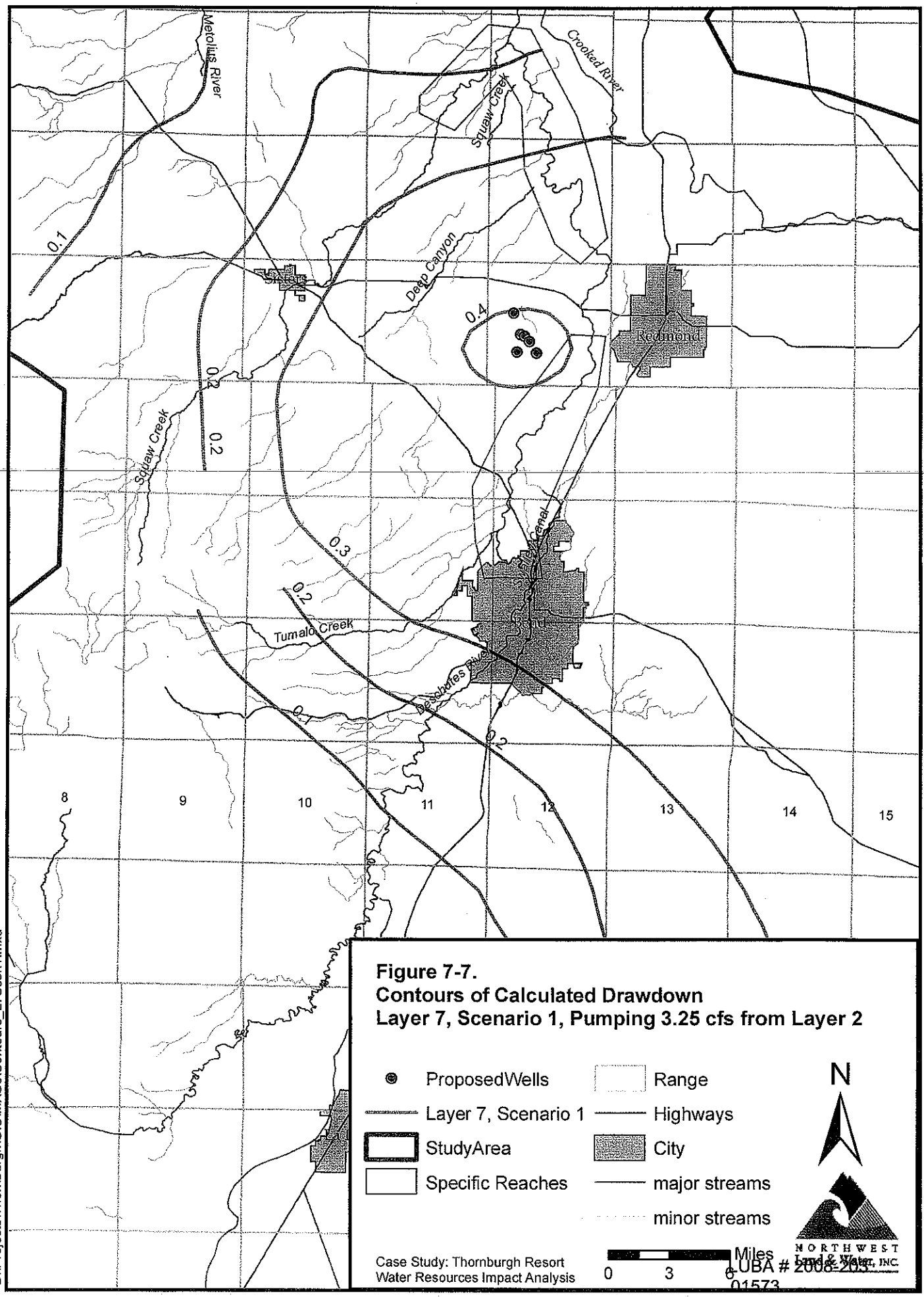
LUBA # 2008-205
01572




LUBA # 2008-203
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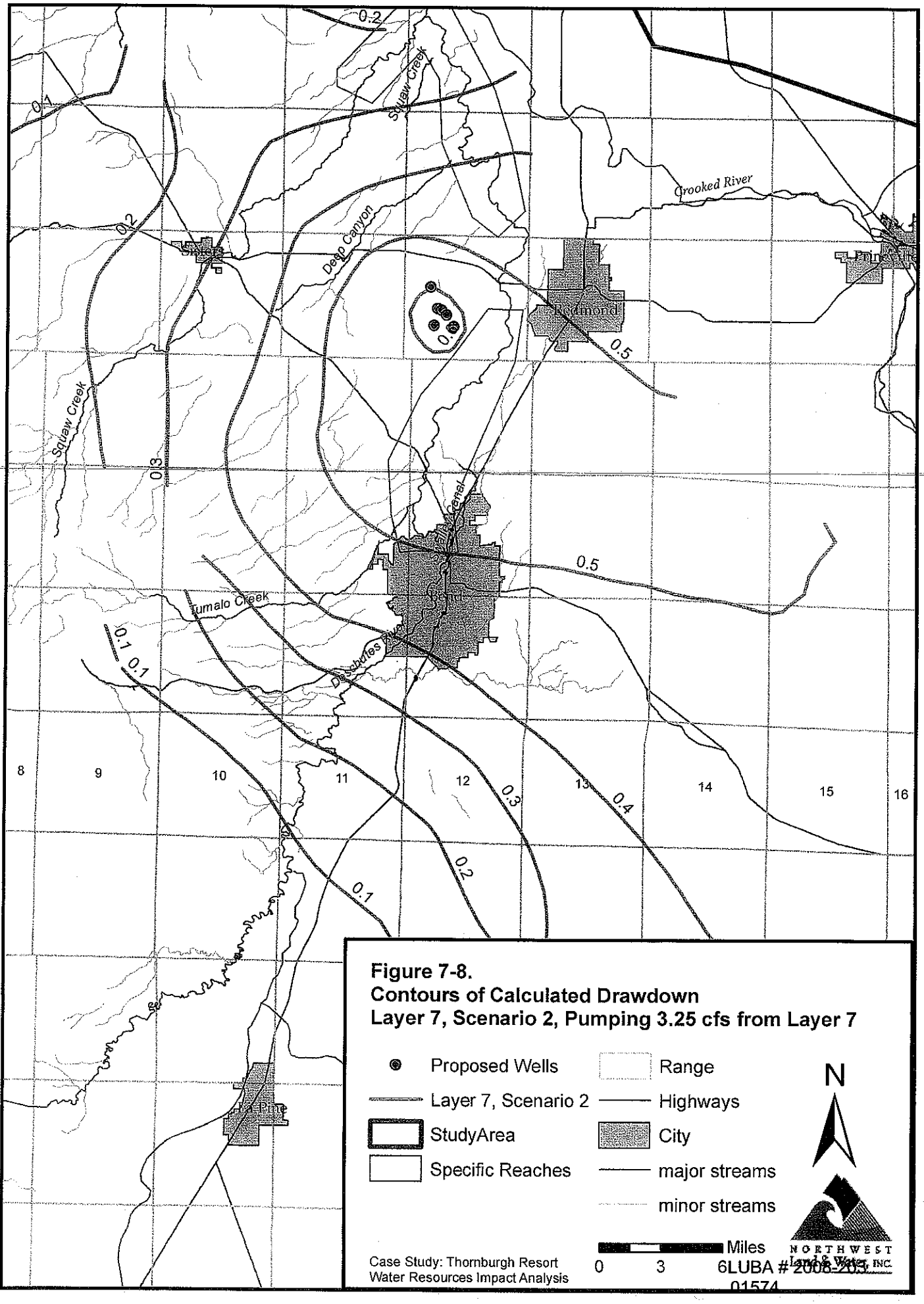


**Figure 7-8.**
**Contours of Calculated Drawdown**
**Layer 7, Scenario 2, Pumping 3.25 cfs from Layer 7**

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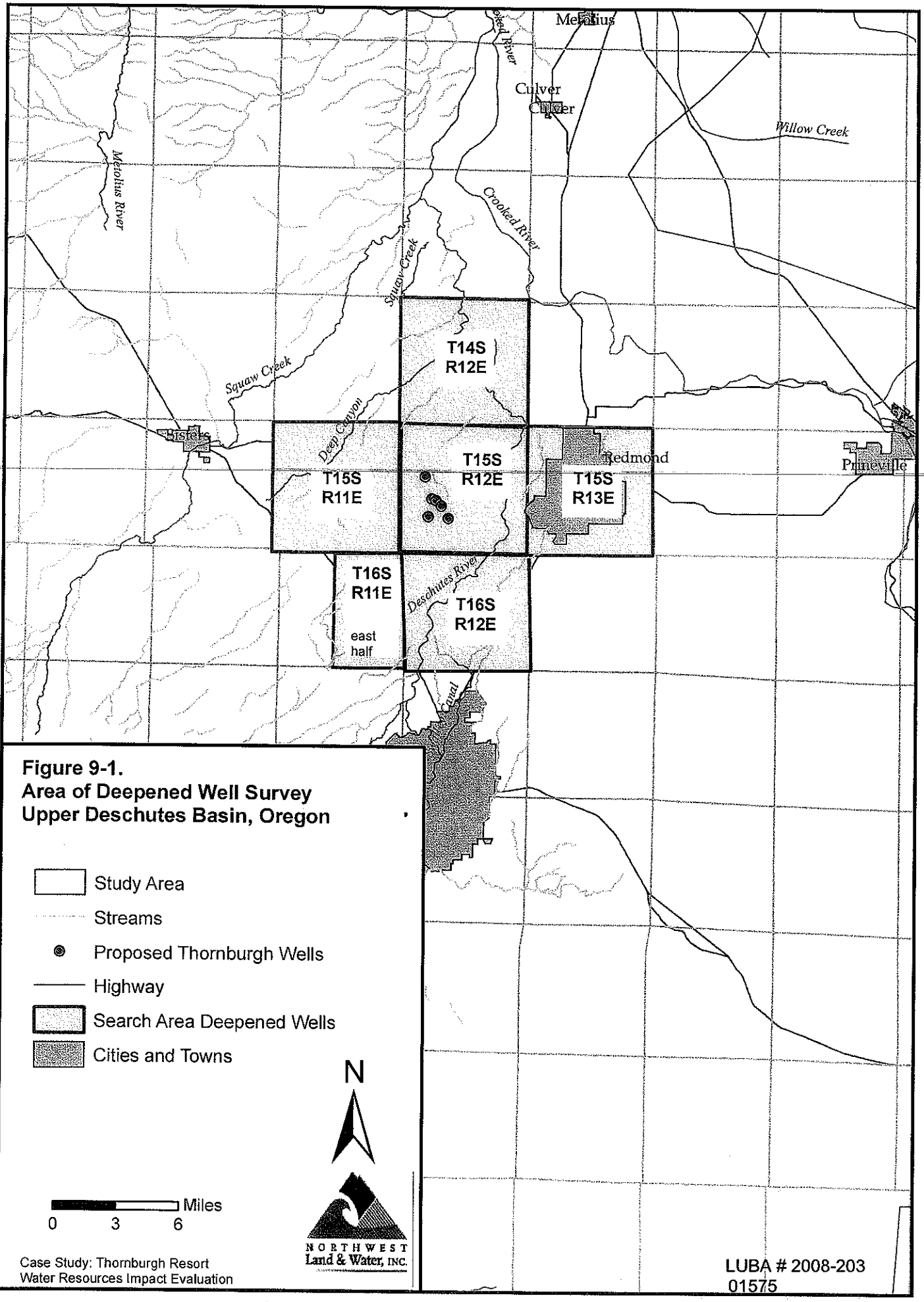
Metolius
Culver
Willow Creek
Metolius River
Crooked River
Squaw Creek
Squaw Creek
Deep Canyon
Sisters
T14S
R12E
T15S
R11E
T15S
R12E
T15S
R13E
Redmond
Prineville
T16S
R11E
east
half
Deschutes River
T16S
R12E
Figure 9-1.
Area of Deepened Well Survey
Upper Deschutes Basin, Oregon
Study Area
Streams
Proposed Thornburgh Wells
Highway
Search Area Deepened Wells
Cities and Towns
N
Miles
0
3
6
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d:\Projects\Thornburgh\GIS\MXDs\DeepenedWellsSearchArea.mxd
LUBA # 2008-203
01575

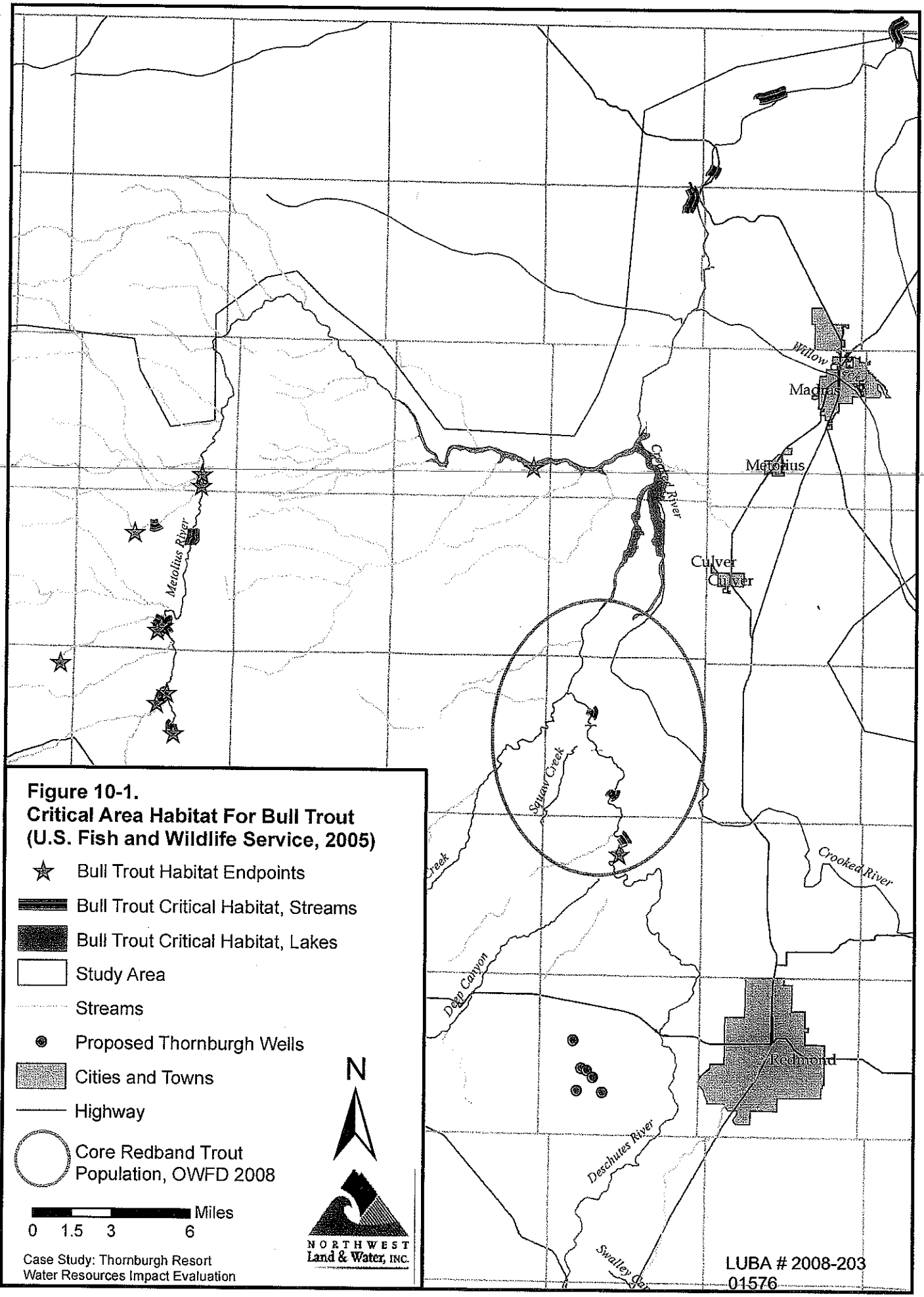


**Figure 10-1.**
**Critical Area Habitat For Bull Trout**
**(U.S. Fish and Wildlife Service, 2005)**

- Bull Trout Habitat Endpoints
- Bull Trout Critical Habitat, Streams
- Bull Trout Critical Habitat, Lakes
- Study Area
- Streams
- Proposed Thornburgh Wells
- Cities and Towns
- Highway
- Core Redband Trout Population, OWFD 2008

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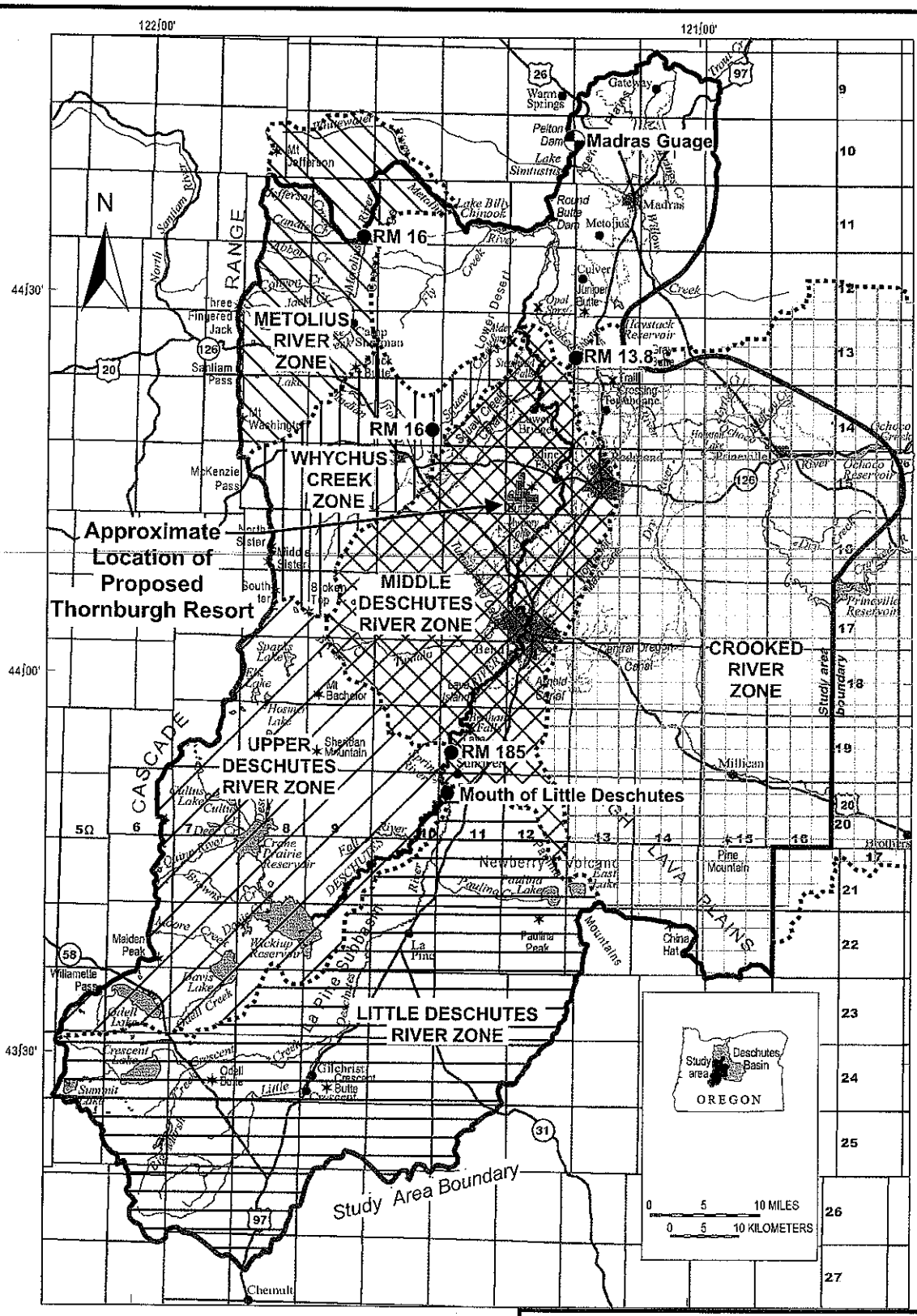
LUBA # 2008-203
01576




Base map taken fromGround-Water hydrology of the Upper Deschutes Basin, Oregon, Water-Resources investigations Relport 00-4162. Deschutes Ground Water Zones of Impact taken from Fig. 10, Deschutes Ground Water Mitigation Program, OWRD, Jan 18, 2008 DRAFT.Proposed Thornburgh Resort and Eagle Crest Resort boundaries taken from Hydrology Report Water Supply Development Feasibility Proposed Thornburgh Resort DCC 18.113.050, 2/2/2005.

**Figure 12-1**
**OWRD Deschutes Ground Water Zones of Impact**

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Mark Yinger ASSOCIATES

LUBA # 2008-203

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