

Final Report

Protection of Groundwater Resources in the Upper Deschutes River Basin, Oregon

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Deschutes County
Community Development Department
Bend, Oregon

www.deschutes.org/cdd/gpp

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Executive Summary

Deschutes County, Oregon, developed, with US Environmental Protection Agency concurrence, a two-part project in 2005 to protect water resources in the Upper Deschutes River watershed (Figure 1) by using onsite wastewater treatment systems (onsite systems). These systems would provide advanced treatment in a rural residential setting spanning a 125 square mile corridor in Central Oregon. The county originally focused the work program on the use of onsite systems because of:

- the county's permitting authority is limited to onsite systems;
- documented public opinion directing the county to avoid using new sewers;
- dispersed, rural patterns of development in the region;
- existing models developed by the U.S. Geological Survey (USGS) showed that groundwater quality can be protected by using onsite systems providing higher levels of wastewater treatment; and
- new state rules (effective March 2005) allowed the county to issue permits for nitrogen reducing onsite systems for the first time.

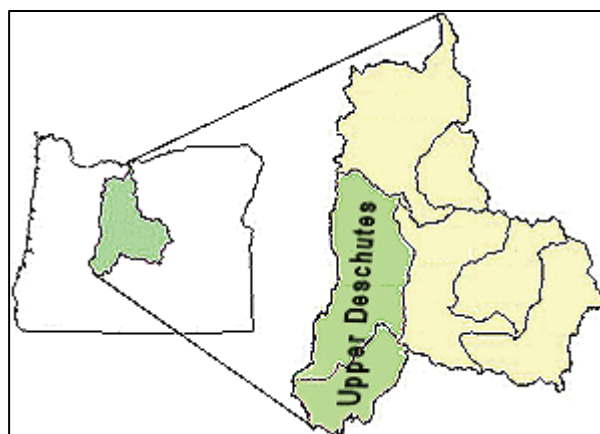


Figure 1: Deschutes River Watershed, Oregon

The grant program described a multi-pronged approach to protecting and improving the aquifer's water quality using performance standards, pollution credits and other incentive programs, and updates to administrative procedures.

The first part of the project was designed to establish the foundation of the groundwater protection program and included:

- using the existing nitrate loading management model (NLMM) developed by the USGS to identify maximum nitrate loading rates for sub regions/neighborhoods that will provide long term compliance with Oregon's groundwater quality standards;
- developing onsite system (onsite system) performance standards;
- researching incentive strategies (financial and regulatory) to retrofit or replace existing onsite systems;
- performing cost / benefit analyses to understand the opportunity costs for selecting different types of denitrifying onsite systems; and
- public outreach.

The second part of the project used the products of the first part to develop policy and regulatory approaches and defined the organizational capacity required to administer program. Identified needs for organizational capacity included:

- operation and maintenance program for new and existing onsite systems,
- designing a groundwater monitoring program, and
- developing financial approaches for providing pollution credits and low-interest loan programs that enable existing property owners to retrofit or replace underperforming systems.



This report also compared the accomplishments of the grant program with an evaluation of those areas where work plan tasks were not attempted or completed. Overall, because of the increased emphasis on the public process related to the Local Rule, slippages in the work program did not have a significant effect on the overall project outcome.

Finally, this report provides an overview of all the accomplishments and products of the Groundwater Protection Project for South Deschutes County. The project website (www.deschutes.org/cdd/gpp/) provides more detail on individual aspects of the project.

Definitions and Acronyms

- Board Deschutes County Board of Commissioners
- La Pine NDP La Pine National Demonstration Project
- NLMM Nitrate Loading Management Model
- ODEQ Oregon Department of Environmental Quality
- Onsite systems Onsite wastewater treatment systems, formerly called septic systems
- PRC Pollution Reduction Credit
- TDC..... Transferable Development Credit
- USGS..... United State Geological Survey



Background

The La Pine sub-basin of the Upper Deschutes River is underlain by a shallow aquifer that currently supplies the primary source of drinking water for approximately 18,000 people. The soils in the region are highly porous and permeable with no impervious layer that protects the aquifer from pollution sources. In addition, the region's soils are young, pumice-based (volcanic), and relatively low in organic matter. Recharge from natural (precipitation) or human (residential onsite system discharges or irrigation) sources moves rapidly down through surface soils to the aquifer.

The water table ranges in depth from less than two feet to about thirty feet below land surface. Recharge (precipitation that reaches groundwater) from infiltration of precipitation averages 2.0 inches per year; the balance of water from precipitation evaporates, transpires, or discharges via surface runoff to rivers. Groundwater discharges in the basin include baseflow contributions to the Deschutes and Little Deschutes Rivers, evapotranspiration by vegetation, and water pumped from wells.

Regional groundwater characteristics include temperatures that are among the lowest in the state, generally 42.5 °F (6 °C) to 48.2 °F (9 °C) and high dissolved oxygen content (3 mg/L to 6 mg/L). Groundwater velocities are low and, at the water table, groundwater is generally oxic (oxygen rich conditions); however, at depths ranging from near zero to more than fifty feet below the water table it becomes suboxic (depleted oxygen conditions) and natural nitrate reduction (denitrification) can occur. Denitrification thus keeps deeper portions of the La Pine aquifer essentially nitrate-free, but the oxic portions remain vulnerable to nitrate contamination from onsite systems, the primary anthropogenic source. Nitrate contamination of the oxic groundwater is a concern in this region because the shallow oxic aquifer is the desired drinking water supply for individual domestic wells and because of the potential for nitrogen-enriched groundwater to discharge to the nitrogen-limited rivers in the region.

Development in rural areas threatens groundwater quality in southern Deschutes County through onsite system discharges. About fifteen thousand lots of one-half to one-acre in size were platted prior to enactment of Oregon's land use planning laws in the 1960s and 1970s. These lots are located within a 125 square mile corridor near the scenic Deschutes River and the Little Deschutes River. Subdivision developers marketed these lots nationally with no promise of infrastructure improvements and without an understanding of the region's high water table or the aquifer's vulnerability. Currently, about 6,400 improved lots in the La Pine region study area use conventional onsite systems and individually owned drinking water wells. Most of these wells draw from the most vulnerable upper 100 feet of the aquifer.

At least 5,000 lots are likely to develop in the coming years based on the county's population projections. Deschutes County had the highest percent change in population of all the Oregon counties – almost 54 percent – between the 1990 Census and 2000 Census. Projected buildout will occur within twenty years if the 1990 to 1999 building rate of 250 homes per year continues. Based on these projections, there will be 26,000 people occupying approximately 9,700 homes served by onsite systems by 2025.

Incorporating the development projections provided above, the U.S. Geological Survey (USGS) produced a three-dimensional groundwater and nitrate fate and transport model that estimated average nitrate concentrations would triple within forty years if all new homes continue using standard or sand-filter systems (Morgan, et al, 2007). Continual reliance on conventional onsite systems would cause nitrate concentrations to exceed federal drinking water (10 mg/L nitrate as N) and state groundwater protection standards (7 mg/L nitrate as N) over large areas within the community.



An extensive public process in the late 1990s used studies completed in the region and resulted in feedback from area residents stating that centralized sewer or water systems were socially and economically infeasible in the La Pine sub-basin. Existing state laws limit centralized wastewater treatment systems in unincorporated areas and most residents in the La Pine region are of low or fixed incomes. Other community values articulated at this time emphasized the desire for comprehensive land use planning to ensure the region retains its rural character. According to March 1998 economic data for the La Pine region, 49.7% of the population is below the low to moderate-income threshold.

Purpose and Goals

Deschutes County implemented a groundwater protection program in recognition of the potential for conventional wastewater management practices and additional future growth to pollute groundwater resources in the region and create negative effects on surface water quality. Currently, the region produces high quality drinking water but groundwater investigations have shown water quality declines within the region. The groundwater protection program recognizes four main goals:

- Prevent groundwater pollution levels from triggering a moratorium on future development on legal lots of record;
- Protect the aquifer that provides the only source of drinking water to the residents in south Deschutes County by maintaining compliance with State groundwater quality standards (7 mg/L) and Federal drinking water standards (10 mg/L) for nitrate-nitrogen concentrations;
- Use results from an existing model to create a watershed-scale management system for existing and future wastewater treatment systems; and
- Document decision-making processes, tools and lessons learned as resources for other communities pursuing watershed-scale management of wastewater treatment systems.

Summary of Achievements and Products

The main achievements of the project are summarized here with detail on the tasks provided below.

A. Creation of the Pollution Reduction Credit Program

The Pollution Reduction Credit Program (PRC) is a financial incentive program that benefits property owners responsible for upgrading their existing onsite systems. This program directs financial resources generated by development of specific county-owned property to owners with existing onsite systems with the goal of reducing the total quantity of nitrate discharged to groundwater serving as drinking water supply for the region.

B. Local rule to require groundwater protection action added to Deschutes County Code

Deschutes County Code Chapter 13.14, adopted July 23, 2008 and effective October 23, 2008, requires all property owners in unsewered areas of southern Deschutes County to take action to protect groundwater quality by November 2022. The county's permitting jurisdiction is limited to onsite systems, which is the reason the county code focuses primarily on upgrades. However, the code also specifies that other approaches may be



used to meet groundwater protection goals, including connection to sewer and innovative techniques that are either not onsite or sewer systems or that have not yet been invented.

C. Recommendations on development of a Financial Assistance Program

The Deschutes County Board of Commissioners convened an advisory committee to provide feedback on community values related to how financial assistance should be provided to homeowners. The Board provided a specific charter for the advisory committee to focus discussions and gain specific feedback on community values. County staff, in the document entitled "Financial Assistance Overview," provided background on basic demographics, county financial assets, projected costs of meeting groundwater protection goals, and proposed financial assistance programs (including loans and grants).

D. Operation and Maintenance Program

The Deschutes County Community Development Department upgraded the permit tracking database to help the county and homeowners comply with state rule. The new features allow the Environmental Health Division to track systems with required maintenance activities, generate automatic reminders to homeowners and maintenance service providers, and maintain records for long term public use.

E. Implementation Plans

An important component of any work program is how products are put to use. In this project, the adoption of a significant piece of local legislation requires a series of short-term administrative actions. In addition, many long-term plans, programs or actions need to be started or established to ensure groundwater protection goals are addressed into the future in a coordinated manner. Deschutes County developed a short-term implementation plan for actions needed following adoption of the county code for onsite system upgrades. The county also developed a long-range implementation plan for regional groundwater protection actions that include the financial assistance program, environmental monitoring, interagency/public coordination, pursuit of grant opportunities, and public information and involvement.

Tasks

The county used a project team approach (Figure 2) for project planning and action items to benefit from diverse backgrounds and perspectives available from different departmental programs. For example, while both the TDC/PRC amendment and the Local Rule are not land use issues, the project team decided to use the land use public involvement process as a model for these legislative actions. This approach allowed for multiple public hearings and extensive public comment periods. The fact that the team approach included managers in addition to staff level professionals meant that interdepartmental communications and priority setting actions were streamlined. The team approach also helped distribute the workload during public meetings and events because all team members were able to speak knowledgeably about the project.

Project team members included interdisciplinary professionals from the Deschutes County Community Development Department. The team included the Deschutes County Community Development Department Director, Planning (Land Use) Director, Environmental Health Director, Senior Analyst, Senior Environmental Health Planner, Principal Planner, and



Registered Environmental Health Specialist. Specific individuals had assigned project administration duties (primarily budget tracking & reporting).

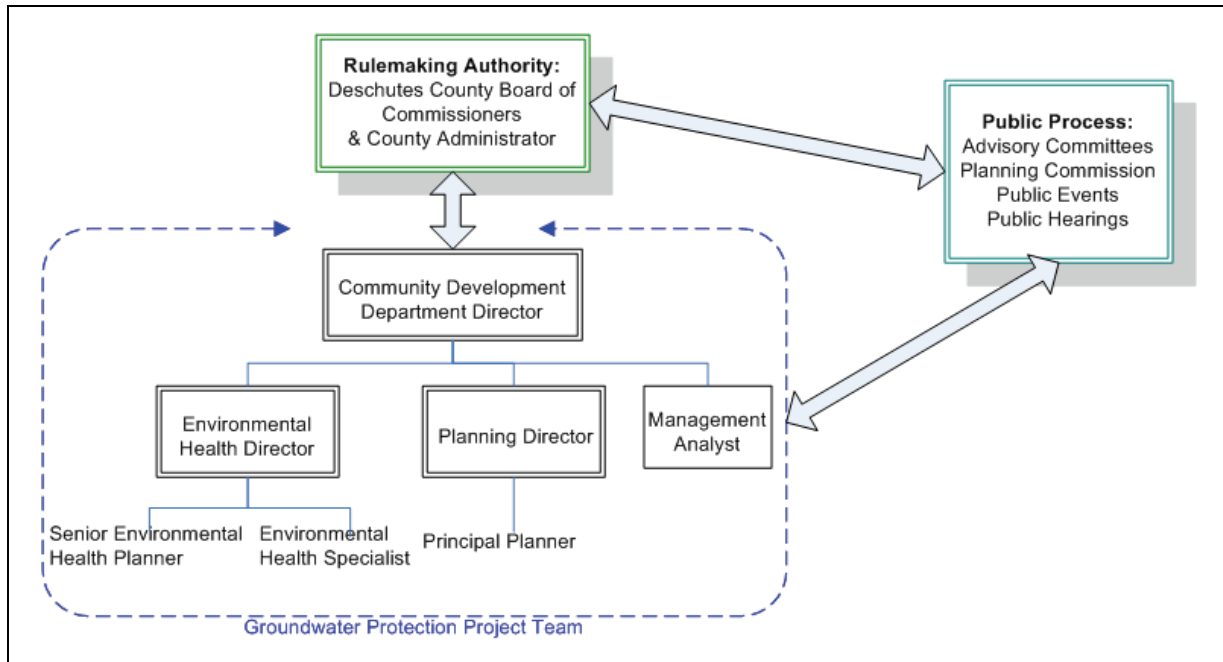


Figure 2: Groundwater Protection Project Team

Task A. Transferable Development Credit Program Amendment

Background and Purpose

Deschutes County adopted the original Transferable Development Credit (TDC) Program in 2002 as one part of the solution to the groundwater pollution problem in the upper Deschutes basin. Originally, a TDC was defined as the development right attached to eligible properties in southern Deschutes County. The goal of the original TDC program was to reduce the total number of onsite systems in rural areas (sending area) by transferring development to a receiving area served by community sewer and water systems.

The receiving area is approximately 500 acres purchased by the county from the Bureau of Land Management (Figure 3). Proceeds from the development of this land are dedicated to helping with groundwater pollution from rural residential development in the sending area. Residential development occurring within this neighborhood (the Neighborhood Planning Area, now included within the city limits of La Pine) is required to obtain TDCs as part of the approval process for new subdivisions.

This project proposed to investigate potential changes to the TDC program to enhance its ability to promote groundwater protection by using the development market to help reduce pollution discharged by existing rural residential development.



Public process

1. Transferable Development Credit Technical Advisory Committee

Deschutes County Community Development Department works with an advisory committee to obtain feedback and recommendations for changes to the TDC program. The county convened the advisory committee in July 2005 to help define how the pollution reduction capability of TDC program could be expanded.

The advisory committee met monthly between July and December 2005. By the end of this working period, the committee agreed on basic recommendations on the TDC program and provided preliminary input on a county code that requires the use of nitrogen reducing systems.

The following recommendations were developed by the committee:

- a) All Neighborhood Planning Area funds should be targeted at retrofitting existing systems.
- b) New development installs best available technology (treats to highest standard achievable with currently approved systems).
- c) The level of treatment for existing development will be based on the Optimization model, which is the science based decision making tool to:
 - Identify the average performance standards for existing systems by management area;
 - Identify the high priority areas to target first for retrofits; and
 - Help measure the success of the program over time.

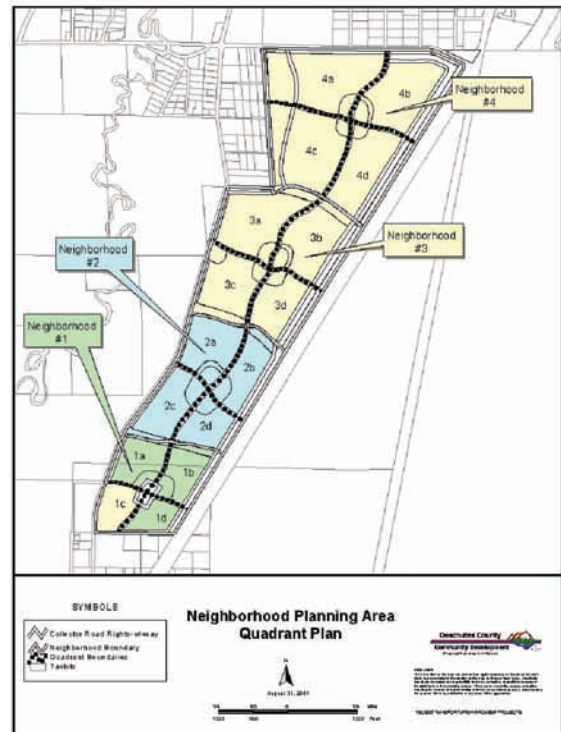


Figure 3: Neighborhood Planning Area, the receiving area for TDCs

The county recognized at this time that amendments to the TDC program would only be successfully implemented if a separate county code was adopted that required the use of nitrogen reducing system to protect groundwater quality. Without this groundwater protection rule, the county would have to rely on voluntary upgrades to existing onsite systems.

Using the advisory committee recommendations, staff developed the Pollution Reduction Credit program and related code amendments and materials for the public process. The amendments create Pollution Reduction Credits (PRCs) that can be used alone or in combination with Transferable Development Credits (TDCs). PRCs are created when residents retrofit existing onsite systems to reduce pollution from existing development. This is in contrast with TDCs that eliminate the potential for future development, and therefore, future pollution. Like TDCs, specific numbers of PRCs are required for development in the Neighborhood Planning Area. Neighborhood Planning Area



developers can work directly with homeowners to retrofit existing onsite systems with nitrogen-reducing technologies or designs or pay into the "Partnership Fund" that would then be used for financial assistance to property owners interested in retrofitting their existing onsite systems.

These revisions were presented to the advisory committee in April 2006 before proceeding to the Deschutes County Planning Commission.

2. Deschutes County Planning Commission

Staff presented the work of the advisory committee and the Pollution Reduction Credit code amendments to the Deschutes County Planning Commission during public work sessions and a hearing held in April and May 2006. Public testimony received during this process was unanimously in favor of the proposed amendments. The planning commission forwarded a recommendation to approve the amendments to the Board of County Commissioners.

3. Board of County Commissioners

The Board of County Commissioners held public work sessions and a hearing during May 2006. Testimony received during the public hearing was unanimously in favor of the proposed amendments. On June 5, 2006, the Deschutes County Board of Commissioners adopted the amendments to the county Transferable Development Credit Program in Deschutes County Code Chapter 11.12. The adopted amendments to the Transferable Development Credit Program (DCC 11.12) and supporting documents are provided in Appendix A.

4. Product / outcome / measures of success

The primary product of this portion of the work program is the adopted change to Deschutes County Code (Appendix A). Another measure of success is the number of PRCs created since the code became effective. Up to the time of this report there have been 17 nitrogen reducing system permits applied for or installed. This number of upgrades compared with the nearly 300 permits issued for conventional systems since the PRC program went into effect, is a measure of the effectiveness of the financial incentive provided by the PRC program in the absence of any regulatory requirement to upgrade systems.

The creation of PRCs will be tracked over time through the electronic permit tracking database used by the Community Development Department. The existing permit database has been modified as part of this project to account for PRCs. This system will track PRCs as they are created, sold, and transferred to developments in the Neighborhood Planning Area.

Task B. Local Rule for Groundwater Protection in Southern Deschutes County

The following provides an overview of public involvement actions and the development of the new Deschutes County Code requiring groundwater protection actions. Appendix B provides more detailed information, including the adopted code.

1. Background and Purpose

Extensive field research and study by the Oregon Department of Environmental Quality and the US Geological Survey has shown that the groundwater underlying southern Deschutes County is threatened by pollution from continued use of traditional onsite systems (standard, pressure distribution and sand filter systems).



The EPA funded the Oregon Department of Environmental Quality (DEQ) to undertake the La Pine National Demonstration Project (La Pine NDP), in partnership with Deschutes County, to test denitrifying onsite systems. The La Pine NDP found that several systems can substantially reduce nitrogen (and other pollutant) loading and protect the groundwater in a manner that meets adopted Comprehensive Plan goals and policies for Regional Problem Solving for South Deschutes County.

The demonstration project led the DEQ to draft and ultimately adopt rule changes to Oregon Administrative Rules pertaining to onsite wastewater treatment. These new rules, which became effective on March 1, 2005, make it easier for property owners in Oregon to use alternative treatment technologies by simplifying the permitting process and requiring the certification of installers and maintenance providers.

Discussions about actions needed to protect and enhance water quality in southern Deschutes County began with a working group that recommended a specific rule for south Deschutes County (Recommendation for Action and Consideration of a Geographic Rule, 1999) and culminated with the recommendation of an advisory committee (TDC Technical Advisory Committee) that met between July 2005 and April 2006. Public feedback (gained during the Regional Problem Solving Project and while working with specific groups or committees) and new statewide rules, Deschutes County drafted the Local Rule, now adopted as Deschutes County Code Chapter 13.14, to protect and improve the drinking water source for the region.

Potential benefits to this approach include:

- Cost of implementation is incurred over a long timeframe (14 years)
- The long implementation period provides a significant amount of time during which the county's financial assistance program can develop additional funding sources
- Groundwater protection begins immediately upon upgrade of an existing system
- Natural groundwater and surface water recharge patterns are maintained
- Innovations in technologies or system designs can be incorporated over time for improvements in costs and/or treatment capability
- Use of soil based systems provides significant environmental protection from pharmaceuticals and other emerging contaminants discharged in residential sewage (Hinkle, et al, 2005)

2. Performance standards

After preliminary work with the USGS to understand how the Nitrate Loading Management Model (NLMM) can be used, including understanding the limitations of the model, county staff developed a series of scenarios to illustrate how the model produces area specific treatment standards that change in response to water quality protection goals. For example, the treatment standard required for a particular area may change if the maximum level of nitrate allowed in the groundwater changes from 10 mg/L to 7 mg/L (7 mg/L nitrate as N is the Oregon Groundwater Protection standard that trigger state action). Also, the treatment standard may change depending on the minimum performance standard established for future development. A requirement that all future development installs systems that achieve at least 79% nitrogen reduction can lower the performance standards for existing development as compared to the effect of a requirement that all future development installs systems that achieve a minimum of 58% reduction.



Staff presented a range of scenarios to the TDC Technical Advisory Committee to obtain feedback on the various approaches. By December 2005, when the advisory committee produced draft recommendations, they recommended that because everyone contributes to the groundwater pollution problem, then everyone should contribute to the solution. In addition, because owners who are developing vacant land have financing opportunities that may not be available to existing residents, the committee recommended that new development should meet the highest performance standard achievable with available technologies.

Based on onsite system performance capabilities, the direction to have all property owners contribute to groundwater protection translated into a minimum of 35% reduction or approximately 30 mg/L nitrate as N in the effluent. This standard was used because, in 2005, several systems that participated in the La Pine NDP could meet this standard. In addition, the demonstration project systems capable of meeting a 35% reduction standard tended to cost less than better performing systems. The NLMM provided the final test by showing that groundwater quality could be maintained using 35% reduction as the lowest standard. This standard is about equal to a maximum of 30 mg/L nitrate as N in the effluent.

At the other end of the range, the best performing system in the demonstration project was able to achieve at least 96% reduction. However, in order to reflect a larger category of systems, and therefore increase homeowner choices, the NLMM scenarios were developed using a minimum of 79% reduction for the highest treatment standard. This allowed the highest treatment standard to promote a variety of systems rather than create a monopoly for the one system that could achieve the standard. Again, the NLMM results showed that groundwater quality could be protected using 79% reduction (roughly equal to a maximum of 10 mg/L nitrate as N in the effluent) as the maximum performance standard.

By the time the Board of County Commissioners adopted the new county code to require the use of nitrogen reducing onsite systems, the population of existing onsite systems needing upgrades had increased to about 6,500 systems. Approximately 2000-3,000 lots remain that have development potential (the number of potential lots is uncertain because many of these lots are tentatively mapped as high groundwater lots (less than 24 inches to groundwater). Development potential on these lots cannot be finally determined until a site-specific evaluation is completed.

The staff team discussed the capability of the NLMM to define the highest priority areas to target with upgrades. Target areas were not established as part of the retrofit program because:

- Hydrogeologic interconnections between areas in the region result in situations where the groundwater pollution problem in a specific area cannot be solved unless pollution from adjacent areas is reduced at the same time. This result is caused by regional groundwater flow patterns that carry pollution from one area into the groundwater underlying down-gradient or “downstream” areas. In other words, high concentrations in one area may be caused by pollution sources from that specific area plus developed areas that are up gradient or “up-stream.”
- Targeting areas with higher levels of existing contamination ignores the opportunity to prevent groundwater pollution in other areas. Groundwater sampling and modeling show that most pollution currently lies above the level of the aquifer that is typically used for drinking water supply. However, pollution, as it continues over time, is moving to deeper levels of the aquifer where drinking



water wells are screened. The only way that this portion of the aquifer can cleanse itself is to stop or slow incoming pollution and allow the nitrate-enriched water to move out of the groundwater system by discharging to streams or to be naturally denitrified at depth in the anoxic portions of the aquifer.

Using the information and experience gained from the discussions described above, staff used the NLMM to produce the performance standards for existing development shown in Figure 4. The performance standard for new development is not mapped because it is a minimum standard (79% reduction) regardless of location. This figure reproduces the exhibit adopted with the county code adopted July 23, 2008 and is provided in larger format in Appendix B.

Constraint:

1. Oregon groundwater quality standard of 7 mg/L nitrate as N in the shallow aquifer
2. Future development achieves at least 79% reduction (at most 10 mg/L nitrate as N in the effluent)
3. Existing development achieves a minimum 35% nitrogen reduction (Figure 2 shows that minimum performance standards in some areas need to be greater than 35% reduction to meet the Oregon groundwater quality standard)

3. Cost / benefit analysis

Public opinion obtained in 1998 following publication of a feasibility study for community and regional sewers directed the county to pursue onsite systems as a potentially less expensive and more sustainable way of solving the groundwater problem. The county, as part of the original work plan for this project, proposed to compare the status quo approach (conventional onsite systems) with other development scenarios that include a variety of treatment standards for nitrogen reducing onsite systems. In addition to what was proposed in the work plan, the county compared the onsite system approach with information available from existing sources about the cost of community and/or regional sewers.

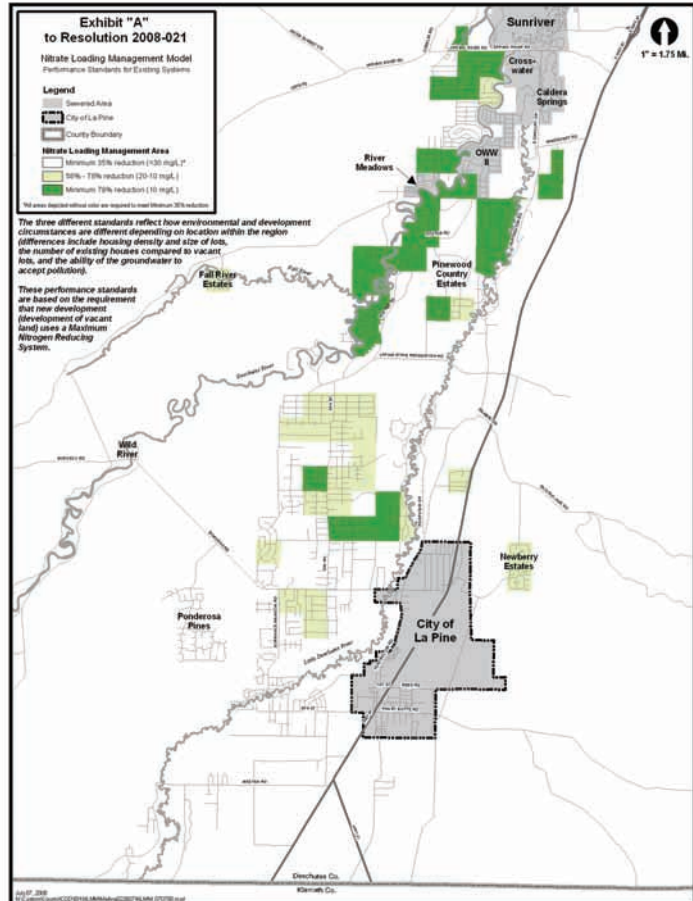


Figure 4: Performance standards produced by the NLMM



Table 1: Onsite System Costs

	2000-2001 La Pine National Demonstration Project	2008
Standard	\$3,500	\$4,000
Bottomless sand filter	\$8,000	\$11,000
Nitrogen reducing (New installations)	\$8,900 - \$19,000	\$8,800 - \$15,200
Nitrogen reducing (Retrofits)	\$3,500 - \$18,900	\$10,700 - \$17,200
Maintenance provider costs	\$200 - \$250/year \$17 - \$21/month	\$300 - \$420/year \$25 - \$35/month

A direct comparison of the costs of nitrogen reducing systems used during the La Pine NDP is not a good representation of how costs have changed over time because of the research nature of these systems and the installers were not familiar with installation requirements. In addition, not many of the manufacturers that participated in the demonstration project have applied for approval in Oregon, which means current costs are unavailable for these products.

In general, it appears that, particularly for new installations, the upper end of the cost range is currently lower than the costs seen during the demonstration project. The low costs at the bottom of the retrofit cost range during the demonstration project resulted from the use of a product that is not yet available in Oregon.

Retrofit costs vary as a result of the type of technology chosen for installation and whether the existing system (or components thereof) can be used for the nitrogen reducing system. New installation costs vary based on the type of dispersal area (drainfield or sand filter) needed. These costs are provided in the table below:

Table 2: Variations in Costs of Onsite Systems

	Uses existing tank and drainfield or existing sand filter	Needs new tank and drainfield	Needs new sand filter and tank
Nitrogen Reducing (Retrofit)	\$8,800 - \$10,200	\$10,800 - \$12,200	\$12,200 - \$15,200
		Uses standard drainfield	Uses bottomless sand filter
Nitrogen Reducing (New installations)		\$10,700 - \$12,200	\$16,600 - \$17,200

Using the information provided in the table above, the marginal costs (the difference in cost) of installing nitrogen reducing systems versus conventional systems for new development ranges between \$6,700 and \$8,200 for a site using a standard drainfield for dispersal and between \$5,600 and \$6,200 for a site using a bottomless sand filter for dispersal.



Variations in costs of retrofit systems are caused primarily by the condition of the existing system and other structural constraints on the property. For example, an older system with a steel tank and an undersized drainfield costs more to retrofit than a recently installed system. Similarly, properties with limited space due to outbuildings or other developed features will be more difficult to work with, and therefore more expensive to retrofit, than properties where the existing system and other affected areas are easily accessed. In the worst-case scenario, the existing system needs to be abandoned completely. In these cases, the marginal cost of retrofitting the system would be the cost of the retrofit versus the cost of a new conventional system. The standard system marginal costs would vary between \$6,800 and \$8,200 and the sand filter marginal costs would vary between \$8,200 and \$11,200.

The hydrogeologic character of the subareas has less of an impact on the cost (whether for retrofits or new installations) than the physical constraints on individual properties. This is due more to the market as it exists at the time of this writing because the systems that are currently available have similar costs regardless of the level of nitrogen reduction achieved. This is expected to change over time as the market develops for nitrogen reducing systems in Oregon.

In either situation, the marginal costs represent a significant increase over the cost of conventional systems. An increase in costs to the homeowner was expected from the start of the project; however, this information will be useful as the financial assistance program is implemented.

The work plan, as originally submitted, did not include any kind of cost comparison or marginal cost analysis of using centralized sewer systems for groundwater protection actions. However, given the public comment related to sewers received during the Local Rule process, existing information on the cost of sewers was summarized for the public. This historic information is provided here in addition to recently generated cost estimates for extension of an existing sewer.

A consultant report to the county, completed in 1997, estimated that sewers (for either community or regional systems) would cost between \$19,000 and \$28,000 per household or amortized at \$1,275 to \$1,880 per household per year (KCM, 1997). The amortized estimate assumed a 20-year payback period at 3% interest. The cost estimates also assumed that land for the treatment site would be available at \$3,000 per acre. In addition to the capital investment for constructing the treatment plant and installing the pipes and pump stations for transporting sewage, monthly charges would typically be charged to generate revenue for ongoing operation and maintenance of the sewer system. Commonly, the debt service on construction loans and long term operating costs are paid through connection fees and monthly service charges. The KCM report did not speculate how a district or municipality might structure fees to cover loan and operating cost payments.

Other more current cost estimates are available. For example, the City of Bend charges about \$28,000 to hook up to the existing system (not including the physical connection of the house to the collection pipe) and monthly charges range between \$20 and \$30. Oregon Water Wonderland, a subdivision in southern Deschutes County, recently estimated (Tye Engineering, personal communication) that an extension of their sewer system to serve a new area including approximately 200 homes would cost about \$2.6 million for construction. The expansion would include the construction costs of extending the collection system to the new area. This expansion would not require any changes to the existing treatment plant such as changes to treatment process or the



amount of land needed for final treatment and dispersal. The sewer district, in order to pay the costs of the construction loan, would charge \$9,500 to hook up to the system. Homeowners would incur an additional cost of an average of \$2,500 to physically connect to the service line, and \$42 per month service charge (\$504 per year). The cost estimates from the KCM report and the cost estimate from the expansion of the existing treatment system are compared to the quoted costs of onsite system retrofits in Table 3 below.

Table 3: Comparison of sewer and onsite system costs

	Low end of cost range	Upper end of cost range
KCM, 1997, new systems, range of housing densities	\$19,000	\$28,000
OWW2 expansion of existing sewer (no expansion of plant capacity needed)	\$12,000 (hook up fee & connection) \$504, annual service charges	
Nitrogen reducing onsite systems	\$8,800 (retrofit existing site) \$300 - \$420, annual maintenance provider costs	\$17,200 (highest cost new installation) \$300 - \$420, annual maintenance provider costs
Difference between KCM costs & nitrogen reducing onsite systems	\$10,200	\$10,800
Difference between OWW2 expansion & nitrogen reducing onsite systems	\$3,200 \$84 - \$204 difference in annual costs	-\$5,200 Similar difference in annual costs

Costs for sewers and onsite systems are significantly affected by site specific factors and choices made for system type and components. Given that variability, the cost estimates provided above do illustrate the large range of actual and marginal costs of centralized sewers and individual onsite systems and the range of costs between expanding existing systems and developing new sewers.

4. Public process

The public process for the proposed local rule formally began in October 2006 with the inclusion of an informational sheet with the tax bills. This mailer went to all owners of property in southern Deschutes County. The mailing targeted properties that used onsite systems and avoided properties that were served by sewer.

Then, in November 2006, staff began holding or attending a series of public events to provide information and answer questions about the groundwater issues in the region. These events culminated with the first public hearing held in March 2007. This hearing, conducted over three nights on three consecutive weeks, included:

- March 13: scientific presentations by US Geological Survey personnel, policy based presentations by county staff, and a question and answer session using questions submitted by members of the public.
- March 20: completion of the question and answer session, public testimony



- March 27: public testimony

Following the close of verbal testimony, the Board of County Commissioners (Board) left the written record open to allow additional public testimony to be submitted. They did not set a time limit on the written record.

Over the next 12 months, the Board held a series of public meetings to continue discussions about the rule proposal. In March 2008 the Board held another public hearing to take verbal testimony on the proposed rule, recognizing it had been revised based on public comment received on the first draft. Substantive changes to the rule at this time included:

- **Sewer:** include sewer systems as a way to meet groundwater protection goals. To ensure that the proposed rule did not inadvertently eliminate the possibility of using existing state processes related to the expansion or creation of sewers, the new language identified the state rules that guide the process for expanding or creating sewers in rural areas as a way to meet groundwater protection goals. The county is working actively with DEQ/DLCD to:
 - Streamline land use review for the Goal 11 process
 - Create public information materials to make the sewer creation/expansion process understandable
 - Draft policies and language to establish a Health Hazard Sewer Overlay Zone
- **Provision for other wastewater treatment approaches:** other techniques or technologies may exist or be invented that could be used to meet groundwater protection goals. New language was added to allow other approaches (one example is composting toilets) that are shown to meet the groundwater protection goal but are not defined as an onsite system or a sewer system.
- **High groundwater lots/Sunset clause:** the county should change its existing policy of restricting development of properties where the groundwater comes closer than 24 inches to ground surface. The new language included a sunset clause for siting standards (specifically the requirement for 24 inches separation from the bottom of the onsite system trench to groundwater). This inclusion is intended to state the county's commitment to investigating the potential for increasing development in high groundwater areas.

Following the March hearing, the Board continued to accept written testimony and, on July 7, 2008, the Board re-opened the public hearing for verbal testimony on the changes to the proposed rule incorporated since March 2008. These changes included:

- **Compliance Date:** the Board changed the grace period before the compliance date from 10 years to 14 years to provide additional time for residents to pursue other methods of protecting groundwater.
- **Definition of Maximum Nitrogen Reducing System:** clarify this definition to ensure that a monopoly is not created for one system achieving the highest reduction possible. Instead, the definition ensures that property owners have a choice of any system that is shown to achieve a minimum of 79% reduction.
- **Variance:** create a way to allow a variance in the event that a failing system is located in an area where a sewer is being established.



- **Ordinance 2008-012:** define “Pollution” and “Public Health Hazard.” These definition were inserted into the ordinance and not rule language because these terms are not used in the rule.

Proposed changes that received significant comment and discussion that were not included in the proposed rule:

- **Time of Sale Upgrade:** The Board of County Commissioners discussed the feasibility of requiring upgrades at the time that property ownership changes. Because of issues related to putting this concept into practice, the proposal was rejected.

5. Product / outcome / measures of success

The primary product of this task is the unanimous vote by the Board to adopt the Local Rule (Deschutes County Code Chapter 13.14, provided in Appendix B). This effort dominated the overall work program of the Groundwater Protection Project because the county devoted over two years to developing drafts of the rule and collecting public comments and suggestions. The Board of County Commissioners gained a thorough understanding of the groundwater issues specific to the region and different wastewater treatment approaches that can be used to solve the pollution problem. In addition, the Board recognized the fact that the largest part of the pollution problem is coming from existing development and acknowledged that the problem could not be solved by “grandfathering” existing development and trying to protect drinking water supplies through regulations on new development alone.

An outcome of the adoption of the Local Rule is the need to plan implementation of the rule in order to ensure a smooth transition to the new regulatory requirements. In many ways, the county began building the administrative structure needed to support the rule with the adoption of the Pollution Reduction Credit Program. This program required updates to the county’s permit processing software to track nitrogen reducing systems specifically.

Other implementation tasks related to adoption of the Local Rule are identified in the outline provided in Appendix B.

Task C. Financial Assistance for Groundwater Protection Actions

Funds from the sale of land in the Neighborhood Planning Area (Figure 3), the Pollution Reduction Credit Program, and other sources will provide long-term support for a county financial assistance program for property owners taking action to protect the drinking water supply.

The Board of County Commissioners appointed an advisory committee of community members to assist with the development of recommendations about financial assistance programs. The community members were intended to provide geographical representation of the southern Deschutes County region. The Board provided the advisory committee with the Financial Assistance Overview document (drafted by staff) and a charter (Appendix C) to guide their discussions.

The “Financial Assistance Overview,” provided in Appendix C, summarizes the estimated financial assistance need and funding sources and identifies potential programs.

The advisory committee met every other week for 5 months and produced a final report on their recommendations. These recommendations were presented to the Board after the



grant period ended; however, the final report is included in Appendix C as the bulk of the activity of this advisory committee took place during the grant period.

Based on feedback from the Financial Assistance Advisory Committee, actions financed by the program will primarily use a loan structure with an emphasis on long term, cost-deferred loans for homeowners who cannot afford monthly loan payments. There are at least two existing organizations in Central Oregon that have an existing administrative structure to work with homeowners needed to complete home improvements (including onsite system improvements) and the county expects one of these organizations to be the third party administrator for county funds.

The Financial Assistance Overview and the advisory committee recommendations are the primary products of this task. Implementation of the financial assistance program was postponed pending completion of advisory committee work.

Task D. Operation and Maintenance for Onsite Systems

Purpose

The US Environmental Protection Agency, in 1997, reported to Congress that onsite systems are a viable alternative to centralized sewer systems if they are properly installed, operated, and maintained.

During this portion of the work program, county staff reviewed state rules pertaining to operation and maintenance requirements for onsite systems and discussed:

- What, if any, added requirements should be adopted at the county level

Staff discussions resulted in a decision to focus on the requirements specified in state rule for nitrogen reducing onsite systems in order to evaluate the effectiveness of the program on a limited population of systems before evaluating the need to expand the program to all onsite systems.

- What changes would be needed to the county's permit tracking database to help keep records of maintenance activities in accordance with state rule and with any additional county requirements

The county's electronic permit processing system, being a system specifically designed for Deschutes County, was well suited for modifications for tracking maintenance actions and compliance on specific properties.

- What fee should be charged

State rules establish a \$50 annual reporting fee that must be submitted annually with required reports. County staff decided to implement the program using this fee with the intent of reassessing fees on a periodic basis in the future as the program develops.

- What action should be required at the time of sale in addition to state rule requirements

State rule requires that alternative treatment technologies be inspected at the time of sale; however, no enforcement actions are available that would help the counties ensure that this occurs. Deschutes County reviewed the manner in which property sale information is recorded in county records to see if there was a trigger point at which the Community Development Department (CDD) would be notified. Staff found that the earliest notification would be received weeks after the sale was



closed. This meant that any reminder issued by CDD would get to the new property owner well after they had taken possession of the property.

Public process

Because of the initial county decision to use existing state rule requirements for proper operation and maintenance of nitrogen reducing systems, there were no county code requirements proposed in the Local Rule language. Comments from the public focused on concern about the cost of maintenance contracts (the costs quoted by maintenance providers ranged between \$25 and \$35 per month or \$350 to \$420 per year depending on the type of system). The county informally surveyed sewer district fees and found that current fees assessed for sewer services in various parts of Oregon ranged from \$20/month to \$60 (including Bend, Redmond, La Pine, Oregon Water Wonderland, Tualatin, and Portland). Annually, this would equate to a range between \$240 and \$720.

Products / outcomes / measures of success

The primary product of this task was the modification of the county's permit processing system to generate reminders of required reports, keep records of maintenance activities, and track individual systems compliance history.

A significant measure of the success of this task is the high compliance rate of maintenance providers filing reports of maintenance activities.

As the grant period ended, county staff developed long range plans to make the report filing procedure easier for maintenance providers by providing a web based service. Additionally, the county plans to make the compliance history of individual systems available to the public in a similar manner that other onsite system information is publicly available and used extensively by real estate professionals.

Slippages in the Work Program

Grant program time extension

The most significant slippage experienced by the project was the one-year extension of the grant period. The county did not request nor did the US Environmental Protection Agency award additional funds to cover the expenses incurred by this extension. This slippage was caused by the extended timeline of the public involvement process related to the Local Rule. After the March 2007 hearing (held over three nights), the Board delayed a decision on the proposed code in order to allow the Oregon Department of Environmental Quality (ODEQ) to review and comment on the USGS publication cited here:

Morgan, DS, Hinkle, SR, and Weick, RJ, 2007. Evaluation of approaches for managing nitrate loading from on-site wastewater systems near La Pine, Oregon. US Geological Survey Scientific Investigations Report 2007-5237, 66 p.

Because county staff was unsure of when ODEQ's comments would be forthcoming, the county applied for and received a one-year no-cost extension to the grant period. As events occurred, significant movement towards a decision on the proposed code did not occur until early 2008, with a final Board decision to adopt on July 23, 2008.

The slippage in the timeline for decision on the Local Rule caused slippages in other aspects of the work program either because of timing issues or because funds were applied towards the



Local Rule process that would have been used for other tasks if a decision on the code had been made at an earlier date.

Staff and financial resources required to achieve the work incurred by this slippage was provided by Deschutes County and is included as match for the federal funds invested in this project.

Monitoring program design

The main task that was deleted from the work program was the design of a long-term monitoring plan to provide a means of measuring performance of the groundwater protection program. This task included an evaluation of existing monitoring and drinking water wells located in the sub-basin to identify a network of wells that would provide appropriate long-term monitoring points.

This task included a contract with the USGS to use the 3-dimensional fate and transport simulation model to identify well locations with the goal of monitoring the long-term effect of regulatory measures on water quality. Public comments received during the Local Rule process suggested that significant monitoring efforts should be devoted to proving that the groundwater tapped by drinking water wells is becoming polluted and “truthing” the USGS 3-dimensional model results. This is a different task than what was proposed in the work program. Additional discussions will be needed to define how this task will move forward.

Financial assistance

Another slippage caused by the lengthy public involvement process was the loss of potential funds to apply to the financial assistance program. Staff had proposed to apply any funds not used on other tasks in the work program to assist homeowners. Because of the slippage described under item A above, all funds not used for other tasks within the work program were applied to the public involvement process related to the Local Rule.





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APPENDIX A: Transferable Development Credit Program code amendment

REVIEWED  LEGAL COUNSEL
REVIEWED  CODE REVIEW COMMITTEE

For Recording Stamp Only

BEFORE THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON

An Ordinance Amending Title 11, County Owned
Land and Property, and Declaring an Emergency

*
*

ORDINANCE NO. 2006-016

WHEREAS, nitrogen, particularly in the form of nitrate, contained in inadequately treated sewage discharged to groundwater poses a risk to both public health and water quality in south Deschutes County and

WHEREAS, the primary goal for south Deschutes County is to protect public health and the environment with the specific objective of protecting public waters of the La Pine sub-basin from impacts of wastewater treatment and dispersal and

WHEREAS, at this time, except for limited areas served by a community water system with access to deeper aquifers, the shallow unconfined aquifer in south Deschutes County provides the sole source of residential drinking water and

WHEREAS, findings from the US Geological Survey's 3D Groundwater Nutrient Fate and Transport Model, La Pine National Decentralized Wastewater Treatment Demonstration Project, and Nitrate Loading Management Model for South Deschutes County (La Pine Studies) illustrate that the assumptions used for the development of the Transferable Development Credit program require modification because the Transferable Development Credit program will have significantly less impact on improving groundwater quality than alternative wastewater treatment systems and

WHEREAS, the La Pine Studies show continued use of conventional wastewater treatment systems in the region will ultimately increase the nitrate-nitrogen levels in the groundwater in most areas of the region beyond the EPA safe drinking water standard of 10 mg/l and

WHEREAS, the La Pine Studies show alternative treatment technologies exist that can denitrify wastewater and using available nitrogen reducing wastewater treatment technologies on individual properties in the La Pine sub-basin will protect the groundwater from exceeding safe drinking water standards for nitrate and

WHEREAS, the Transferable Development Credit Review Committee and Planning Staff met for six months from July 2005 to December 2005, and reconvened on April 11, 2006 to discuss the need for, and direction of, changes to the Transferable Development Credit Program based on findings from the La Pine Studies.

WHEREAS, the Transferable Development Credit Review Committee recommends that the Transferable Development Credit program should be amended to include Pollution Reduction Credits that would be created when a conventional onsite wastewater treatment system is retrofitted to become a nitrogen reducing system; that existing property owners in the south County need incentives to accept retrofits or financial assistance in order to afford to install retrofits; and that development should be able to commence in the Neighborhood Planning Area regardless of whether or not there are sufficient retrofitted onsite wastewater treatment systems at the time a developer is ready to begin development so long as the developer provides sufficient funds to allow the County to retrofit existing onsite wastewater treatment systems, and

PAGE 1 OF 3 - ORDINANCE NO. 2006-016 (06/05/06)



WHEREAS, the Deschutes County Planning Commission concurs with the recommendation of the Transferable Development Credit Review Committee to amend the Transferable Development Credit program as described and

WHEREAS; additional formulas are needed to calculate the number of Pollution Reduction Credits required for developing a tract in the La Pine Neighborhood Planning Area and for establishing the amount per Pollution Reduction Credit when a developer of the Neighborhood Planning Area chooses to fund the proportional cost of a retrofit and

WHEREAS, the purpose of the County fund is solely to provide financial assistance for property owners to retrofit existing wastewater treatment systems and

WHEREAS, Deschutes County entered into a contract with Pahlisch Homes, Inc. to develop Quadrants 2a, 2b, and 2d in Neighborhood 2 of the Neighborhood Planning Area and Pahlisch Homes, Inc., now Elk Horn Land Development LLC, wants to submit a tentative plat for their next phase in Quadrant 2a in Spring 2006 and

WHEREAS, Vic Russell owns Quadrants 1a, 1b, and 1d of Neighborhood 1 and is responsible for obtaining Transferable Development Credits for those quadrants; now therefore,

THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON, ORDAINS as follows:

Section 1. AMENDMENT. DCC 11.12 is amended to read as described in Exhibit "A," attached hereto and by this reference incorporated herein, with new language underlined and language to be deleted in ~~strikethrough~~.

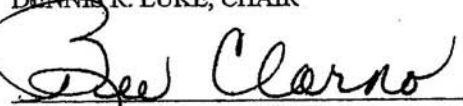
Section 2 FINDINGS. The Board of Commissioners adopts as its findings in support of this amendment the Staff Report dated 5/31/06, EXHIBIT "B" to Ordinance 2006-016 and incorporated by reference herein.

Section 3. EMERGENCY. This Ordinance being necessary for the immediate preservation of the public peace, health and safety, an emergency is declared to exist, and this Ordinance takes effect on its passage.

Dated this 5th of June 2006

BOARD OF COUNTY COMMISSIONERS
OF DESCHUTES COUNTY, OREGON


DENNIS R. LUKE, CHAIR


BEV CLARNO, VICE CHAIR


MICHAEL M. DALY, COMMISSIONER

ATTEST:


Recording Secretary



Date of 1st Reading: 5th day of June, 2006.

Date of 2nd Reading: 5th day of June, 2006.

Record of Adoption Vote

Commissioner	Yes	No	Abstained	Excused
Dennis R. Luke	<u>X</u>	___	___	___
Bev Clarno	<u>✓</u>	___	___	___
Michael M. Daly	<u>✓</u>	___	___	___

Effective date: 5th day of June, 2006.

ATTEST:

Bonnie Baker
Recording Secretary



“Exhibit A”

Chapter 11.12. TRANSFERABLE DEVELOPMENT CREDIT PROGRAM

11.12.010. Definitions.

11.12.020. TDC transactions.

11.12.030. TDC sending area eligibility criteria.

11.12.040. TDC Advisory Committee.

11.12.010. Definitions.

As used in DCC 11.12, the following words and phrases shall mean as set forth in DCC 11.12.010.

“Certificate of TDC Purchase” means a certificate from Deschutes County that documents the purchase or, in the case of a PRC, creation of TDC(s).

“Department” means, for purposes of this chapter, the Deschutes County Community Development Department.

“Existing Wastewater Treatment System” means a wastewater treatment system in use in the Sending Area on May 31, 2006 that is not a Nitrogen Reducing System approved by Deschutes County.

“High Priority Deer Migration Corridor Area” means the area mapped in 2000 by the Oregon Department of Fish and Wildlife which shows the area of priority protection for migrating mule deer within a larger migration corridor acknowledged under statewide planning Goal 5. A copy of this map is on file with the Community Development Department.

“Net Ddevelopable Aacre” means the acreage in a tract of land in a Rceiving Aarea calculated by subtracting the acreage reserved for collector road right-of-way and community parks and open space from the gross acreage of a subject tract.

“Nitrate Loading Management Model” means the groundwater model developed by

the US Geological Survey to determine the nitrate loading capacity of the drinking water aquifer underlying south Deschutes County.

“Nitrogen Reducing System” means a wastewater treatment system that reduces nitrogen loading to the groundwater in accordance with the Nitrate Loading Management Model and that is approved by Deschutes County.

“Pollution Reduction Credit” (PRC) means the credit given for the Retrofitting of an Existing Wastewater Treatment System or payment into the County’s fund.

“Receiving Aarea” means the area designated by the County where Transferable Development Credits are required in order to purchase and develop a tract of land.

“Restrictive Covenant” means a legal instrument which places restrictions on future development on a lot or parcel of land in the Sending Aarea.

“Retrofit” means to upgrade or replace an Existing Wastewater Treatment System in the Sending Area with a Nitrogen Reducing System approved by the County.

“Sending Area” means the area designated by the County in which Transferable Development Credits may be sold.

“TDC Report” means a report from a title company verifying title to and encumbrances on the subject property.

“Transferable Development Credit” (TDC) means the credit given for a Restrictive Covenant granted to Deschutes County restricting the placement of a septic system on the subject property or a PRC. (Ord. 2006-016 § 1, 2006; Ord. 2004-007 § 1, 2004; Ord. 2002-010 § 1, 2002)

11.12.020. TDC transactions.

A. Sale of TDCs from the Sending Area. Either Section B or C. The following



“Exhibit A”

~~procedures shall be followed for a property owner to sell the creation of TDCs, from an eligible lot or parcel in the Selling Area to Deschutes County or other TDC purchaser.~~

B. Restrictive Covenant

1. The property owner or any other interested person shall request verification from the County that the subject property is eligible for a TDC.
2. The Department shall send the property owner or interested person written verification confirming the number of TDCs the subject property is eligible for based on the criteria in DCC 11.12.030.
3. Upon mutual agreement of a sale between the property owner and TDC purchaser, the following transactions shall occur:
 - a. The property owner shall provide a TDC Report to the Department.
 - b. If the TDC purchaser is other than the County then the property owner and TDC purchaser shall sign a TDC Contract form provided by the County.
 - c. Upon Department review and approval of the TDC Report and receipt of payment of the consideration in accordance with the County's agreement with the property owner or the TDC Contract pursuant to DCC 11.12.010(A)(3)(b), the County shall prepare a Restrictive Covenant that restricts development on the subject property. This Restrictive Covenant shall be signed by the County and the property owner. The County shall record the Restrictive Covenant.
 - d. Contemporaneously with the recording of the Restrictive Covenant, County shall provide the TDC purchaser with

documentation of the TDC purchase.

C. PRC.

1. The property owner or any other interested person shall request verification from the County that the subject property is eligible for a PRC.
2. The Department shall provide the property owner or interested person written verification confirming the subject property is eligible for a PRC based on the criteria in DCC 11.12.030.
3. The County shall grant a PRC to a developer in the Receiving Area if the developer provides one of the following:
 - a. A Retrofit, in cooperation with the property owner of a property eligible for a PRC, Existing Wastewater Treatment System and documentation submitted to the County that includes proof of ownership of the subject property, proof of consent of the property owner for the Retrofit, and final County inspection of the Retrofit; or
 - b. Payment into the County's fund for TDCs and PRCS the proportional cost established by Board of County Commissioner resolution for a Retrofit. The County's fund shall be used to aid property owners in Retrofitting their Existing Wastewater Treatment Systems.

BD. Assignment of TDCs to the Receiving Area. Prior to ~~tentative~~ final plat approval in the Receiving Area, the Department must have record of the required number of TDCs ~~purchased established~~ and available ~~for transfer to~~ to apply to development of a tract or lot meeting the following criteria within the Receiving Area:

1. The tract or lot shall be located within the La Pine Neighborhood Planning Area in the La Pine Urban



“Exhibit A”

- Unincorporated Community and be zoned Residential General or Residential Center. The TDC ~~Receiving a~~Area is identified on a map prepared and maintained by the ~~Community~~ ~~Development~~ Department.
2. TDCs shall be assigned to a lot or tract based on the ~~Net D~~developable ~~a~~Acres at a rate approved by Board of County Commissioner ~~r~~Resolution.
 3. PRCs shall be assigned to a tract at a rate established by Board of County Commissioner resolution.
 4. The Board may, by ~~r~~Resolution, adjust the number of TDCs required per acre or alter the factors for which TDCs are required in the receiving ~~a~~Area.
- E. ~~Non-Residential Uses—Districts~~. Where permitted under DCC 18.61.050, uses in non-residential uses—districts in the ~~r~~Receiving aArea do not require TDCs.
- F. Right to Develop. If an owner of a lot or parcel of land eligible for a TDC chooses not to participate in the TDC program, the owner shall not be restricted from developing said lot or parcel in accordance with the applicable zoning standards in DCC Title 18, and any other applicable regulations, rules or standards.

(Ord. 2006-016 § 1, 2006; Ord. 2004-007 § 1, 2004; Ord. 2002-010 § 1, 2002)

11.12.030. TDC sending area eligibility criteria.

- A. A lot or parcel that meets the following criteria is eligible to receive a TDC. The lot or parcel shall:
1. Be located within the “~~S~~ending ~~A~~area” identified on a map prepared and maintained by the Department;
 2. Be no greater than two acres in area;
 3. Be capable of being served by an on-site sewage disposal system that meets current Oregon Department of Environmental Quality standards, as demonstrated by a satisfactory

- feasibility evaluation for an on-site sewage disposal system or when the lot or parcel is shown as being eligible for such system on the TDC ~~s~~ending ~~a~~Area map; and
4. Not be developed with an existing sewage disposal system, or if developed with an existing sewage disposal system, the landowner shall disable said system, or
 5. Have received prior approval for a site evaluation or an installed septic system that has expired or is no longer valid, or
 6. Have an Existing Wastewater Treatment System eligible for a Retrofit.
- B. TDCs and PRCs shall be assigned to an eligible lot or parcel that meets the criteria in DCC 11.12.030(A), as follows:
1. An eligible lot or parcel upon which a Restrictive Covenant is recorded shall be assigned receive one TDC.
 2. An eligible lot or parcel located in the High Priority Deer Migration Corridor Area upon which a Restrictive Covenant is recorded shall be assigned receive—an additional one-half TDC.
 3. An eligible lot or parcel upon which an Existing Wastewater Treatment System has been Retrofitted shall be assigned one PRC.
 34. The Board of County Commissioners may by Resolution revise the number of TDCs assigned or the factors for which TDCs are assigned to eligible lots or parcels in the ~~S~~ending ~~a~~Area.

(Ord. 2006-016 § 1, 2006; Ord. 2004-007 § 1, 2004; Ord. 2002-010 § 1, 2002)

11.12.040. TDC Advisory Committee.

- A. Purpose. The TDC Advisory Committee is an advisory committee whose purpose is to assist staff in implementing the TDC program and to recommend to staff the means to accomplish the goals of Regional Problem Solving insofar as the transfer of development credits from the



"Exhibit A"

- sSending aArea to the rReceiving aArea are concerned.
- B. Duties. The committee will advise staff in evaluating the TDC program for record keeping accuracy, determine if program goals are being met, consider whether any changes to the TDC allocation criteria in the sSending aArea or TDC requirements in the rReceiving aArea are advisable, or if any other revisions to the program are warranted. The committee may assist the County in determining which TDC options to exercise.
- C. Committee member terms. Committee members will be selected by staff based on the knowledge and expertise that each member may contribute to the development of the TDC Program. One-half the initial members shall serve for one year and one-half shall serve for two years. Thereafter, members shall serve two-year terms. Members may be requested to serve additional terms. Staff shall report the membership of the TDC Advisory Committee to the Board of County Commissioners on an annual basis.
- D. Committee members. The TDC Advisory Committee may include a representative from each of the following organizations, agencies or professions:
1. The International Society of Appraisers or an Oregon State Certified Appraiser;
 2. A firm established for the purpose of real estate development or the representation of development interests;
 3. An individual with recognized expertise in hydrology or ground water;
 4. An individual with recognized expertise in big game wildlife management;
 5. The Community Solutions Team for Central Oregon;
 6. An individual who resides in the designated sSending aArea;
 7. A member of the La Pine Community Action Team;
 8. The Deschutes County Community Development Department Director or designee as an ex officio member.
 9. Staff may select additional members as it deems appropriate.
 10. ~~The Deschutes County Community Development Department Director or designee as an ex officio member.~~
- (Ord. 2006-016 § 1, 2006; Ord. 2003-033 § 1, 2003; Ord. 2002-010 § 1, 2002)



APPENDIX B: Local Rule for Groundwater Protection in Southern Deschutes County

1. Summary of public outreach
2. Ordinance and adopted code
3. Staff report
4. Resolution and performance standard map for existing systems
5. Local Rule Implementation Plan



Summary of public outreach

Local Rule Communication Plan and Public Outreach Summary

Deschutes County Community Development Department
117 NW Lafayette Ave., Bend, OR 97701
PH: (541) 388-6575, FAX: (541) 385-1764
Web: www.deschutes.org/cdd/gpp/



The goal of the Local Rule is to protect the sole source of drinking water for the residents of south Deschutes County using the least cost option and creating financial assistance programs.

Web site

- www.deschutes.org/cdd/gpp/. The documents listed below are available under "Project News."

Articles and reports

This list reflects articles published in print media. Television and radio spots are not included.

- Bend Chamber, September 2008
- Bend Bulletin, 09-09-08
- Bend Bulletin, 08-28-08
- Bend Bulletin, 08-21-08
- Bend Bulletin, 08-13-08
- Bend Bulletin, 07-10-08
- Bend Bulletin, 07-08-08
- Bend Bulletin, 06-20-08
- Bend Bulletin, 06-12-08
- Bend Bulletin, 06-06-08
- Bend Bulletin 05-19-08
- Bend Bulletin 05-15-08
- Bend Bulletin 05-05-08
- Bend Bulletin 04-24-08
- Questions from the March 19, 2008 Hearing
- Bend Bulletin 04-03-08
- Bend Bulletin 04-03-08 Map
- Newberry Eagle April 2008
- Bend Bulletin 03-28-08
- Bend Bulletin 03-23-08
- Bend Bulletin 03-20-08 B
- Bend Bulletin 03-20-08 A
- Bend Bulletin 03-17-08
- Bend Bulletin 02-06-08
- Bend Bulletin 01-31-08
- Oregon DLCD Response, 01-30-08
- Questions from the Board to Oregon DEQ & DLCD, 01-30-08
- Bend Bulletin Clarification 12-05-07
- Bend Bulletin 11-06-07
- Bend Bulletin 11-04-07
- USGS Fact Sheet, Questions and answers about the effects of septic systems on water quality in the La Pine area, Oregon
- USGS Report, Evaluation of approaches for managing nitrate loading from on-site wastewater systems near La Pine, Oregon
- USGS Report, Ground Water Redox Zonation near La Pine Oregon: Relation to River Position within the Aquifer-Riparian Zone Continuum
- Bend Bulletin 10-29-07
- Press Release 10-08-07
- Bend Bulletin 10-07-07



- Bend Bulletin 09-27-09
- Bend Bulletin 07-24-07
- Newberry Eagle Article, April 2007
- EH information, Newberry Eagle April 2007
- Bend Bulletin Article, March 30, 2007
- The Source Article, March 29, 2007
- Bend Bulletin Article, March 29, 2007
- Bend Bulletin Article, March 28, 2007
- Bend Bulletin Article, March 21, 2007
- Bend Bulletin Article, March 19, 2007
- Bend Bulletin Article, March 7, 2007
- Bend Bulletin article, March 1, 2007
- Bend Bulletin Article, February 22, 2007
- Newberry Eagle article, February 2007
- Bend Bulletin Article, February 1, 2007
- Bend Bulletin Article, January 17, 2007
- Citizen Update Newsletter, January 2007
- Newberry Eagle articles, January 2007
- Journal of Hydrology paper
 - Supplement 1
 - Supplement 2
 - Supplement 3
 - Supplement 4
- Groundwater Science Open House Notice December 2006
- Bend Bulletin article, December 21, 2006
- Bend Bulletin article, December 20, 2006
- Newberry Eagle article, December 2006
- Bend Bulletin Article, December 1, 2006
- Bend Bulletin Article, November 2006
- Newberry Eagle article, November 2006
- Newberry Eagle article, October 2006
- Newberry Eagle article, September 2006
- Newberry Eagle article, May 2006
- Deschutes County Citizen Update, May 2006
- Bend Bulletin article, May 2006
- Bend Bulletin article, April 2006
- Bend Bulletin article, February 2006

Notices (PDF files)

- Press releases issued prior to each public meeting
- Notices of meetings posted at area stores, libraries, La Pine Senior Center, post office, etc.
- Notice of Public Hearing, July 7, 2008
- Notice of Public Meeting, June 5 & 6, 2008
- Notice of Public Hearing 02-15-08
- Notice of Public Hearing on Proposed Local Rule
 - Ordinance 2007-011
 - Draft Local Rule
 - Staff Report
 - Resolution 2007-023
 - Exhibit A to Resolution 2007-023
- Office Hours Scheduled in January 2007
- Notice of Planning Commission meeting, November 30, 2006
- Notice of Local Rule - Tax Bill Insert, October 2006
- Notice of Groundwater Protection Project (distribution began March 2006)
- Groundwater Protection Project Update, September 2006



Brochures, Handouts & Posters (PDF files)

- Application form - south county advisory committee - direct mailed to owners of property in south Deschutes County, 10/09/07
- Frequently Asked Questions (one page), 04/18/08
- Proposed Local Rule documents
- Deschutes County memo on nitrate concerns
- Oregon Department of Human Services - Technical Bulletin on Nitrates
- Nitrogen Reducing Onsite Systems Poster
- Effects of onsite systems on groundwater poster
- Frequently Asked Questions
- Alternatives Analysis
- Retrofit Cost Scenarios, Winter 2007
- Proposed Local Rule Concepts
- But my water was just tested! November 2006
- Pollution Reduction Credit Program Brochure, Fall 2006
- Project Overview Brochure, Spring 2006
- South County Groundwater Protection History, Spring 2006
- Why Not Sewer? Brochure, Spring 2006

Other Outreach/Participation events:

- Installer meetings – typically held by Deschutes County Environmental Health staff
 - August 22, 2006
 - October 17, 2006
- Realtor meetings
 - Regular weekly meetings with COAR representatives – typically held by Deschutes County Community Development Director and Planning Director
 - September 6, 2006 – conducted by County EH staff and the CDD Director
 - November 27, 2006 (requested by realty office) – presentation provided by EH staff
 - December 9, 2006 (requested by two realty offices) – two presentations provided by EH staff
 - July 2
- Public meetings and events
 - May 13, 2003, Presentation of results from the 3-D model, groundwater study and nitrogen reducing system field test to the Board of County Commissioners in La Pine.
 - May 11, 2006, Planning Commission meeting (part of TDC Amendment Hearing)
 - All published materials leading up to and following up on TDC amendments also referred to the need for a Local Rule (see "Project News" page of website)
 - November 9, 2006 (requested by the La Pine Senior Center)
 - November 30, 2006 (hosted by the Deschutes County Planning Commission)
 - December 20, 2006 (Science Session requested at 11/30/2006 Planning Commission meeting)
 - Office Hours:
 - January 4, 2007, 5:00 - 7:00, Deschutes County office, La Pine
 - January 9, 2007, 1:00-5:00, Village Properties office, Sunriver
 - January 18, 2007, 1:00-5:00, Village Properties, Sunriver
 - January 23, 2007 3:00 - 5:00, Deschutes County office, La Pine
 - Hearing before the Board of County Commissioners, March 13, 20, 27th, 6:00 – 9:00 PM, La Pine High School
 - Written record for proposed Local Rule open from February 2007 to present (February 2008)



- Board of County Commissioners work session with Oregon Department of Environmental Quality and Department of Land Conservation and Development, April 18, 2007
 - Board of County Commissioners work session with Oregon Department of Environmental Quality and Department of Land Conservation and Development, January 30, 2008
 - Hearing before the Board of County Commissioners, March 19, 2008, La Pine High School
 - Public work sessions of the Board of County Commissioners, April through June 2008
 - Hearing before the Board of County Commissioners, July 7, 2008, Board Hearing Room
 - Deliberation and Decision of the Board of County Commissioners, July 9, 2008
 - Adoption of Deschutes County Code Chapter 13.14, unanimous vote of the Board of County Commissioners, July 23, 2008, effective October 23, 2008
- Other public information contacts
- On-going one on one contacts with EH staff either in person or by phone/e-mail
 - Deschutes County Home Show, May 2006
 - Open House, May 6, 2006, Deschutes County office, 51340 S. Highway 97, La Pine
 - Groundwater Science Open House, December 20, 2006, 4:00-6:00 PM, 51340 S Highway 97, La Pine
 - Presentations available upon request



Ordinance and adopted code

REVIEWED
sl
LEGAL COUNSEL

For Recording Stamp Only

BEFORE THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON

An Ordinance Adding Chapter 13.14 to Title 13,
Public Services, of the Deschutes County Code.

*
*

ORDINANCE NO. 2008-012

WHEREAS, the Oregon Department of Environmental Quality, in a letter date January 4, 2008, determined that a public health hazard exists in the south Deschutes County area, the cause of which is pollution discharged by conventional onsite wastewater treatment systems;

WHEREAS, "Pollution" is defined in OAR 340-071-0100 as "any alteration of the physical, chemical, or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt, or odor of the waters, or any discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state that, alone or in connection with any other substance, threatens to create a public nuisance or render such waters harmful, detrimental, or injurious to public health, safety, or welfare or to domestic, commercial, industrial, agricultural, recreational or other legitimate beneficial uses or to livestock, wildlife, fish, or other aquatic life or the habitat thereof;"

WHEREAS, "Public health hazard" is defined in OAR 660-011-0060 as "a condition whereby it is probable that the public is exposed to disease-caused physical suffering or illness due to the presence of inadequately treated sewage;"

WHEREAS, Deschutes County Community Development Department staff proposed amendments to the Deschutes County Code ("DCC") to require the use of nitrogen reducing onsite systems for permits issued by the County; and

WHEREAS, notice of the proposed DCC text amendment was mailed in the Deschutes County tax statements to 10,243 property owners in the South Deschutes County area; and

WHEREAS, the Deschutes County Planning Commission hosted an information session on the proposal in November 2006, notice of which was published in The Bulletin on November 25, 2006 and the Newberry Eagle on November 1, 2006; and

WHEREAS, the Board of County Commissioners ("Board") held public hearings on March 13, 20 and 27, 2007 and on March 13, 2008, notice of which was published in The Bulletin on March 4, 2007; and

WHEREAS, the public record for the rule was open for written testimony between March 27, 2007 and April 18, 2008; and

WHEREAS, the Board held a public hearing on March 19, 2008, a notice of which was published in the Bend Bulletin on February 18, 2008;

WHEREAS, the Board mailed information about the proposed amendment entitled "Frequently Asked Questions" to 9,484 property owners in south Deschutes County on April 18, 2008; and

PAGE 1 OF 2 - ORDINANCE NO. 2008-12 (7/9/08)



WHEREAS, the Board finds that the public will benefit from changes to the Deschutes County sanitation regulations to require better nitrogen reducing wastewater treatment systems in the south Deschutes County area; now, therefore,

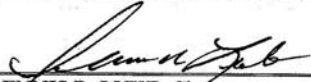
THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON, ORDAINS as follows:

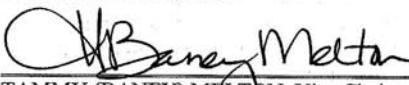
Section 1. ADDING. That Deschutes County Code Title 13 is amended by the addition of a new chapter as described in Exhibit "A," attached hereto and by this reference incorporated herein.

Section 2. FINDINGS. That the Board adopts as its findings in support of this decision, the Staff Report, attached as Exhibit "B" and incorporated by reference herein.

Dated this 23rd of July, 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

Date of 1st Reading: 9th day of July, 2008.

Date of 2nd Reading: 23rd day of July, 2008.

Record of Adoption Vote

Commissioner	Yes	No	Abstained	Excused
Dennis R. Luke	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tammy Melton	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Michael M. Daly	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Effective date: 23rd day of October, 2008.

ATTEST:


Recording Secretary



EXHIBIT "A"

Chapter 13.14. SOUTH COUNTY ONSITE WASTEWATER TREATMENT

- 13.14.010. Application.**
- 13.14.020. Definitions.**
- 13.14.030. Siting Criteria for New Development.**
- 13.14.040. Groundwater Level Determinations.**
- 13.14.050. Performance Standards.**
- 13.14.060. Listing Nitrogen Reducing Systems.**
- 13.14.070. Approval of Other Groundwater Protection Wastewater Treatment Systems.**
- 13.14.080. Variances.**
- 13.14.090. Appeals.**
- 13.14.100. Fees.**
- 13.14.110. Violation.**

13.14.010. Application.

- A. The provisions in DCC Chapter 13.14 are in addition to the requirements of ORS 454.605 to 454.755 and OAR chapter 340, divisions 071 and 073 and, in the event of an inconsistency, the more stringent provisions shall apply.
- B. The provisions in DCC Chapter 13.14 apply only to those wastewater treatment systems that treat flows of residential strength wastewater, as defined in OAR 340-071, of 2,500 gallons per day or less.
(Ord. 2008-012 §1, 2008)

13.14.020. Definitions.

"Department" means, for purposes of this chapter, the Deschutes County Community Development Department.

"Existing Development" means uses in South County on a Lot served by an Onsite System that does not meet the performance standards contained in DCC 13.14.050(E) as of the effective date of Ordinance 2008-012.

"Lot" means lot or parcel as defined in ORS chapter 92. Tax lots may or may not be equivalent to legal Lots of record.

"Maximum Nitrogen Reducing System" means an Onsite System or Systems allowed for use by ODEQ and listed by the Department in accordance with DCC 13.14.060 as having demonstrated at least 79% nitrogen reduction and total nitrogen concentrations of less than 10 mg/L.

"New Development" means the establishment of a use on a Lot in South County where there is no existing use served by an Onsite System as of the effective date of Ordinance 2008-012.

"Nitrate Loading Management Model" means the model produced by the US Geological Survey ("USGS") that specifies the performance standards that must be met by Onsite Systems in order to meet groundwater protection goals.

"ODEQ" means the Oregon Department of Environmental Quality.

"Onsite System" means onsite wastewater treatment system as defined in OAR 340, division 71.

"Sewer System" means a system as defined in OAR chapter 660, division 11 that serves more than one Lot or parcel, or more than one condominium unit or more than one unit within a planned unit development, and includes pipelines or conduits, pump stations, force mains, and all other structures,



devices, appurtenances and facilities used for treating or disposing of sewage or for collecting or conducting sewage to an ultimate point for treatment and disposal. The following are not considered a Sewer System for the purpose of this code:

- A. A system provided solely for the collection, transfer and/or disposal of storm water runoff; or
- B. A system provided solely for the collection, transfer and/or disposal of animal waste from a farm use as defined in ORS 215.203.

“South County” means those unincorporated portions of Deschutes County contained in Townships 19, 20, 21, 22 and Ranges 9, 10, and 11, except those areas authorized for sewer.

“WPCF Permit” means Water Pollution Control Facility permit.
(Ord. 2008-012 §1, 2008)

13.14.030. Siting Criteria for New Development.

New Development shall meet the following criteria in order for an Onsite System to be permitted and constructed on the Lot:

- A. For the purpose of site evaluation approval, any modification to the Lot, including the placement of fill or the installation of groundwater interceptors, shall not be allowed.
- B. For site evaluations applied for and approved after the effective date of Ordinance 2008-012, an Onsite System, including the absorption facility, shall be installed on the Lot where the use to be served by the system is located.
- C. Locating the Onsite System or portion thereof on an adjoining Lot may be permitted if the Lots are consolidated or the Lot line adjusted following a final land use decision by the County.
- D. The absorption facility for the Onsite System shall be installed to provide a minimum 24 inch vertical separation to the highest level attained by a groundwater table as measured from the bottom of the absorption facility to the highest level of the groundwater table.
- E. The provisions in DCC 13.14.030(A), (B) and (C) expire 3 years from the effective date of Ordinance 2008-012 unless amended by the Board of County Commissioners.

(Ord. 2008-012 §1, 2008)

13.14.040. Groundwater Level Determinations.

- A. If the County, upon review of a site evaluation application for an Onsite System, finds that soil characteristics indicating conditions associated with saturation as defined in OAR 340-071 are inconclusive and groundwater levels cannot be determined, then groundwater levels shall be determined using direct measurement of groundwater on the Lot and in the general area.
- B. Direct measurements by the County shall be made during a spring following a winter (October through March) with at least average Central Oregon historical total precipitation.
- C. Application for groundwater level determinations shall be made to the Department no later than the February 15 prior to the dates the groundwater measurements are to be conducted pursuant to DCC 13.14.040(A) and (B).
- D. If the winter precipitation for the year in which the application is made is not equal to at least average precipitation levels described in DCC 13.14.040(B), then the application will be held and the groundwater level determination made after the next winter with at least average Central Oregon historical total precipitation.

(Ord. 2008-012 §1, 2008)

13.14.050. Performance Standards.

- A. The following performance standards shall apply to:
 - 1. New Development at time of application for site evaluation and permit issuance;



2. Existing Development at time of application for an authorization notice, major alteration, or major repair, and
 3. Existing Development at the time of upgrade required under DCC 13.14.050(F).
- B. New Development shall install a Maximum Nitrogen Reducing System.
- C. Subject to DCC 13.14.050(F), Existing Development located on a Lot that does not meet the 24 inch vertical separation to groundwater shall install a Maximum Nitrogen Reducing System.
- D. Subject to DCC 13.14.050(F), Existing Development located on a Lot that meets the 24 inch vertical separation to groundwater shall install an Onsite System that reduces nitrogen to at least the level specified for the area within which the Lot lies as specified in DCC 13.14.050(E).
- E. The Board shall adopt by resolution:
1. The Nitrate Loading Management Model;
 2. Minimum nitrogen reduction standards applicable to this chapter; and
 3. The map depicting where standards for Existing Development apply. The Department shall maintain the map depicting where standards for Existing Development apply.
- F. Except as provided in DCC 13.14.050(G) and DCC 13.14.080, all Existing Development served by Onsite Systems shall be upgraded with nitrogen reducing systems in accordance with DCC 13.14.050(C) and (D) no later than November 15, 2022.
- G. An Onsite System that was or is operating under a WPCF Permit from ODEQ shall not be required to meet the performance standards in DCC 13.14.050(D) until such time as a major alteration or major repair is needed in accordance with OAR 340, division 71.
- (Ord. 2008-012 §1, 2008)

13.14.060. Listing Nitrogen Reducing Systems.

- A. Onsite Systems used for upgrades to Existing and New Development in the South County shall be Onsite Systems allowed by the ODEQ.
- B. Onsite Systems or components designed to reduce nitrogen, including Maximum Nitrogen Reducing Systems, shall be identified on a list maintained by the Department.
1. The list shall categorize the systems or components by demonstrated nitrogen reduction capability.
 2. The nitrogen reduction categories in this list shall correspond to the performance standards shown in the legend on the map adopted under DCC 13.14.050(E) and which shows where the specific performance standards must be achieved.
- C. Vendors or designers of Onsite Systems may apply to the County to have additional systems listed by the Department as nitrogen reducing systems.
1. Applications must be submitted on a form specified by the Department and shall be accompanied by the fee established by the Board.
 2. Applications must include documentation that the proposed Onsite System will meet the standards contained in DCC 13.14.050(E) and 13.14.060(A).
 - a. An application by a vendor or designer to list an additional Onsite System as a nitrogen reducing system shall include, but is not limited to, the following information:
 - i. The quality of the septic tank effluent or wastewater influent received by the system during the performance test;
 - ii. The quality of the proposed Onsite System influent and effluent including the following:
 - a. The quality of the proposed Onsite System nitrogen concentration including organic and inorganic forms of nitrogen;
 - b. Biochemical oxygen demand (5-day), total suspended solids, pH, dissolved oxygen, and temperature; and
 - c. Measurements of wastewater flow to the system during the performance test.
 - iii. Lists of installers and maintenance providers certified to work in Oregon;
 - iv. List of distributors or qualified designers for the system in Oregon; and



- v. Additional information and application fee as required by the Department.
 - b. Data submitted by vendors or designers in support of an application to list an additional Onsite System as a nitrogen reducing system shall include at least one of the following:
 - i. Peer reviewed articles;
 - ii. Third party reports; or
 - iii. Papers and data presented and published in conference proceedings.
 - c. If data show the total nitrogen concentration of the influent to the proposed Onsite System is less than 65 mg/L on average, then the system's nitrate reduction performance shall be prorated accordingly unless the data show that nitrogen reduction increases as influent increases.
- G. Onsite Systems listed by the Department shall continue to be listed unless performance data indicates that listing should be changed or revoked.
(Ord. 2008-012 §1, 2008)

13.14.070. Approval of Other Groundwater Protection Wastewater Treatment Systems.

- A. A Sewer System is permitted when:
 - 1. A Sewer System has been authorized pursuant to OAR 660-11-0060(9) and OAR 660, division 4, including documentation that the Deschutes County Comprehensive Plan and Zoning Code have been amended and acknowledged pursuant to ORS 197; or
 - 2. A Sewer System has been authorized pursuant to OAR 660-011-0060(4) through (7), including documentation that the Deschutes County Comprehensive Plan and Zoning Code have been amended and acknowledged pursuant to ORS 197; and
 - 3. The performance of the Sewer System reduces total nitrogen loading for the area to be served, as measured in kilograms per day, to the minimum level specified by the Nitrate Loading Management Model and in DCC 13.14.050.
 - B. A property owner may propose to the County a system other than an Onsite System or a Sewer System to reduce nitrogen loading to groundwater.
 - 1. The property owner shall have the burden of proof that the proposed system will perform equal to or better than the performance standards established in DCC 13.14.050.
 - 2. The system proposed to serve either New Development or Existing Development shall meet the minimum requirements adopted by the Board per DCC 13.14.050.
- (Ord. 2008-012 §1, 2008)

13.14.080. Variances.

- A. The Department Director or, if on appeal, the Board, may authorize a variance from the requirements of DCC 13.14.050.
- B. Applications to the Department for variances shall be submitted on a form specified by the Department and accompanied by the fee established by the Board.
- C. The application must state fully the grounds for the variance and facts relied upon by the applicant and must demonstrate how strict compliance with the standard is impracticable.
- D. The Department Director or the Board may grant a variance in one of the following situations:
 - 1. The applicant provides a report of a detailed hydrogeologic investigation by a registered hydrogeologist that demonstrates that the groundwater is protected from nitrogen contamination by the presence of persistent oxygen-limited groundwater conditions that will reduce nitrogen in the groundwater for the life of the system; or
 - 2. The applicant demonstrates that an extreme or unusual financial hardship exists.
 - a. The following factors shall be considered by the Department or the Board in reviewing an application for a variance based on financial hardship:
 - 1) Applicant's advanced age or poor health;



- 2) Applicant's financial ability to pay for a nitrogen reducing system;
 - 3) Applicant's need to care for aged, incapacitated, or disabled relatives;
 - 4) The availability of financial assistance that is sufficient to offset the cost of installing, operating, or maintaining a nitrogen reducing Onsite System;
 - 5) Environmental impacts from the variance.
- b. Hardship variances granted by the Department shall include conditions that:
- 1) Limit permits to the life of the applicant;
 - 2) Limit the number of permanent residents using the system;
 - 3) Require that the system is retrofitted to a nitrogen reducing Onsite System at time of sale of the property; and
 - 4) Requiring that the compliance date specified in DCC 13.14.050(F) shall not apply until time of sale of the property.
3. The applicant demonstrates that:
- a. The onsite system serving the property is failing;
 - b. The application for the variance includes a legal commitment from the sewer district or other legal entity to extend a sewer system that meets the requirements of DCC 13.14.050 to the property covered by the application; and
 - c. The connection of the property to the sewer will be complete within five years from the date of application.
- (Ord. 2008-012 §1, 2008)

13.14.090. Appeals.

- A. Decisions of the Department made pursuant to this chapter may be appealed to the Board within twelve days of the date the Department's decision was mailed.
 - B. The appeal shall be filed with the Department using a form specified by the Department and fee established by the Board.
 - C. The documentation supporting the appeal must state fully the grounds on which the applicant is appealing the decision, the facts relied upon by the applicant and must demonstrate how strict compliance with the standard is impracticable.
 - D. Decisions of the Board may be appealed in accordance with DCC 13.40.
- (Ord. 2008-012 §1, 2008)

13.14.100. Fees.

- A. The Board shall establish fees by resolution for permits and services under DCC 13.14.
- (Ord. 2008-012 §1, 2008)

13.14.110. Violation.

- A. Violation of any provision of DCC 13.14 is a Class A violation.
- (Ord. 2008-012 §1, 2008)



Exhibit "B"



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/>

STAFF REPORT

Public Hearing July 7, 2008

The Board will consider adoption of the proposed "Local Rule," under which all residential properties in the unincorporated areas of South Deschutes County that are not currently served by sewer systems would be required to upgrade their septic systems to reduce nitrogen discharges, connect to sewer systems or take some other nitrogen-reduction measure within 14 years of the effective date of the ordinance.

Highlighted areas in the staff report indicate the significant changes from previous versions.

PROPOSAL: Consider adoption of a Local Rule to require the use of nitrate reducing onsite wastewater treatment systems or other approaches to achieve the same level of groundwater protection in south Deschutes County to protect the primary source of drinking water and surface waters of the upper Deschutes River watershed.

The proposal includes requirements that:

1. New development installs systems that are Maximum Nitrogen Reducing Systems (defined as systems that achieve a minimum of 79% reduction in total nitrogen and discharge a maximum of 10 mg/L total nitrogen);
2. Existing systems upgrade within 14 years of the date the rule takes effect;
3. Existing systems meet a variable nitrogen reduction standard established by the USGS Nitrate Loading Management Model

Other programs interacting with the proposal include financial assistance programs funded by the sale and development of land within the La Pine Neighborhood Planning Area and state rules governing the expansion or creation of sewers in rural areas.

STAFF: Tom Anderson, Community Development Department Director
Dan Haldeman, Environmental Health Director
Barbara Rich, Senior Environmental Health Planner
Peter Gutowsky, Principal Planner
Todd Cleveland, Environmental Health Specialist
George Read, Management Analyst

Dated this 2nd day of July, 2008

Local Rule for Onsite Wastewater Treatment Systems in South Deschutes County

Page 1 of 35 – EXHIBIT "B" TO ORDINANCE NO. 2008-012 (7/9/08)

Quality Services Performed with Pride



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Local Rule for Onsite Wastewater Treatment Systems in South Deschutes County

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I. **EXISTING POLICY:**

OAR 340-071, Onsite Wastewater Treatment System Rules
OAR 340-040, Groundwater Quality Protection
Deschutes County Comprehensive Plan, Chapter 23.44, Regional Problem Solving
Deschutes County Code Chapter 13.08, Onsite sewage disposal and septic systems
Deschutes County Code Chapter 11.12, Transferable Development Credit Program
Ordinance 2008-019

II. **BASIC FINDINGS:**

- A. **Affected area:** The areas affected by the proposal are unsewered areas between Sunriver and the Klamath County border, this area is formally defined as those unincorporated portions of Deschutes County contained in Townships 19, 20, 21, and 22 and Ranges 9, 10 and 11, except those areas authorized for sewer.
- B. **Affected uses:** Uses affected by the proposal are those generating less than 2,500 gallons of residential strength wastewater per day.
- C. **Purpose:** The goal of the proposed rule is to reduce onsite wastewater treatment system pollutants, particularly nitrogen, discharged to the sole source aquifer in order to maintain and improve public waters in the La Pine basin of the upper Deschutes River watershed. The proposed rule applies only to those systems for which the County has permitting authority (systems that generate less than 2,500 gallons per day of residential waste strength wastewater).
- D. **History and background:** South Deschutes County has been the focus of extensive local, state and federal attention beginning in the early 1980s with the identification of significant groundwater impacts from onsite wastewater treatment systems in the La Pine Unincorporated Community. Provided below is a timeline of events related to water quality in the region.

1960's and 1970's	125-square mile area of La Pine subdivided into over 12,000 lots
1982	La Pine Aquifer Study finds high nitrate levels in groundwater underlying the core area of La Pine.
1986	La Pine core area sewerred.
1994	Oregon DEQ finds increasing nitrate levels outside of the La Pine area.
1996	County receives a \$157,250 Regional Problem Solving grant from DLCD to identify regional problems and evaluate solutions.
1997	Sewer Feasibility Study determined that creating or expanding sewers in the study areas to cost between \$19,000 and \$28,000 per household. A 20-year payback at 3% costs between \$1,275 and \$2,880 per household per year. This estimate also assumed that the sewage treatment plant site and related land could be purchased at \$3,000 per acre.



1998	<p>Water Quality Directives resulting from Regional Problem Solving:</p> <ul style="list-style-type: none"> ▪ Continue studying nitrates, well head protection, and alternative sewage disposal systems. ▪ Do not build a new sewer system in study areas ▪ Reduce residential density to meet the carrying capacity of onsite sewage disposal systems through a market-based Transfer of Development Credit Program ▪ Identify areas where existing community sewer systems can be expanded (La Pine Sewer District). ▪ Support Oregon Water Wonderland II (OWW2) efforts to upgrade existing sewage treatment facilities for that subdivision
1999	Oregon DEQ received \$5.5 million grant from US Environmental Protection Agency to study the groundwater, model the aquifer, and field test nitrogen reducing onsite systems
2000	<p>Deschutes County Comprehensive Plan amended to include these goals in response to public involvement during Regional Problem Solving:</p> <ol style="list-style-type: none"> 1. To preserve water and air quality, reduce wildfire hazards and protect wildlife habitat. 2. To ensure that domestic water derived from groundwater meets safe drinking water standards. 3. To develop an equitable, market-driven system, that reduces the potential development of existing lots in floodplains, wetlands, mule deer migration corridors and areas susceptible to groundwater pollution. 4. To create a new neighborhood, primarily residential in character, between La Pine and Wickiup Junction, that provides services efficiently, sustains economic development and reduces adverse impacts to groundwater quality in South Deschutes County. 5. To explore innovative sewage treatment and disposal methods
1999-2004	Field sampling of groundwater and onsite wastewater treatment system effluent. Results of studies reported at numerous national, regional and state meetings.
2002	Transferable Development Credit Program adopted
2003	Findings of the La Pine National Demonstration Project groundwater investigation and three-dimensional groundwater modeling presented at a public meeting in La Pine.
2005	The US Geological Survey completes an upgrade to the three dimensional groundwater model and produces the Nitrate Loading Management Model
2005	The County convenes the TDC Technical Advisory Committee to amend the Transferable Development Credit Program to better focus the resources created by the La Pine Neighborhood Planning Area on solving the groundwater protection problem.
Dec 2005	The TDC Technical Advisory Committee recommends creating a Pollution Reduction Credit program to work in conjunction with a local rule to require the use of nitrogen reducing onsite wastewater treatment systems.
May 2006	The Planning Commission, after holding a public hearing in La Pine, recommended that the Board of County Commissioners adopt amendments to the Transferable Development Credit Program to create Pollution Reduction Credits and financial assistance for homeowners upgrading their existing onsite wastewater treatment systems to better protect groundwater.

Local Rule for Onsite Wastewater Treatment Systems in South Deschutes County

Page 4 of 35 – EXHIBIT "B" TO ORDINANCE NO. 2008-012 (7/9/08)



June 2006	The Board of County Commissioners adopted amendments to the Transferable Development Credit Program to create Pollution Reduction Credits.
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E. Public involvement: The Community Development Department developed a public participation plan to solicit comments and suggestions for the proposed Local Rule while the Pollution Reduction Credit program was being established. The first phase of the public participation process was to develop a notice of the Groundwater Protection Project to include with all site evaluation and permit application materials. The Environmental Health Division began distributing this notice with permit materials in March 2006.

Next, the Department developed the first of a series of public information brochures about the issues and proposal:

- Project Overview Brochure, Spring 2006
- South County Groundwater Protection History, Spring 2006
- Why Not Sewer? Brochure, Spring 2006

These brochures were first distributed at an open house for the opening of the South County Services building and at the Home Show at the Deschutes County Fairgrounds in May 2006.

Next steps included revising the Groundwater Protection Project website and initiating meetings with area onsite system installers and realtors.

Further public information materials were developed in late summer 2006 with monthly articles in the *Newberry Eagle* beginning in September 2007. Additional public information materials were developed at this time including the following notices and brochures:

- Notice of Planning Commission meeting, November 30, 2006
- Notice of Local Rule - Tax Bill Insert, October 2006
- Notice of Groundwater Protection Project (distribution began March 2006)
- Groundwater Protection Project Update, September 2006
- But my water was just tested! November 2006
- Pollution Reduction Credit Program Brochure, Fall 2006

The Tax Bill Insert was mailed to 10,243 property owners to provide individual notice of the proposed rule. Following this the Department held a series of public meetings to present the reason for the proposed rule and solicit comments and suggestions about the Local Rule Concepts. The public meetings began with two events held at the La Pine Senior Center:

- November 9, 2006 (requested by the La Pine Senior Center)
- November 30, 2006 (hosted by the Deschutes County Planning Commission)

The attendees at the November 30 meeting requested a session specifically for reviewing the scientific basis of the proposed rule. This session was held December 20, 2006 and was presented as the Groundwater Science Open House with the USGS in attendance to answer questions about the groundwater investigation and models. The open house format was used to allow interested persons to move from station to station and ask specific questions easily and quickly without having to wait through a lengthy

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presentation. The Department decided to use this format after receiving feedback from the November 30 meeting that some attendees felt intimidated about asking questions in the lecture format when audience members were loudly responding to questions and answers.

The Department, following the Groundwater Science Open House, scheduled additional office hours to provide more opportunities for interested persons to drop by and obtain more information about the science or other aspects of the proposal. The Department scheduled office hours each week in January 2007 on different days of the week and at different times during the day. The variation in locations, times and days were in response to comments that all the meetings were held in the southern portion of the affected area and that they were being held in the evening. By mixing the days, locations and times, Department staff intended to create opportunities for interested persons to be able to attend at least one session. Unfortunately, times and locations for the office hour sessions in the northern portion of the affected area were constrained by the available space. As a result these sessions were made twice as long as the southern sessions.

- January 4, 2007, 5:00 - 7:00, Deschutes County office, La Pine
- January 9, 2007, 1:00-5:00, Village Properties office, Sunriver
- January 18, 2007, 1:00-5:00, Village Properties, Sunriver
- January 23, 2007 3:00 - 5:00, Deschutes County office, La Pine

The Board of County Commissioners held a public hearing over three nights on March 13, 20, and 27, 2007 on the proposed rule. The Board closed the hearing on March 27th but left the written record open for public comments. The Board re-opened the record for verbal testimony on the amendments presented at the March 19, 2008 hearing. The record was closed for verbal testimony at the end of the hearing and the written record was left open until April 18, 2008. Because this is a legislative code amendment, the Board has accepted all written testimony submitted after April 18, 2008.

The Board of County Commissioners held public work sessions with the Oregon Department of Environmental Quality and the Oregon Department of Land Conservation and Development on April 18, 2007 and January 30, 2008 to discuss the groundwater science and modeling and next steps for protecting groundwater in the region.

The full list of notices, public information materials, and newspaper articles is available as Appendix A. Appendix B provides a summary of the materials and information provided at the Groundwater Science Open House. These materials were also provided at the office hour sessions.

The Transferable Development Credit Technical Advisory Committee and the Deschutes County Planning Commission have also been kept apprised of the Local Rule public comment and participation process leading up the public hearing in March 2007.

On June 11, 2008, the Board of County Commissioners adopted Ordinance 2008-019 to require the use of nitrogen reducing systems on all new development and existing development at the time of major alteration (major house remodels or replacements) or major repair at time of system failure. This ordinance acknowledges the existing Oregon Administrative Rule that states that county permitting authorities acting on behalf of the State, such as Deschutes County, may not authorize installation of a wastewater treatment system that is likely to pollute public waters, but rather, must require the installation of a wastewater treatment system that protects public waters or public health (OAR 340-071-0130(1)). Ordinance 2008-019 is provided in Appendix C.

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F. **Public comments:** As of this writing, the Department or the Board of County Commissioners has been accepting public comments and inquiries on the proposal Local Rule for nineteen months. The comments and inquiries are too numerous to include (estimated 3,500 to 4,000 pages of material) in this report but are available for review in the Community Development Department offices in Bend and La Pine or online at <http://www.deschutes.org/cdd/gpp/> at the link to "Public Record for Local Rule." The list below provides basic comment categories:

Cost: Affects on cost of living are too great, what kinds and quantity of financial assistance are available, what is the cost of upgrades, what are cost comparisons with other potential solutions, this will have a negative effect on the real estate market, and ideas for additional financial assistance programs.

Science: What is the quantity and quality of science supporting the proposed rule, how much sampling was conducted and where were the wells located, how was the quality of the information assured, was the study design and the results peer reviewed, what are the sources of nitrogen in the region, the proposal should be to change drinking water wells instead of onsite systems.

Nitrogen Reducing System Performance: How will the performance of these systems be verified, who can install and maintain the systems, what are the types of available systems

Policy: Why not a moratorium, what happens with Klamath County (as part of the groundwater system), are there case studies from other parts of the country, will there be future changes to rule requirements, what are the public participation plans, are there appeal procedures in the proposal, will there be a requirement of time of property sale upgrades, what are the enforcement procedures, are there recent installations, what are operation and maintenance requirements and costs

Sewer: Why not use sewer instead, what is Goal 11, use a combination of onsite and clusters

Public Participation: How do interested persons receive notice of events, what is the public participation plan, what is timing of events

DEQ jurisdiction: What are the treatment requirements for commercial and other large systems, will Klamath County have requirements for their residents, how are alternative systems approved, what are the Groundwater Management Area requirements, why not adopt a Geographic Rule instead of a Local (County) Rule

Local Rule: What are the performance standards, what is the affected area, what is the time period for upgrades, what are the standards for new development, what are the variance and appeal options, are there time of sale requirements

Other: Are there financial reports of previous projects, work plans for previous projects, the County should allow development on high groundwater lots, what is the effect of La Pine incorporation



III. **FINDINGS OF FACT:**

A. **Impacts to water quality from conventional onsite systems:**

1. ***Aquifer-scale controls on the distribution of nitrate and ammonium in ground water near La Pine, Oregon, USA. Hinkle, et al, Journal of Hydrology, (2007) 333, 486-503. (Available on the web at: <http://or.water.usgs.gov/proj/or186/>)***

FINDING: In order for the US Geological Survey to have a paper accepted for publication in the Journal of Hydrology, the manuscript must pass review in two stages. First, the manuscript must pass review by the editors. The editors have the option of accepting, rejecting or forwarding the manuscript for further review. Those papers rejected at this stage are insufficiently original, have serious scientific flaws, have poor grammar or English language, or are outside the aims and scope of the journal. Those that meet the minimum criteria are passed on to at least 2 experts for more thorough scientific review. The expert reviewers, or referees, are matched to the paper according to their expertise. The Journal of Hydrology uses single blind review, where the referees remain anonymous throughout the process. Referees are asked, among other considerations, to evaluate whether the manuscript:

- Is original
- Is methodologically sound
- Follows appropriate ethical guidelines
- Has results which are clearly presented and support the conclusions
- Correctly references previous relevant work

In summary, the findings of this paper have been reviewed by experts of national and/or international standing in the field of hydrology and these experts found the paper to be methodologically sound and produced results supporting conclusions that:

1. groundwater in the region is slow moving
2. the source of nitrate in the groundwater is septic tank effluent,
3. the source of ammonium in the groundwater is natural,
4. denitrification can occur in the aquifer at depths where oxygen has been depleted,
5. the nitrate contamination that has entered the aquifer so far is concentrated in the most shallow portions of the aquifer and is slowly moving to greater depths
6. the typical drinking water well produces water that is older than development in the region and therefore is generally not currently contaminated.

2. ***Evaluation of Approaches for Management Nitrate Loading from On-Site Wastewater Systems near La Pine, Oregon. Morgan et al, 2007, USGS Scientific Investigations Report 2007-5237. (Available on the web at: <http://or.water.usgs.gov/proj/or186/>)***

FINDING: The US Geological Survey, in partnership with Oregon DEQ, developed the three-dimensional groundwater and nutrient fate and transport model for the La Pine sub-basin of the Upper Deschutes River watershed. This model built on the groundwater study and model developed for the Deschutes River watershed by Gannett, et al (2001 and 2004). The three-dimensional model simulates the aquifer and its response to recharge from precipitation, discharge to streams and wells and certain geochemical loads.



Basic findings of the three-dimensional model are that:

1. using nitrogen reducing onsite systems can reduce the nitrogen load and protect the aquifer;
2. using nitrogen reducing systems on new development alone won't adequately protect groundwater quality;
3. upgrades occurring when systems fail or when houses are remodeled or replaced (approximately 100/year) do not occur quickly enough to protect groundwater quality;
4. the aquifer's ability to remove nitrogen is incorporated into the model (via discharge to rivers, pumping wells, or denitrification in the oxygen depleted portions of the aquifer); and
5. time is of the essence in that as more development is allowed to occur without taking action, more nitrogen enters the aquifer and more existing systems are created that need upgrades.

Resource optimization is a technique used by the military to determine how many planes, tanks, etc. can be constructed with available resources (for example, steel). When this technique is applied to natural resources (like the groundwater in the La Pine sub-basin), the resulting tool tells us how much nitrogen can be allocated to various locations with the region given the different characteristics of each area.

The US Geological Survey (Morgan et al, 2007), developed the Nitrate Loading Management Model by linking resource optimization methods to the three-dimensional simulation model. This model provides a tool that can be used to evaluate alternative strategies for managing nitrate loading to the shallow groundwater system. This model allows resource managers to identify the desired outcome (for example, groundwater meets the Oregon groundwater quality standard action level of 7 mg/L) and obtain, as a model output, the performance standards that need to be met to achieve that desired outcome (for example, area X needs to meet a performance standard of 58% to 78% reduction). Because this model can produce variable performance standards by area, it can help keep the cost for upgrades to existing systems as low as possible by avoiding a requirement that all systems install the highest level of treatment available.

The findings of this study are summarized in US Geological Survey Fact Sheet 2007-3103 entitled, "Questions and Answers About the Effects of Septic Systems on Water Quality in the La Pine Area, Oregon," (Williams et al, 2007).

Peer review processes for USGS Scientific Investigations Reports are comparable to the peer review processes described above for the Journal of Hydrology paper. As a result, staff finds that hydrogeologic expertise of both national and international caliber has reviewed the work embodied in this report and determined that it is scientifically rigorous and defensible.

3. ***Ground Water Redox Zonation near La Pine, Oregon: Relation to River Position within the Aquifer-Riparian Zone Continuum.*** Hinkle et al, 2007, USGS Scientific Investigations Report 2007-5239. (Available on the web at: <http://or.water.usgs.gov/proj/or186/>)

FINDING: This study was initiated in order to study how nitrogen enriched groundwater can enter nitrogen-limited surface water bodies in the upper Deschutes River watershed. Additions of nitrogen to nitrogen-limited rivers can lead to increases in primary productivity (for example, algae and aquatic plant growth) which then can reduce dissolved oxygen and change pH levels in the

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river. Significant declines in dissolved oxygen have led to fish and other aquatic life kills in other similarly affected water bodies. This study found that oxic (and potentially nitrate-rich) groundwater can enter rivers in south Deschutes County, which means that there are areas where rivers are vulnerable to impacts from increased nitrogen loading if no corrective action is taken.

4. Drinking water well tests at time of property sale.

FINDING: Thirty-one percent (31%) of 8,756 samples collected from private drinking water wells at the time of sale between September 1988 and November 2005 exceeded 1 mg/L nitrate (exceeded background levels). The samples showing greater than background levels of nitrate are shown in the table by concentration:

Concentration of NO ₃	Number of samples
1 - 4.99 mg/L	2068
5.00 - 9.99 mg/L	540
≥10 mg/L	82

The samples equaling or exceeding 10 mg/L ranged from 10 to 72 mg/L.

This database, as received from the Oregon DEQ, contains multiple results reported for individual properties because an individual property could have sold more than once during the period between 1988 and 2005. In addition, the quality assurance/quality control of the sample collection and analyses changed over time and could have changed from location to location. There is no information available showing that sample collection and analysis protocols were consistent over the record. While the dataset creates some concerns for the quality of data presented therein, the dataset does show that, given the fact that onsite wastewater treatment systems are the single largest source of nitrate in groundwater in the region, drinking water wells can be and are impacted by onsite system effluent in the south Deschutes County region.

5. Drinking water well sampling in 2000.

FINDING: Oregon Department of Environmental Quality and Deschutes County Community Development Department staff sampled a well network three times between June 2000 and June 2001 as part of the La Pine National Demonstration Project. Data from these sampling events showed 24% of the wells discharged water with nitrate concentrations greater than background levels:

NO ₃ concentrations	Number of wells	Notes
<1.0 mg/L	128	Background NO ₃ concentrations
1-6.9 mg/L	35	Showing human impacts
7.0-9.9 mg/L	5	Oregon Groundwater Management Area trigger
≥10 mg/L	0	
Total	168	

This dataset was collected in strict compliance with the Oregon DEQ's quality assurance/quality control protocols and the laboratory analyses were conducted in compliance with the Environmental Protection Agency's certification requirements for the DEQ lab, including specific

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quality assurance and quality controls specifications. Therefore these data are considered high quality.

6. Shallow monitoring well sampling

FINDING: The Oregon DEQ and Deschutes County installed and sampled a network of nearly 200 shallow monitoring wells between 2000 and 2004 as part of the La Pine National Demonstration Project. The monitoring well locations were specified by a registered hydrogeologist and the wells were installed by a licensed well driller in accordance with Oregon Water Resources Department well construction standards.

The table below entitled "Network monitoring well data" shows the descriptive statistics of the sample results from three years of sampling a network of 141 wells. These wells were located at the periphery of the properties on which the field test system was located. These wells provided information on groundwater flow direction, depth to water table, and ambient groundwater quality conditions. The wells were screened at or near the water table in order to document conditions in the shallow aquifer.

The total nitrogen, nitrate and chloride results show that on average, ambient conditions in the shallow aquifer are already showing the effects of human sewage discharged to groundwater because total nitrogen and chloride levels are greater than 1.0 mg/L. Chloride can be used as a tracer for sewage plumes in the environment of south Deschutes County because human sewage is the predominant source of this element.

The bacteria sample results (fecal coliform and E. coli) show that these bacteria are not present in the aquifer.

Network monitoring well data

Mean of means 141 Network Wells	Nitrate- Nitrite As N (mg/L)	TN (mg/L)	Chloride (mg/L)	Fecal Coliform	E. coli	Dissolved Oxygen (mg/L)	Depth to Water Table (ft)	Total Phosphorus (mg/L)
Mean	3.7	4.0	12	N/A	N/A	5.1	13.1	0.2
Geometric Mean	0.7	1.3	6.5	N/A	N/A	3.3	12.0	N/A
Median	1.2	1.5	5.9	ND	ND	6.2	11.9	0.2
Standard Deviation	10.5	11	20	N/A	N/A	2.8	5.7	0.4
Minimum	0.005	0.1	0.5	ND	ND	0.1	4.6	ND
Maximum	99	99	139	41	41	8.3	29.9	3.8
Count	141	141	141	139	139	141	141	105
95% Confidence Level	1.7	1.8	3.3	N/A	N/A	0.5	0.9	0.08
99% Confidence Level	2.3	2.4	4.3	N/A	N/A	0.6	1.2	0.10

N/A = statistic not calculable

ND = nondetect

The table below shows data from three years of sampling 48 monitoring wells placed in drainfields in the field test program. These wells provide information about the effect of the onsite system on the shallow aquifer immediately below the drainfield. Data show that nitrate and chloride levels are elevated in these wells, indicating the effects of the onsite system on the aquifer. There are some bacteria results indicating that some contamination may be occurring; however, these

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results were not repeated during subsequent sampling. Total phosphorus results indicate that the soil removes most of the phosphorus from wastewater.

48 Drainfield MW	Nitrate-Nitrite As N (mg/L)	Total Nitrogen (mg/L)	Chloride (mg/L)	Fecal Coliform	E. Coli	Dissolved Oxygen (mg/L)	Depth to Water Table (ft)	Total Phosphorus (mg/L)
Mean	9.0	9.2	17	33	47	5.3	12.6	0.18
Geometric Mean	2.4	3.6	12	N/A	N/A	3.7	11.6	0.16
Median	4.1	4.2	11	ND	ND	6.4	11.1	0.17
Standard Deviation	13	13	15	N/A	N/A	2.6	5.6	0.10
Minimum	0.003	0.1	0.7	ND	ND	0.1	4.9	0.04
Maximum	52	52	72	1502	2189	8.5	29.0	0.4
Count	48	48	48	48	48	48	48	37
95% Confidence Level	3.8	3.8	4.3	N/A	N/A	0.8	1.6	0.03
99% Confidence Level	5.0	5.0	5.8	N/A	N/A	1.0	2.2	0.04

N/A = statistic not calculable
 ND = nondetect

This dataset was collected in strict compliance with the Oregon DEQ's quality assurance/quality control protocols and the laboratory analyses were conducted in compliance with the Environmental Protection Agency's certification requirements for the DEQ lab, including quality assurance and quality control specifications. Therefore these data are considered high quality.

B. Nitrate Standards

1. Safe Drinking Water Act standard

FINDING: The US Environmental Protection Agency (EPA) has established the Maximum Contaminant Level for nitrate as nitrogen (N) as 10 mg/L for municipal drinking water supplies. This level is considered protective to prevent methemoglobinemia (blue baby syndrome) in susceptible populations. As a point of comparison, the World Health Organization recommends setting the drinking water standard at 45 mg/L nitrate. While these standards appear to be different, the two concentrations are actually the same because 45 mg/L nitrate is equivalent to 10 mg/L nitrate as N. These two values (10 and 45) use different units to measure the amount of nitrogen contained in a water sample.

The Maximum Contaminant Level does not apply to private drinking water wells but the EPA encourages private well owners to test their wells annually to confirm that their drinking water supply is safe.

2. Groundwater Quality Protection

FINDING: The Oregon DEQ establishes groundwater quality protection standards in OAR 340-040 (available at: <http://www.deq.state.or.us/wq/onsite/rules.htm>). This rule sets the water quality standard action level for nitrate as N in groundwater at 70% of the drinking water standard, or 7 mg/L. The proposed rule is designed to maintain compliance with this standard on average in south Deschutes County.

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C. Nitrogen Reducing Systems

FINDING: The Oregon DEQ was awarded \$5.5 million for the La Pine National Demonstration Project. One of the main tasks of this project was to field test nitrogen reducing systems. During the project, the DEQ partnered with Deschutes County to install and monitor 49 onsite wastewater treatment systems. Nine of these systems were conventional systems that were installed and monitored on the same schedule as the nitrogen reducing systems. The nitrogen reducing systems included 14 different designs; each design was replicated in two or three locations. Each onsite system was installed at a residential site and monitored monthly for a year and every two months for the following 1.5 to 2 years.

The results from the field test were reported at national, regional and state meetings of onsite wastewater treatment professionals. The field test demonstrated that nitrogen reducing systems exist nationally or internationally that protect groundwater while eliminating the need for the extensive infrastructure associated with centralized sewer systems. The La Pine National Demonstration Project results indicate that nitrogen reducing systems currently available on the market nationally range in performance between about 35% to 96% nitrogen reduction. Not all of the systems performed adequately for nitrogen reduction and the systems that failed were replaced. The chart on page 15 shows all of the systems participating in the project by their performance for nitrogen reduction.

The Oregon DEQ used the results of this field test when the statewide onsite wastewater treatment system rules were amended in 2005 to allow the use of nitrogen reducing at the residential level under a construction-installation permit. This rule amendment allowed Deschutes County to issue permits for nitrogen reducing systems rather than requiring that homeowners obtain a Water Pollution Control Facility permit from the DEQ.

Since the Oregon DEQ amended OAR 340-071 in 2005, four companies have applied and been approved for use of their product in Oregon. The Oregon DEQ listing process reviews system performance for basic wastewater treatment capabilities (for example, biochemical oxygen demand and total suspended solids reduction) but may not include a review for nitrogen reduction. If nitrogen reduction is included in the review, the standard that systems must meet is to discharge less than 30 mg/L total nitrogen. Deschutes County has reviewed data on the approved systems and found that three of these companies produce nitrogen reducing systems and the fourth does not. A fifth company with a product that is a nitrogen reducing add-on component was approved for use in Oregon on February 12, 2007; however, this product has limited availability because the distribution network has not been fully established in Oregon and certification of installers and maintenance providers has not been completed. While additional wastewater treatment systems have applied for listing in Oregon, until the DEQ completes review of the current applications, staff does not know whether additional nitrogen reducing systems will be available for use locally.

A non-proprietary system is also now available for installation under a construction-installation permit from the County as a result of the 2005 DEQ rule amendment. Recirculating gravel filters are available for use and data published by the National Small Flows Clearinghouse indicates that these systems provide approximately 50% reduction in total nitrogen on a reliable basis. Other research indicates the performance of these systems may achieve higher levels of reduction. Data supporting this research is currently under review.

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IV. POTENTIAL GROUNDWATER PROTECTION APPROACHES:

A. Sewer Systems

FINDING: The creation of new or the expansion of existing sewers is governed by state rule (OAR 660-011-0060 available online at: <http://www.oregon.gov/LCD/adminrules.shtml>). This rule defines any wastewater treatment system that serves two or more lots as a sewer system.

Two processes for creating or expanding sewers in rural areas could apply to the south Deschutes County region and include OAR 660-011-0060(4), when the DEQ determines that a public health hazard exists and that there is no practicable alternative to sewer (the problem cannot be solved using onsite systems), and OAR 660-011-0060(9), when there is an imminent health hazard for which there is no practicable alternative to sewer.

The County retained KCM, Inc. (now KCM-TetraTech, Inc.) to study the feasibility of extending or creating new sewers in the region. The estimates developed in 1997 assumed that sewer treatment plant sites could be acquired for \$3,000 per acre and that the cost of financing the treatment works and transmission system would be 3% per year over 20 years. The consultant estimated in 1997 that each lot would be charged between \$19,000 and \$28,000 for a sewer system hook-up.

Since 1997, land, material, and energy costs have increased significantly and would add to the per lot estimated cost. Adjusting the 1997 costs using historic inflation rates between 1998 and 2008, the per household cost for sewer would be between \$24,000 and \$33,000. In comparison, the City of Bend currently charges about \$28,000 to hook up to the existing sewer system plus about \$22 per month for service charge. The City of Tualatin charges \$40,000 to hook up to sewer. Oregon Water Wonderland Unit 2 charges about \$9,500 to hook up to the sewer system and \$42 per month for service. This low charge reflects the low price for the sewer treatment plant site (about \$500 per acre) and other financial assistance.

The creation or extension of sewer systems requires a large initial capital investment to construct or upgrade the treatment site and install transmission facilities. Construction grants are no longer available for creating or extending sewer systems. Construction loan programs are in place with varying fund amounts available with repayment periods ranging from 5 to 20 years. Using the \$19,000-\$28,000 estimate above, the annual cost to a sewer system user for a loan of this amount at 3% would be between \$1,275 and \$1,880 per household per year.

The amount of time required to establish extensions to existing sewers can be quite long. The expansion of the existing Oregon Water Wonderland Unit 2 sewer took seven years from the time the decision was made to proceed until the first new house was hooked to the system. According to Oregon Department of Land Conservation and Development records, no new sewers in rural areas have been constructed in Oregon (White, personal communication).

B. Onsite Wastewater Treatment Systems

FINDING: In response to the KCM study referenced above, public participation during the Regional Problem Solving Project identified the creation or extension of sewers into the rural areas as the least desired solution because of the cost. At that time, the public directed the County to pursue the use of innovative kinds of onsite wastewater treatment systems to protect groundwater quality. In response to this direction from the public, the Oregon DEQ sought and obtained \$5.5 million from the US Environmental Protection Agency to identify onsite

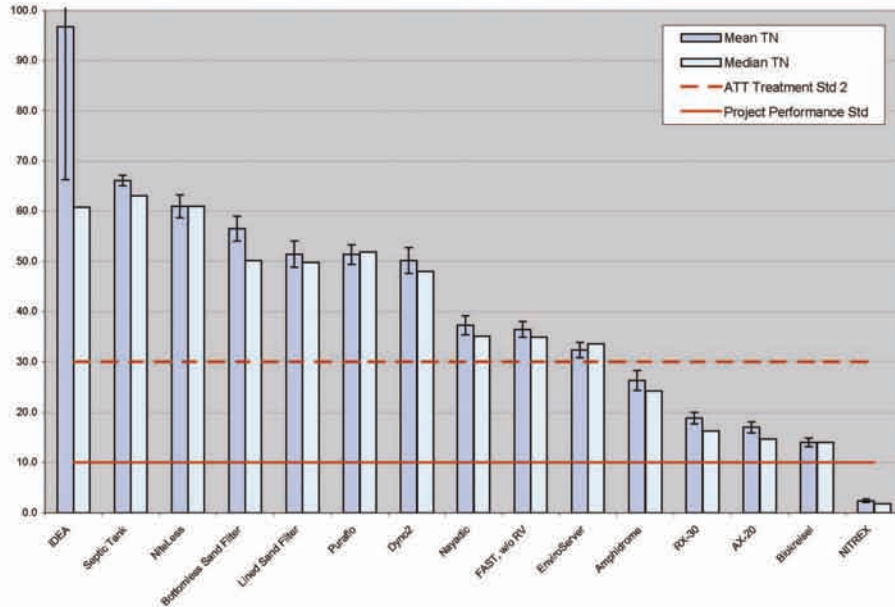
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wastewater treatment systems that would solve the groundwater pollution problem. Performance testing of onsite wastewater treatment systems shows they can be as effective as sewer systems for protecting water quality while maintaining natural groundwater recharge patterns.

The La Pine National Demonstration Project found that there are several commercially available systems that will reduce nitrogen at levels greater than achievable using conventional onsite systems like standard, pressure or sand filter systems. The figure below shows how the systems participating in the La Pine Project can be ranked by nitrogen reduction. Of the systems participating in the project, the AX-20, Puraflo, and NITREX systems have applied for and been listed in Oregon for use under County-issued construction-installation permits. The County has listed the AX-20 as a nitrogen reducing system and has received data on the NITREX to be added to the list. The County has not yet received data on the Puraflo system's nitrogen reducing capability.



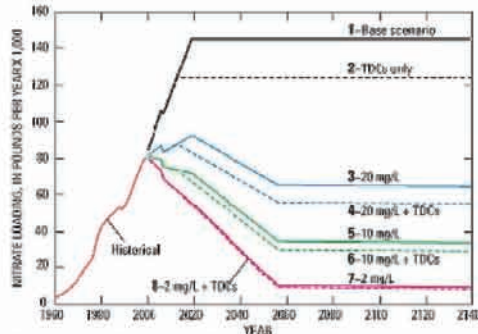
The onsite wastewater treatment systems currently available that reduce nitrogen range between about \$9,000 (standard drainfield) and \$16,000 (bottomless sand filter) for upgrades to existing systems depending on the condition of the existing system. Increased costs can be incurred during upgrades if the existing septic tank is damaged or otherwise unsound or if the drainfield is failing or inappropriately located. Maintenance costs range between \$25 and \$35 per month depending on the system chosen by the property owner. Operation costs will vary depending on the type of system chosen and are largely dependent on electricity demand. In comparison, a new standard system currently costs between \$3,500 and \$4,500 and a new sand filter costs between \$10,000 and \$12,000. The added cost for the nitrogen reducing system is between \$4,500 and \$5,500 for a site using a standard drainfield and between \$4,000 and \$6,000 for a site using a bottomless sand filter.

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Some advantages of using onsite system upgrades are that groundwater protection can begin immediately as compared to typical sewer hookup strategies of waiting until the treatment plant or collection system is complete before water quality protection becomes effective. The figure below shows the increasing nitrogen load to groundwater historically and into the future as the area is built out under different scenarios. The capacity to reduce nitrate loading immediately can be an important consideration because every new system installed in south Deschutes County that does not reduce nitrogen increases pollutant loading while simultaneously increasing the demand for financial assistance.



Historical nitrate loading from onsite wastewater systems and eight nitrate loading scenarios tested with the study-area model. (Morgan et al, 2007)

C. Do Nothing

FINDING: On January 4, 2008, the Oregon Department of Environmental Quality (DEQ) issued a letter determining that a public health hazard is being created in the region by continued use of conventional onsite wastewater treatment systems. The DEQ states that potential solutions to this health hazard may include a variety of approaches ranging from onsite wastewater treatment systems to expanded or new sewer systems. In comments to the Board of County Commissioners (Board) on January 30, 2008, the DEQ also indicated that doing nothing is not an appropriate course of action in light of the developing public health hazard. The proposed rule is an opportunity for the Board to decide on whether it is appropriate to undertake protective action at the local level.

Environmental impacts of a "Do Nothing" scenario include large areas of the region's groundwater contaminated with nitrate concentrations greater than 10 mg/L nitrate as N (equivalent to 45 mg/L nitrate) and adverse impacts to surface water bodies in the region. Surface water impacts include increased algae growth, fluctuations in dissolved oxygen levels, and die-offs of aquatic organisms requiring cold, highly oxygenated water. (Morgan et, 2007; Hinkle et al, 2007)

Financial impacts of a "Do Nothing" scenario are difficult to determine because, while the costs of sewers or onsite system upgrades are avoided, there are other market impacts resulting from declining property values because of groundwater quality degradation, impacts to the sport fishing or recreational boating industry, or the possible imposition of a moratorium on building in the region.



V. PROPOSED LOCAL RULE:

FINDING: The proposed amendment would require the use of nitrogen reducing systems in south Deschutes County for systems permitted by Deschutes County Community Development Department. While sewer may be a viable option in some circumstances, the county role is largely that of reviewer for the land use process for creating or extending sewers in rural areas under Goal 11 (OAR 660-011-0060, Sewer Service to Rural Lands). The county typically does not have permit authority over sewer systems because the county can issue permits only for wastewater treatment systems that discharge less than 2,500 gallons per day of residential strength wastewater.

Staff finds that there may be a variety of approaches that can be used to protect groundwater quality in south Deschutes County and that one of those approaches is to use nitrogen reducing onsite systems that are appropriately located and installed. Another approach that may be feasible is to use community or regional sewer systems or some other approach that provides the same level of protection. All of these methods are potential actions and therefore need to be reviewed and permitted by the appropriate authorities to ensure that groundwater protection is achieved. With this proposed amendment to Deschutes County Code, the County proposes to ensure that groundwater protection efforts undertaken at the local level meet the overall groundwater protection goals.

A. Siting criteria for New Development.

The proposed Local Rule will allow onsite wastewater treatment systems serving New Development to be sited on lots that are shown to provide 24 inches of natural vertical separation between the bottom of the trench and the highest level reached by groundwater.

FINDING: The County, in keeping with direction received during the public process conducted during the Regional Problem Solving Project, proposes to codify its current practice of allowing installation of onsite wastewater treatment systems when there is at least 24 inches vertical separation. Based on this pattern of practice, lots or parcels with less than 24 inches of separation will not be approved for onsite systems. The County further proposes to deny lots or parcels that have been filled or dewatered for reasons described below.

Research conducted during the La Pine National Demonstration Project showed that one foot of soil below the bottom of the trench provided significant protection for the groundwater from contamination by pathogenic organisms. The table below shows data from samples taken from the unsaturated zone one foot below the trench in a pressure distribution system. The geometric mean and median values represent a 99.9% reduction in bacteria counts from the bacteria levels discharged from the septic tank. The additional foot of soil (for a total of 24 inches) provides added reduction, particularly for those events when higher bacterial counts are seen, when groundwater mounding occurs and/or during times of high water use in the house (more wastewater loaded to the drainfield or sand filter). This data shows how the soil performs an important treatment function by protecting groundwater from bacterial contamination. These findings are also corroborated by the findings of the USGS report, "Organic Wastewater Compounds, Pharmaceuticals, and Coliphage in Ground Water Receiving Discharge from Onsite Wastewater Treatment Systems near La Pine, Oregon: Occurrence and Implications for Transport." (Hinkle et al, 2005; available online at: <http://pubs.usgs.gov/sir/2005/5055/index.html>)

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Bacteria samples taken one foot below a pressure distribution drainfield

	<i>Fecal Coliform</i> <i>E. coli</i>		<i>Fecal Coliform</i> <i>E. coli</i>	
	One foot below trench		Septic tank effluent	
Geometric mean	23	23	159,000	140,000
Median	10	10	102,000	100,000
Minimum	ND	ND	1,000	1,000
Maximum	100,000*	81,000*	5,800,000	4,400,000
Count	21	21	21	21

The maximum counts reported here were not replicated with subsequent sampling.

Further, preliminary research conducted on the performance of soil in reducing emerging contaminants like pharmaceuticals, personal care products and household contaminants indicates that the natural soil environment provides important treatment for many of these contaminants. (Tchobanoglous & Leverenz, personal communication).

Groundwater interceptors are a method used to lower, or dewater, the groundwater level within a specific area. These work by collecting groundwater and diverting it to the nearest surface water drainage. While these systems may work physically, they tend to have adverse impacts on surface water quality by diverting nutrient rich groundwater directly to rivers. The rivers in the Deschutes River watershed are nitrogen limited. This means that diverting nitrate-rich groundwater to surface water bodies can increase algae and aquatic plant growth, which in turn affects the levels of dissolved oxygen available for other aquatic organisms, including fish.

Finally, developing high groundwater table lots will add nitrogen loading that can increase the nitrogen reduction requirements for existing and other future development in the area. Increased nitrogen reduction standards could translate into higher treatment costs for property owners based on a preliminary evaluation using the Nitrate Loading Management Model.

B. Future Development on lots or parcels with high groundwater levels

FINDING: The County, funded by a grant from Oregon DLCD, will begin a public involvement process to determine whether or how development should be allowed on properties with less than 24 inches of separation from ground surface to the highest level reached by groundwater. The County, in a work plan approved by Oregon DLCD, began this process during Fiscal Year 07-08. The process will bring together regional stakeholders, including natural resource managers (Oregon DEQ, Oregon Department of Fish and Wildlife, Oregon Department of State Lands, etc.) and property owners, to investigate the cumulative impacts of increasing development in areas with high groundwater levels. Possible outcomes of this work program could, for example, be increased performance standards for existing systems, increased protection for wetland and riparian resources and/or maintain the existing pattern of practice. Any changes to Deschutes County Code would require a legislative process to solicit public comment and feedback on the proposal.

Staff proposes to reference this work program in the code language in the form of a sunset clause for siting criteria. Standards contained in this portion of the rule would no longer be enforceable as Deschutes County Code three years from the effective date of rule adoption unless amended as a result of the high groundwater work program.



C. Limit the use of easements.

FINDING: The County proposes to eliminate the use of easements to establish a location for a portion or all of the onsite wastewater treatment system on a lot or parcel separate from the lot or parcel where the source of wastewater is located. The County has witnessed the dissolution of easements to the detriment of the lot where the wastewater is generated. In addition, lots or parcels that propose to use easements typically cannot maintain 24 inches of separation from the bottom of the trench to groundwater. Developing these lots can impact wetlands and riparian resources and is directly counter to the direction received from the public process of the Regional Problem Solving Project. Further, developing high groundwater lots will add nitrogen loading that could have the effect of increasing the nitrogen reduction requirements of, and potentially the cost to, existing development in the area based on a preliminary evaluation using the Nitrate Loading Management Model.

D. Groundwater level determinations.

FINDING: The County, at DEQ's suggestion, is proposing to codify existing practices used to determine groundwater levels. This procedure is only used for those sites where soil characteristics make it difficult to determine the highest level that groundwater reaches. This procedure only applies to vacant sites seeking approval for development.

E. Performance standards.

FINDING: The US Geological Survey and Deschutes County, in a grant from the National Decentralized Water Resources Capacity Development Project, developed the Nitrate Loading Management Model. The development of this model is documented in Morgan et al, 2005 and Morgan et al, 2007 (available on the web at: <http://pubs.usgs.gov/sir/2007/5237/>).

Performance standards are established by setting constraints for the region, such as:

1. Future Development installs the maximum nitrogen reducing system available (as defined in the proposed code). This approach reduces the level of nitrogen reduction required for existing systems in many management areas.
2. Existing Development upgrades to achieve a minimum 35% reduction
3. Shallow groundwater meets the 7 mg/L groundwater quality protection standard on average.

Additional constraints may be set for the region using this model, including a constraint on the amount of nitrogen reaching the rivers. No river protection constraints are proposed because it appears that significant protection for the rivers is provided by reducing nitrogen discharges from onsite systems. Future river protection projects may be considered to improve riparian conditions to reduce nitrogen before it reaches the stream channel. If future resource evaluation work indicates the need for increased performance standards for existing onsite wastewater treatment systems, staff expects that it would not be necessary to further upgrade the systems that have already been changed to nitrogen reducing systems in accordance with the code in effect at the time.

F. Compliance date: Fourteen years from the effective date of the proposed rule.

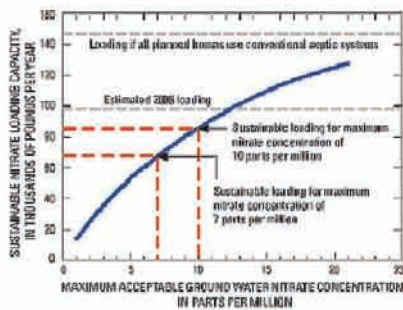
FINDING: The groundwater studies and predictive models show that groundwater protection actions should be implemented as soon as possible. The chart inserted below is taken from the

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USGS Fact Sheet (Williams et al, 2007) and shows that the cumulative nitrate load already discharged to the aquifer from existing development significantly exceeds the load needed to exceed the Oregon groundwater quality action level and the federal safe drinking water standard. In spite of the science that indicates a need for immediate action, staff has proposed a fourteen year upgrade schedule to coordinate with projected build-out of south Deschutes County, the sale of land in and platting of the Newberry Neighborhood, and the long term average rate of home sales in the region. Fourteen years from 2008 should allow enough time for the region to build out based on projections for south Deschutes County. Fourteen years also allows significant financial assistance to be generated in the form of revenue from land sales in the Neighborhood Planning Area in La Pine or some form of bonding. Finally, practically speaking, the projected inspection workload for the County's Environmental Health Division would average 400 to 500 systems per year.



The relation between maximum acceptable nitrate concentration in groundwater and the sustainable nitrate loading capacity of the aquifer determined by the study-area model. (Williams et al, 2007)

G. Listing nitrogen reducing systems.

FINDING: The Oregon DEQ must first approve any system before the County may issue a construction-installation permit (OAR 340-071-0135 and -0345). During the listing process, the DEQ reviews performance data and the National Sanitation Foundation (NSF) certification. The only explicit nitrogen standard contained in Oregon DEQ rule is a listing criteria for an Alternative Treatment Technology under Treatment Standard 2 (30 mg/L total nitrogen). Because groundwater protection goals in south Deschutes County require nitrogen reduction levels greater than that achieved by a system discharging 30 mg/L total nitrogen in the effluent, the Oregon DEQ and Deschutes County agree that the County should require additional information from system manufacturers or designers in order to determine which listed Alternative Treatment Technologies can support the groundwater quality goals. And, because the NSF certification process commonly uses influent wastewater that is lower strength (is more dilute) than typical single-family residential wastewater, the Oregon DEQ and the County agree that a system's nitrogen reduction capabilities should be defined by field tests of the treatment system.

H. Other approaches to groundwater protection.

FINDING: The proposed rule is focused on performance standards for onsite systems within the jurisdiction of Deschutes County and therefore does not limit the creation or expansion of sewer systems. The creation or expansion of sewers is governed by rules contained in OAR

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660-011-0060, Sewer Service to Rural Lands. The proposed code language has been modified to acknowledge this existing process and ensure that the proposed rule does not inadvertently eliminate sewers as an option.

Other approaches may also become available in the future that cannot be predicted at this time. The proposed code language has been modified to ensure that these approaches are not eliminated inadvertently as options and to create a mechanism by which these approaches can be incorporated into the program to protect groundwater quality.

I. Variances and Appeals.

FINDING: The County received several comments on the Local Rule concepts that concerned the opportunity to apply for variances or appeals of decisions made under the proposed rule. The draft rule language includes variances in the case of economic or personal hardship or where sewer systems are being established.

J. Fees.

FINDING: The Community Development Department is currently entirely fee supported. Other means of offsetting the cost for permit fees have not been identified or proposed. Currently retrofits of existing systems would be conducted under a repair permit. Repair permits are currently \$380 plus a \$60 DEQ surcharge. The DEQ increased the surcharge from \$40 effective July 1, 2008.

K. Violations.

FINDING: The County currently enforces the Deschutes County Code. The proposed rule would be enforced in the same manner as any other code requirement and the existing County code enforcement policies are expected to continue to apply for the foreseeable future. Currently the county works with violators to achieve compliance in advance of going to court. In the long run, the level of enforcement undertaken will be a decision for Board of County Commissioners in 14 years. However, the Board will have a responsibility to honor the financial commitment made by those who have complied, by not waiving the requirements of those who have not.

VI. FINANCIAL ASSISTANCE:

A. Existing Financial Assistance Programs

FINDING: There are existing mechanisms by which property owners can gain access to funds available for home improvements, including onsite system repairs or upgrades. The County proposes to coordinate with existing programs to the greatest extent possible.

1. Pollution Reduction Credit Rebates

FINDING: Developers in the Neighborhood Planning Area have the option of generating Pollution Reduction Credits or paying into the County's Partnership a fee in lieu of credits. The fee paid in lieu of generating Pollution Reduction Credits is \$7,500 per credit. Currently, Elk Horn Land Development is offering a rebate to homeowners upgrading to nitrogen reducing systems in exchange for the Pollution Reduction Credit created by the upgrade.

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2. USDA Rural Development Program

FINDING: The USDA offers loans and grants to low income and elderly residents for home improvements. Onsite wastewater treatment system replacements or upgrades qualify for these funds.

3. NeighborImpact

FINDING: NeighborImpact currently offers loans to residents at or below 80% of the county median income bracket for home improvements. Homeowners must repay the loan once the house is rented, sold or refinanced. As loans are repaid, proceeds are returned to the program to provide loans for future homeowners. Projects include but are not limited to wastewater treatment systems, roofs, heating systems, handicap accessibility, and exterior paint. NeighborImpact is partnering with Deschutes County during the current round of applications for Community Development Block Grants with the goal of increasing the availability of funds for Deschutes County residents.

B. Planned Financial Assistance Programs

FINDING: The Deschutes County Board of Commissioners has established an advisory committee to produce recommendations on how financial resources should be allocated to property owners faced with implementing groundwater protection measures. The following sections provide an outline of the type of financial programs that could help homeowners offset the cost of groundwater protection measures.

1. Low interest loans

FINDING: Funds generated by payment of fees for credits or from the sale of land in the Newberry Neighborhood will be used to assist with groundwater protection measures. The balance between using this fund for loans versus grants may be the subject of a recommendation from the Financial Assistance Advisory Committee.

Funds earmarked for homeowner assistance from the La Pine National Demonstration Project must be used for loans, which may include deferred payment loans, as specified by the grant agreement.

2. Partnership Fund

FINDING: Developers in the Neighborhood Planning Area have the option of generating Pollution Reduction Credits or paying into the County's Partnership a fee in lieu of credits. The fee paid in lieu of generating Pollution Reduction Credits is \$7,500 per credit. Any funds paid into this fund are dedicated to assisting homeowners upgrading their onsite systems to nitrogen reducing systems. The administration of this program will most likely be through a third party. Funds may be disbursed either as conventional loans, payment deferred loans (liens), and/or grants. A recommendation for how funds are disbursed may come from the Financial Assistance Advisory Committee.

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3. State Clean Water Revolving Loan Funds

FINDING: Oregon DEQ administers the program for the state revolving loan fund. Loans to communities are available for loan periods of between 5 and 20 years at about 2% interest plus an annual fee of 0.5% of the amount owed. This is a potential source of funds to help homeowners upgrade their systems or for neighborhoods to extend or create sewers (more information is available online at: <http://www.deq.state.or.us/wq/loans/loans.htm>). Careful consideration of the impacts of the cost of administering such funds on the interest rate and fees is important. Staff proposes reviewing the potential for using this source of funds if the proposed rule is adopted and after implementation of the County generated financial programs.

C. Source of Funds

FINDING: The County has existing assets of about \$350,000 in funds for a low interest loan program, the revenue from the Partnership Fund, and revenue from the sale of county-owned land in the Newberry Neighborhood in La Pine. Estimates of the land value are based on 300 acres sold at \$100,000 per acre for a total of \$30 million. The funds can be made available over time through the sale of property and the use of the Pollution Reduction Credit Program through and/or through County bond sales or the loaned use of County interdepartmental fund transfers.

The estimated total cost of retrofits in south Deschutes County ranges between \$43 million and \$65 million. Therefore, considerable financial assistance can be generated by using existing County assets. Using County assets in addition to other programs like the state revolving loan fund and partnering with organizations like USDA Rural Development and NeighborImpact could cover the majority of the projected need for financial assistance.

VII. RECOMMENDATION:

Staff recommends **Adoption** of the proposed Local Rule in coordination with the development of additional financial assistance programs that target pollution reduction actions.

BJR:slr



VIII. REFERENCES:

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- NOWRA Annual Conference 2003
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- NOWRA Annual Conference 2004
- NOWRA Annual Conference 2006

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Appendix A: Updated June 27, 2008 Local Rule Communication Plan and Public Outreach Summary

Deschutes County Community Development Department
117 NW Lafayette Ave., Bend, OR 97701
PH: (541) 388-6575, FAX: (541) 385-1764
Web: www.deschutes.org/cdd/gpp/



The goal of the Local Rule is to protect the sole source of drinking water for the residents of south Deschutes County using the least cost option and creating financial assistance programs.

Web site

- www.deschutes.org/cdd/gpp/. The documents listed below are available under "Project News."

Articles and reports

This list reflects articles published in print media. Television and radio spots are not included.

- Bend Bulletin 05-19-08
- Bend Bulletin 05-15-08
- Bend Bulletin 05-05-08
- Bend Bulletin 04-24-08
- Questions from the March 19, 2008 Hearing
- Bend Bulletin 04-03-08
- Bend Bulletin 04-03-08 Map
- Newberry Eagle April 2008
- Bend Bulletin 03-28-08
- Bend Bulletin 03-23-08
- Bend Bulletin 03-20-08 B
- Bend Bulletin 03-20-08 A
- Bend Bulletin 03-17-08
- Notice of Public Hearing 02-15-08
- Bend Bulletin 02-06-08
- Bend Bulletin 01-31-08
- Oregon DLCD Response, 01-30-08
- Questions from the Board to Oregon DEQ & DLCD, 01-30-08
- Bend Bulletin Clarification 12-05-07
- Bend Bulletin 11-06-07
- Bend Bulletin 11-04-07
- USGS Fact Sheet, Questions and answers about the effects of septic systems on water quality in the La Pine area, Oregon
- USGS Report, Evaluation of approaches for managing nitrate loading from on-site wastewater systems near La Pine, Oregon
- USGS Report, Ground Water Redox Zonation near La Pine Oregon: Relation to River Position within the Aquifer-Riparian Zone Continuum
- Bend Bulletin 10-29-07
- Press Release 10-08-07
- Bend Bulletin 10-07-07
- Bend Bulletin 09-27-09
- Bend Bulletin 07-24-07
- Newberry Eagle Article, April 2007
- EH information, Newberry Eagle April 2007
- Bend Bulletin Article, March 30, 2007
- The Source Article, March 29, 2007
- Bend Bulletin Article, March 29, 2007
- Bend Bulletin Article, March 28, 2007

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- Bend Bulletin Article, March 21, 2007
- Bend Bulletin Article, March 19, 2007
- Bend Bulletin Article, March 7, 2007
- Bend Bulletin article, March 1, 2007
- Bend Bulletin Article, February 22, 2007
- Newberry Eagle article, February 2007
- Bend Bulletin Article, February 1, 2007
- Bend Bulletin Article, January 17, 2007
- Citizen Update Newsletter, January 2007
- Newberry Eagle articles, January 2007
- Journal of Hydrology paper
 - Supplement 1
 - Supplement 2
 - Supplement 3
 - Supplement 4
- Groundwater Science Open House Notice December 2006
- Bend Bulletin article, December 21, 2006
- Bend Bulletin article, December 20, 2006
- Newberry Eagle article, December 2006
- Bend Bulletin Article, December 1, 2006
- Bend Bulletin Article, November 2006
- Newberry Eagle article, November 2006
- Newberry Eagle article, October 2006
- Newberry Eagle article, September 2006
- Newberry Eagle article, May 2006
- Deschutes County Citizen Update, May 2006
- Bend Bulletin article, May 2006
- Bend Bulletin article, April 2006
- Bend Bulletin article, February 2006

Notices (PDF files)

- Press releases issued prior to each public meeting
- Notices of meetings posted at area stores, libraries, La Pine Senior Center, post office, etc.
- Notice of Public Hearing, July 7, 2008
 - Ordinance 2008-012
 - Deschutes County Code Chapter 13.14
 - Resolution 2008-021
 - Exhibit A to Resolution 2008-021
- Notice of Public Hearing - issued February 15, 2008
 - Summary of Changes, 03-19-08
 - Revised DCC 13.14, 2-15-2008 (Deletions are identified by strike-through and additions are identified by underline.)
 - DRAFT Ordinance 2008-012, 2-15-2008
 - Revised Staff Report, 2-19-08 (Deletions are identified by strike-through and additions are identified by underline.)
 - DRAFT Resolution 2008-021, 2-15-2008
 - Exhibit A to Resolution 2008-021, Map of Performance Standards for Existing Onsite Systems with explanatory statement
- Notice of Public Hearing on Proposed Local Rule
 - Ordinance 2007-011
 - Draft Local Rule
 - Staff Report
 - Resolution 2007-023
 - Exhibit A to Resolution 2007-023
- Office Hours Scheduled in January 2007
- Notice of Planning Commission meeting, November 30, 2006

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- Notice of Local Rule - Tax Bill Insert, October 2006
- Notice of Groundwater Protection Project (distribution began March 2006)
- Groundwater Protection Project Update, September 2006

Brochures, Handouts & Posters (PDF files)

- Application form - south county advisory committee - direct mailed to owners of property in south Deschutes County, 10/09/07
- Proposed Local Rule documents
- Deschutes County memo on nitrate concerns
- Oregon Department of Human Services - Technical Bulletin on Nitrates
- Nitrogen Reducing Onsite Systems Poster
- Effects of onsite systems on groundwater poster
- Frequently Asked Questions
- Alternatives Analysis
- Retrofit Cost Scenarios, Winter 2007
- Proposed Local Rule Concepts
- But my water was just tested! November 2006
- Pollution Reduction Credit Program Brochure, Fall 2006
- Project Overview Brochure, Spring 2006
- South County Groundwater Protection History, Spring 2006
- Why Not Sewer? Brochure, Spring 2006

Other Outreach/Participation events:

- Installer meetings – typically held by Deschutes County Environmental Health staff
 - August 22, 2006
 - October 17, 2006
- Realtor meetings
 - Regular weekly meetings with COAR representatives – typically held by Deschutes County Community Development Director and Planning Director
 - September 6, 2006 – conducted by County EH staff and the CDD Director
 - November 27, 2006 (requested by realty office) – presentation provided by EH staff
 - December 9, 2006 (requested by two realty offices) – two presentations provided by EH staff
- Public meetings and events
 - May 13, 2003, Presentation of results from the 3-D model, groundwater study and nitrogen reducing system field test to the Board of County Commissioners in La Pine.
 - May 11, 2006, Planning Commission meeting (part of TDC Amendment Hearing)
 - All published materials leading up to and following up on TDC amendments also referred to the need for a Local Rule (see "Project News" page of website)
 - November 9, 2006 (requested by the La Pine Senior Center)
 - November 30, 2006 (hosted by the Deschutes County Planning Commission)
 - December 20, 2006 (Science Session requested at 11/30/2006 Planning Commission meeting)
 - Office Hours:
 - January 4, 2007, 5:00 - 7:00, Deschutes County office, La Pine
 - January 9, 2007, 1:00-5:00, Village Properties office, Sunriver
 - January 18, 2007, 1:00-5:00, Village Properties, Sunriver
 - January 23, 2007 3:00 - 5:00, Deschutes County office, La Pine
 - Hearing before the Board of County Commissioners, March 13, 20, 27th, 6:00 – 9:00 PM, La Pine High School

Local Rule for Onsite Wastewater Treatment Systems in South Deschutes County

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- Written record for proposed Local Rule open from February 2007 to present (February 2008)
 - Board of County Commissioners work session with Oregon Department of Environmental Quality and Department of Land Conservation and Development, April 18, 2007
 - Board of County Commissioners work session with Oregon Department of Environmental Quality and Department of Land Conservation and Development, January 30, 2008
 - Hearing before the Board of County Commissioners on March 19, 2008, La Pine High School
 - Board of County Commissioners public meeting on Ordinance 2008-019 on June 11, 2008, Deschutes County Services Building
 - Hearing before the Board of County Commissioners on July 7, 2008, Deschutes County Services Building
- Other public information contacts
- On-going one on one contacts with EH staff either in person or by phone/e-mail
 - Deschutes County Home Show, May 2006
 - Open House, May 6, 2006, Deschutes County office, 51340 S. Highway 97, La Pine
 - Groundwater Science Open House, December 20, 2006, 4:00-6:00 PM, 51340 S Highway 97, La Pine
 - Presentations available upon request



Appendix B

Groundwater Science Open House

December 20, 2006

Staff Available for Q&A:

Deschutes County: Tom Anderson, Dan Haldeman, Barbara Rich, Todd Cleveland, Peter Gutowsky, Jerry Kathan, Jeff Freund

US Geological Survey: Dave Morgan, Steve Hinkle

Oregon DEQ: Bob Baggett

Posters/Info Stations:

- USGS Groundwater Model and Groundwater Investigation
- Nitrogen Reducing Systems
- Onsite Wastewater Treatment System Effects on Groundwater
- Background and History
- Physical model illustrating groundwater flow
- The increase in performance standards required as a result of added development between 1999 and 2005
- Map of monitoring and drinking water wells sampled in the region

Print Materials Available for Review:

- La Pine National Demonstration Project Draft Final Report
- La Pine National Demonstration Project Work Plan
- Data from the La Pine Project Innovative System Field Test including onsite system data and monitoring well data
- South County Regional Cost Benefit Analysis – Regional Problem Solving, Final Report, August 1997, KCM
- CDC Health Water Fact Sheet, Nitrate and Drinking Water from Private Wells, Summer 2003
- Oregon DEQ Fact Sheet, Nitrate in Drinking Water, September 2002
- Oregon DEQ Fact Sheet, Southern Willamette Valley Groundwater Management Area Declared, May 2004
- US Environmental Protection Agency (EPA) Consumer Fact Sheet on: Nitrates/Nitrites, downloaded from <http://www.epa.gov/cgi-bin/epaprintonly.cgi> on 12/15/06.
- US EPA web page print out, "Drinking Water from Household Wells," <http://www.epa.gov/safewater/privatewells/booklet/concern.html> downloaded 12/15/06.
- "Spontaneous Abortions Possibly Related to Ingestion of Nitrate Contaminated Well Water – LaGrange County, Indiana, 1991-1994," Center for Disease Control, Morbidity and Mortality Weekly Report, July 5, 1996/ 45(26); 569-572. Downloaded from <http://www.cdc.gov/mmwr/preview/mmwrhtml/00042839.htm> on 7/16/01.
- "Municipal Drinking Water Nitrate Level and Cancer Risk in Older Women: The Iowa Women's Health Study," Weyer et al, Epidemiology, May 2001, Vol. 11, No. 3, pp 327-338.
- "An Analysis of Nitrate Nitrogen in Groundwater Beneath Unsewered Subdivisions," Tinker, J.R., Ground Water Monitoring and Remediation, Winter 1991, pp 141-150.
- "Overview of the occurrence of Nitrate in Ground Water of the United States," Madison, R.J. and J.O. Brunett, National Water Summary 1984, Hydrologic Events, Selected Water-Quality Trends, and Ground-Water Resources, US Geological Survey Water-Supply Paper 2275, pp 93-105.
- "Fate and Transport of Biological and Inorganic Contaminants from On-Site Disposal of Domestic Wastewater," Reneau et al, Journal of Environmental Quality, Vol. 18, No. 2, pp 135 – 144.
- "Nitrate/Nitrite Toxicity – Additional Suggested Reading," Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, downloaded from http://www.atsdr.cdc.gov/HEC/CSEM/nitrate/additional_reading.html on 12/15/06.

Local Rule for Onsite Wastewater Treatment Systems in South Deschutes County

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- "Nitrate/Nitrite Toxicity," Case Studies in Environmental Medicine, Agency for Toxic Substances and Disease Registry, Course SS3054, Revised January 2001.
- "A demonstration of innovative treatment and disposal technologies in environmentally sensitive karst terrain near Rock Bridge Memorial State Park, Missouri," Solomon et al, National Onsite Demonstration Program, downloaded from http://www.nesc.wvu.edu/nodp/nodp_reports.htm on 12/15/06.
- "Evaluation of Movement of Septic System Effluent from Lake Development Into Near-Shore Areas of Table Rock Lake, Midwest Environmental Consultants, December 2001.

Handouts

- Local Rule Concepts
- Local Rule Communication Plan and Public Outreach Summary
- Transferable Development Credit Technical Advisory Committee Summary of Accomplishments and Direction excerpted from the minutes December 15, 2006
- Bend Bulletin Article, December 20, 2006
- "But my water was just tested!" Deschutes County CDD, November 2006
- "Pollution Reduction Credit Program," Deschutes County CDD, Fall 2006
- "Project Overview," Deschutes County CDD, Spring 2006
- "South County Groundwater Protection History," Deschutes County CDD, Spring 2006
- "How Contaminants Reach Groundwater," University of Florida Cooperative Extension Service, SL143
- "Why Not Sewer?" Deschutes County CDD, Spring 2006
- "Septic tank waste strength and sampling onsite systems: The nuts and bolts," Rich, B.J., et al, reprinted from 2004 Conference Proceedings, 13th Annual Technical Conference and Exposition National Onsite Wastewater Recycling Association.
- Papers from the 2003 Conference Proceedings of the 12th Annual Technical Conference and Exposition of the National Onsite Wastewater Recycling Association:
 - Denitrifying systems using forced aeration in the La Pine National Demonstration Project
 - Denitrifying systems using packed bed filters in the La Pine National Demonstration Project
 - Denitrifying systems using sequencing batch reactors and rotating biological contactors in the La Pine National Demonstration Project
- "Chemical and Algae Suffocating Lakes & Streams," Cone, M., Los Angeles Times, September 4, 2004.

Estimated Attendance: 60-80 persons

Press Coverage: Bend Bulletin, KTVZ

Local Rule for Onsite Wastewater Treatment Systems in South Deschutes County

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property owners have not received a permit to install the wastewater treatment system, and for those site evaluation report approvals, the onsite wastewater treatment system that would have been approved at the time of the site evaluation report is for a system that will not protect the groundwater in South Deschutes County from nitrogen discharges; and

WHEREAS, repairs, replacements or remodels of existing development comprise approximately ninety percent (90%) of the permits currently being issued; now, therefore,

THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON, ORDAINS as follows:

Section 1. Except as provided in Section 4 of this Ordinance, every owner of property with or without an existing onsite wastewater treatment system site evaluation report approval must install a nitrogen-reducing onsite wastewater treatment system in order to receive a County permit for construction, major alteration or major repair, as defined in Section 3 of this Ordinance.

Section 2. The requirements shall apply to onsite wastewater treatment system permit applications submitted on and after the effective date of this Ordinance.

Section 3. The following definitions from OAR 340-071-0100 are applicable to this Ordinance:

- a. "Alteration" means expansion or change in location of an existing system or any part thereof.
 - 1) Major alteration is the expansion or change in location of the soil absorption facility or any part thereof.
 - 2) Minor alteration is the replacement or relocation of a septic tank or other components of the system other than the soil absorption facility.
- b. "Construction" includes the installation of a new system or part thereof or the alteration, repair, or extension of an existing system. The grading, excavating, and earth-moving work connected with installation, alteration, or repair of a system or part thereof is considered system construction.
- c. "Repair" means installation of all portions of a system necessary to eliminate a public health hazard or pollution of public waters created by a failing system. Major repair is the replacement of a sand filter, RGF, ATT, or soil absorption system.
- d. "Onsite Wastewater Treatment System" means any existing or proposed subsurface onsite wastewater treatment and dispersal system including but not limited to a standard subsurface, alternative, experimental, or nonwater-carried sewage system.
- e. "Site Evaluation Report" means a report on the evaluation of a site to determine its suitability for an onsite system prepared in accordance with OAR 340-071-0150.
- f. "System" or "onsite system" means "onsite wastewater treatment system."

Section 4. The requirements of this Ordinance shall apply only to those unincorporated properties within Townships 19, 20, 21, 22 and Ranges 9, 10, and 11, except those areas authorized by the State for a sewer system.

Section 5. If any section, subsection, sentence, clause or phrase of this Ordinance is, for any reason, held to be invalid or unconstitutional, such decision shall not affect the validity of any remaining portion or portions of this Ordinance, unless:

1. The remaining part or parts are so essentially and inseparably connected with and dependent upon the unconstitutional or invalid part that it is apparent that the remaining part or parts would not have been enacted without the unconstitutional or invalid part; or

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Local Rule for Onsite Wastewater Treatment Systems in South Deschutes County

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2. The remaining part or parts, standing alone, are incomplete and incapable of being carried out in accordance with the Board of County Commissioners' intent.

Section 6. EMERGENCY. This Ordinance being necessary for the immediate preservation of the public peace, health and safety, an emergency is declared to exist, and this Ordinance takes effect on its passage.

Dated this 11th of June 2008

BOARD OF COUNTY COMMISSIONERS
OF DESCHUTES COUNTY, OREGON


DENNIS R. LUKE, Chair


TAMMY (BARNEY) MELTON, Vice Chair

ATTEST:

Recording Secretary


MICHAEL M. DALY, Commissioner

Date of 1st Reading: 11th day of June, 2008.

Date of 2nd Reading: 11th day of June, 2008.

Record of Adoption Vote				
Commissioner	Yes	No	Abstained	Excused
Dennis R. Luke	<u>✓</u>	—	—	—
Tammy Melton	<u>✓</u>	—	—	—
Michael M. Daly	<u>✓</u>	—	—	—

Effective date: 11th day of June, 2008.

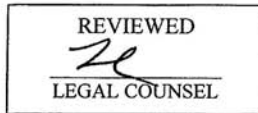
ATTEST:

Recording Secretary

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Resolution and performance standard map for existing systems



For Recording Stamp Only

BEFORE THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON

A Resolution Adopting the Nitrate Loading
Management Model to Establish Performance
Standards for Onsite Wastewater Treatment
Systems in South Deschutes County.

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*

RESOLUTION NO. 2008-021

WHEREAS, on July 21, 2008, the Board of County Commissioners ("Board") adopted Ordinance 2008-012 to add Deschutes County Code ("DCC") Chapter 13.14 to protect public waters in south Deschutes County from pollution by onsite wastewater treatment systems, and

WHEREAS, DCC 13.14.050(E) provides that the Board must adopt by resolution the minimum nitrogen reduction standards and the map depicting the locations where these standards apply; and

WHEREAS, beginning in 1999, the United States Geological Survey ("USGS") and the Oregon Department of Environmental Quality ("DEQ") conducted significant groundwater investigations in the Upper Deschutes River watershed, in general, and the La Pine sub-basin in particular, and

WHEREAS, the USGS and the DEQ developed the three-dimensional groundwater and nutrient fate and transport model of the La Pine sub-basin of the Upper Deschutes River watershed, and

WHEREAS, on or about 2007, the USGS and the DEQ published documentation of the development and findings of the groundwater study, the three-dimensional groundwater and nutrient transport model and the Nitrate Loading Management Model, and

WHEREAS, the USGS developed the Nitrate Loading Management Model ("Model") as a groundwater quality management tool for use in south Deschutes County;

WHEREAS, the Model can be used to identify performance standards for onsite systems that will maintain no higher than 7 mg/L nitrate as N average concentrations in the shallow groundwater in accordance with OAR 340-040, Groundwater Quality Protection, now, therefore,

BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON, as follows:

Section 1. The Board adopts the Nitrate Loading Management Model published by the USGS in December 2007 as the basis for approving the nitrogen reducing onsite wastewater treatment systems pursuant to DCC Chapter 13.14.

Section 2. The minimum nitrogen reduction require pursuant to DCC Chapter 13.14.050(D) shall be 35% reduction of total nitrogen, which is approximately equal to a maximum of 30 mg/l total nitrogen in wastewater treatment system effluent from a typical residence at average flows of 225 gallons per day.



Section 3. The maximum nitrogen reduction required pursuant to DCC Chapter 13.14.050(D) shall be the nitrogen reduction achieved by a system approved by the DEQ and listed by Deschutes County as a Maximum Nitrogen Reducing System pursuant to DCC 13.14.060.

Section 4. The locations, as produced by the Nitrate Loading Management Model, where the performance standards for existing onsite systems must be achieved in the south Deschutes County region are identified on the map attached as Exhibit "A," attached hereto and by this reference incorporated herein.

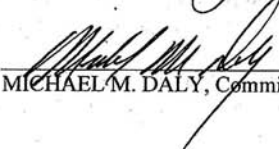
Section 5. The Deschutes County Community Development Department shall maintain the map identifying the locations where the above performance standards must be achieved for existing systems in south Deschutes County.

DATED this 23rd day of July, 2008.

BOARD OF COUNTY COMMISSIONERS
OF DESCHUTES COUNTY, OREGON


DENNIS R. LUKE, Chair

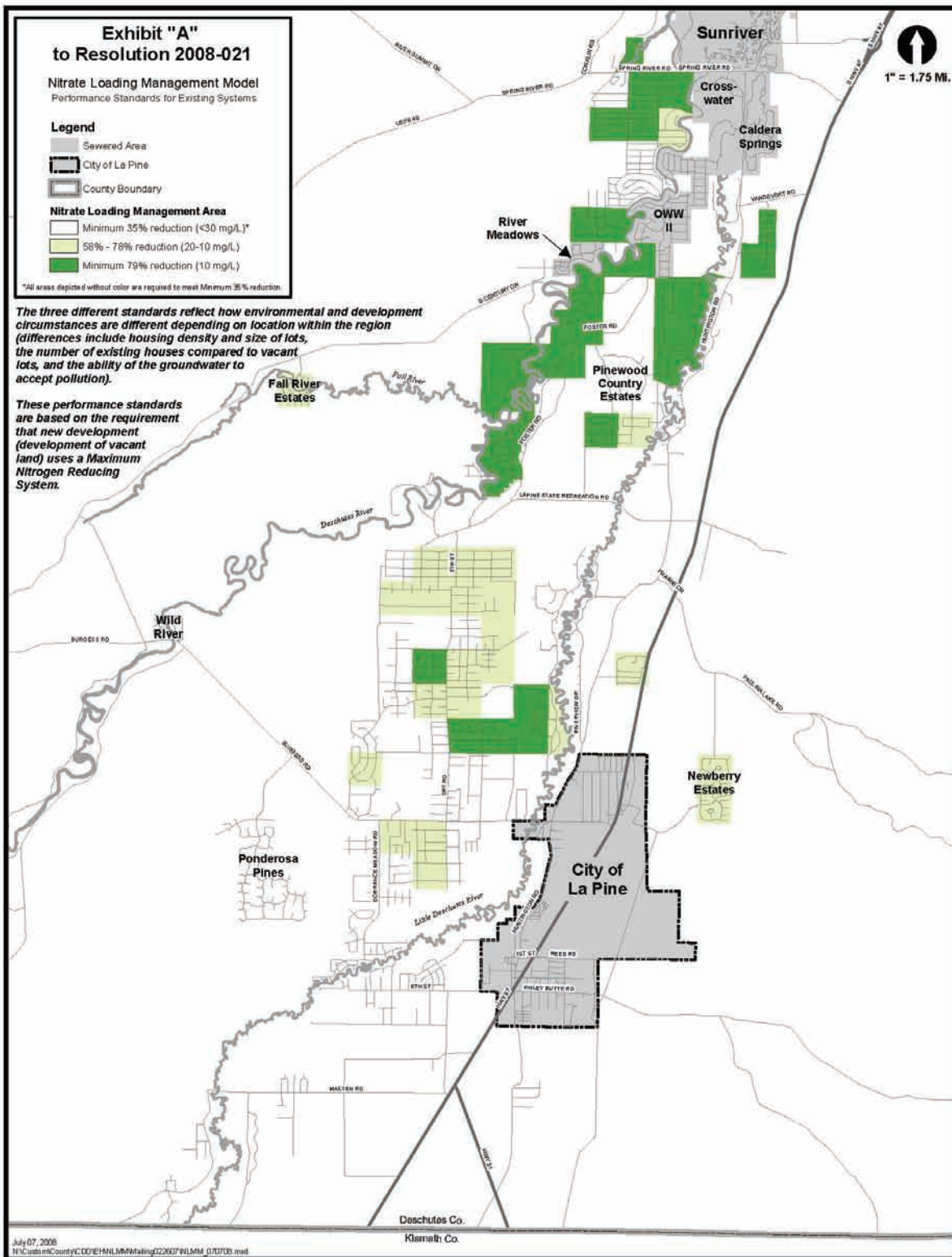

TAMMY (BANEY) MELTON, Vice Chair


MICHAEL M. DALY, Commissioner

ATTEST:


Recording Secretary





Local Rule Implementation Plan (90 days between adoption and effective date)

A. Public Notice

1. Notice to prop. owners with existing site evaluations
2. Notice to prop. owners currently applying for site evals
 - a. Update: Notice of Groundwater Protection Program
3. Notice to vendors
 - a. Letter drafted
 - b. Compile mailing list
 - c. Mail letter
4. DIAL notice (DIAL is a web-based service providing property information)
 - a. Notice of requirement to upgrade & flag of upgrade completed

B. Public information materials/meetings

1. Realtor info/procedures
 - a. Continuing Education class
 - b. "Property specific ""bid sheet"" with upgrade requirements"
 - c. "Update: Frequently Asked Questions - to web, handout"
 - d. Establish procedure for getting upgrade information into property records
 - e. ID groups of homes that have same requirements - potential for cost sharing
2. Installer info/procedures
 - a. One on one contacts
 - b. Newsletter
 - c. Meetings
3. Treatment standard map to LAVA/CD Map (Locally produced electronic maps)
 - a. Coordinate with IT & GIS
 - b. Permit Tech preview & training

C. Permit process update

1. Permit tech training
 - a. Procedure/handout: Ordinance 2008-019
 - b. Training session #1: Ordinance 2008-019
 - c. Training session #2: LAVA/CD Map preview
2. Permit Tech procedures manual
 - a. Section for each nitrogen reducing system
 - b. Talking points on NLMM
 - c. Section for training materials & procedures
3. Update permit & site evaluation letter templates
 - a. Update: Replacing existing residences in HGW areas
 - b. Update: Site evaluation letter - Local Rule
 - c. Update: Site evaluation - inside city limits/sewer district
 - d. Update: Permit letters
 - e. Update: Trouble letters
 - f. CIDWT homeowners guide to service contracts to web
 - g. Certificate of Completion of Upgrade
4. Establish composting toilet permit process
 - a. Establish performance standard
 - b. Establish permit process
 - c. Create maintenance report form

D. Web update (reorient towards action)



APPENDIX C: Financial Assistance for Groundwater Protection Actions

1. Financial Assistance Overview
2. Advisory Committee Charter
3. Advisory Committee Final Report





DESCHUTES COUNTY GROUNDWATER PROTECTION PROJECT LOCAL RULE FINANCIAL ASSISTANCE OVERVIEW

MAJOR ELEMENTS:

	Page
• Introduction/Policy Issues	2
• Projected Cost of Retrofits.....	3
• Projected Funds Available	5
• Basic Assistance Mechanisms	6
• Logistical Issues	7



INTRODUCTION/POLICY ISSUES

In order to protect drinking water resources in southern Deschutes County, the County is considering adopting a Local Rule governing the type of septic systems allowed in the affected area. The Rule would also require retrofits of existing systems by requiring existing development to meet at least 35% nitrogen reduction (discharge a maximum of 30 mg/L total nitrogen as N) based on the density of development and the vulnerability of the groundwater to contamination. The nitrogen effluent standard for existing systems can vary by area from a minimum of 30 mg/L to a maximum of 10 mg/L or less total nitrogen as N. The Rule as proposed would require all existing systems to be upgraded within 10 years of the date the rule is adopted. The proposal intends to give property owners a fairly long period of time in which to retrofit systems. The Rule will apply to those unsewered areas between Sunriver and the Klamath County border, an area formally defined as those unsewered areas of Townships 19, 20, 21, and 22 and Ranges 9, 10 and 11.

It is the County's desire to provide financial assistance to property owners retrofitting existing systems within the affected area. According to 2000 census data, over 12% of the population has an income level below the poverty level, and undertaking a retrofit of their septic system, even at the lowest reduction level required, would be very difficult financially. Further, again according to the 2000 census, over 18% of the area population is 65 or older, most of whom live on a fixed income where absorbing additional expense would be a significant burden. In addition to the figures above, there exists a significant additional segment of the population where the expense of the required retrofit would represent a serious financial burden.

In examining the ability of Deschutes County to assist property owners retrofitting existing systems, this report will address the following topics:

- Potential cost of retrofits
- Existing and future financial resources available
- Basic assistance types
- Other logistical Issues

Policy Questions for Board/Community:

What should the funding level be?

- Should funding cover 100% of all costs? 75% or 50% of costs?
- Should assistance go to low/moderate income households only?
- Are grants (no payback) at some level acceptable?



PROJECTED COST OF RETROFITS

Estimated number of retrofits to be done: 6,400 (Based on the number of permits issued to date (May 2007) in the affected area. Active and pending permits are included in order to provide a conservative estimate of need.)

1) Calculation of estimated cost

The tables below reflect two methods of calculating total potential cost of retrofits. Both of the methodologies split the retrofits by 'required reduction' area. The first method averages cost per retrofit between the low and high end of the cost range. The second goes further and factors in the age of the existing system in projecting the cost of the retrofit (e.g. newer systems will generally be less expensive to retrofit and achieve the required level of nitrate reduction).

Rough cost approach

	Number	Lower	Upper	Lower Cost	Upper Cost	
<10 mg/L	1685	\$7,500	\$18,000		\$12,637,500	\$30,330,000
20 mg/L	1613	\$7,500	\$18,000		\$12,097,500	\$29,034,000
30 mg/L	3099	\$5,000	\$10,000		\$15,495,000	\$30,990,000
Total	6397				\$40,230,000	\$90,354,000
					\$6,289	\$14,124
						\$65,292,000
						\$10,207

Total ave cost
Ave cost per system

Age related cost approach

	<1988	1988+	Lower	Upper	Cost for Newer (1988+)	Cost for Older (<1988)	
<10 mg/L	46	1639	\$7,500	\$18,000	\$12,292,500	\$828,000	
20 mg/L	127	1486	\$7,500	\$18,000	\$11,145,000	\$2,286,000	
30 mg/L	150	2949	\$5,000	\$10,000	\$14,745,000	\$1,500,000	
Total	323	6074			\$38,182,500	\$4,614,000	
					\$6,286	\$14,285	Ave cost per syst- age
	Older	Younger				\$42,796,500	Total average cost
						\$6,690	Ave cost per system

As shown above, the two methods reflect a wide range of possible total cost, with \$65 million at the high end and \$43 million at the low end. While we would expect that the cost will be closer to \$43 million than \$65 million, based on the logic used in the second method, there is no way of knowing for certain what the costs will be without investigating property specific characteristics and other variables such as the integrity of each existing system, the type of new system chosen, and the variability of retrofit costs over time. The costs could further vary over time as new technologies are approved for use in Oregon. (In comparison, the KCM report from 1997 estimated it would cost \$200 to \$280 million to sewer the study area, or between \$20,000 and \$28,000 per household.)

2) Estimated Time Frame for Retrofits/Cost Expenditure

The three tables below show variations on the possible time frame for retrofits. The first table shows an even pace of voluntary retrofits. The second table factors in retrofits/upgrades that occur naturally each year due to failures, repairs or remodels. The final chart adds in the possible effect of financial incentives offered by the



County to encourage property owners to retrofit their systems early. Those incentives are explored later in this report but may include lower percentage rates on loans offered earlier in the ten year required retrofit period, and also the expiration of the rebate currently offered by the developer of Neighborhood 2 in the Newberry Neighborhood.

Even Pace of Retrofits (assumes an equal number of property owners will voluntarily retrofit each year)

	Year 1	2	3	4	5	6	7	8	9	10	Totals
# Retrofits	640	640	640	640	640	640	640	640	640	637	6397
Cost Meth 1	6532480	6532480	6532480	6532480	6532480	6532480	6532480	6532480	6532480	6501859	65294179
Cost Meth 2	4281600	4281600	4281600	4281600	4281600	4281600	4281600	4281600	4281600	4261530	42795930

Retrofits Based on Historical Averages (Adds the historical number of naturally occurring retrofits to the numbers above)

	Year 1	2	3	4	5	6	7	8	9	10	Totals
# Retrofits	771	771	771	771	771	509	509	509	509	506	6397
Cost Meth 1	7869597	7869597	7869597	7869597	7869597	5195363	5195363	5195363	5195363	5164742	65294179
Cost Meth 2	5157990	5157990	5157990	5157990	5157990	3405210	3405210	3405210	3405210	3385140	42795930

Retrofits Based on Historical Averages Including Incentives (Includes County financial early replacement incentives)

	Year 1	2	3	4	5	6	7	8	9	10	Totals
# Retrofits	964	925	887	810	771	500	450	400	350	341	6397
Cost Meth 1	9836996	9443516	9050037	8263077	7869597	5103500	4593150	4082800	3572450	3480587	65295710
Cost Meth 2	6447488	6189588	5931689	5415890	5157990	3345000	3010500	2676000	2341500	2281290	42796934



PROJECTED FUNDS AVAILABLE

1) County Funds

- a. \$369,310 National Demonstration Project Loan Funds
- b. \$92,500 Carryover TDC Funds
- c. \$67,045 Federal Earmark Grant
- d. \$1,260,750 Neighborhood 2 Pollution Reduction Credits
(Assumes 50% \$7,500 fallback purchase and 50% \$3,500 issued rebate-see below)
- e. \$2,436,000 Neighborhood 1 Pollution Reduction Credits
(Assumes 100% \$7,500 fallback purchase)
- f. \$1,296,500 Remaining Neighborhood 2 Land Sales
- g. \$30,000,000 Neighborhood 3 & 4 Land Sales
(Assumes 300 net of 344 gross acres to be sold at \$100,000 per acre)

\$35,435,750* Estimated total County Funds available
* Does not include loan payment funds

Timing of County Fund Availability

	Year 1	2	3	4	5	6	7	8	9	10	Totals
a	\$369,310	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$369,310
b	\$92,500	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$92,500
c	\$67,045	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$67,045
d	\$315,188	\$315,188	\$315,188	\$315,188	\$0	\$0	\$0	\$0	\$0	\$0	\$1,260,750
e	\$609,000	\$609,000	\$609,000	\$609,000	\$0	\$0	\$0	\$0	\$0	\$0	\$2,436,000
f	\$324,125	\$324,125	\$324,125	\$324,125	\$0	\$0	\$0	\$0	\$0	\$0	\$1,296,500
g	\$0	\$0	\$0	\$0	\$15M	\$0	\$0	\$15M	\$0	\$0	\$30M
Totals	\$1,777,168	\$1,248,313	\$1,248,313	\$1,248,313	\$15M	\$0	\$0	\$15M	\$0	\$0	\$35.5M

Note: figures in table above do not include loan payment funds.

Additional Note: County could borrow funds against the future sale of Neighborhood 3 & 4 land sales at market interest rates, to be paid back within a specified term.

2) Other Funds and Sources of Funds

- \$1,260,750 Pahlisch Rebates (Assumes 360 rebates issued over 4 years)
- DEQ Clean Water State Revolving Fund Loan Program
- USDA Rural Development Loan & Grant Program
- NeighborImpact Community Development Block Grant loan funds
- Private Lenders Mortgage, Refinance



BASIC ASSISTANCE MECHANISMS

1) County Programs

a) Full Grants

Up to \$10,000 per retrofit – no eligibility restrictions
(Policy and Legal (gift of public funds) questions)

Partial Grants

Flat \$1,000 per household – Cost \$5,800,000

Either program could be limited to qualifying low income households
Policy question-retroactivity for previously installed?

b) Cost Deferral Program

Based on State Dept of Revenue Program

County funds improvement, and a lien is established against the property. County is paid back when the property is sold or goes through probate or owner can make payments if they wish. State interest rate is 6% per year and is only available to those 62 or older. County could adjust interest rate and/or eligibility. Cost-varies depending on terms and limits.

c) Conventional Loan Program

Funds could be combined with the \$369,000 National Demonstration Project and federal earmark funds and used for loans to qualifying households under the terms and limitations specified in the grant. To encourage loan repayments, the interest rate could be set lower than the Cost Deferral Program (b). Alternatively, Cost Deferral could be offered to qualifying lower income households only, while a conventional loan could be offered to all households.

d) Reduced Cost System Purchase

County could purchase a significant quantity of nitrogen reducing systems at a potentially reduced rate and pass savings on or reduce cost further to property owners. Sales to installers would include requirement that savings are passed on to property owners.

2) Other Programs

a) Pahlisch Rebates – Flat \$3,500 per retrofit

b) DEQ Clean Water State Revolving Fund Loan Program

Below market interest rates for qualifying loans. County would apply for loan and re-loan funds to qualifying households. Competitive award process. This program requires all borrowed fund to be paid back within 10 years.

c) USDA Loan Program

d) Private Financing through conventional mortgage or refinance.

e) DEQ Pollution Control Tax Credit

Is intended to cover expenses for “on-the-ground improvements” Note: this incentive would require an amendment to state law to allow application for on-site septic systems.

f) Manufacturer Incentives -



LOGISTICAL ISSUES

- 1) Third Party Administrators – for loan administration, etc
 - a. Central Oregon Intergovernmental Council (COIC)
 - b. Central Oregon Regional Housing Authority (COHRA)
 - c. NeighborImpact
 - d. Private lending institutions

Grant funding for administration of grant expires 6-30-08. Continued subsidization using CDD funds a question mark.
- 2) Create Incentives to Retrofit Early
 - a. Loan Interest rate increases over time
 - b. First come, first served
 - c. Grants during first two years
 - d. Pahlisch rebate limited to Neighborhood 2 buildout
- 3) Retrofit Trigger Events
 - a. System Repair/Alteration
 - b. Time of Sale
 - c. Probate
 - d. Incentives
 - e. Deadline
- 4) Operations & Maintenance (O&M) Assistance
 - a. Policy question-Should the County assist in this area?
 - b. State law requires that the first two years of O&M is included in the purchase and installation price to property owners
 - c. Assistance difficult to manage through loans or cost deferral
 - d. One option would be for the County to contract with a certified O&M provider in order to subsidize or cover the cost to qualifying (lower income) households.
 - e. Provide assistance to homeowner associations, etc. to create their own district to provide O&M services
- 5) Board Policy Question: What shall be done with remaining funds, and funds to be paid back in the future, after all retrofits have been accomplished?
 - a. Long term well network monitoring
 - b. Riparian restoration to remove maximum nitrogen from groundwater before it reaches the rivers
 - c. Ongoing onsite system repairs
 - d. Etc...



Financial Assistance Advisory Committee Charter

Financial Assistance Advisory Committee Charter

Givens: These items have been reviewed, peer-reviewed and accepted by the Department of Environmental Quality (DEQ) and the Deschutes County Board of Commissioners. Further discussion of these items is not within the committee purview:

- The groundwater underlying southern Deschutes County is the primary source of drinking water for the residents of the region.
- Scientific investigations conducted by the Oregon Department of Environmental Quality and the United States Geological Survey, published in the Journal of Hydrology, found that the groundwater underlying southern Deschutes County is threatened by conventional onsite wastewater treatment systems (formerly called septic systems).
- The Oregon DEQ has determined that a public health hazard exists and that groundwater protection actions need to be taken (doing nothing is not an option).
- Sampling to date has shown that contaminant plumes exist in the aquifer. Some drinking water well sites, exceed the federal safe drinking water standard for nitrate and Oregon's standard for groundwater quality protection.
- The County owns assets worth an estimated \$35 million that are dedicated to solving the groundwater pollution problem identified in southern Deschutes County.

Purpose / Guidance / Questions:

The purpose of the advisory committee shall be to provide a recommendation to the Board of Commissioners for a program to assist property owners financially to implement groundwater protection measures.

- How can the county's resources best be used to help homeowners implementing groundwater protection measures?
- Should any financial assistance be available for development on vacant land or should all financial resources target existing development?
- Should property owners who hold approvals for conventional systems be compensated for having to install an ATT system?
- What population should receive the bulk of financial resources? All low income? Some to middle income? Some available to all income levels?
- What proportion of the funds should be available as loans that are paid back (and so can be used again) or grants?
- Should loans or grants cover 100% of the costs of the groundwater protection measures or should the homeowner have some cost share or some kind of sweat equity? Or should a set amount be available for all property owners?
- Should the county provide long term, cost deferred loans?
- Should financial programs focus on groundwater protection measures completed at the time of property sale?
- Should incentives be offered that would motivate people to implement groundwater protection measures sooner rather than later? If so, what should those incentives be?
- Are there reasons to focus financial assistance geographically? For instance, areas that are closer to rivers or areas of denser development? If so, what form would that take?
- Should the county resources be used to finance feasibility studies of sewer districts and other alternatives or should financial resources target septic and replacement only?
- Should resources be used to provide education and/or promotion to the community regarding pollution credits?
- Does the revised language of the local rule (Sec. 13.14.070) clarify that nitrate reducing alternatives to septic upgrades are acceptable?



Financial Assistance Advisory Committee Final Report

Financial Advisory Committee Final Report

12 residents from Southern Deschutes County applied for and were selected for the FAC. The parameters for selection were census blocks and from within those census blocks, preference for homeowner association or neighborhood recommendations if they were given.

During the course of the Committees life 5 members resigned for various reasons. The remaining 7 remained seated and were able to address most of the Charges given by the county.

The FAC was prohibited from addressing the science or question the model as presented their scope of responsibility was to only address the expenditure of funds. And potential funds generated by land sales and PRC credits.

Charge 1: How can county resources best be used to help homeowners implement groundwater protection measures?

The Local Rule as initially presented has no comprehensive plan to initiate the groundwater protection. (See attached letter from State Representative Gene Whisnant). The County has begun the initial steps but has no formulated plan for implementing the course of events that will lead to an effective and fiscally responsible solution. The resources the County currently has should be utilized in implementing a comprehensive plan. Included in the comprehensive plan would be confirmation of the models assumptions. This confirmation would validate the County position and its validation would encourage action of those affected. Danil Hancock who has been involved in scenarios similar to the nitrate infiltration has attached a letter that explains a suggested action that would encourage citizen acceptance should the testing prove the models predictions. Independent testing would be the key.

Charge 2: Should any financial assistance be available for development on vacant land or should all financial resources target existing development?

Financial assistance should be directed towards existing developed properties. Feasibility studies for sewer systems could benefit undeveloped properties but no expenditure for installs of ATT systems for a piece of currently vacant land.

Charge 3: Should property owners who hold approvals for conventional systems be compensated for having to install ATT systems?

This charge has been addressed by the County. The FAC agrees with the County's decision.

Charge 4: What population should receive the bulk of the financial resources? All low income? Some middle income? Some available to all income levels?



All income levels should have access to funds that are available. First areas of high nitrate levels addressed. Expenditure of funds would be dependent on those areas particular circumstance (sewer district, ATT's, green alternatives).

Charge 5: What proportion of the funds should be available as loans that are paid back (and so can be used again) or grants?

Without current demographic information a percentage of a loan versus a grant is not an issue that can be addressed satisfactorily. Concerns on who will initiate the grants and loans and who will administer the loans have not been established and would be part of a comprehensive plan. Protection of the money available and insuring that those funds will revolve and be used to address the models assumptions rather than be lost in a loan program as yet unidentified gives the FAC a cause for concern. Allowing the FAC or a board similar to be a watchdog insuring that the funds are maintained for groundwater safety should be part of the plan.

Charge 6: Should loans or grants cover 100% of the costs of groundwater protection measures or should the homeowner have some cost share or some kind of sweat equity? Or should a set amount be available for all property owners?

See answer to Charge 5. A comprehensive plan would include these factors and identify sweat equity programs. Many residents will have an out of pocket expense.

Charge 7: Should County provide long term, cost deferred loans?

Yes if possible, this would be a part of the overall solution. The program has yet to be identified fully or initiated to the degree required to be a part of the solution.

Charge 8: Should financial programs focus on groundwater protection measures completed at time of sale?

No, this is already addressed by the County. The timeline would take precedence over time of sale.

Charge 9: Should incentives be offered that would motivate people to implement groundwater protection sooner rather than later? If so, what form would it take?

Groundwater pollution is the projected danger being addressed. Incentives, if created in a Comprehensive Plan, should first be offered to high nitrate areas. Incentives would not be limited to ATT installation but funds available for sewer feasibility studies should an area develop the interest for the formation of a sewer district/authority.

Charge 10: Are there reasons to focus financial assistance geographically? For instance, areas that are closer to the river or areas of denser development? If so what would that form take?



Current high nitrate levels should be addressed first.

Charge 11: Should County resources be used to finance feasibility studies of sewer districts and other alternatives or should financial resources target septic and replacement only?

The finances should definitely be made available to neighborhoods who initiate the possibility of forming a sewer district. The removal of a large number of nitrate contributors would alter the assumptions presented in the model. If projected development is indeed limited to the currently platted developable lots.

Charge 12: Should resources be used to provide education and or promotion to the community regarding pollution reduction credits?

No, there has been discussion of a changing how PRC's are purchased. Will the County be purchasing PRC's? This is an important part of the solution to be addressed in a comprehensive plan. The FAC can not stress the formulation of a plan needs to be completed with the County and the residents working on that plan. Clarification of the PRC program should have been identified in the ordinance.

Charge 13: Does the revised language of the Local Rule clarify that nitrate reducing alternatives to septic upgrades are acceptable?

Since the rule has passed the County has answered this question for the Committee



APPENDIX D: Long Range Plan for Groundwater Protection in Southern Deschutes County (Outline)

A. Local Rule Implementation (90 days between adoption & effective date)

B. Financial Assistance Program

1. Formal program description
2. Update work plan
3. Establish implementation schedule
4. Third party administrator - contracts
 - a. Reporting
 - i. Identify measures of success
 - ii. Identify shortcomings
 - iii. Create public information process
 - b. Specify contractual obligation re: targeting funds to:
 - i. Geographic areas
 - ii. Specific income levels

C. Long term environmental monitoring

1. Domestic well testing (estimated timeframe 2011)
 - a. Work with USGS to identify appropriate wells
 - i. Representative number of wells
 - ii. Sampling plan (including QA/QC)
 - b. Identify costs
 - c. Identify funding source
 - d. Reporting
 - i. Interagency report (DEQ, DHS)
 - ii. Incorporate public water system data, real estate data
 - iii. Public information
2. Nitrogen reducing system performance audit
 - a. Develop system for randomizing spot checks
 - b. Identify costs
 - c. Identify funding source
 - d. Reporting

D. Sewer & other approaches to pollution reduction

1. Coordination role in sewer expansion/creation processes
 - a. Land use
 - b. District formation
 - c. Information resource
 - d. Examples: OWW1 & 2, Sunriver
2. Maintain state of knowledge of emerging technologies

E. Identify interagency partnerships, pursue grant opportunities

1. Sunriver feasibility study proposal
2. Wetland delineation study
3. Other

F. Coordinate with Comprehensive Plan update

1. High Groundwater Area work program
 - a. Local rule sunset - code amendment
2. Other water quality related comprehensive plan updates



G. Ongoing Public Involvement & Information

1. Web site revision
 - a. Orient towards available solutions
 - b. Highlight processes for different approaches
 - i. Onsite wastewater treatment
 - ii. New or expanded sewers
 - County role
 - Land use process
 - District formation
 - c. Other approaches
2. Potential continuation of advisory committee (FAAC or other group)
3. Other

H. Legislative action

1. County code updates
2. State legislation
3. Federal legislation
4. Grant opportunities



APPENDIX E: References for groundwater investigations and other research related to southern Deschutes County

(Additional references are provided in the Staff Report contained in Appendix B.)

Region-specific research used in the development of the proposed rule:

Hinkle SR, Weick RJ, Johnson JM, Cahill JD, Smith SG, Rich BJ, 2005. *Organic Wastewater Compounds, Pharmaceuticals, and Coliphage in Ground Water Receiving Discharge from Onsite Wastewater Treatment Systems near La Pine, Oregon: Occurrence and Implications for Transport*. US Geological Survey Scientific Investigations Report 05-5055, 98 p.

Hinkle SR, Bohlke, JK, Duff, JH, Morgan DS, Weick RJ, 2007. *Aquifer-scale controls on the distribution of nitrate and ammonium in ground water near La Pine, Oregon, USA*. *Journal of Hydrology*, 333, 486-503.

Hinkle, S.R., Morgan, D.S., Orzol, LL, and Polette, DJ. *Ground water redox zonation near La Pine, Oregon – Relation to River Position within the Aquifer-Riparian Zone Continuum*. US Geological Survey Scientific Investigations Report 2007-5239, 30 p.

KCM, 1997. *South County Regional Cost/Benefit Analysis Final Report*. Consultant report.

Morgan, D. S. and R. Everett. 2005. *Simulation-Optimization Methods for Management of Nitrate Loading to Groundwater From Decentralized Wastewater Treatment Systems*. Project No. WU-HT-03-37. Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by US Geological Survey, Oregon Water Science Center, Portland, OR.

Morgan, DS, Hinkle, SR, and Weick, RJ, 2007. *Evaluation of approaches for managing nitrate loading from on-site wastewater systems near La Pine, Oregon*. US Geological Survey Scientific Investigations Report 2007-5237, 66 p.

Oregon DEQ, 2006. *Groundwater Water Quality Report for the Deschutes Basin*. <http://www.deq.state.or.us/lab/techrpts/groundwater/dbgroundwater/dbgwreport.pdf>.

Oregon DEQ, 2005. *Data from the La Pine National Demonstration Project*. Available online at: <http://www.deq.state.or.us/wq/lapine/siterptcriteria.asp>.

Williams, JS, Morgan, DS, and Hinkle, SR. *Questions and Answers About the Effects of Septic Systems on Waste Quality in the La Pine Area, Oregon*. US Geological Survey Fact Sheet 2007-3103, 6 p.

