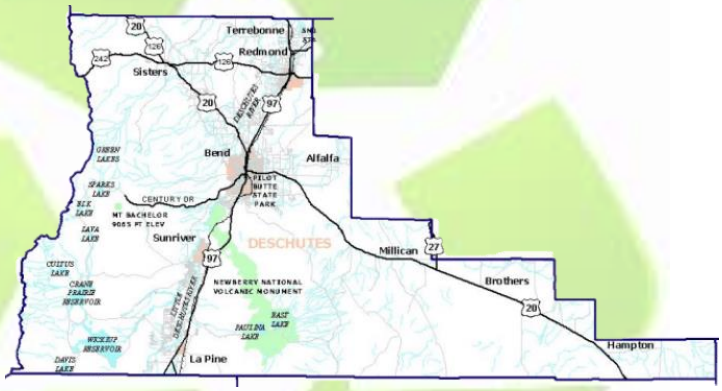
Deschutes County

Solid Waste Management Plan



"Providing a Roadmap for a Sustainable Future"

Prepared:

July 2019

JRMA
ARCHITECTS ENGINEERS

Deschutes County

Department of Solid Waste

Solid Waste Management Plan

Prepared by

JRMA, Inc.

In Association With
GBB, Inc.
ESI
G. Friesen, Associates
Barney & Worth

July 2019

Document has been Printed on Recycled Paper

Solid Waste Advisory Committee (SWAC)

Recognition

The Board of County Commissioners would like to recognize the members of the Solid Waste Advisory Committee (SWAC) for their dedication of time and effort to participate in preparing the 2019 Solid Waste Management Plan (SWMP). The SWAC held monthly meetings to review and comment on the SWMP as it was developed. At each meeting, they provided time for members of the general public to comment and offer suggestions. The SWAC also participated in two public meetings during the planning process. Their commitment of time and input made a valuable contribution to help shape the direction of the solid waste management system for the citizens and businesses of Deschutes County.

Name	Representing	Note
CURRENT		
Jerry Andres	Citizen at Large	
Brad Bailey	Bend Garbage and Recycling	
Jared Black	Citizen at Large	
Bill Duerden	City of Redmond	
Paul Bertagna	City of Sisters	
Catherine Morrow	Citizen at Large	
Jake Obrist	City of La Pine	
Cassie Lacy	City of Bend	Replaced G. Ockner 2/12/19
Mike Riley	The Environmental Center	
Erwin Swetnam	Cascade Disposal	
Rick Williams	Citizen at Large	
FORMER		
Gillian Ockner	City of Bend	Replaced by C. Lacy 2/12/19
Brant Kucera	City of Sisters	Replaced by P. Bertagna 8/21/18
Smith Reese	Citizen at Large	Resigned 7/12/18

Table of Contents

List of Tables

List of Figures

Glossary

Alfalfa Transfer Station	A recycling and transfer facility in Alfalfa that accepts recyclable materials to be loaded into roll-off bins for transport to a recycling facility and solid waste to be loaded into roll-off bins for transport to a landfill.
Anaerobic biodegradation	The breakdown of organic matter by natural processes that do not use oxygen.
Btu	British thermal unit
C/D	Construction and demolition waste
CCAR	California Climate Action Registry
CDL	Construction, demolition and land-clearing
CED	Covered electronic devices
CNG	Compressed natural gas
Commingled	Placement by residents of a variety of recyclable materials into a single container for curbside collection. Compare to **source-separated**.
Composting	A process by which organic matter is decomposed under controlled conditions into its component parts, and subsequently used for mulching or as a soil supplement.
Composting facility	A facility designed to facilitate the controlled process of biologic conversion of some portions of municipal solid waste (i.e., yard waste) into material for land spreading and soil enrichment.
DB	Disposal Bans
DEQ	Oregon Department of Environmental Quality
DSW	Deschutes County Department of Solid Waste
Knott Landfill Recycling Facility	A facility located at Knott Landfill that receives recyclable materials, yard debris, wood waste and food waste and composts these wastes to produce organic soil amendment.
Knott Landfill Transfer Station	A transfer facility located at Knott Landfill that accepts solid waste to be loaded into trailers for transport to a landfill.
Disposed waste	The total amount of waste delivered to a waste management facility (landfill, WTEF, etc.) in or out of the County, as reported to DEQ by the operators.
EDD	Oregon Economic Development Department
EPA	Environmental Protection Agency
FTE	Full-time equivalent position
FY	Fiscal year
Franchised haulers	See **service providers**
GHG	Greenhouse Gas
Green waste	Garden, food and wood waste
Generated waste	The sum of **disposed waste** and recycled waste.

Heavy metals	Any of a class of metals of high atomic weight and density, such as mercury, lead, zinc, and cadmium, which are known to be toxic to living organisms.
HHV	Higher heating value
HHW	**Household hazardous waste** (see definition)
Household hazardous waste	Products found in the home that present potential health and safety hazards. These products are often labeled as toxic, flammable, corrosive, reactive, infectious or radioactive.
Host fee	A fee charged for disposing waste at a solid waste facility and paid to the local city or county jurisdiction where a landfill is located.
Knott Landfill	The landfill owned and operated by Deschutes County where municipal solid waste generated in the county is disposed.
kWh	Kilowatt-hour
LFG	Landfill gas. LFG is generated through the decomposition of waste buried in a landfill.
LNG	Liquefied natural gas
Landfill	A solid waste facility or part of a facility for the permanent disposal of solid wastes in or on the land. This includes a sanitary landfill, balefill, landspreading disposal facility, or a hazardous waste, problem waste, special waste, wood waste, limited purpose, inert, or demolition waste landfill.
Leachate	Water or other liquid that has been contaminated by dissolved or suspended materials as a result of contact with solid waste or solid waste byproducts.
Liners	Materials used to prevent the passage of leachate from one part of the landfill area to another or to the environment outside the landfill liner. May be composed of soil or may be a synthetic material.
MACT	Maximum achievable control technology
MRO	Mandatory Recycling Ordinance
MRF	Material Recovery Facility – a facility that processes and separates materials for the purposes of recycling from incoming mixed solid waste stream, or from mixed source-separated recyclable stream.
Msl	Mean sea level
MSW	**Municipal solid waste** (see definition)
MW	Megawatt
Municipal solid waste	Waste generated by residences, offices, institutions, commercial businesses and other waste generators not producing special wastes.

Negus Transfer Station	A recycling and transfer facility in Redmond that accepts recyclable materials to be loaded into roll off bins for transport to a recycling facility and solid waste to be loaded into trailers for transport to a landfill.
Northwest Transfer Station	A recycling and transfer facility located on Fryrear Road between Sisters and Redmond that accepts recyclable materials to be loaded into roll-off bins for transport to a recycling facility and solid waste to be loaded into trailers for transport to a landfill.
NPDES	National Pollution Discharge Elimination System
OAR	Oregon Administrative Rules
OCC	Old corrugated cardboard recovered and recycled
OEA	Oregon Office of Economic Analysis
ORS	Oregon Revised Statutes
PAYT	**Pay-as-You-Throw** (see definition)
PGE	Portland General Electric
Pay-as-You-Throw	Waste collection programs designed so that households are charged for the amount of waste they generate (by weight or volume) each week as opposed to each household paying the same collection fee.
PVC	Polyvinyl chloride
RFP	Request for Proposals
RI/FS	Remedial Investigation and Feasibility Study
Recovery rate	The percentage of materials recovered and recycled, reused and/or diverted from disposal in a landfill divided by the total waste generated. The recovery rate, as determined by the statewide goal, is calculated by **DEQ.**
Recycling rate	The percentage of materials recycled, divided by amount of waste generated (compare to **recovery rate)**.
Residuals	Unrecoverable material received at the recycling centers.
SWM	Solid waste management
SWAC	Solid Waste Management Advisory Committee (see definition)
SWMP	Solid Waste Management Plan
Service providers	Privately-owned businesses that provide garbage collection services. Other terms used for service providers include: **franchised haulers** and **waste haulers**.
Single-stream recycling	A collection method where garbage and recyclables are mixed together in curbside disposal and taken to a facility for sorting.

Solid waste	As defined by the Resource Conversation and Recovery Act, a broad term which includes garbage, refuse (e.g., metal scrap, wall board, etc.), sludge from treatment facilities, and other materials including solids, semisolids, liquids, or gaseous material from industrial, commercial, mining, agricultural, and community activities. Exceptions include domestic sewage, industrial wastewater, irrigation return flows, nuclear materials, and mining material not removed during the extraction process.
Solid Waste Advisory Committee	A committee comprised of cities, citizens, businesses, and interested parties appointed to provide input and direction for developing solid waste programs.
Source-separated	Separation by residents of recyclable materials into several containers for curbside collection. Compare to **commingled**.
Southwest Transfer Station	A recycling and transfer facility located north of La Pine off Hwy 97 that accepts recyclable materials to be loaded into roll-off bins for transport to a recycling facility and solid waste to be loaded into trailers for transport to a landfill.
Special waste	Certain wastes which have disposal regulations that differ from **MSW.** Each special waste category has its own characteristics and handling requirements. Some examples of special waste are: incineration ash, fluorescent bulbs, hazardous waste, latex paint, Styrofoam, and appliances.
TCLP	Toxicity Characteristic Leaching Procedure. Laboratory testing procedure for determining the levels of toxic constituents in a sample.
TDF	Tire-derived fuel
TDR	Tire Disposal and Recycling, Inc., a private company that owns facilities to collect and process used tires. TDR has two facilities in Oregon: one in Clackamas and one in Prineville.
TPD	Tons per day
TPY	Tons per year
Tip fee	The fee charged for disposing waste at a solid waste facility such as a transfer station/MRF, a landfill or incinerator.
Transfer station	A permanent facility that accepts waste and recyclable materials from self-haulers and/or franchised haulers. The waste is dumped into larger trailers for transportation to a landfill. Recyclables are typically loaded into roll-off bins for transport to a recycling facility

WCI	Western Climate Initiative
WTEF	Waste-to-Energy Facility (see definition)
Waste disposal	The discharging, discarding, or abandoning of solid wastes, hazardous wastes, or moderate risk wastes. This includes the discharge of any such wastes into or on land, air, or water.
Waste haulers	See **service providers**
Waste-to-Energy facility	A facility that burns municipal solid waste and produces electricity. The facility reduces the volume of waste by 90% and results in producing ash residue.
Waste recycling/transfer facility	Any waste processing facility which collects, stores, or treats waste materials for reuse. This can include buy-back recycling centers, drop-off recycling centers, salvage yards, reclamation sites, and waste storage centers.
Waste reduction	To reduce, prevent, or eliminate the generation of wastes.
Waste stream	The entire spectrum of wastes produced by all waste generators.
WR/R	Abbreviation for Waste Reduction, Reuse and Recycling

Deschutes County
Solid Waste Management Plan

Executive Summary

Introduction

This Executive Summary provides an overview of the Solid Waste Management Plan (SWMP) prepared by the Department of Solid Waste (DSW). The SWMP provides a roadmap for moving forward with actions to advance the solid waste management system in Deschutes County. It provides guidance for how resources should be spent to reduce waste, expand recycling services to divert waste from landfills and maintain efficient collection and disposal services over the next 20 years. The SWMP centers on the principal that waste be managed as a resource and to have a new disposal system in place when Knott Landfill closes. It includes a summary of the key strategies and recommendations as well as a schedule for implementing those strategies.

State of the Solid Waste Management System

Over the past 30 years, the County, working with cities, franchised collection companies and special interest groups has developed and operated a solid waste management system that provides efficient and cost-effective services to residents and businesses. During this period, new services to reduce waste and recycle materials that respond to State mandated programs and address local needs have been added.

The County and each of the cities provide collection services to residents and businesses through franchise agreements with private companies. The system also includes Knott Landfill and several transfer stations located throughout the County that provide convenient locations for customers to drop off recyclable materials and solid waste.

A key component of the solid waste system is to provide a menu of waste reduction and recycling programs and services. The County and the cities work cooperatively and effectively with the franchised haulers, the Environmental Center and others to provide these services, which are required by the State. In 2017 and 2018, approximately 33% of the waste generated in the County was diverted from disposal at Knott Landfill. This is less than the 45% recovery goal recently assigned to the County by the State. However, during this period, most communities in Oregon and across the country experienced a reduction in recycling due to a downturn in the markets for recovered materials brought on by China's new, more restrictive standards for purchasing recycled materials. Whereas several jurisdictions in the State have cut back on services and the materials collected due to these market conditions, the County, working with cities and the franchised collection companies, continues to maintain a full range of services to customers. Developing new strategies and expanding existing programs to increase the amount of waste diverted from landfills is a key issue addressed in the SWMP.

The cornerstone of the system is Knott Landfill, operated by DSW, which provides a local resource for disposing of municipal solid waste (MSW) that cannot be recycled. Over the past 25 years, DSW has enhanced the landfill facility to meet or exceed State

requirements for operation of a modern disposal site while maintaining a financially stable operation. All wastes collected by franchise collection companies and received at the County's transfer stations are delivered to the landfill.

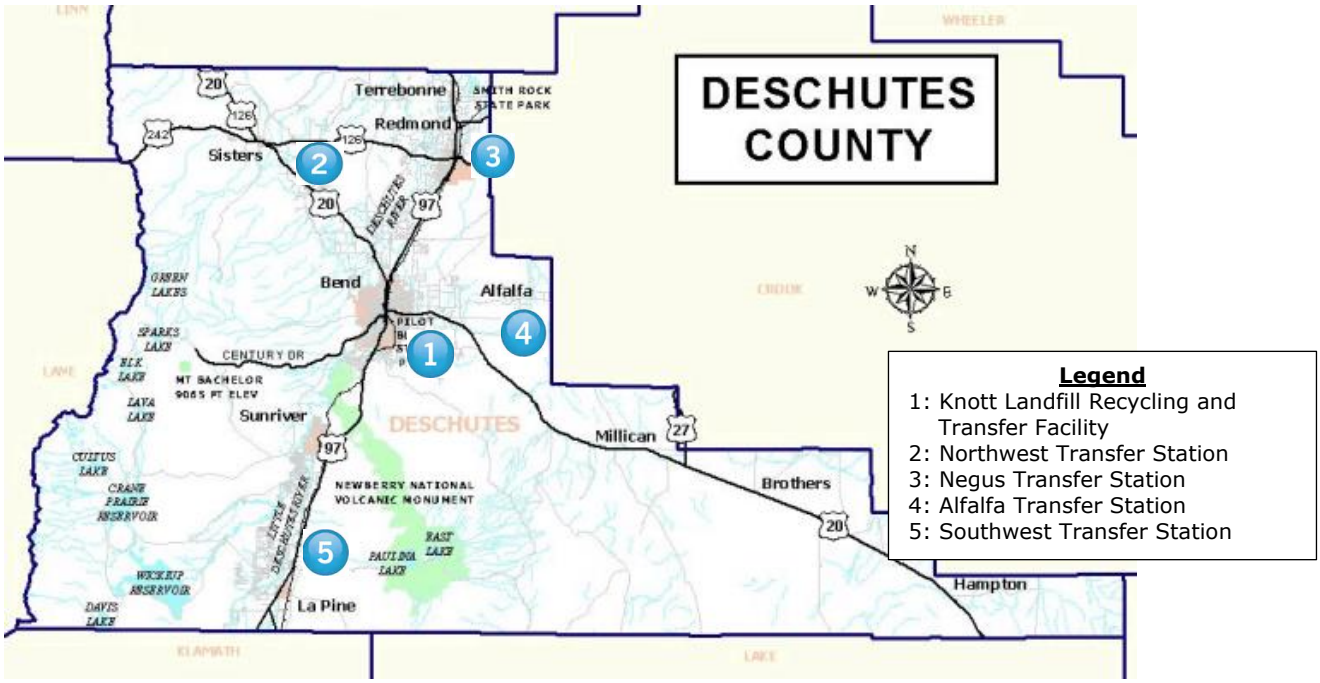
Within the next 10 years, Knott Landfill is expected to reach its designed capacity. At that time, a new long-term disposal system must be in place. Also, in 2017 the State of Oregon adopted regulations that resulted in establishing new goals for reducing the amount of waste disposed in landfills for all communities throughout the State. The focus of these new regulations is to manage waste as a resource and to reduce impacts of greenhouse gas emissions generated from landfills.

These conditions led the Board of County Commissioners to direct DSW to prepare a comprehensive SWMP to evaluate options and make recommendations for managing solid waste in the future.

Description of the Current Solid Waste System

In the State of Oregon, counties and cities have the responsibility and authority to provide comprehensive services for managing solid waste. Deschutes County executes this mandate by placing the primary responsibility with DSW to oversee these services and operate necessary facilities. DSW functions as an enterprise fund where all revenues needed to operate the system are generated by fees charged for customer services and no general tax revenues are used.

DSW currently operates four rural transfer stations and the Knott Landfill Recycling and Transfer Facility. The locations of these facilities are shown on the map below.



The four rural transfer stations augment regular collection services by providing convenient locations in more rural areas for citizens to deliver waste and recyclables.

Over the past three years, Negus Transfer Station in Redmond and Southwest Transfer Station near La Pine have experienced increases in waste quantities of 23% and 19% respectively. The increases in the number of customers and the amount of waste received at these two transfer stations has created the need to expand them in the near future.

The cities of Bend, Redmond, Sisters and La Pine are responsible for providing collection services within their jurisdictions and DSW is responsible for providing collection services to the unincorporated portions of the County. Collection services are carried out by four private companies operating under franchise agreements. Each jurisdiction is responsible for setting the service standards and the rates charged to residents and businesses.

As stated previously, DSW estimates remaining capacity of Knott Landfill to be about 10 years. The landfill accepted over 180,000 tons of solid waste per year over the past two years and is one of only two modern disposal sites permitted to accept MSW in central Oregon. The other landfill, located in Crook County, accepts less than 40,000 tons per year. When Knott Landfill reaches capacity, a new disposal solution must be in place. The SWMP examines the options and presents a recommended approach to have a new in-County landfill operational when Knott Landfill closes.

Growth in The County

Waste disposed at Knott Landfill decreased by 3.3% between 2010 to 2011 as a result of the recession that occurred between 2009 and 2013. The decline in waste disposed was a result of a slower economy, reduced construction activity and perhaps a reduction in tourism. From 2010 to 2016, the population grew by almost 15% while the rest of the State of Oregon grew a little over 6%. The result of this growth and changes in the economy are reflected in the following table. Over the past three years, the amount of waste disposed at Knott Landfill has increased at a rate of 11% per year.

Table ES-1 - History of Waste Disposed at Knott Landfill

Year	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***
Annual Waste Disposed (tons)	**114,307**	**112,751**	**113,611**	**119,682**	**130,956**	**144,067**	**161,087**	**182,095**
% Change		***(1.4%)***	***0.9%***	***5.4%***	***9.4%***	***10.0%***	***11.8%***	***13.0%***

In 2018, DSW reported that 182,000 tons of waste was disposed at Knott Landfill. Population data prepared by the Center of Population Research at Portland State University in 2018 shows that Deschutes County is expected to continue to grow by almost 3.0% per year, while the rest of the State is projected to grow at just 1.3%.

The SWMP includes projections for the amount of waste generated and disposed over the next 20 years. With the estimated remaining capacity of Knott Landfill at 10 years, it will be important to monitor the data to ensure that a new disposal site is permtted and ready to receive waste when it closes. The SWMP presents several strategies to reduce waste, recycle more materials and divert waste from landfill disposal.

Implementation of these programs will help reduce waste disposed at Knott Landfill, but will only aid in providing limited additional time before a new disposal solution is in place.

Preparing the SWMP

With the impending issues discussed above, the Board of County Commisioners allocated funds in fiscal year 2018/19 for DSW to prepare a comprehensive SWMP. DSW proceeded by first selecting a consultant team that specialize in the solid waste management industry to provide policy analysis and technical assistance and to draft the SWMP. A team of consultants, led by JRMA, Inc. was retained. The County also appointed a Solid Waste Advisory Committee (SWAC) and assigned them with the responsibility to review information and provide input and guidance into the formulation of the plan. The SWAC is comprised of representatives of the cities, franchised collection companies, the Environmental Center and technical experts in related areas.

The overriding goal of the County is ***"to work cooperatively with cities and service providers to offer citizens and businesses an integrated solid waste management system that delivers quality and cost-effective services while achieving the best use of our resources and reducing waste disposed in landfills."***

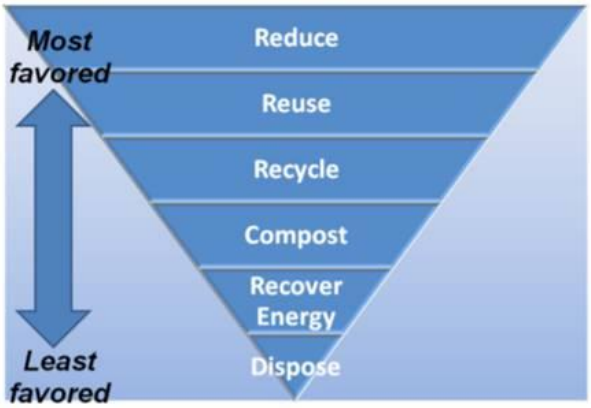
In preparing the SWMP, the County adopted several guiding principles or objectives to be used in evaluating and selecting recommended strategies. These objectives include factors such as enhancing services, using proven and reliable technologies, determining cost-effectiveness and considering environmental impacts. The specific objectives are:

1. ***To provide an integrated solid waste management system*** that addresses an effective combination of strategies and programs guided by the hierarchy adopted by the State of Oregon to first, reduce waste at the source; second, to reuse and recycle materials; third, to compost; fourth, to recover energy; and last, to dispose of waste in landfills.
2. ***To continue educating consumers regarding practices and methods to reduce the long-term per capita waste generation rate*** and to seek, through community outreach, a cooperative approach to individual responsibility for waste reduction.
3. To develop programs and support implementation of system improvements that seek to ensure materials recovered from the waste stream ***attain the highest and best use and are recycled***.
4. To develop a solid waste system that is based on ***sound financial principles, provides cost-effective services and maintains rate stability over the long term***, while allocating costs equitably to all users.
5. ***To maintain system flexibility to respond to changes*** in waste stream composition, waste management technologies, public preferences, new laws and changing circumstances.

A primary objective of the State is to protect the environment by emphasizing waste reduction and reducing waste disposed in landfills. Therefore, each wasteshed or

county has been assigned a targeted recovery rate, which is the amount of materials reused and recycled divided by the total amount of waste generated. The State's goal established under Oregon Revised Statutes (ORS) 459A.010 sets Deschutes County's recovery rate at 45% by 2025. This target will be measured on an annual basis, and programs and facility assessments will be made on the County's progress towards reaching this goal.

The SWMP addresses each component of the solid waste system according to the hierarchial management approach adopted by the State. As shown on the adjacent graphic, the SWMP considers strategies that first, reduce waste; second, reuse materials; third, recycle; fourth, compost; fifth, recover energy; and finally, dispose of waste that cannot be recycled or used to produce alternative energy resources.



Over the past 17 months, DSW, the consultant team and the SWAC have examined existing conditions, identified waste management system needs and opportunities and evaluated alternatives to address these needs. The process included regular meetings with the SWAC to review the draft plan and provided valuable input into shaping the direction in the development of the solid waste system. DSW established a special webpage where people could access the plan as it was being drafted and reviewed by the SWAC. All SWAC meetings were open to the public for comments. Also, during the preparation of the SWMP, DSW held two public meetings to gain input. The outreach program included conducting several surveys to solicit input. After reviewing each component of the solid waste system, the SWAC reviewed and endorsed recommendations for the future system. A summary of the comprehensive public outreach and involvement program and results of the surveys are included in Appendix B.

Summary of Key Issues Addressed in the SWMP

The SWMP addresses several key issues related to managing solid waste in the County over the next 20 years. While these issues are a result of changing regulations, some are driven by the impending closure of Knott Landfill. The following is a list of some of the key issues addressed in the SWMP.

1. Currently, the County recovery rate is 33%. What strategies can be implemented that will increase the recovery rate to potentially meet the recovery goal of 45% by 2025?

2. What strategies can be implemented in the near term that might extend the site life of Knott Landfill?

3. Are there proven and reliable technologies that would be cost-effective to implement that would further reduce the County's dependence on landfill disposal?

4. What is the best approach for providing for reliable and cost-effective long-term disposal capacity and should a new landfill be sited in the County, or should the County transfer waste to an existing regional landfill?

5. What investments and improvements are needed at the County's transfer stations to address the long-term system needs and maintain convenient cost-effective services?

6. Are there regional approaches to work with Crook County and provide opportunities to provide cost-effective solutions?

7. What is the timeline for making needed investments in the solid waste system and when do facilities need to be operational?

A full list of the primary issues is presented in Chapter 1, Section 1.3 of the SWMP.

Highlights of the SWMP

Deschutes County has the largest population and economy in the State east of the Cascade Mountains. In addtion to a growing commercial/industrial sector, the County is a regional and nationally recognized location for year-round tourism. As previously mentioned, the County is growing at a faster rate than other parts of Oregon. By 2030 the population of Deschutes County is expected to be 230,000, an increase of over 25% as projected by the Population Research Center at Portland State University.

Because of the location of the County in relation to other large population centers, it was imperative that the County develop a cost-effective and reliable system for managing waste. As a significant economic center for central Oregon, the County, working with the cities, has developed a well managed and cost-effective integrated solid waste system. It provides a wide range of programs and services aimed at reducing waste and recovering materials for reuse and recycling. Knott Landfill has been upgraded over the past 25 years and provides a state of the art disposal site comparable to other major regional landfills operating in the Pacific Northwest.

A focus of the SWMP was to examine the current system and evaluate what strategies can be implemented to not just maintain services, but to consider alternatives that can improve them in the future. The SWAC considered many alternatives for reducing waste, recycling more materials and diverting more waste from landfill disposal. They considered options to convert waste to renewable energy sources using new or evolving alternative technologies and other ways to maximize the use of waste as a resource. The result was a set of recommendations that set forth a strategy to reduce waste disposed in landfills by as much as 15% or more over the next 10 to 15 years. When combined with the current waste reduction and recycling programs, these strategies are designed to help the County achieve and possibly exceed a recovery goal of 45% by 2025. However, it is important to acknowledge that recycling services provided by the County and cities are responsible for about 55% of the total recovery rate. The remaining 45% is a result of private business initiatives that recycle and report independently to the State.

To address future needs, the SWMP recommends several actions to enhance the County's solid waste system infrastructure. This includes expanding existing transfer stations over the next several years to enhance services and meet the needs of the growing population in the County. It also identifies the need to site and develop a new landfill located in the County when Knott Landfill closes.

Once the Draft SWMP was completed, a survey was conducted by Triton Polling and Research, Inc., an independent polling and research company. The purpose of the Triton survey was to obtain additional input on whether the County should pursue

siting a new landfill in Deschutes County, or transport waste to an out-of-County landfill when Knott Landfill closes. Results of this survey indicate that 84% of respondents support the position that waste generated in Deschutes County be disposed of in Deschutes County, with 93% supporting the recommendation to site a new landfill in the County.

The following discussion presents a summary of the recommendations in the SWMP. It is important to recognize that the SWMP is a roadmap outlining a strategy for achieving the goals set by the County and cities. There are many details and future actions to be considered during the implementation phase over the next 10 years. In moving forward with these actions, there will be many opportunities for the public to comment and provide input to shape the services to achieve the desired results.

Summary of the SWMP Recommendations

Waste Reduction and Recycling

Currently, about 33% of the waste generated in Deschutes County is recycled. In 2016, the State adopted new rules and established a new recovery rate goal of 45% for Deschutes County. Therefore, a significant focus of the SWMP is addressing how the County's residents and businesses can recover and recycle more materials and reduce the amount of waste disposed in landfills. The SWAC considered many options that can lead to a sustainable management approach to reduce waste and recycle more materials. In doing so, they examined each of the primary waste generators, what services are currently being provided, and how those services could be enhanced to increase recycling. Waste generators included:

1. Residential single-family households
2. Multifamily units
3. Commercial businesses
4. Construction and demolition (C/D) generators

In considering these generators, the SWAC identified certain targeted materials for recovery. These include separating vegetative food waste and collecting it with yard waste, expanding collection of source separated materials from multifamily units, increasing recycling from commercial businesses and separating C/D waste for processing. The following are recommendations for achieving a higher recovery rate.

Recommendations that Apply to all Generators

Recommendation 3.1: Move toward establishing a *standard waste reduction and reuse program* throughout the County for single-family homes, multifamily units and businesses, which focuses on education and promotion.

Recommendation 3.4: *Expand and develop additional materials to educate residents of single-family homes*, multifamily units and businesses on how *to reduce food waste and develop promotion of vegetative food waste collection with yard waste and consider universal service for vegetative food waste collection*.

Recommendation 4.8: The County should *complete a waste characterization study* to better understand the composition of its waste stream, which will aid in evaluating options for recovering targeted materials and designing the programs and facilities needed.

Recommendations for Residential Single-Family Households

Curbside recycling for single-family households in the cities and urbanized unincorporated County is well established. Expanding and enhancing these services to more customers is an ongoing activity.

Recommendation 4.1: *Expand the current residential collection of vegetative food waste* with yard waste to increase participation.

Recommendations for Multifamily Units

Collection of source separated materials is provided to many multifamily units by the franchise haulers; however, participation is very low. The SWAC considered establishing a task force to focus on a comprehensive program to expand recycling service to the ever-growing number of multifamily developments being constructed in the County. The task force would look at establishing standards for ensuring there is adequate space for recycling containers and providing consistent educational and promotional material for these residents.

Recommendation 3.2: Expand and improve a *standard for a multifamily recycling program* that includes a comprehensive education and outreach program to expand participation at multifamily developments and increase collection opportunities.

Recommendations for Commercial Businesses

Collection of source separated recyclable materials is currently provided to some businesses in the County. However, it is desirable to increase their participation in recycling. Also, the County experiences many tourists year-round and the SWAC identified a need to increase efforts to expand opportunities to provide more recycling services to tourists and businesses that service the tourism industry.

Recommendation 3.3: Expand business education and promotion to *target expansion of recycling for businesses, focusing on hotels and resort communities to reach the year-round tourist population*. As part of the business education and promotion program, develop a program to target food waste recovery.

Recommendation 4.5: Develop a *recycling and vegetative food waste collection program targeting businesses, hotels and resort communities*.

Recommendations for C/D Generators

The County estimates that 25% or more of the waste disposed at Knott Landfill is generated from C/D activities. This waste stream contains large amounts of wood, sheetrock and roofing as well as typical commodity materials such as metal, cardboard and plastics. Also, there is an inert residue component (i.e. dirt, grit, glass) that is being disposed in the landfill. Completing a waste composition study and examining options to process and recover C/D material to reduce waste disposed in Knott Landfill or a future landfill can be part of a long-term solution.

Recommendation 3.5: Expand and *develop new programs aimed at increasing recycling of C/D material.*

Recommendation 4.7: Evaluate and develop a plan *to provide incentives for recycling of C/D material and programs to recycle these materials* to minimize its disposal at Knott Landfill or future landfills.

Infrastructure and Facility Needs

The SWMP considered the impacts to existing County solid waste facilities and identified the need for new infrastructure to support the recommended strategies. These facilities are needed to continue to provide long term, cost-effective services.

Recommendations for Compost Facilities

One focus on reducing waste disposed in landfills is to recover food waste and other organics from the waste stream. This will result in possibly as much as a 50% increase in the amount of organic materials to be composted.

The existing compost facility is located at Knott Landfill where there have been issues with odor. Given the fact there is increasing residential development in the area around the landfill, this site may not be well suited to handle the expected increase from food waste and other organics unless more advanced technologies that can process these materials faster and control odors are implemented. Also, there may be other locations more suitable for this operation that are closer to potential markets.

The SWAC has identified several recommendations to address the need to process more organics.

Recommendation 4.2: Conduct an *assessment of markets for compost products* resulting from expanded organics programs.

Recommendation 4.3: Evaluate alternatives to enhance and expand composting facilities. The study should *evaluate optimal locations considering proximity to generators, markets and surrounding land uses*.

Recommendation 4.4: *Upgrade the organics processing capacity and technology to efficiently handle additional food and yard waste,* including meats and dairy from residential and commercial sources and other organic waste streams.

Recommendations for Transfer and Recycling Stations

DSW operates four rural transfer stations to serve areas of the County that are remote to Knott Landfill. These transfer stations have been in operation since the early 1990s. Negus Transfer Station in Redmond and Southwest Transfer Station near La Pine are at capacity and need improvements. The following recommendations outline a phased, multi-year strategy to upgrade transfer station facilities.

Recommendation 5.1: Develop a *Facility Plan for Negus Transfer Station in 2019* for making improvements to the facility by 2021 or as needed.

Recommendation 5.2: Develop a *Facility Plan for Southwest Transfer Station within the next three years.* Modifications to this facility can be made as the demand for enhanced services for managing increased waste volumes and traffic is required.

Recommendation 5.3: Develop a *Facility Plan for the Knott Transfer and Recycling Facility as necessary to address long-term disposal options or within five years* of closure of Knott Landfill.

Recommendation 5.4: Establish *a capital improvement program for making investments in transfer station modifications over the next 10 years*.

Recommendations for Alternative Technologies

Over the past 10 years, there have been advancements in alternative technologies to recover and convert the energy value of solid waste into renewable energy. The SWMP includes a review of various technologies to determine if any may be practical for implementation in Deschutes County. The results of the review led to the following findings:

1. Alternative technologies for managing waste in Deschutes County do not appear feasible at this time.
2. Markets for renewable energy or fuel products are not currently available locally.
3. Knott Landfill is expected to reach capacity within 10 years. This provides an opportunity for the County to monitor the continued advancement of new technologies and to reassess the potential for implementing an alternative technology project in three to five years.
4. The County should only consider those technologies and vendors that have a proven record of successfully operating a commercial scale alternative technology facility.

Recommendation 6.1: The County should *continue to monitor and assess the status and feasibility of alternative technologies as a part of the solid waste system in three to five years.*

Recommendations for Landfill Disposal

When Knott Landfill reaches capacity, the County must be prepared to have a new solution in place. Two primary options were considered in the SWMP:

1. Transport waste to regional landfills located between 135 and 185 miles from Deschutes County near the Columbia Gorge.

2. Site and build a new landfill in Deschutes County.

DSW, working with the SWAC and the consultant team, completed an evaluation of the landfill options considering several factors. A public meeting was held to solicit additional input into which option was preferred. After examining the alternatives, the SWAC reached a consensus that the best approach for providing a long term and cost-effective waste management system was to site and construct a new in-County landfill. Some of the key factors supporting this recommendation include:

1. The ability to control decisions for managing the County's waste stream without having to consider impacts to a contract with an out-of-County service provider.

2. Environmental and other impacts resulting from transporting waste almost 250 to 300 miles (roundtrip) to a regional landfill located in the Columbia Gorge region are excessive when compared to disposing of waste in Deschutes County. Depending on the effectiveness of waste reduction and recycling programs, there will be about 25 to 30 large transfer trucks that need to make this trip each day. Vehicle emission impacts are substantially greater with the out-of-County disposal option. Additionally, these trucks must travel through several towns along the route and the number of trips is expected to increase as the population grows.

3. With an average depth to ground water of over 500 feet and an arid climate with less than 14 inches of precipitation annually, conditions in Deschutes County are conducive to siting a new, environmentally safe landfill operation. These conditions are similar to those prevalent at other regional landfills.

4. The cost to build and operate an in-County landfill is expected to be less than the alternative to transport waste over long distances and dispose in a regional site that is also obligated to pay host fees, which in turn would likely be paid by the County.

5. The County has demonstrated its ability to effectively build and operate a modern landfill complex in an environmentally safe and cost-effective manner.

There was much discussion on the difficulty of siting a new landfill and the possibility of a protracted process to successfully obtain permits. However, the geographic and demographic conditions in the County are favorable in comparison to locations west of the Cascade Mountains where siting has not been successful. It was noted that prior to expanding Knott Landfill in the late 1990s, the County did conduct a siting process and was able to identify sites that were environmentally suitable.

The SWAC considered the impacts of greenhouse gases from landfills and concluded these impacts are the same whether the waste is landfilled in the County or disposed at another site. However, avoiding the emission impacts of transporting waste over the required distances was a distinct environmental benefit.

Recommendation 7.1: The County should proceed to site and permit a new in-County landfill to be operational when Knott Landfill closes. The landfill should be capable of handling all waste streams generated in the County.

Recommendation 7.2: The County should begin a formal process to site and permit a new landfill by 2021.

Recommendation 7.3: Consider privatization of development and operations of the new landfill.

Recommendations for Administration and Financial Management

The County has provided a leadership role in developing much of the infrastructure that supports the management of solid waste. Day-to-day management and operations of the transfer stations and Knott Landfill are carried out directly by DSW staff. DSW also contracts out certain operations to private franchise companies, primarily to provide collection, transportation and recycling services. This also includes a license for Deschutes Recycling to operate the recycling and compost facility at Knott Landfill.

As part of the SWMP, it is important to consider the recommended strategies and what impact they could have on the current administrative responsibilities of DSW, or if changes in the management structure are needed. Likewise, the SWMP identified needed investments to site, permit and construct a new landfill as well as necessary upgrades and expansions to existing transfer stations.

Currently, the County and the cities of Bend and Redmond have entered into intergovernmental agreements that commit to disposal of waste at Knott Landfill. These agreements state the commitment to work together for managing solid waste. In addition, each jurisdiction has a franchise agreement with private companies to provide collection and recycling services.

Upon review of the current management structure, no major changes were suggested. Regarding the financial management of the system, DSW operates as an enterprise fund where revenues generated from disposal fees are used to provide direct services. DSW also provides several dedicated reserve accounts used to fund routine capital improvements at the landfill, thus avoiding the need to borrow money. This approach provides for stability in the rates charged to customers. Also, the County has been able to procure low cost funding using the County's bonding capacity for larger capital investments when required. The last time bonds were required was in 2005 when the Knott Landfill Recycling and Transfer Facility was constructed.

Recommendation 8.1: Given the need to implement the necessary changes to the solid waste management system over the next 10 years, the County should meet with the cities to reaffirm commitments and update, as necessary, the intergovernmental agreements. The agreements should also address the cities' participation in the process for implementing the recommendations adopted in the SWMP.

Recommendation 8.2: The County should establish a formal process that provides for continued involvement of cities, other stakeholders, businesses and the general public in implementing the recommendations of the SWMP. This process may include establishing an ongoing advisory group and/or assigning task force committees to oversee development and implementation of specific programs.

Recommendation 8.3: The County should consider the current DSW organization and determine the resources that are needed to carry out the implementation of the recommendations adopted in the SWMP. This will require perhaps some additional staff as well as financial resources.

Recommendation 8.4: DSW should prepare a financial study of the current rates to determine the impacts of implementing the improvements identified in the SWMP and develop a capital improvement plan for a five to seven year period aimed at maintaining a stable financial strategy for facility improvements.

Recommendation 8.5: Consider privatization of all aspects of the solid waste system as changes and programs are implemented, as referenced in *Appendix A*, as has been the practice of the solid waste system historically.

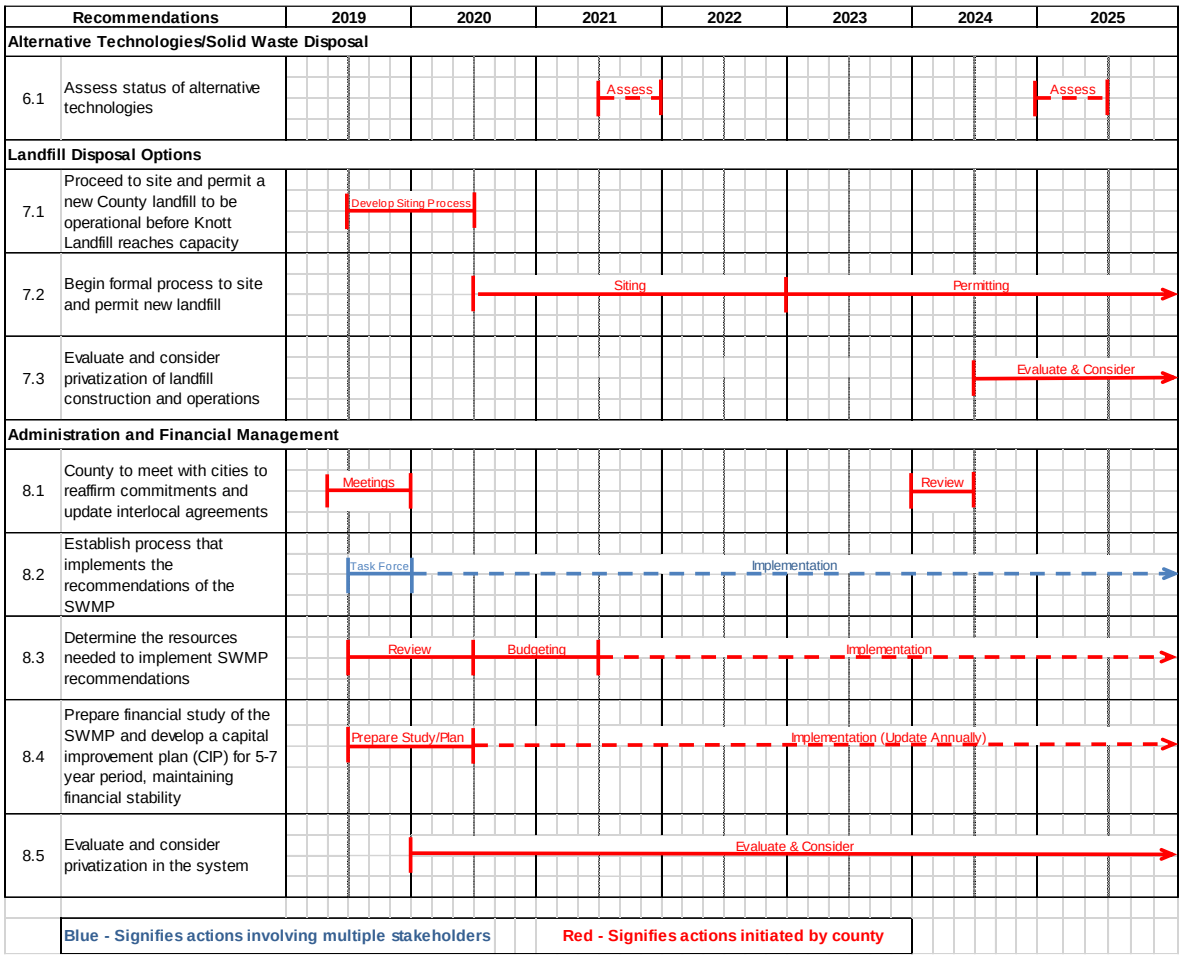
Implementation Schedule

The SWMP provides a roadmap for guiding the future development of the solid waste management system. It consists of 24 recommendations; several are related actions while others are dependent on the time when certain policies or facilities are completed. Also, certain actions are a priority while others can be delayed. The implementation schedule provides a comprehensive summary tool to help coordinate and manage the timeframe when actions should occur and be completed and when others may begin. It is important to recognize that public participation and input for implementing new programs is essential. While there is flexibility in the schedule, there are, however, certain actions that have identified key dates that will need to be considered.

(Intentionally Left Blank)

Deschutes County SWMP 2019 Implementation Schedule

	Recommendations	2019	2020	2021	2022	2023	2024	2025
Recommendations that Apply to All Generators								
3.1	Set up standard waste reduction and recycling program for single/multifamily and businesses	Task Force				Implementation		
3.4	Expand education to single/multifamily and businesses to promote reducing/recycling food waste	Planning	Task Force			Implementation		
4.8	Complete a waste characterization study	Implementation						
Recommendations that apply to Residential Single Family Households								
4.1	Expand current collection of residential food waste with yard waste	Continue Pilot Program				Implement Full Program		
Recommendations that apply to Multifamily Units								
3.2	Develop standard for multifamily recycling promotion and education program	Task Force		Implement Pilot Program			Implement Full Program	
4.6	Develop a multifamily recycling and food waste collection program	Task Force		Implement Pilot Program			Implement Full Program	
Recommendations that apply to Commercial Businesses								
3.3	Expand business education/promotion focusing on tourism	Task Force				Implement Program		
4.5	Start a recycling food waste collection program targeting hotels/resort communities		Planning			Implement Program		
Recommendations that apply to Construction and Demolition (C/D) Generators								
3.5	Expand and develop new programs aimed at increasing recycling C/D materials		Planning			Implement Program		
4.7	Evaluate and develop program to provide incentives for recycling C/D materials		Planning			Implement Program		
Compost Facilities								
4.2	Assess markets for compost products resulting from expanded organics program		Assess					
4.3	Evaluate alternatives to expand composting facilities involving optimal locations			Evaluation				
4.4	Upgrade organics processing from residential and commercial sources			Planning		Implement Program		
Transfer and Recycling Stations								
5.1	Develop and implement plan for Negus Transfer Station improvements	Design		Construction		Operation		
5.2	Develop and implement plan for Southwest Transfer Station improvements				Planning	Design	Construction	Operation
5.3	Develop plans for Knott Transfer and Recycling Facility improvements							Planning
5.4	Establish a capital improvement program			Implementation		Update Annually		


Recommendations
2019
2020
2021
2022
2023
2024
2025
Alternative Technologies/Solid Waste Disposal
6.1
Assess status of alternative technologies
Assess
Assess
Landfill Disposal Options
7.1
Proceed to site and permit a new County landfill to be operational before Knott Landfill reaches capacity
Develop Siting Process
7.2
Begin formal process to site and permit new landfill
Siting
Permitting
7.3
Evaluate and consider privatization of landfill construction and operations
Evaluate & Consider
Administration and Financial Management
8.1
County to meet with cities to reaffirm commitments and update interlocal agreements
Meetings
Review
8.2
Establish process that implements the recommendations of the SWMP
Task Force
Implementation
8.3
Determine the resources needed to implement SWMP recommendations
Review
Budgeting
Implementation
8.4
Prepare financial study of the SWMP and develop a capital improvement plan (CIP) for 5-7 year period, maintaining financial stability
Prepare Study/Plan
Implementation (Update Annually)
8.5
Evaluate and consider privatization in the system
Evaluate & Consider
Blue - Signifies actions involving multiple stakeholders
Red - Signifies actions initiated by county

1. INTRODUCTION

1.1 Context of the Plan Update

Solid waste management is a system that provides for waste storage, collection, transportation, processing, recycling, recovery, conversion to fuel/energy products, and disposal of what is left. It also provides for the accumulation and appropriate management of special wastes and materials like household hazardous waste, oil, electronics, bulky materials, and construction demolition (C/D) materials.

Deschutes County, has operated Knott Landfill as the primary solid waste disposal facility for the County since 1972. The County has also been responsible for providing the necessary facilities for managing solid waste generated by residents and businesses in the cities and unincorporated areas of the County. Working with the cities, franchised collection companies and local recyclers, the County has developed the infrastructure needed to meet the challenges of providing comprehensive waste reduction and recycling services while ensuring adequate capacity for safely disposing of waste in a most cost-efficient manner. In anticipation of the eventual closure of Knott Landfill, the County is taking the lead role to evaluate the options for managing waste in both the near future and after Knott Landfill is closed.

This Solid Waste Management Plan (SWMP) is the first comprehensive assessment of the solid waste system in many years. The timing for this project is most advantageous because of two important factors:

1. Based on current projections, it is anticipated that Knott Landfill will be at full capacity in about 10 years. It will require several years to plan, permit and build any facilities needed to continue providing constituents with infrastructure that is both reliable and cost-effective for long term use.

2. The State of Oregon passed SB459A that amends the Opportunity to Recycle Act and established new goals for all counties (also referred to as wastesheds) throughout the State. It requires jurisdictions to expand waste reduction and recycling programs to meet these goals by 2025.

Preparing a SWMP entails engaging stakeholders, service providers and local jurisdictions to assess current conditions, determine needs and opportunities, evaluate options and make recommendations to set a course for continuing to provide a reliable and most efficient system. Solid waste is a heavily regulated industry in the United States and is governed by a combination of federal standards, state statues and mandates, and local ordinances. These ever-changing regulations continue to challenge local jurisdictions to prevent waste and recycle more to reduce waste disposed in landfills.

Additionally, there are a number of private companies that are aggressively working to develop technologies to make the highest and best use of the resources yielded by processing out recyclables and converting waste to fuel and/or energy products. The adoption of new regulations and emerging technology has caused many communities to examine how best to manage solid waste in the future.

Chapter 1

This SWMP provides a forward look at the solid waste management system and identifies the needs and opportunities for the next 15 years. It provides decision-makers with general direction as to what facilities and programs are required to continue the success of the solid waste system.

The County, together with stakeholders (local jurisdictions, private sector operators and the public), must continually review the progress made and assure the overriding values of the community and the overall solid waste system needs are being met. By following the direction and priorities adopted in this SWMP, Deschutes County will provide a road map for making changes to manage the solid waste system for meeting local service needs as well as address statewide goals.

1.2 Plan Purpose and Goals

The SWMP examines each component of Deschutes County's solid waste system. It is designed to provide guidance and direction for developing policies and programs as well as the infrastructure needed to manage solid waste over a 15-year planning period (2019-2034). It is important to acknowledge there are many stakeholders that are impacted by the direction and decisions made for managing solid waste. This includes generators such as residents, institutions and businesses, cities and service providers. As such, these stakeholders have been consulted and given opportunity to provide input as the plan was prepared. Gaining consensus and support for the direction of the services to be provided is important going forward with implementing the recommendations.

It should also be recognized that solid waste practices, regulations, and technologies are dynamic in nature and will result in a need to routinely update the SWMP on a regular basis in the future. ***Thus, the purpose of the SWMP is to prioritize the steps necessary to continue to provide cost effective services, set a timetable for when decisions are made and identify the facilities needed for managing the required services.*** The plan provides the tool that communicates a strategy and implementation schedule to manage Deschutes County's recycling and waste management services.

In developing a SWMP that will guide the decisions and direction for managing solid waste, the County has embraced several goals and guiding principles for how waste is managed. These guiding principles consider the emphasis of the State of Oregon's 2050 vision to reduce waste disposed in landfills and to recover more materials, consistent with a theme to have local jurisdictions manage waste as a resource. While these directives are an important consideration, the County will rely on strategies that can accomplish these goals with an understanding they are fiscally responsible and consistent with delivering cost effective services.

The overriding goal for the County is ***"to work cooperatively with cities and service providers to offer citizens and businesses an integrated solid waste management system that delivers quality and cost-effective services while achieving the best use of our resources and reducing waste disposed in landfills."***

This SWMP presents a comprehensive long-term approach to solid waste management in the County, designed around this resource conservation and management principle.

The SWMP provides citizens and decision-makers in the County with a guide to implement, monitor, and evaluate solid waste facilities and programs in the future to meet the above-stated goal. The guiding principle for Deschutes County's SWMP is that solid waste should be viewed and managed as a resource using the most cost effective and reliable strategies that are consistent with the policies as adopted by the State. The County will strive to conserve resources through behavioral changes and recognizes the integral link between solid waste management, the environment, and ultimately the quality of life. Recommendations developed for the SWMP not only guide local decision-makers but substantiate the need for local funds and State grants for local solid waste projects and new programs.

When preparing this SWMP, there were several guiding principles or objectives that were considered in order to select the best approach from meeting the goals of the County and its partners. Achieving these objectives requires the plan consider and evaluate key factors such as programs to enhance services, proven and reliable technologies, cost effectiveness and environmental impacts. These specific objectives are:

1. ***To provide an integrated solid waste management system*** that addresses an effective combination of strategies and programs guided by the hierarchy adopted by the State to first, reduce waste at the source; second, to reuse and recycle materials; third, to compost; fourth, to recover energy; and last, to dispose of waste in landfills.

2. ***To continue educating consumers to promote practices and methods to reduce the long-term per capita waste generation rate*** and seek, through community outreach, a cooperative approach to assume individual responsibility to reduce waste.

3. To develop programs and support implementation of system improvements that seek to ensure materials recovered from the waste stream ***attain the highest and best use and are recycled***.

4. To develop a solid waste system that is based on ***sound financial principles, provides cost effective services and maintains rate stability over a long term***, while allocating costs equitably to all users.

5. ***To maintain system flexibility to respond to changes*** in waste stream composition, waste management technologies, public preferences, new laws and changing circumstances.

A primary objective of the State is to protect the environment by emphasizing waste reduction and reducing waste disposed in landfills. Therefore, each wasteshed (or county) has been assigned a targeted recovery rate, which is defined as the amount of materials reused and recycled divided by the total waste generated. The statewide goal established under Oregon Revised Statutes (ORS) 459A.010 sets Deschutes County's recovery rate at 45% by 2025. This target will be measured on an annual basis, and programs and facility assessments will be made on the County's progress towards reaching this state goal.

1.3 Issues Addressed by the Plan

With the commitment to produce a comprehensive SWMP, the County has taken the opportunity to fully assess all aspects of the solid waste system and, with its stakeholders, identify deficiencies and opportunities to make improvements. It also offers the opportunity to examine the current infrastructure and to plan for future investments strategically and develop a financial plan to implement improvements with the most cost-effective approach. Some of the key issues to be addressed in the SWMP are as follows:

1. Currently, the County recovery rate is 33%. What strategies can be implemented that will increase the recovery rate to potentially meet the 2025 recovery goal of 45%?

2. What are the impacts and changes needed, if any, to current collection services considering the potential for new recycling programs? Are changes needed to address population growth in the County?

3. What strategies can be implemented in the near term that might extend the site life of Knott Landfill?

4. Are there proven and reliable technologies that would be cost effective to implement that would further reduce the County's dependency on landfill disposal and enhance resource recovery?

5. What is the best approach for providing for reliable and cost-effective long-term disposal capacity?

6. What investments/improvements are needed at the County's transfer stations to address long-term system needs and to provide convenient cost-effective services?

7. What is the best approach for funding the capital improvements required to meet the future solid waste system needs?

8. Are there regional approaches to work with Crook County and provide opportunities to provide cost effective solutions?

9. What is the timeline for making needed investments in the solid waste system and when do new facilities need to be operational?

These represent some of the key issues and concerns addressed in the SWMP. As each component of the solid waste system was assessed, the consultant team working with the County and stakeholders identified and discussed the needs and opportunities pertaining to specific components of the solid waste system. As each component of the solid waste system was reviewed and updated, issues related to meeting the goals of the SWMP were addressed.

1.3.1 Overview of Regulations for Managing Solid Waste

In preparing this SWMP, it is important to understand the regulations that pertain to the responsibility and authority of the County and cities.

Deschutes County is the primary agency that manages solid waste disposal services for all generators in the County. The cities of Bend and Redmond have supported Deschutes County's role by entering into intergovernmental agreements. Also, both La Pine and Sisters have worked cooperatively to support the County-wide system. However, each of the cities has franchised agreements with private companies to provide collection and recycling services in their jurisdictions for both residential and commercial waste generators. This relationship has been in place for over 30 years as the County has owned and operated Knott Landfill.

The Department of Solid Waste (DSW) has had the primary responsibility for planning and operating the County's solid waste system. DSW is also responsible for providing collection and recycling services for the unincorporated areas of the County.

1.4 Regulations Related to Local Authority

In section 459.085 of the Oregon Revised Statutes (ORS), the specific authority for solid waste management for each county in the State is spelled out. The section deals with a county's authority outside cities and the effect of annexation and interagency agreements. Some key highlights of the regulations are as follows:

1. With respect to areas outside of cities, a board of county commissioners may, by ordinance or by regulation or order adopted pursuant to an ordinance or regulation:
    a. Prescribe the quality and character of and rates for collection service.
    b. Divide the unincorporated area into service areas, grant franchises to persons for collection service within service areas.
    c. Prescribe a procedure for issuance, renewal or denial of a franchise to a person providing or proposing to provide collection service.
    d. Regulate solid waste management.

2. With respect to areas outside of cities, a board of county commissioners may adopt ordinances to:
    a. Own and operate disposal sites and may license of disposal sites as an alternative to franchising of service.
    b. Regulate, license or franchise salvage businesses or the operation of salvage sites where such action is found necessary to implement any part of a solid waste management plan applicable in the county.

These primary authorities and responsibilities listed above are also applicable to cities. In summary, both cities and counties are responsible to ensure basic solid waste collection, recycling and disposal services are provided to all residents and businesses. Although local jurisdictions can operate collection services, the primary delivery method in the State of Oregon is through franchised agreements. There are several other citations, but those cited above represent the primary authority granted to local jurisdictions for managing solid waste.

The State supports local governments cooperatively working to prepare a SWMP and to coordinate services in the most efficient approach. ORS 459.065 states local governments may enter into intergovernmental agreements as follows:

a. For joint franchising of service or the franchising or licensing of disposal sites.
b. For joint preparation or implementation of a solid waste management plan.
c. For establishment of a joint solid waste management system.
d. For cooperative establishment, maintenance, operation or use of joint disposal sites, including but not limited to energy and material recovery facilities.
e. For the employment of persons to operate a site owned or leased by the local government unit.
f. For promotion and development of markets for energy and material recovery.
g. For the establishment of landfills including site planning, location, acquisition, development and placing into operation.

As part of preparing this SWMP, a key step was to review and update intergovernmental agreements, especially as it related to moving forward with implementation of recommendations. Therefore, the planning process was designed to obtain input from cities, other stakeholders and the general public as the SWMP was being prepared.

ORS 459 has several citations that govern the management of solid waste. The ORS citations above describe the authority of local governments to manage solid waste within their jurisdictional boundaries and for local governments to work together on solutions and services.

There are additional citations that relate to waste reduction and recycling and landfill disposal sites. First, through SB 263, the State's regulations for waste reduction and recycling were amended and codified in ORS 459A. This amendment to the original "Opportunity to Recycle Act" enacted new recovery rates for all wastesheds. For Deschutes County, the recovery rate was set at 45%. It also removed the recycling rate credits awarded to local jurisdictions: therefore, Deschutes County will need to consider approaches to increase the recovery rate from 33% in 2016 to 45% by 2025. This will be discussed in Chapter 3 Waste Reduction Programs.

Second, listed in ORS 459 are the regulations related to new landfill disposal sites. In section 459.017 it states:

1. The Legislative Assembly finds and declares that:
    a. The planning, location, acquisition, development and operation of landfills is a matter of statewide concern.
    b. Local government units have the primary responsibility for planning for solid waste management.
    c. Where the solid waste management plan of a local government unit has identified a need for a landfill, the State has a responsibility to assist local government and private persons in establishing such a site.

2. It is the intent of the Legislative Assembly that any action taken by the Environmental Quality Commission to establish a landfill under ORS 459.049 be recognized as an extraordinary measure that should be exercised only in the closest cooperation with local government units that have jurisdiction over the area affected by the proposed establishment of a landfill.

Furthermore, Section 459.047 identifies how the State will work with local government to site, permit and implement any new landfill disposal site. In summary, the State recognizes the complexity and challenges in locating a new landfill disposal site and will offer assistance where needed.

This overview is intended to provide background information necessary for understanding what regulations impact the preparation of the SWMP and its findings and recommendations. As each element of the solid waste system is presented and evaluated for future impacts, more details regarding the regulations that impact that element will be discussed.

1.5 Plan Organization

The plan will consider the entire solid waste system by preparing a separate chapter for each component of the system. This introductory chapter provides information on the purpose of the SWMP and guiding principles for managing solid waste in Deschutes County. Chapter 2 Background and Waste Stream Analysis describes the current system and the types and quantities of solid waste generated in the County.

The remaining chapters address each component of the solid waste system, including:

- Waste Prevention, Reduction, Reuse and Recycling Analysis (Chapter 3)
- Collection and Recycling/Processing (Chapter 4)
- Transfer System (Chapter 5)
- Alternative Technologies and Solid Waste Disposal (Chapter 6)
- Landfill Disposal Options (Chapter 7)
- Administration and Financial Management (Chapter 8)

The information prepared for each Chapter and component includes the following subjects:

- Review of current practices
- Needs and opportunities
- Discussion and evaluation of alternatives
- Recommendations for future actions

The process for completing the SWMP as illustrated in Figure 1-1 uses a building block approach to first examine the programs and services for reducing or preventing waste from being generated as well as services for reuse of materials. These programs affect the residents and businesses that generate waste. Next, the plan reviews the recycling programs to consider approaches to recover more materials. The chapters then progress to looking at ways to process and transform/convert waste to a useful resource. Finally, with waste that cannot be recycled or used, final disposal options are evaluated.

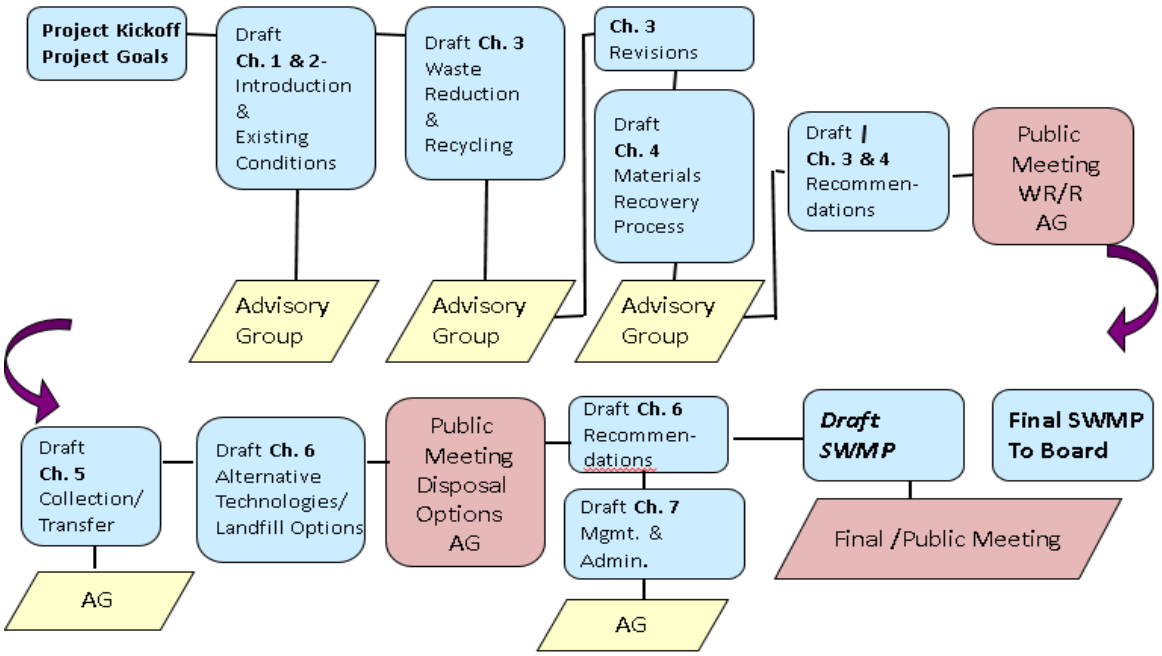


Figure 1-1: Deschutes County SWMP Interactive Planning Process

1.6 Public Participation

In preparing the SWMP, the County developed a comprehensive outreach program to solicit input and reaction from stakeholders, citizens and businesses. This included setting up a dedicated page in the County and DSW's website. This webpage was updated monthly. As shown on the process flow chart, there were several SWAC meetings to evaluate options of the different components of the solid waste system. In total during the preparation of this SWMP, the SWAC held 14 meetings, all of which were advertised and open for the public to attend. As the draft SWMP achieved certain milestones, the County sought to provide opportunity for additional public input by holding two public meetings. One meeting was held to obtain input and feedback regarding the draft recommendations of proposed actions for reducing waste and recycling more materials. A second public meeting was held to obtain input regarding future disposal options for the County's waste when Knott Landfill closes.

To obtain additional input, DSW issued surveys to obtain feedback of various waste reduction and recycling programs, and also to gain some insight of public opinion on future disposal options. Finally, DSW expanded its outreach by conducting a phone survey using an independent firm to receive further input on whether the County should site a new landfill in Deschutes County, or consider transporting waste to a regional landfill located in another jurisdiction.

A full description of the public outreach program is provided in Appendix B.

2. BACKGROUND AND WASTE STREAM ANALYSIS

2.1 Introduction

This chapter provides the following information:

- The physical and economic characteristics of the planning area (Deschutes County);
- A description of the current solid waste management system;
- An analysis of the current solid waste stream composition;
- Trends in waste generation and recovery rates; and
- A presentation of waste generation projections.

2.2 Characteristics of the Planning Area

Deschutes County is located in Central Oregon and comprises 3,055 square miles bounded to the west by the Cascade Mountains and lies within the central high desert plateau. It is bounded by Jefferson County to the north, Crook County to the east, Klamath and Lake Counties to the south, and Lane and Linn counties to the west. Topography is above mean sea level ranging from 2,411 feet at the lowest elevation to over 10,000 feet at South Sister, located in the Three Sisters Wilderness of Central Oregon's Deschutes National Forest. The Forest Service owns 51% of the land within the County's boundary.

Since most of the region is located at a higher elevation (average elevation is 4,575 feet), the climate tends to be cooler most of the year. In the summer, the average high temperature is 84 degrees Fahrenheit and in the winter, the average is 24 degrees Fahrenheit. The County receives an average of 11 inches of rain per year and 22 inches of snow. On average, there are 266 sunny days per year.[1]

Despite the slowdown in growth during the 2008 recession, the population of Deschutes County has been one of the fastest growing in Oregon. It grew 3% from 2014 through 2015 and has increased at an average rate of more than 3% per year and by a total of 57% since the 2000 Census.[2] According to the 2010 Census, the County had a population of 157,733 and was estimated to be 181,307 in 2016. According to 2016 estimates, this population resided in a total of 85,933 housing units, with an average household size of 2.49.[3] County-wide population and housing figures from the 2010 US Census estimates are shown in Table 2-1.

[1] Source: US Climate Data, https://www.usclimatedata.com/climate/bend/oregon/united-states/usor0031 Accessed: November 17, 2017

[2] Source: Coordinated Population Forecast: Deschutes County 2015-2016, Population Research Center, Portland State University, June 2015.

[3] Source: US Census Bureau, www.census.gov

Table 2-1: Population and Housing, Deschutes County vs. State of Oregon

Category	Year	Deschutes County	Oregon Wide
Population	2010	157,733	3,831,074
Population Estimate	2016	181,307	4,093,465
Population percent change	2010-2016	14.9%	6.4%
Number of Housing Units	2010	80,139	1,675,562
Number of Housing Units Estimate	2016	85,933	1,732,786
Housing Units percent change	2010-2016	7.2%	3.4%

Population is generally concentrated in the City of Bend, which is located in the center of the County with 83,500 residents (Table 2-2). Most of the urbanized areas in the County are located along or near the major road corridors of Highways 20 and 97.

Table 2-2: 2016 Estimated Population of Cities in Deschutes County, OR[4]

Jurisdiction	Population
Bend	83,500
Redmond	27,595
La Pine	1,675
Sisters	2,390
Un-incorporated Cities	66,147
Total	**181,307**

The Deschutes County seat is in Bend, which is considered the political and economic hub of Central Oregon. As the major population center for Central Oregon, Deschutes County has evolved into a diversified economic region. The main industries representing major employers include:

- Leisure and Hospitality
- Medical/Health Care
- Industries
  - Secondary Wood Products
  - Aviation/Aerospace
  - Renewable Energy Resources
  - Recreation Equipment
- Retail
- Specialty Manufacturing
- Office/Services
- Government

Also, agriculture is still a large part of the Central Oregon economy. Tourism brings many visitors to the County each year to the resort communities of Black Butte, Sunriver, Eagle Crest, Pronghorn, and Inn of the Seventh Mountain. Other attractions include Mount Bachelor ski area, the High Desert Museum, numerous golf courses, several lakes and rivers, and hiking trails.

In general, the region experiences an influx of visitors year-round, especially to Bend and its surrounding communities. Data published by "Visit Bend" states there were an estimated 2.5 million visitor-trips to the City of Bend alone in 2015. If one assumes

[4] Source: Population Research Center, Portland State University.

that each trip represents one person, that would translate to about 200,000 visitors each month. Comparing current data to information published in 2010 where it showed about 150,000 visitors per month indicates there has been an increase in tourist visits of 25%.[5] This represents visitors to the Bend only and not the entire County.

Acknowledging the large number of visitors is an important aspect of evaluating options for managing solid waste. It not only impacts the total waste disposed, but also the composition of the waste generated. Since the largest concentration of destination resorts in the Pacific Northwest is in the County, tourism and hospitality trade are an important sector of the economy.

In 2007, the unemployment rate was 4.7%, dropping to 4.2% in 2017.[6] The most common employment sectors are healthcare and social assistance, retail trade, and accommodation and food service.[7]

Table 2-3: Deschutes County Economic Activity

Category	Year	Deschutes	Oregon
Median Household Income	2015	$51,223	$51,243
Median Value of Owner-Occupied Housing Unit	2015	$253,400	$237,300
Civilian Labor Force	2015	61.30%	62.10%
Unemployment Rate[6]	Aug-17	4.20%	4.10%
Full & Part Time employment	2015	60,309	1,498,727
Total Employment - Percent Change	2015	6.80%	3.80%
Total employer establishments	2015	6,530	112,393
Building Permits	2016	2,274	19,586

The City of Bend, working with civic leaders, industry representatives and other interest groups, prepared a comprehensive economic forecast report in August 2016 entitled "Bend Economic Opportunities Analysis". This report cites the recent trends in the growth for the City of Bend and the County, pointing to recent increases in employment. It supports the conclusion that the area is expected to continue to have stronger growth than other areas of the State. It also suggests the need for more multi-family housing as well as more land in the urban growth boundary to support growth.

[5] Source: Oregon Visitor Trips, RRC February 2016; Estimation of Bend Oregon Visitor Trips and Visitor Days Prepared by RRC Associates, September 1, 2010, www.visitbend.com
[6] Source: Bureau of Labor Statistics, www.bls.gov
[7] Source: Data USA, https://datausa.io/profile/geo/deschutes-county-or/#economy

2.3 Description of the Current Solid Waste Management System

The current solid waste system in Deschutes County consists of storage, collection, transfer, waste recovery, recycling, household hazardous waste (HHW), composting and disposal facilities. Collectively, the facilities and programs in Deschutes County effectively manage all of the County's waste and recyclables. This chapter provides a description of the major components of the current solid waste management system in the County. Some of the smaller recycling facilities or specific programs that are currently in place within the County may not be included, but will be discussed in later chapters of this SWMP

As mentioned in Chapter 1, the County and the cities, by State law, are empowered with the responsibility to ensure recycling services are provided and waste is managed in a safe and efficient manner. To meet the needs of citizens and businesses, solid waste and recycling services and programs are provided through a partnership of local jurisdictions with private service providers. A basic overview of the County's solid waste system is presented in Figure 2-1.

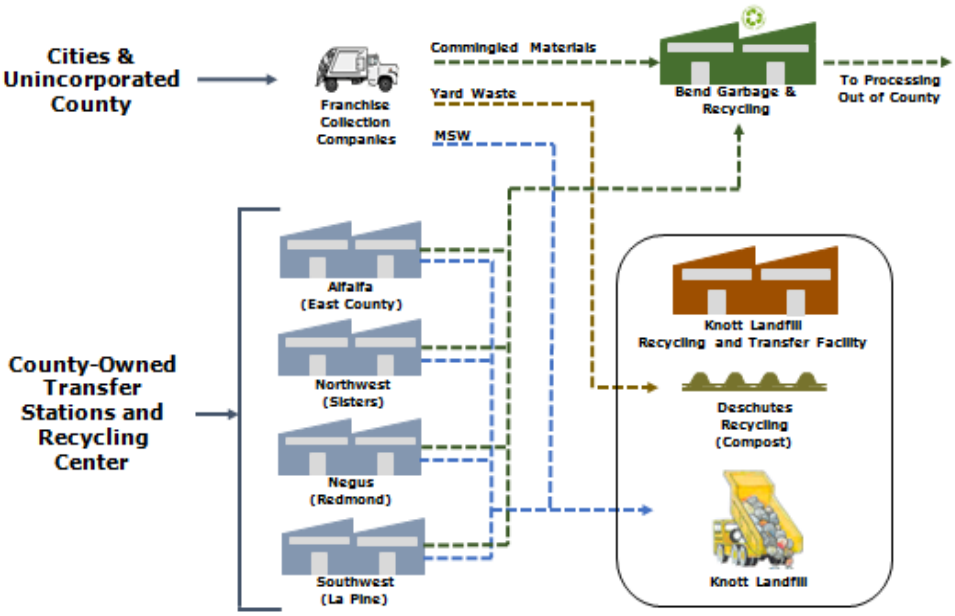


Figure 2-1: Deschutes County Solid Waste System

Deschutes County owns the four transfer stations, composting site, some of the recycling facilities and the landfill that serves the solid waste system. The processing facilities and some of the recycling facilities are owned by private companies or other local government agencies.

2.3.1 Summary of Annual Solid Waste Generation

Over the past seven years, the County has experienced a continual increase in the amount of waste generated. Table 2-4 shows the amount of materials that were recovered, and waste disposed from 2010 to 2017 as reported by the Oregon

Department of Environmental Quality (DEQ).[8] The total waste generated is the sum of the waste disposed plus recovered materials.

Table 2-4: Solid Waste Tons Per Year

Total Solid Waste	2010	2011	2012	2013	2014	2015	2016	2017
Generated	177,107	185,386	185,676	193,744	203,921	227,333	240,844	270,658
Disposed	115,030	112,751	113,611	119,682	130,956	143,952	161,087	181,095
Recovered	62,077	72,635	72,065	74,062	72,965	83,381	79,757	89,536

Waste disposed, includes what is received at the Knott Landfill and special waste including HHW that is recycled or disposed at designated sites. Waste disposal at Knott Landfill includes MSW and C/D waste.

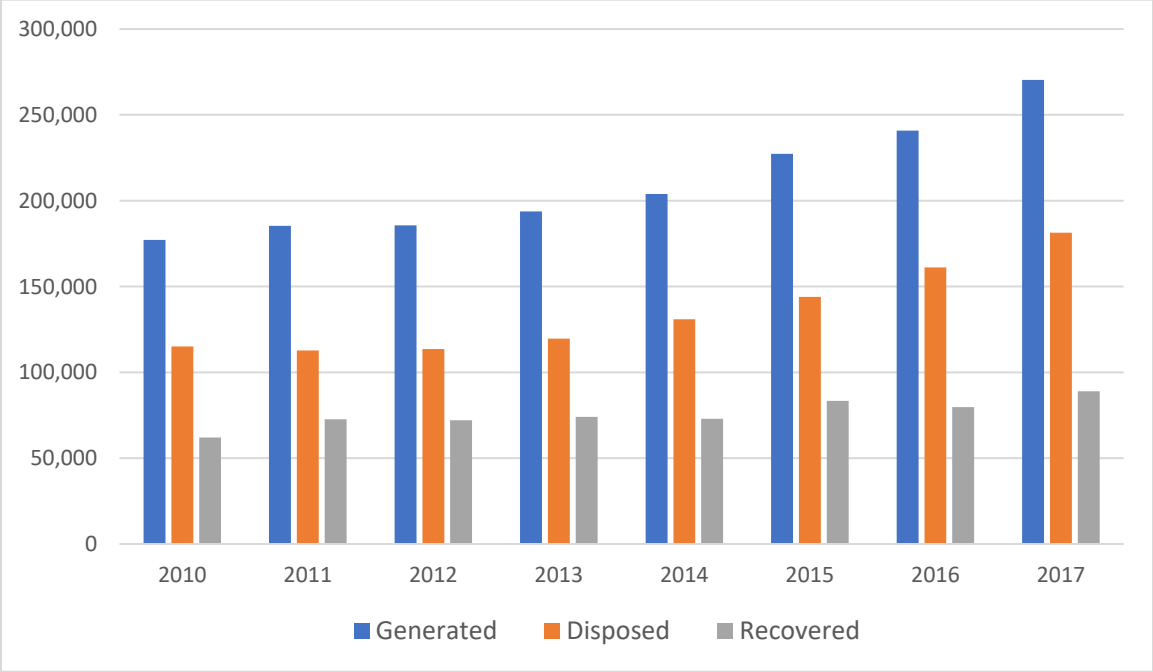


Figure 2-2: Graph of Annual Solid Waste

The data shown graphically in Figure 2-2 indicates that during the five years between 2012 and 2017, the County has experienced an increase of 46% in the amount of waste generated.

[8] DEQ Annual Reports

2.3.2 Refuse Collection

Deschutes County has franchised agreements with four different private companies for the collection of municipal solid waste from residences and commercial establishments (see Table 2-5). Each of these companies is franchised by the city it serves and with the County for unincorporated areas, under authority granted by ORS 459.125. This same legislation also gives Deschutes County the authority to:

> *"Regulate, license, franchise and certify disposal, transfer, and resource recovery sites or facilities; establish and collect license or franchise fees; and otherwise control and regulate the establishment and operation of all public or private disposal, transfer and resource recovery sites or facilities located within the County."*

Franchised agreements grant each company the sole right to collect solid waste and recyclables from a specified area. Waste haulers are obligated to provide a regular schedule for collection of waste in all areas of the County and recyclables in urbanized areas. Service charges by the waste haulers are regulated by cities and by the County.

Table 2-5: 2008 Private Solid Waste Haulers and Service Areas

Collection Service Provider	Service Area	Term of Contract
Bend Garbage and Recycling	North Bend	Rolling seven[9]
Cascade Disposal	South Bend and Sunriver	Rolling seven
High Country Disposal	Redmond and Sisters	Rolling seven
Wilderness Garbage and Recycling	La Pine	Rolling seven

Note: Deschutes County contracts with all four collection companies for service in the unincorporated areas of the County.

2.3.3 Transfer Stations

DSW manages four transfer stations in the County. The transfer station system was developed in the 1990s to replace closed landfills and to offer convenient locations where residents and businesses in rural areas could take waste and recyclables. Waste is transferred for disposal at Knott Landfill and recyclables are taken to Mid-Oregon Recycling, located in Bend.

The four transfer stations include Negus Transfer Station located in Redmond, Northwest Transfer Station near Sisters, Southwest Transfer Station between Sunriver and La Pine, and Alfalfa Transfer Station located off Walker Road near Alfalfa (Figure 2-3).

[9] Denotes a continuously renewing 7-year term for contracts, per franchised ordinance.

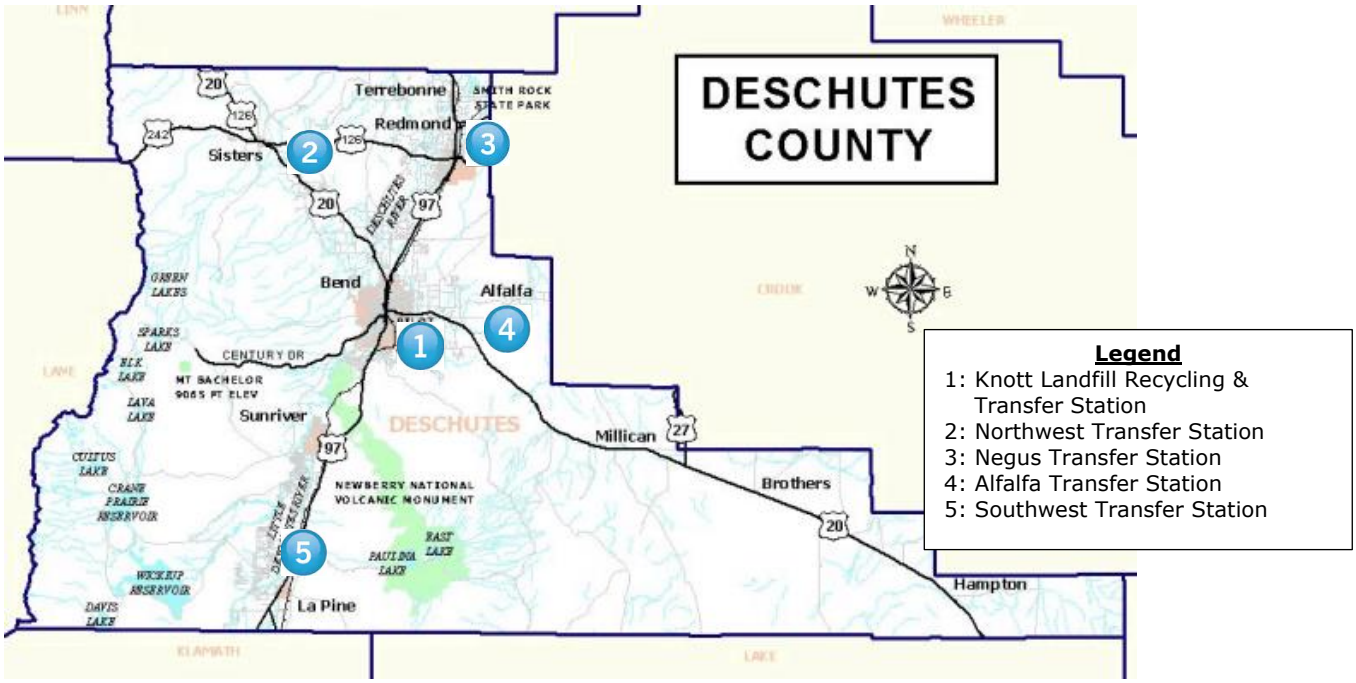


Figure 2-3: Transfer Station Locations in Deschutes County

Negus Transfer Station serves the largest population center outside Bend and receives the most customers since it is located near the city of Redmond, the second largest city in Deschutes County. Table 2-6 shows the tonnage of waste materials that flow into these facilities.

Table 2-6: Remote Transfer Station Tonnages[10]

Transfer Station	*2012 Tons*	*2013 Tons*	*2014 Tons*	*2015 Tons*	*2016 Tons*	*2017 Tons*
Negus	21,825	23,510	25,444	28,502	31,309	34,948
Northwest	3,166	2,965	3,037	3,429	3,738	3,630
Southwest	6,491	7,074	7,386	8,203	9,193	9,788
Alfalfa	155	157	151	165	170	184
Subtotal Remote Transfer Station	**31,637**	**33,706**	**36,018**	**40,299**	**44,410**	**48,550**
Knott Transfer Station	**22,838**	**25,349**	**25,444**	**28,501**	**31,509**	**45,020**
Total Transfer	**54,475**	**59,055**	**61,462**	**68,800**	**75,919**	**93,570**

The amount of waste received at the County's four transfer stations has increased by 53% since 2012, while tonnages at the Knott Transfer Station increased 97%. Overall, transfer station tonnages increased 72% over this period. Most of this increase has occurred at the two largest transfer stations, Negus in Redmond and Southwest near La Pine respectively by 43% and 42%. This increase corresponds with the growth in population throughout the County.

[10]DSW Annual Reports

In addition to these remote transfer stations, DSW operates a central transfer station at Knott Landfill. This station was built to receive waste delivered by self-haul customers and eliminated these users from unloading at the landfill working area for safety reasons. A recycling center is also located at Knott Landfill. The total amount of waste received at all transfer stations and Knott Transfer Station is shown in Figure 2-4.

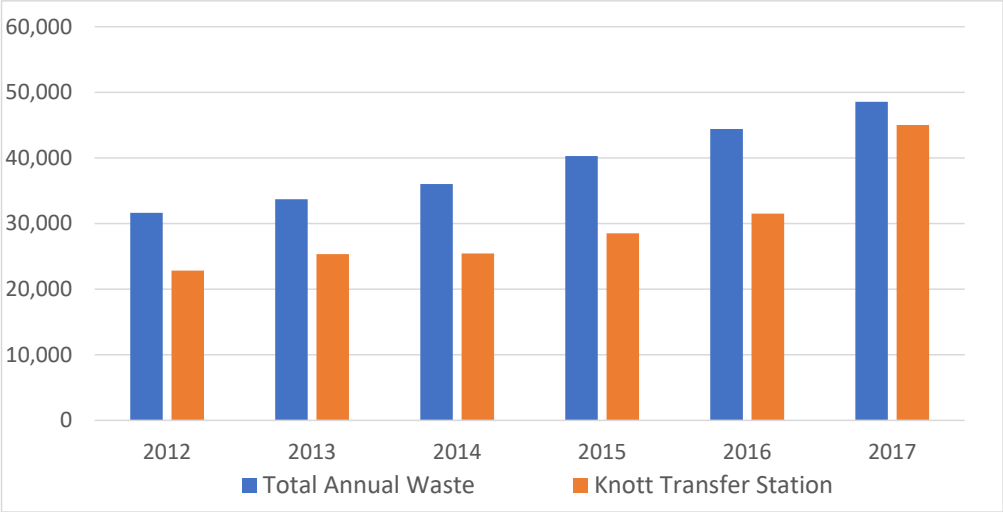


Figure 2-4: Deschutes County Yearly Transfer Station Tonnages

The Knott Recycling and Transfer Facility and the Northwest, Southwest and Negus transfer stations accept items such as household refuse and construction debris, commingled recyclables, cardboard, glass, appliances, auto batteries, computer monitors, CPUs, printers, keyboards, TVs and other electronics, motor oil, tires, scrap metal, wood waste and yard debris. Knott Landfill also accepts asbestos and contaminated soil. The Alfalfa facility accepts commingled recyclables, cardboard, glass, auto batteries, computer monitors, CPUs, TVs, motor oil and scrap metal. [11] Table 2-7 lists the hours of operation for each facility.

Table 2-7: Deschutes County Transfer Station Hours of Operation

Transfer Station	*Days of Operation*	*Hours of Operation*
Knott Landfill Recycling and Transfer Facility	November 1-April 30 Monday-Saturday	7:00 a.m.–4:30 p.m.
	May 1-October 31 Monday-Sunday	7:00 a.m.–5:00 p.m.
Negus	Monday-Saturday	8:00 a.m.–4:00 p.m.
Northwest	Wednesday-Saturday	8:00 a.m.–4:00 p.m.
Southwest	Wednesday-Saturday	8:00 a.m.–4:00 p.m.
Alfalfa	Saturday	8:00 a.m.–4:00 p.m.

[11] Source: Department of Solid Waste Deschutes County Brochure from website November 2017, www.descutes.org/solidwaste

2.3.4 Disposal Facility – Knott Landfill

Landfill disposal is part of every solid waste system. There are different types of landfill facilities that are designed and permitted to handle different waste streams. The primary type of landfill is one that is designed to dispose of MSW. In Deschutes County, the only landfill permitted to accept MSW is Knott Landfill, which is anticipated to close in 2029. Data for recent waste tonnage received at Knott Landfill is shown in Table 2-8.

Table 2-8: Deschutes County Tonnage to Disposal Operations[12]

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Annual Waste Disposed (tons)	**114,307**	**112,751**	**113,611**	**119,682**	**130,956**	**144,067**	**161,087**	**182,095**
% Change		***(1.4%)***	***0.9%***	***5.4%***	***9.4%***	***10.0%***	***11.8%***	***13.0%***

Knott Landfill has been the County's primary disposal site since 1972 and is projected to close in 2029 or in about 10 years. In 2017, over 181,000 tons of municipal and non-municipal solid wastes were disposed at Knott Landfill. About 75% of the waste received at Knott Landfill is delivered by franchised collection companies and self-haul customers. The remaining 25% of the waste is collected and transferred to Knott Landfill from the four rural transfer stations located in Deschutes County. The rural transfer station waste is delivered by truck, averaging approximately 15-25 tons of waste per load.

Landfill gas (LFG), comprised primarily of methane, is a byproduct of waste decomposing in landfills. Collection and destruction of LFG is important to reduce greenhouse gas emissions and prevent LFG-related fires and explosions. Currently, the County collects LFG and operates a flare system to burn off the gas safely. In 2009, Deschutes County completed a study of options for using LFG generated by the landfill. Due to market conditions at the time, that study generally focused around electric generation options and included LFG recovery assessments based on 2009 conditions at the landfill. Since then, numerous factors have changed both internally within Knott Landfill's operations and externally within the LFG utilization industry as a whole. Since incorporation of leachate/condensate recirculation into the site operation in 2010, the landfill has seen a significant increase in LFG production, which necessitated the need for expanding the flare system in 2017. DSW is considering options for managing the LFG produced even after the landfill is closed.

2.3.5 Recycling Systems

Deschutes County dedicates 2.5% of the annual budget to recycling education, which has helped to increase diversion numbers in the County. Many private collection companies and volunteer organizations participate in programs to recycle materials

[12]Oregon Department of Environmental Quality; *2017 Oregon Material Recovery and Waste Generation Rates Report*.

from the County's waste stream. This section describes the primary facilities that receive, process, and market materials produced from collection services.

The State requires that every jurisdiction with a population of 4,000 or more provide recycling programs and services. In Deschutes County, recycled materials are primarily collected from residences and businesses at the curb. Residents and businesses can also drop off recyclables at several locations across the County. In addition, a number of waste reduction and recycling education programs for residents and businesses are conducted by the County or its agents and the franchised collection companies. The following is an overview of the recycling facilities currently operating in Deschutes County.

2.3.5.1 Recycling at Transfer Stations

All four transfer stations accept recyclable materials including comingled materials, cardboard (OCC), auto batteries, glass, electronics, motor oil, scrap metals and propane tanks. The transfer stations do not accept the following:

- Dirt, sod, concrete, rocks, bricks, and other inert material (accepted at Negus Transfer Station)
- Hazardous materials
- Liquids
- Manure
- Ashes (dead or alive)
- Asbestos
- Bulky heavy items that may damage the transfer trailers or hinder unloading as determined by the site attendant

Table 2-9 provides the amount of these materials received at each of the transfer stations.

Table 2-9: Annual Recycling Materials Recycled at Deschutes County Transfer Stations (2016 Tons per Year)

	Alfalfa	Knott	Negus	Northwest	Southwest	Total
Appliances			166	27	74	**267**
Batteries			7	2	4	**14**
Cardboard			114	24	63	**201**
Commingled	20		122	37	94	**273**
Electronics			100			**100**
Glass	8		78	27	45	**158**
Hazardous Waste		264				**264**
Motor Oil			23	2	11	**37**
Scrap Metal	9	4	230	71	138	**451**
Propane Tanks		0.84				**0.84**
Tires	0.06		43	4	14	**61.06**
Totals	**37**	**269**	**883**	**193**	**443**	**1,826**

In addition to the recyclable materials listed in Table 2-9, the County's transfer stations receive yard debris, which is ground and transported to Knott Landfill for use as alternate daily cover. Wood waste is accepted at Negus Transfer Station which is ground and shipped to mills for use as boiler fuel for electricity production. Quantities of wood waste and yard debris managed through the County's transfer stations is shown on Figure 2-5.

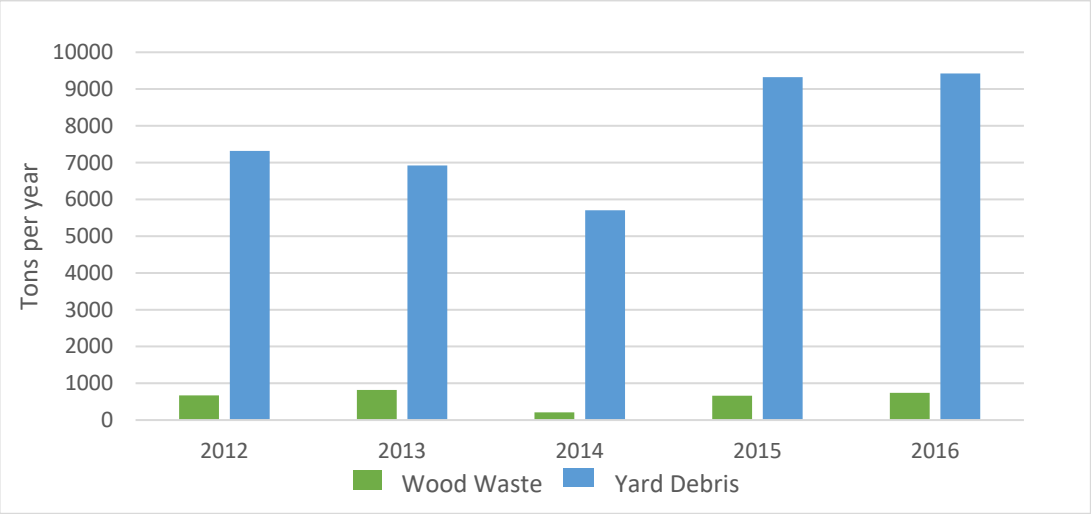


Figure 2-5: Annual Wood/Yard Waste at Deschutes County Transfer Stations (Tons per Year)

2.3.5.2 Recyclables Processing

Commingled recyclable materials are collected by the franchised hauler for each of the four cities and taken to Mid-Oregon Recycling's facility. Commingled recyclables are then baled and sent to processors outside of the County. Cardboard and scrap metal are also baled and shipped out of the County to be recycled. Table 2-10 shows the amount of materials collected for the past three years by the different franchised haulers.

Table 2-10: Commingled Recyclables Collected by Haulers in Deschutes County (Tons per Year)

Hauler:	2014	2015	2016
Bend Garbage and Recycling	4,289	4,480	4,753
Cascade Disposal	4,450	4,658	4,805
High Country Disposal	3,225	3,318	3,409
Wilderness Garbage and Recycling	54	58	50
Total	**12,018**	**12,514**	**13,017**

2.3.5.3 Household Hazardous Waste Facility (HHW)

Deschutes County collects HHW at the Knott Landfill Recycling and Transfer Facility. Residents can drop off HHW during posted times. Motor oil (less than 5 gallons) and auto batteries (household only) can be dropped off at one of the four transfer stations or the Knott Landfill Recycling Center. In addition, the County conducts annual HHW collection events in Redmond, Sisters and La Pine.

Motor oil can also be collected curbside by the franchised collection companies within Bend city limits if it is in a sealed container that is clearly labeled with the contents and set next to the glass bin on collection day.

2.3.5.4 Composting

The Knott Landfill Recycling Center, operated by Deschutes Recycling, receives most of the yard debris and wood waste generated in the County. The facility includes a grinder and screen operation to produce various soil amendment and ground cover products. These products are available for sale at the facility. The compost sold at the facility is independently tested every three months by a U.S. Composting Council approved lab to ensure quality. The company offers three different types of compost, which vary by size and application use. One product contains 50% food-based compost, which helps enhance landscapes with much needed nutrients. The facility also offers spreaders, delivery of material and a place for customers to drop off yard debris, clean wood waste, stumps and sod. They do not accept rocks, dirt, garbage, plastic bags, or concrete. The facility is open seven days a week in the summer, six days a week in the winter and closed on major U.S. holidays.

2.4 Projected Waste Stream Quantities and Composition

The following Waste Stream Analysis provides a summary of current waste stream generation and composition in Deschutes County, and forecasts future disposal and recycling levels.

For the purposes of this projection, the total waste stream is defined as tons of solid waste generated in Deschutes County, which includes both disposed and reused/recycled materials. Most types of solid waste are landfilled, while others are reused, recycled, or disposed of at sites designated for a specific type of special waste. The waste disposed includes both MSW and C/D waste. MSW consists of waste generated by residences, offices, institutions, commercial businesses and other waste generators not producing special wastes. Special wastes have their own characteristics and handling requirements. Special wastes include industrial waste, hazardous waste, infectious waste, sludges and septic tank pumpings, tires, and recycled waste.

C/D waste is generated by contractors on construction projects and by self-haul customers. This waste stream is a material that can be largely inert or may contain large amounts of wood.

All operators that collect and/or process waste report the amount of recycled materials to DEQ each year. This includes specific generators that recycle their own waste, as well as all solid waste handling facilities. The result is an annual report, prepared by DEQ, which summarizes the recovery rate for each county. Recovery rates for each

county in Oregon are listed in DEQ's annual Material Recovery and Waste Generation Rates Reports. The recovery rate is defined as the total material recovered divided by the total material generated and pertains to the amount of material that is recycled, composted, or recovered for energy and not disposed in landfills. In the past, each wasteshed could earn up to six recovery credits for waste prevention, reuse and residential composting programs that were then added to calculated recovery rates. As a result of new legislation, counties or wastesheds will no longer receive these credits. The recovery rate (without the credits) is the value shown in the tables in this chapter unless otherwise stated.

Estimates used in this SWMP demonstrate a distinction between "disposed" quantities and "generated" quantities. As used in this SWMP, disposed solid waste is considered to be all solid waste delivered to Knott Landfill as reported to DEQ, whether generated in or out of the County. Waste generation is calculated by adding the total waste disposed and the materials that are recovered, as reported to DEQ.

2.4.1 Historical Solid Waste Data

Each year, DEQ compiles a report of the amount of materials recovered and disposed for each county or wasteshed. Table 2-11 provides a summary of this Deschutes County data over an eight year period between 2010 and 2017. The total waste generated is the sum of the waste reportedly disposed and materials recovered each year. DEQ then computes the per capita generation rate by dividing the total waste generated by the published population for that wasteshed. This provides a measurement of how much waste each person generates on a daily basis, whether at work or at home. The top priority of the State hierarchy is to reduce the total waste generated on a per capita basis. Similarly, the amounts of waste disposed and recovered are also divided by the population to produce per capita rates for those waste streams. This information is one method used to measure the success of waste reduction and recycling programs and is used to compare with other wastesheds.

Table 2-12 provides the "Per Capita Rates" over the same eight year period.

Table 2-11: Deschutes County Historic Waste Stream Data (Tons, 2010 through 2017)[13]

Waste	2010	2011	2012	2013	2014	2015	2016	2017
Generated	177,107	185,386	185,676	193,744	203,921	227,333	240,844	270,658
Disposed	115,030	112,751	113,611	119,682	130,956	143,952	161,087	182,095
Recovered	62,077	72,635	72,065	74,062	72,965	83,381	79,757	88,563
Recovery Rate*	35%	39.2%	38.8%	38.2%	35.8%	36.7%	33.1%	32.7%

*Does not include recovery credits that are no longer counted.

[13] DEQ Annual Wasteshed Report

Table 2-12: Deschutes County Per Capita Rates (Pounds per Year)

Per Capita	2010	2011	2012	2013	2014	2015	2016	2017
Generated	2,243	2,334	2,319	2,384	2,451	2,663	2,727	2,959
Disposed	1,457	1,419	1,419	1,473	1,574	1,686	1,824	1,991
Recovered	786	914	900	911	877	975	903	968

The historic data shows that Deschutes County has experienced about a 33% increase in the amount of waste generated over the past three years. Other jurisdictions throughout Oregon also experienced larger than normal growth over a similar period. However, the average increase was between 7% in Lane County to as high as 10% in Marion County. Over this three year period, the State experienced an increase in the economy. It is assumed the increase in construction and the housing market in Deschutes County was a contributor to the higher generation rate as well as additional tourist population that is constant throughout the year.

Waste that is not recycled requiring disposal in Deschutes County is delivered to Knott Landfill. It is anticipated that Knott Landfill will be at capacity and will discontinue accepting MSW in 2029. The amount of waste disposed at this site in 2010 through 2017 as reported to DEQ is shown in Table 2-11.

2.4.2 Waste Stream Composition

It is important to understand the composition of the waste stream because it provides an estimate of the types and quantities of materials that are generated and disposed, including recyclable and compostable materials. This composition analysis uses the best available data to create a snapshot of materials that are being disposed at Knott Landfill.

The amount of recycled materials shown represents the actual materials reported to DEQ in 2016. Composition data for waste disposed was developed from several sources, including past data from DEQ studies and detailed waste characteristic studies recently completed for other jurisdictions. This data was used to estimate the percentage of different materials that are being disposed. The total waste stream composition is the sum of that which is recycled and disposed. The results of this analysis are summarized in Table 2-13.

Table 2-13: Deschutes County Waste Stream for 2016

Waste Composition	% of Total Waste[1]	Total Waste (Disposed + Recycalbes) (tons)	Waste Disposed (tons)	% Disposed	Recycled Materials (tons)[4]
TOTAL PAPER	**26%**	**62,198**	**40,272**	**25%**	**21,926**
Cardboard/Kraft	8%	18,185	5,638	4%	12,547
Clean Mixed Paper/ONP	7%	15,822	6,443	4%	9,379
Mixed Paper	5%	11,276	11,276	7%	
Compostable/Soiled	7%	16,109	16,109	10%	
TOTAL PLASTICS	**6%**	**14,327**	**12,887**	**8%**	**1,440**
		-	-		
ORGANICS	**43%**	**102,654**	**67,657**	**42%**	**34,997**
Yard Debris	14%	33,266	6,443	4%	26,823
Wood	9%	22,330	16,109	10%	6,221
Food	18%	42,701	41,883	26%	818
Other Organics	2%	4,357	3,222	2%	1135
		-	-		
GLASS	**4%**	**9,786**	**3,222**	**2%**	**6,564**
		-	-		
METALS	**8%**	**19,844**	**11,276**	**7%**	**8,568**
Aluminum	1%	2,230	1,611	1%	619
Tin Cans	1%	3,549	3,222	2%	327
Other (scrap metal)	6%	14,065	6,443	4%	7,622
		-	-		
OTHER INORGANICS	**9%**	**21,584**	**19,330**	**12%**	**2,254**
Rock / Concrete / Brick	3%	6,033	4,833	3%	1,200
Gypsum Wallboard	2%	4,833	4,833	3%	
Electronics	1%	2,663	1,611	1%	1052
Misc Organics	5%	11,278	11,276	7%	2
		-	-		
OTHER MATERIALS	**4%**	**10,055**	**6,443**	**4%**	**3,612**
Motor Oil	1%	2,245	322	0.20%	1,923
Other Materials	3%	6,522	4,833	3%	1,689
Other Recyclables	**0%**	**396**	-	**0%**	**396**
TOTAL WASTE	**100%**	**240,844**	**161,087**	**100%**	**79,757**

Although this total waste stream is comparable to results of other jurisdictions, it should be noted that it assumes the total waste disposed at Knott Landfill is largely comprised of MSW. However, the total of 161,000 tons disposed in 2016 does include C/D wastes. C/D data will be further evaluated later in the SWMP.

This 2016 snapshot provides a starting point for discussing opportunities to evaluate various options for managing waste in the future. The options can be in the form of new policies that may impact generators to reduce or recycle more materials as well as considering new technologies to maximize reuse of resources and reduce waste

disposed in landfills. Figure 2-6 graphically depicts the estimated composition of the waste stream that was disposed at Knott Landfill in 2016.

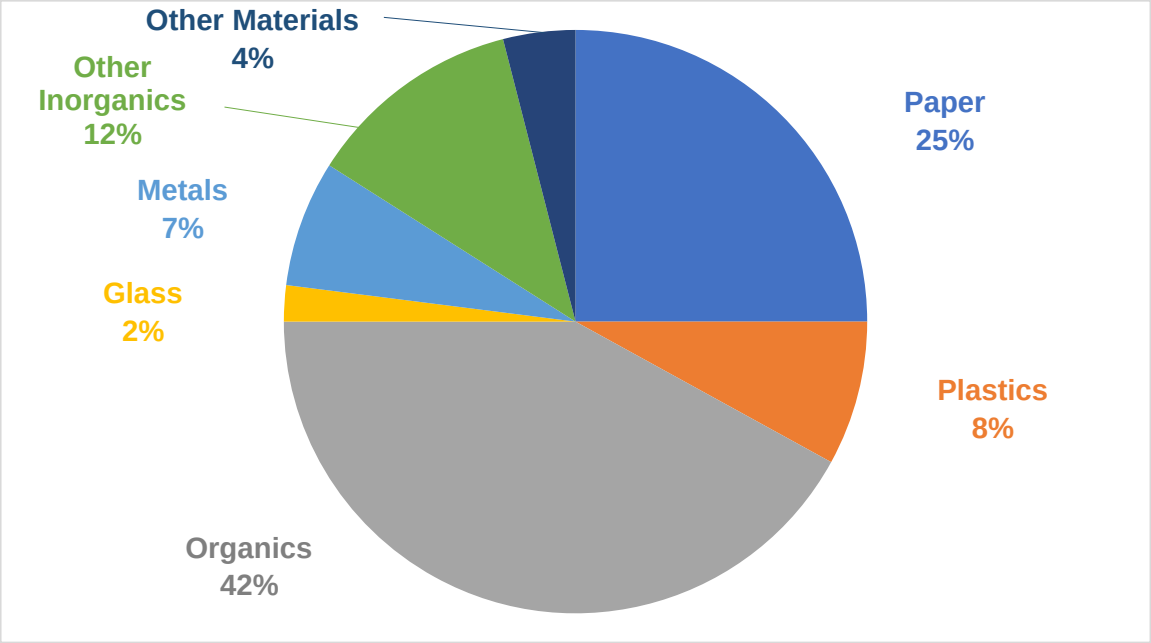


Figure 2-6: Composition of Waste Disposed in Deschutes County

Based on the estimated quantities of materials currently being disposed at Knott Landfill, there appears to be several opportunities to increase the recovery rate. There is still an appreciable amount of recoverable commodities such as paper, plastics and metals that comprises about 40% of what is disposed. Not all of these materials can be recovered and marketed, but there may be options that can be evaluated to recycle more of these materials.

Another observation is that an estimated 42% of waste disposed is comprised of organics, of which almost 60% is food waste. This too may present opportunities to recover more materials for composting and reduce the amount of waste disposed.

This data represents a starting point to examine different alternatives for managing Deschutes County's waste. More detailed information may be needed as these alternatives are vetted.

2.4.3 Waste Stream Generation Forecast

Estimates of future waste generation levels, which are used in solid waste planning, can be calculated by multiplying forecasted population numbers by per capita waste generation. Population forecasts developed by the Population Research Center (PRC)

at Portland State University assume variable annual growth rates for each five-year period at about 1.5%.

U.S. Census figures indicate that the population in Deschutes County increased by 3% annually between 2000 and 2016 estimates. Information obtained from the Growth Management Department at the City of Bend that tracks census data and data from PRC support this conclusion. From 2014 to 2016, PRC projected annual growth rate in the City of Bend to increase an average of 2.18%. The census data demonstrates the City population grew an average of 3.9% over this same period. The result was that PRC showed an increase in population of 3,515 versus 7,106 in the census, more than twice of what was expected in the City, thus suggesting possibly a larger amount of growth is occurring in the County than originally projected. There is no information available to confirm whether this is the case or if the total growth in the County is greater than what PRC is projecting. At this time the best assumption is to rely on the PRC data that is accepted statewide. The projected population is shown on Table 2-14.

Table 2-14: Deschutes County Population Projections

Year	PSU Population Projections[14]	Annual Growth Rate of Period[15]
2015	170,606	---
2020	190,734	2.4%
2025	210,826	2.1%
2030	230,412	1.9%
2035	249,037	1.6%
2040	267,798	1.5%

According to DEQ, Deschutes County's per capita waste generation rate was 2,960 pounds per person in 2017, up from 2,319 pounds per person in 2012, an increase of almost 27% or about 5.4% per year. Much of this increase is a result of a recovering economy after the recession. In the period from 2010 to 2014, the increase averaged about 1.6%, lending some support for not expecting this kind of increase over a long period.

In making projections for future waste generation, the average generation rate over the past five years was used. Recent data shows improved economic conditions where the GNP increased to about 3% suggests the economy catching up to pre-recession levels. This trend is also reflected in the construction industry. However, on a national level the average waste generation rate is projected to decline as a result of the increase in the amount of plastics or lighter materials and a reduction of less heavier materials such as glass and newspaper.

[14] Source: "Coordinated Population Forecast 2015 through 2065, Deschutes County Urban Growth Boundaries & Area Outside UGBs". Population Research Center PSU. June 2015.
[15] Source: Forecasts of Oregon's County Populations and Components of Change, 2010-2050, Office of Economic Analysis, Department of Administrative Services, State of Oregon, March 2013.

The average waste generation rate over the five year period is 2,509 pounds per capita per year. One reason to discount the decrease in lighter weight materials of packaging experienced on a national level is the influence of the tourism industry in Deschutes County. These conditions are somewhat unique to the County and therefore, the waste generation trends are expected to vary from regional conditions.

Table 2-15 shows the projected waste generation quantities for 2015 through 2040, which were calculated by multiplying the per capita generation rate by the projected population estimates from Table 2-14. The per capita rate is shown to decline from the current rate to one that reflects the average generation rate over the past five years. This approach discounts the impacts of the extended recession, which is considered to be an anomaly. Although recessions will occur in the future, the extent of such market changes cannot be accurately predicted.

Table 2-15: Deschutes County Waste Stream Projections

Year	**Population[16]**	**Waste Generation (tons)[17]**	**Per Capita (pounds)[18]**
2015	170,606	227,333	2663
2020	190,734	246,619	2586
2025	210,826	264,481	2509
2030	230,412	289,052	2509
2035	249,037	312,541	2509
2040	267,798	336,086	2509

The projected generation rates were combined with generation rates experienced over the past 10 years in Figure 2-7.

(Intentionally left blank)

[16] Source: US Census Bureau, www.census.gov
[17] Calculated using population estimates from 2010 census and projected waste volumes based on 5-year average from 2012 to 2016.
[18] The Per capita generation rate is projected to decline from high in 2017 to 5 yr. average from 2012 to 2016.

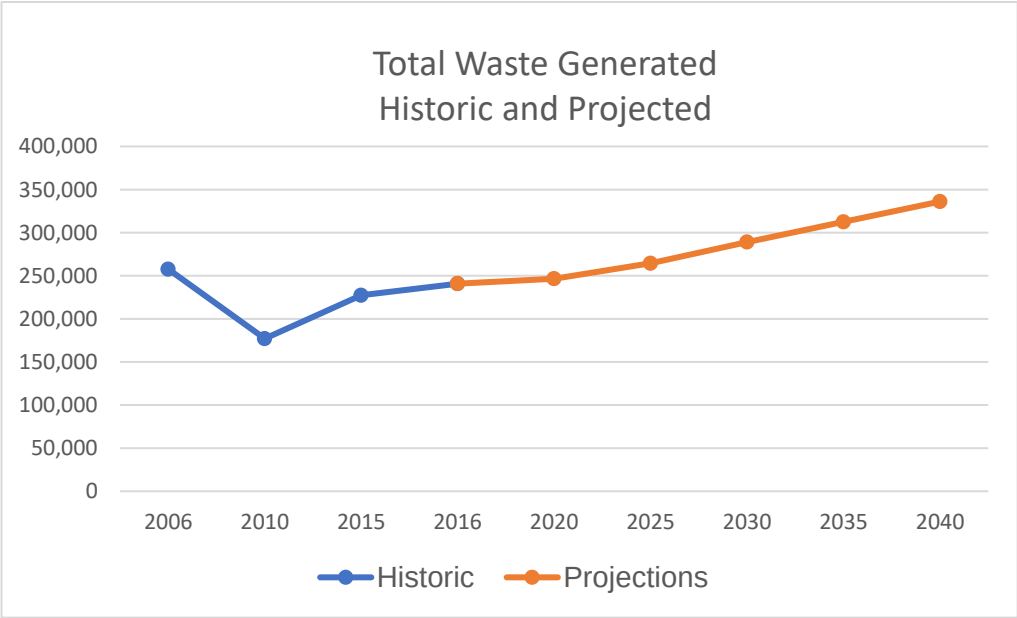


Figure 2-7: Deschutes County Waste Generation Per Capita Rates

The historic generation data represented by the blue line shows the impacts of the 2008 recession on the amount of waste generated between 2006 and 2016. Although the population in the County increased, factors such as slower growth in the housing market, a lower GNP and even lower market prices for recyclable materials contributed to this effect. In the past three years, the amount of waste disposed at Knott Landfill increased by 39%. This is not a trend that is expected to continue, thus the projected generation reflects that the waste stream will grow a rate commensurate with the growth in the population of Deschutes County. In 2016, the County reportedly generated about 240,000 tons of waste and disposed of 161,000 tons at Knott Landfill. By 2040, the amount of waste generated is estimated to grow to 336,000 tons. How much is disposed will be determined by how much can be recycled and/or converted to other resources.

Using the projected waste generation rate, Deschutes County can plan for their solid waste management system to handle future quantities of materials. Although these projections will vary due to conditions outside the control of the County, they serve as a starting point to evaluate alternative strategies for managing waste and for planning the infrastructure to best serve citizens and businesses. Upon adoption of this SWMP it will be important to examine in more detail the quantities and composition of the waste stream and recyclable materials during the implementation phase.

3. WASTE PREVENTION, REDUCTION, REUSE AND RECYCLING ANALYSIS

3.1 Introduction

Over the last three decades, Deschutes County's waste prevention, reduction, reuse, and recycling programs have continued to expand. With a 57% population growth rate since 2000, Deschutes County now exceeds 180,000 residents, with an additional 200,000 visitors on average per month, as noted in Chapter 1. Correspondingly, waste disposed at the transfer stations has increased 40% since 2010, with a 22% overall waste generation increase since 2012.

Of all the material brought to Knott Landfill, 75% is delivered directly to the landfill by franchised haulers and self-haul customers, while 25% comes from the rural transfer stations. With 10 years left in the life of Knott Landfill, now is the time to prevent, reduce and reuse waste while increasing recycling.

Components of the County-wide waste prevention and recycling program are discussed in the following sections. After a description of existing programs, further program needs and opportunities in Deschutes County are evaluated. Alternative approaches to address needs in three categories are then investigated:

- Improvements to current educational and support services
- Targeting specific waste streams and generators
- Enhanced recovery of new materials

Within each category, specific areas are identified that can be targeted for greater waste prevention, reduction, reuse and recycling.

3.2 Background

DSW's mission is to provide the customers of Deschutes County with an environmentally responsible and cost-effective system for reduction and disposal of solid waste, through quality services, education, and public involvement. With that mission at its core, the County has implemented a multifaceted, comprehensive reuse and waste reduction program in cooperation with environmental organizations, schools, residents and businesses, franchised haulers and private recyclers.

Through SB 263, the State's regulations for waste reduction and recycling, which are codified in ORS 459A, were amended. This amendment to the original "Opportunity to Recycle Act" enacted new recovery rates for all counties and wastesheds. For Deschutes County, the recovery rate goal was set at 45%. The State also removed the recycling rate credits awarded to local jurisdictions; therefore, Deschutes County will need to consider approaches to catalyze the increase of the recovery rate from 33% to 45% by 2025.

A primary component of Deschutes County's SWMP objective is to protect the environment by emphasizing waste reduction. The County will measure their

progression toward this and their targeted recovery goal by establishing educational and promotional programs and facility assessments on an annual basis.

Since the inception of the Deschutes County recycling program in the early 1990s, the amount of waste generated on a per capita basis has fluctuated, with more recent year-to-year increases following the 2008 economic recession. Additionally, between 1992 and 2009, Deschutes County invested more than $1.8 million to expand its waste prevention and recycling educational program to try to keep pace. As mentioned in Chapter 2, this accounts for roughly 2.5% of the DSW annual budget.

Figure 3-1 displays per capita generation and recovery in Deschutes County between 2006 and 2016 based on data derived from the DEQ 2016 Material Recovery and Waste Generation Rates Report. Similarly, sourced from the same report, Figure 3-2 displays the recovery rate in the County during that time. Figure 3-3 depicts the annual rate of change in waste generation in the County.

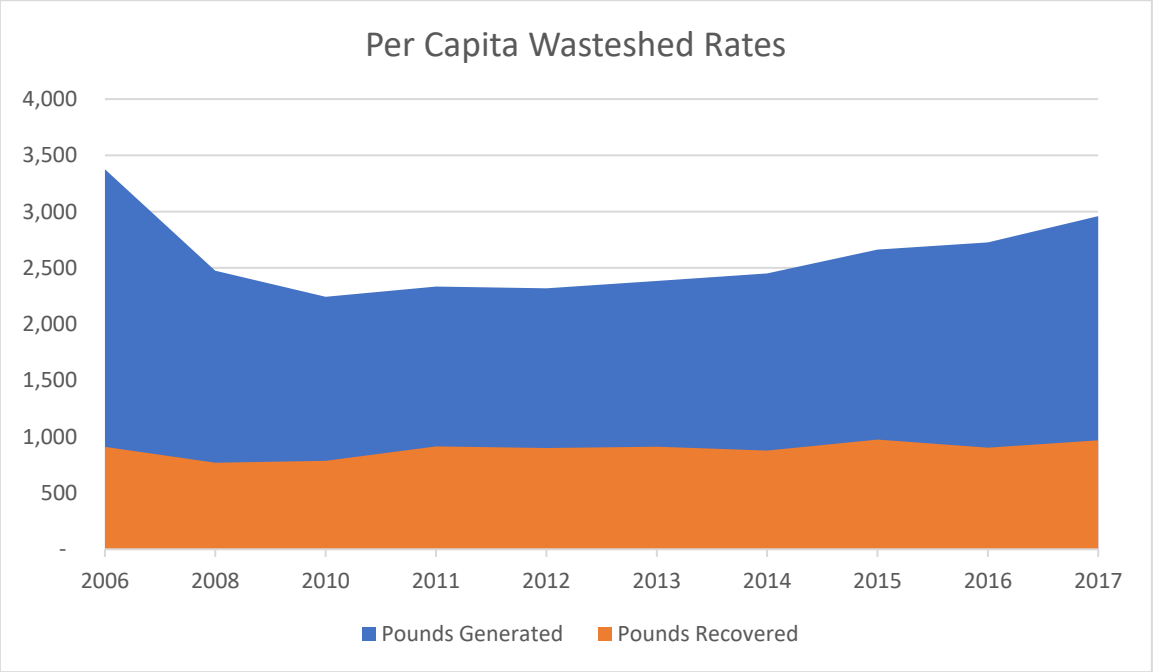


Figure 3-1: Deschutes County Per Capita Waste Generation and Recovery

Figure 3-1 indicates that per capita waste generation in the County peaked in 2006 at 3,376 pounds and declined through 2012 before rebounding, consistently increasing to 2,960 pounds in 2017. Considering that no substantive policy measure was enacted during this time coupled with the growing use of computer and mobile technologies to access information that would have significantly reduced per capita waste generation rates, it is likely that the observed decline is a result of the economic recession between 2008 and 2010. Likewise, the increase in per capita generation reflects a growing economy as well as a thriving tourism sector in Deschutes County. The latter point is critical to note as the rise in tourism may significantly exceed the rate of population growth in the County, and waste generated by tourists is counted in the waste stream in County-wide figures.

Figure 3-2 illustrates the County's recovery rate (equal to the per capita recovery rate) from 2006 through 2016. It is difficult to ascertain a meaningful relationship between the generation and recovery rate, but it is notable that in 2006 when the County's generation peaked, it was also paired with the lowest rate of recovery rate (27%). During this time, the County's recovery rate in relative terms peaked at 39% in 2011 and 2012; however, 2015 saw the greatest amount of recovery in absolute terms with 975 pounds per capita being recovered versus 914 pounds per capital being recovered in 2011. However, the recovery rate in 2017, as reported by DEQ, was 32.7%, which is slightly less than 33% reported in 2016.

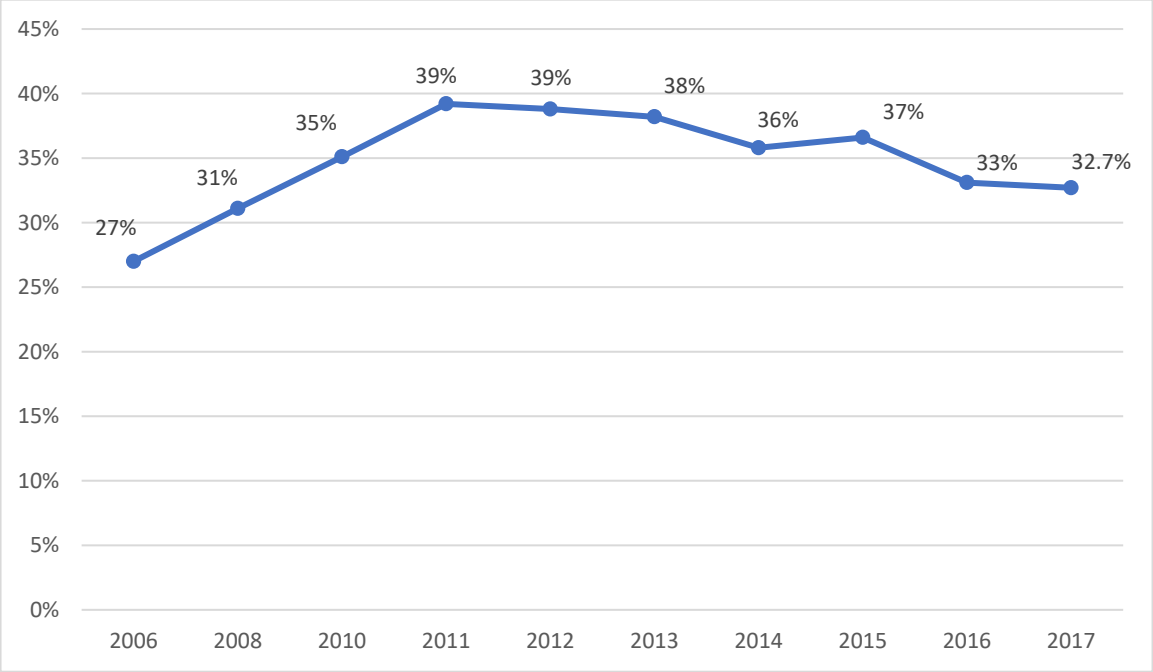


Figure 3-2: Recovery Rate in Deschutes County

Figure 3-3 displays the change in year-to-year waste generation in Deschutes County on a percentage basis relative to the previous year. Beginning in 2008 and comparing 2008 to 2006, a 20% decline in waste generation is observed over a one-year period. This is immediately followed by another significant drop in 2010 when generation in the County fell to 2,243 pounds per capita, compared to 2,475 pounds in 2008. Since then, there have been no year-to-year declines in waste generation. Between 2011 and 2012, generation was essentially equal. Since then, the County has seen an increase in waste generation on an annual basis, as reflected in Figure 3-3. As shown the marginal rate of growth in the generation rate increased over 12% in 2017. This growth rate is a result of the increase the total amount of waste disposed resulting from a much improved economy and new construction in the County.

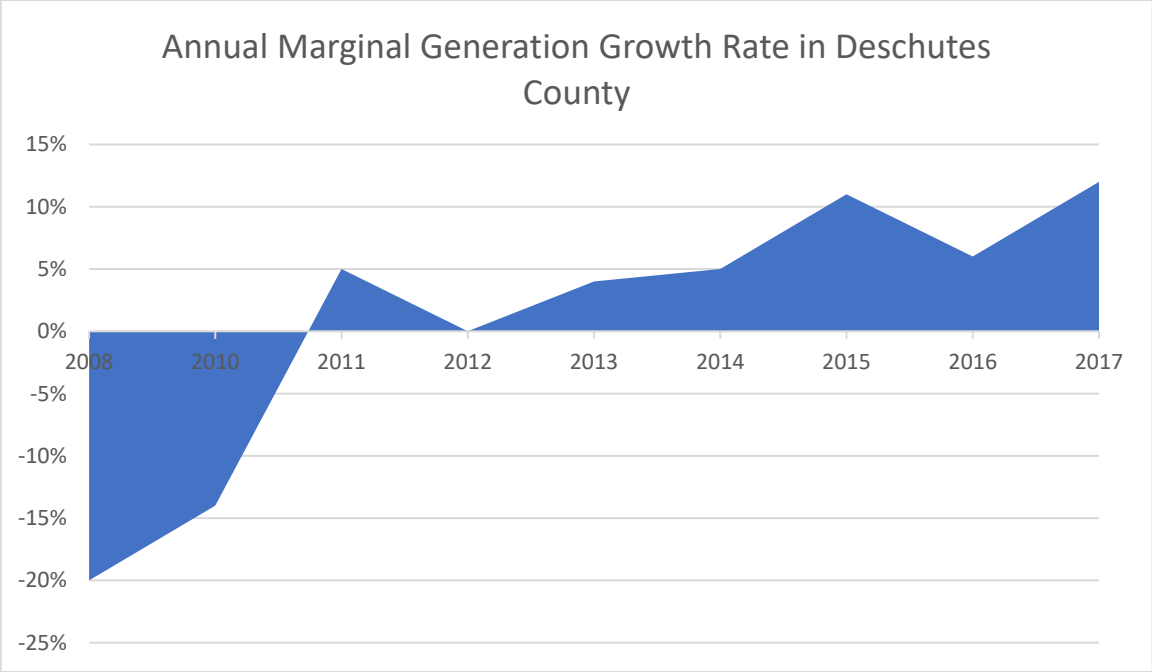


Figure 3-3: Annual Marginal Rate of Generation in Deschutes County since 2008

Figure 3-4 shows the County's recovery of recyclable materials between 2014 and 2017. The totals in this table combine the annual materials reported to the County by the franchised haulers providing curbside collection, commercial generators, recycling depots and transfer stations.

(Intentionally left blank)

Table 3-1 Collection of Recyclables in Deschutes County (2014-2016) [19]

Recyclables	2014 (tons)	2015 (tons)	2016 (tons)	2017 (tons)
Aluminum	649	567	627	800
Animal Waste/Grease	564	443	503	198
Antifreeze	142	159	152	165
Cardboard/Kraft	14,578	13,228	13,337	15,022
Composite Plastic	3	3	3	4
Electronics	1,014	1,140	1,064	951
Fluorescent Lamps	2	1	3	10
Food Waste	644	790	819	720
Glass Containers	5,470	6,618	6,681	7,119
Gypsum Wallboard	1	1	1	2
HHW	155	227	264	229
Lead Acid Batteries	766	923	1,087	1,178
Mixed Batteries	1	1	1	2
Paint	197	280	180	191
Paper Fiber	8,063	10,165	9,380	9,498
Plastic Film	247	196	231	228
Plastic Other	377	130	172	110
Rigid Plastic Containers	686	943	1,040	1,166
Roofing/Asphalt	2	2.5	2	4
Scrap Metal	13,140	12,113	7,722	13,261
Solvents	3	2	2	2
Textiles	1	1	-	-
Tin Cans	110	317	327	326
Tires	498	1,040	633	370
Used Motor Oil	1,400	1,455	2,484	2,422
Wood Waste	3,855	7,037	6,221	6,189
Yard Debris	20,396	25,487	26,823	28,393
Total	**72,964**	**83,270**	**79,759**	**88,562**

Materials directly recycled by waste generators (i.e. not collected by waste haulers and/or not taken to County transfer stations) that may not be reported to the County but are reported directly to the DEQ are included in Table 3-1 as well. It should be noted that the estimated tonnage of collected recyclables in 2016 is slightly different than the DEQ report (by 2.0 tons), which is attributable to rounding.

[19] *Source: Oregon DEQ Material Recovery and Waste Generation Summary, Deschutes County (2016)*

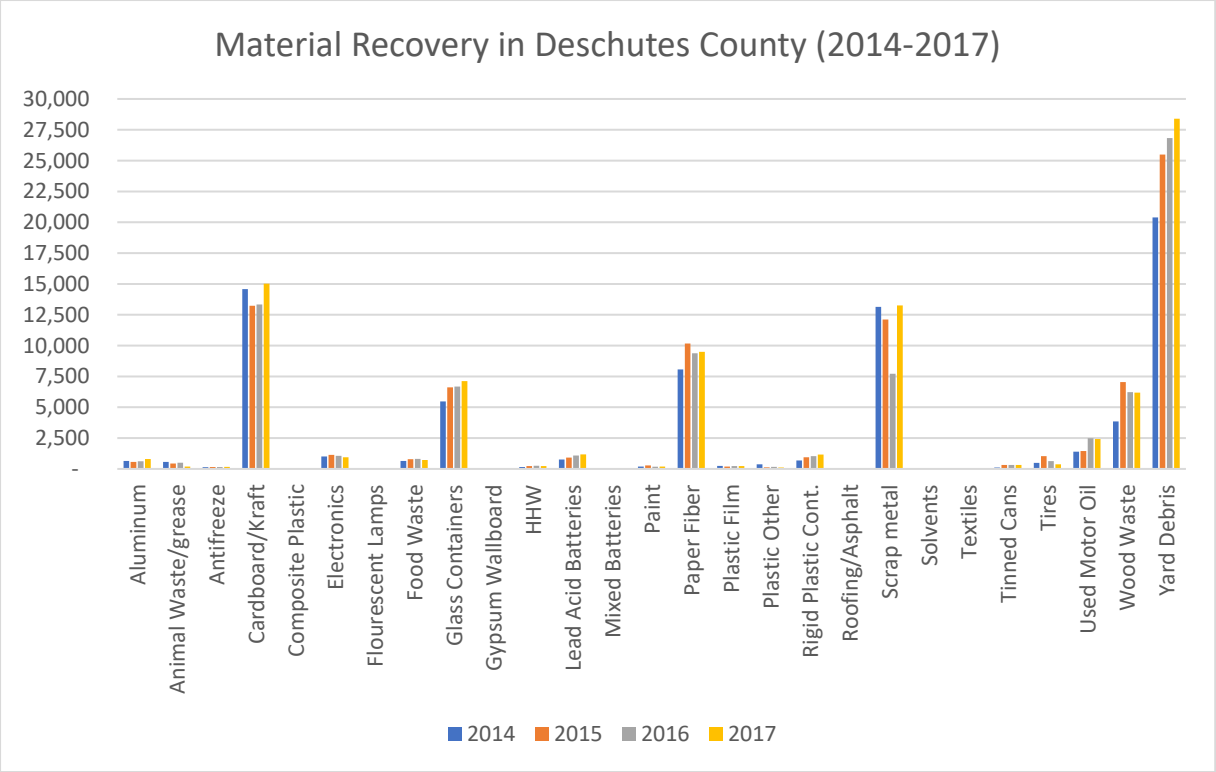


Figure 3-4: Material Recovery in Deschutes County from 2014 to 2016 (tons)

Based on Table 3-1 and Figure 3-4, it appears that, with a few exceptions, the general recovery rate of materials overall has remained consistent between 2015 and 2017. Noteworthy increases are observed in the amount of organic waste recovered as yard waste (32%), wood waste (61%), and food waste (27%) since 2014. The increasing prevalence of wood waste may be attributable to more construction and development in Deschutes County. Also, the increase in the total amount recycled between 2016 and 2017 is largely due to an increase in amount of scrap metal.

Additionally, the recovery of household hazardous waste (HHW) displayed remarkable growth from 155 tons in 2014 to 264 tons in 2016, an increase of 70%. In contrast, the recovery rate of old corrugated cardboard (OCC) declined 10% during this time. With OCC increases in the waste stream overall given the popularity of online shopping, the tons have moved to the commingled residential stream and may be harder to track separately. Similarly concerning is a reduction in the recovery of scrap metal, down 41% from 2014 levels. Local haulers explain this change in metal being price driven. There could also be an impact from local scavenging activity, especially observed at Negus and Southwest Transfer Stations.

3.3 Existing Waste Reduction and Reuse Programs

Oregon has established waste recovery goals for jurisdictions throughout the State. Waste generation quantifies the total amount of material generated, whether the used item was eventually discarded or recycled. While diverting materials to recycling

markets is important, reducing the overall generation of all materials will ultimately lessen the burden on natural resources, manufacturing, distribution, retail, collection, recycling and disposal infrastructures.

To address waste reduction and prevention, the Oregon State Legislature enacted ORS 459A, most recently amended in 2015, which established several statewide waste generation goals. Specifically, section 459A.007-010 outlines the elements through which programs should achieve these goals, as follows:

- 459A.007 – Describes fee structures as a mechanism to reduce waste generation by lowering collection rates for customers who use smaller or lower volume waste bins
- 459A.008 – Describes the requisite educational and promotion programs that should be enacted to encourage more sustainable behavior regarding the generation and disposal of waste
- 459A.010 – Outlines the State's waste management policies, and establishes goals and recovery rates for various generators and material streams

statewide, the primary waste reduction and recovery goals set forth in 459A.010 include:

- Food waste recovery rate: 25% by 2020
- Plastic waste recovery rate: 25% by 2020
- Carpet waste recovery rate: 25% by 2025
- General solid waste recovery rate: 55% by 2025
- Total solid waste generation between 2025-2049 should be 15% lower than it was in 2012
- Beyond 2050, total solid waste generation shall be 40% lower than it was in 2012
- Deschutes County should maintain a 45% recovery rate by 2025 and beyond

Also, in 2015, the Legislature passed SB 263 to further catalyze the effort of local municipalities in achieving the State's 2050 Vision. With respect to waste reduction and reuse programming, some of the objectives of SB 263 include:

- Increasing the number of recycling program elements available to local governments
- Expanding the education and promotion element to include contamination reduction
- Allowing local governments using a DEQ-approved alternative program to meet the recovery levels and goals of comparable communities

These goals attempt to stop both the growth in per capita solid waste generation and the growth in total solid waste generation by the County as a whole. Therefore, the County will need to continue providing waste reduction and education programs to affect the generation rate within its borders.

3.3.1 Existing Waste Reduction Programs

Reduction of solid waste generated by residents and commercial establishments is a priority for the Deschutes County's solid waste management program. Overall, DSW estimates that it has spent approximately $1.8 million on recycling education and promotional efforts from 1992 to 2009 and in 2017 alone, the County budgeted $110,000 towards these efforts. A focus on increased education programming is reflected in the objectives adopted in this SWMP.

The Deschutes County SWMP objectives pertaining to waste prevention, reduction, reuse and recycling are as follows:

1. ***To provide an integrated solid waste management system*** that addresses an effective combination of strategies and programs guided by the hierarchy adopted by the State to first, reduce waste at the source; second, to reuse and recycle materials; third, to compost; fourth, to recover energy; and last, to dispose of waste in landfills.

2. ***To continue educating consumers to promote practices and methods to reduce the long-term per capita waste generation rate*** and seek, through community outreach, a cooperative approach to assume individual responsibility to reduce waste.

3. To develop programs and support implementation of system improvements that seek to ensure materials recovered from the waste stream ***attain the highest and best use and are recycled***.

4. To develop a solid waste system that is based on ***sound financial principles, provides cost effective services and maintains rate stability over a long term***, while allocating costs equitably to all users.

5. ***To maintain system flexibility to respond to changes*** in waste stream composition, waste management technologies, public preferences, new laws and changing circumstances.

Current Waste Reduction and Recycling Programs and Services

The newly adopted Oregon State law impacts the promotion and education programs that are currently provided.

Table 3-2 details the Waste Reduction, Reuse and Recycling (WR/R) programming elements featured in ORS 459A.007(1) and their present status within Deschutes County. According to ORS 459A.007(4) subsection (e), as a municipality "with a population of more than 10,000… located more than 150 miles from the City of Portland," Deschutes County is obligated to implement either Elements A, B, and C and any additional element, or at least five elements.

Table 3-2 Required Elements for WR/R Programs and Status of County Programs

Element A: Provide curbside recycling container	**Status:** Cities and urbanized portions of the County are meeting this requirement because the haulers provide residents curbside commingled recycling and glass separate, but these services are not offered in rural areas.
Element B: Provide weekly curbside recycling	**Status:** Recycling services in all cities and the urbanized portions of the County are offered every other week. This element is not satisfied.
Element C: Expanded recycling education and promotion program which includes a contamination reduction education plan.	**Status:** The Environmental Center together with local collection companies has implemented and expanded programing to promote reduction and recycling. All collection companies submitted plans to DEQ as to how they are reducing contamination.
Element D: Provide multi-family recycling to apartment complexes that request it.	**Status:** Haulers provide recycling services to those that request it; participation is not mandatory.
Element E: Curbside yard debris collection is available to residential collection service customers at least once a month, and depots that accept yard waste are conveniently located	**Status:** Yard waste is offered on subscription-only basis in Bend and Redmond only and all but one recycling depot (Alfalfa) accept yard waste. In Bend and Redmond where yard debris service is available, it is offered on a subscription-only basis. All customers in Sisters have yard debris service.
Element F: Recycling is available to businesses and schools.	**Status:** All cities meet this requirement since haulers offer this service.
Element G: There is a recycling depot available for every 25,000 residents.	**Status:** With 181,000 residents and eight recycling drop off centers located throughout the County for average of about 1 per 22,600 people. These are operated either by the County or other parties.
Element H: Weight based collection rates that encourage reduction, reuse, and recycling	**Status:** No cities use weight-based rates. However, the current volume-based rates provide incentives for customers to use smaller containers to reduce waste disposal.
Element I: Food composting/anaerobic digestion is available for businesses.	**Status:** Composting is available for commercially generated food waste. No anaerobic digestion is taking place.
NEW Element J: Cities (and county for the UGB) require businesses that generate four or more cubic yards/week of garbage to have a recycling program in place.	**Status:** No cities require businesses to recycle.

NEW Element K: Curbside food composting/anaerobic digestion is available for residents.	**Status:** All cities above 4,000 have residential curbside food collection available. There is no food waste collected in the unincorporated County. Food waste is then composted. No anaerobic digestion is taking place.
NEW Element L: Cities require recycling program for construction/demolition (C/D) (6 cy for self-haul, 10 cy for collection service)	**Status:** Source separated C/D waste is recycled to the extent it is possible, however a significant amount is brought directly to landfill.
NEW Element M: Cities require food waste program for large generators (50 tons/yr).	**Status:** No cities require large generators to divert food.

A review of Deschutes County's programs suggests that the County is compliant with the direction of ORS 459A.007. In fact, the County satisfies several elements beyond what they are required. Some of the program elements that the County does not satisfy at the moment, which are intended to increase wasteshed recovery rates are further evaluated later in this chapter. Nonetheless, in keeping with the objectives of ORS 459A.007, the County, cities and franchised haulers have implemented several waste reduction initiatives described below.

Fee Structures

As described in ORS 459A.007, well-designed fee structures administered for curbside collection services are a critical component of reducing waste generation. Commonly referred to by resource economists as "unit-pricing," the notion of charging generators based on their disposal quantities is widely viewed as an optimal strategy for encouraging reduction efforts. To that end, a jurisdiction establishes a standard fee for the collection of containers sized 21 gallons or less. While residents are permitted to request larger or more containers, a jurisdiction is prohibited from offering lower fees or an adjusted price per unit that benefits larger generators.

Additionally, to internalize the economic and environmental costs incurred in "providing the opportunity to recycle," municipalities are encouraged to include associated "net costs." According to the ORS, this includes costs including but not limited to "collecting, handling, processing, storing, transporting, and delivering to market recyclable material and for providing any required education and promotion or data collection services adjusted by a factor to account for proceeds from the sale of recyclable material."

In Deschutes County, service charges by the waste haulers are regulated by the cities and the County with maximum rate schedules. As presented in rate schedules effective August 1, 2017, in Exhibits A through D, the County sets maximum solid waste rates for the following:

- Unincorporated Rural (Cascade Disposal, Bend Garbage and Recycling, and High Country Disposal)

- Unincorporated Distant Rural (Cascade Disposal, Bend Garbage and Recycling, High Country Disposal, and Wilderness Garbage and Recycling)
- Rates for container rental and transfer services provided by Deschutes Transfer Company to DSW

The County maximum rates are set based on a volume of solid waste basis. For a 35-gallon can, maximum rates range from $17.75 to $18.40 per month. Bulky services are an additional charge paid by the customer. Backyard or non-curb/roadside rates are also set. The solid waste rate sizes include 20, 35, 65, and 95-gallon cans.

For refuse collection in the cities, a list of maximum service charges allowed for the different levels of service is contained in Appendix A. These rates include providing recycling carts and collection service. Recycling collection services are provided every other week using a 95-gallon cart provided by the franchised hauler for the cities of Bend, Redmond, La Pine and Sisters.

Yard waste service in a 95-gallon cart is subscription only in the cities of Bend and Redmond. Residents can add vegetative food waste to the yard service. Bend Garbage and Recycling notes that for city customers, yard debris curbside recycling is a yearly subscription service for $4.90 per month. Acceptable yard debris includes: grass clippings, brush, weeds, pine needles, plant prunings, branches no larger than 2" in diameter and 36" in length. Raw fruit and vegetable scraps are also acceptable such as apple cores, banana peels, potato skins, zucchini, pumpkins, coffee grounds and filters, tea bags, etc.[20]

Franchised haulers bill customers directly and pay the DSW 3% franchise fee, all disposal fees at Knott Landfill, as well as a 5% franchised fee to the City of Bend[21] and the City of Redmond.

Promotion, Advertising, Education, Information, and Customer Service Programs (Including Reuse and Recycling Education)

Enlisting residents, commercial businesses and institutions in waste recovery efforts is key to program participation and success. As such, providing businesses and citizens with the information necessary to appreciate and properly use the recycling services available to them is critical. Through partnerships with local environmental groups, citizen volunteers, schools, and companies involved in solid waste management, the County has developed a solid waste education outreach, promotion, and advertising program for recycling, composting and other waste reduction and reuse efforts.

In following the guidelines of ORS 459A, the County has implemented education and promotion efforts that emphasize the environmental benefits of reducing waste generation along with useful guidelines to achieve these goals. Specifically, brochures and promotional materials issued by the County and the franchised haulers at least

[20] Commercial collection of food waste is being offered to interested customers, discussed in more detail below.

[21] http://www.codepublishing.com/OR/Bend/html/Bend11/Bend1116.html

once per year outline which materials are collected, how to prepare them for collection and why separation is necessary. Customers are also notified of contamination in their collection cans, as collection companies will place a tag on carts noting the contamination. If unaddressed, customer service representatives from collection companies will call customers to inform them as well.

Education and promotion efforts generally comply with ORS guidance as they target community and media events, highlight prevalent contaminants in the waste stream, and highlight energy-intensive and toxic materials as well as providing guidelines to reduce wasteful consumption habits. The existing County programs are multi-faceted and provide information to residents, teachers and students, businesses and institutions, and community groups. In addition, the County offers funding, technical assistance, and special events to collect materials that present difficulties when it comes to disposal.

To align with future programming, the primary contaminants found in Deschutes County commingled materials are film and plastic bags and other rigid plastics that are not included in the County's recycling program. Local haulers also note that household garbage is a common contaminant in the recycling stream. The DEQ Contamination Education Reduction Plan further highlights the following materials as focus areas: hypodermic needles, ropes, wires and chains, and clothing [22].

Discussed next are various programs and services that have been instituted in Deschutes County for waste reduction and recycling:

- **Key Educational Programs**

The Environmental Center and Rethink Waste Project

The Environmental Center is a grassroots environmental sustainability organization focused on Central Oregon and has taken the lead in promoting educational programs and technical support to schools in Deschutes County. Together with DSW and local waste and recycling service providers, The Environmental Center launched the "Rethink Waste Project" in 2011. This was initially circulated as a print guide to offer Deschutes County residents information about the needs and ways they could more sustainably manage their waste. A corresponding website, www.rethinkwasteproject.org was assembled as well, and in 2015 the site was updated with the assistance of a local design company to improve marketing efforts.

The informational website, sponsored by The Environmental Center, provides students and teachers with comprehensive waste prevention and recycling information. The site informs generators of ways to reduce, reuse, recycle and compost, as well as the benefits, and promotes the use of recycling services while also reducing contamination in collected recyclables. It is a key reference for local collection companies and environmental groups as an outlet for keen and digestible information about the importance of reducing and properly managing waste.

[22] http://www.oregon.gov/deq/mm/Pages/Contamination-Reduction.aspx

EarthSmart

The Environmental Center also hosts the "EarthSmart" youth education program, offering information for grades K-12 on waste-related topics. The objective of this program is to educate young students about the environmental implications of their behavior, encouraging them to reduce their footprint whenever possible. In the 2016-17 academic year, The Environmental Center gave 172 presentations in schools and community centers, reaching an audience of 5,029 students. Twenty-one classes and eight schools took part in the EarthSmart program that included six lessons and a field trip to the Knott Landfill. More than 450 students toured Knott Landfill as a result. In addition, funding from this program also enabled schools to have a guest speaker educate students about important and various ways they can reuse plastic bags.

Students are also invited to take additional responsibilities as Sustainability Advisors in the EarthSmart program. Sustainability Advisors are encouraged to advocate for environmental reforms such as energy efficiency and recycling and are given promotional materials to distribute to peers. Additionally, Sustainability Advisors review programming with teachers and schools and take note of progress.

Oregon Green Schools

Oregon Green Schools, a nonprofit organization formed in 1997, is another education-oriented initiative that promotes environmentally sustainable behavior in schools across the State by offering varying degrees of certification. A key component of the Green Schools program is waste reduction and recycling. Schools in Deschutes County that want to become a certified Green School can work with The Environmental Center's educational program to achieve certification. Bend Garbage and Recycling also provides a scholarship to a local teacher yearly to participate in this program.

- **Key Promotional Programs**

The general objective of promotional programming is to inform County residents and businesses on how and why to properly reduce, reuse, recycle and compost materials. The County provides several documents that outline these concepts. These promotional materials describe the general function of DSW, and key information about recycling, composting, hazardous waste, disposal, and fee information. All of these brochures are available on the County website www.deschutes.org/solidwaste and are distributed to residents and businesses multiple times throughout the calendar year.

The Environmental Center and EarthSmart

To expand its reach, The Environmental Center promotes the EarthSmart program by distributing information at gatherings for teachers, and through the school districts' email systems. Print ads in local media outlets are another avenue The Environmental Center uses to promote their campaign. Additionally, the Center's newsletters and programming all direct their audience to the Rethink Waste website. There is also a Facebook page and a Twitter account that disseminates updates to followers. The Environmental Center documents and analyzes their following and the 'likes' they receive to monitor traction.

Franchised Haulers

As one of the largest franchised haulers, Bend Garbage and Recycling sends out quarterly newsletters to customers, as featured in Figure 3-5. Apart from highlighting noteworthy community developments they are associated with, Bend Garbage and Recycling markets special events such as half-priced yard waste disposal for residents at Deschutes Recycling. Also featured is advice about how to properly add compost for mulching or topdressing to prepare gardens and lawns for the winter season. Other recommendations present useful advice on reducing paper waste including providing information about opting out of mass-marketing materials that are paper-intensive such as marketing catalogs and phone books. DEQ's Waste Food campaign materials will be featured in upcoming issues.


BEND Garbage & Recycling

Curbside News

Newsletter for Bend Garbage & Recycling www.bendgarbage.com Fall 2017

Congratulations to our 2017 Scholarship Recipients

Tim Trelogger

Kiana Graham

Sallie Clark

Tabitha Bryant

25% off BioFine & SoilBuilder Compost Oct. 1-31

Topdressing Your Lawn & Mulching Your Plants

Fall Tips - Topdress your yard and mulch your plants with compost from Deschutes Recycling. Compost is an essential ingredient to winterizing your lawn and garden.

Half Price Yard Debris Recycling at Deschutes Recycling

City Yard Debris Service

Important Holiday Collection Schedule

Bend Garbage & Recycling collects every holiday except Christmas Day and New Year's Day. This year all of our customers will be affected by our holiday collection schedule.

Pay Your Bill Online and Sign up to Go Paperless

Figure 3-5: Front Page of Bend Garbage and Recycling's Quarterly Newsletter

Independent Recyclers

The Broomsman is an independent company operating in Deschutes County to provide hands-on event recycling and compost containers and outreach, as well as business recycling assistance. Starting first with weddings and other events, clients have grown to include the Les Schwab Amphitheater and the Cascade Lakes Relay. They provide hands-on support to increase recycling and composting at these public venues and

events. Clients also include businesses and local breweries who are looking to implement sustainable waste practices on-site.

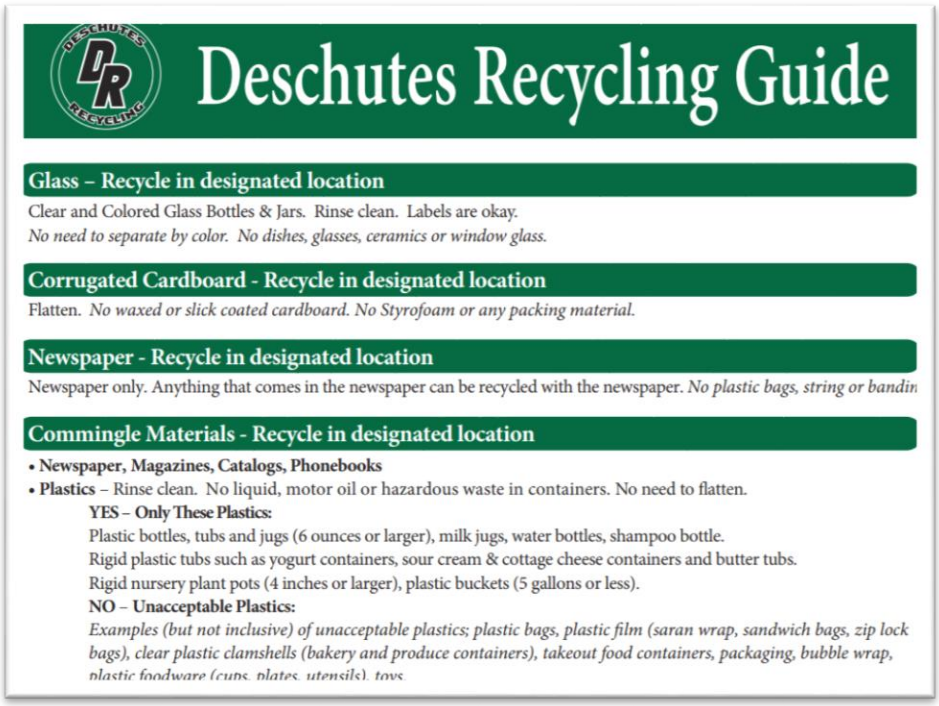
Other independent recyclers also operate within Deschutes County. However, no data is directly collected by DSW regarding their operations. Recycling from independent sources is gathered directly by DEQ and allocated to the Deschutes County recycling figures presented previously in Table 3-1.

Recycling Brochures

In line with ORS 459A.008 which outlines educational and promotional programming, DSW's recycling brochure specifies the materials collected, facility hours and collection schedules, how to prepare recyclables for collection so as to reduce contamination, and why source-separating materials is necessary. The brochure explains which recyclable materials can be commingled and that they are free to recycle. Other recyclable materials that can be collected for free but must be separated from commingled materials include auto batteries, OCC, electronics, glass, and HHW.

Each franchised collection company in Deschutes County also offers promotional materials and programming to keep their customers aware of scheduling, how to prepare recyclables for collection, and to encourage participation. Figure 3-6 is taken from a section in the Deschutes Recycling brochure that highlights which items cannot be commingled. Figure 3-7 is an example taken from Bend Garbage and Recycling's collection brochure that outlines how residents can prepare recyclables for pickup and reducing contamination. Figure 3-8 displays the recycling schedule that is distributed between two and four times per year to customers.

(Intentionally Left Blank)



Deschutes Recycling Guide

Glass – Recycle in designated location

Clear and Colored Glass Bottles & Jars. Rinse clean. Labels are okay.
No need to separate by color. No dishes, glasses, ceramics or window glass.

Corrugated Cardboard - Recycle in designated location

Flatten. *No waxed or slick coated cardboard. No Styrofoam or any packing material.*

Newspaper - Recycle in designated location

Newspaper only. Anything that comes in the newspaper can be recycled with the newspaper. *No plastic bags, string or bandin*

Commingle Materials - Recycle in designated location

- **Newspaper, Magazines, Catalogs, Phonebooks**
- **Plastics** – Rinse clean. No liquid, motor oil or hazardous waste in containers. No need to flatten.

YES – Only These Plastics:
Plastic bottles, tubs and jugs (6 ounces or larger), milk jugs, water bottles, shampoo bottle.
Rigid plastic tubs such as yogurt containers, sour cream & cottage cheese containers and butter tubs.
Rigid nursery plant pots (4 inches or larger), plastic buckets (5 gallons or less).
NO – Unacceptable Plastics:
Examples (but not inclusive) of unacceptable plastics; plastic bags, plastic film (saran wrap, sandwich bags, zip lock bags), clear plastic clamshells (bakery and produce containers), takeout food containers, packaging, bubble wrap, plastic foodware (cups, plates, utensils), toys

Figure 3-6: Deschutes Recycling Brochure

Recycling Preparation Guide

Help Keep These Out of the Commingle Roll Cart

Io -
Plastic Bags
Saran Wrap
Garbage
Styrofoam
Frozen Food Packaging
Pet Food Bags
Plastic Clamshells
Bakery Containers
Foil Wrapping Paper

No -
- Paper/Plastic Plates
- Paper Napkins
- Paper/Plastic Cups
- Waxed Cardboard
- Plastic Lids & Caps
- Liquid in Container
- Glass Bottles & Jars
- Lightbulbs
- Batteries

No Plastic Bags

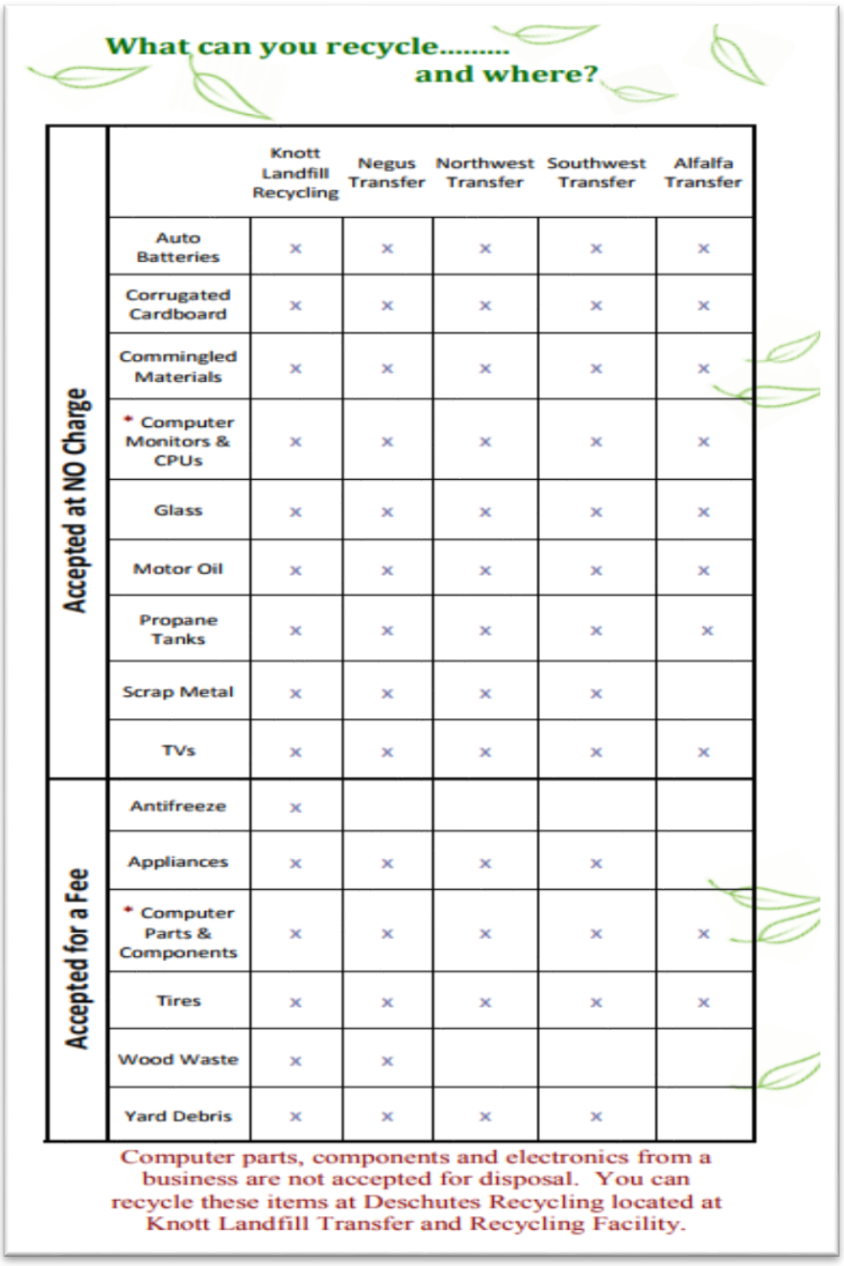
Figure 3-7: Bend Garbage and Recycling's Preparation Guide

Figure 3-8: Bend Garbage and Recycling's Collection Schedule

Recyclable materials that must be separated and can be recycled for a fee are listed as tires, wood waste, yard waste, certain kitchen appliances and electronics. There is also information about non-recyclable materials, such as polystyrene. The brochure encourages residents and businesses to avoid buying these non-recyclable materials, as well as provides keen insights into reusing consumable goods. Distinct information about each material, respective fees and at which facility they are accepted is also presented in the brochure. An inset from the brochure showing what materials are accepted at each facility can be found in Figure 3-9.

The locations and operating hours of the various drop-off depots throughout the County, each of which are open during some weekend days (per ORS 459.007.a.) are also listed. Lastly, the brochure provides information about the DSW's office location and hours and features a link to The Environmental Center's website and phone number for more educational information about recycling opportunities.

(Intentionally Left Blank)



What can you recycle.....
and where?

		Knott Landfill Recycling	Negus Transfer	Northwest Transfer	Southwest Transfer	Alfalfa Transfer
Accepted at NO Charge	Auto Batteries	x	x	x	x	x
	Corrugated Cardboard	x	x	x	x	x
	Commingled Materials	x	x	x	x	x
	* Computer Monitors & CPUs	x	x	x	x	x
	Glass	x	x	x	x	x
	Motor Oil	x	x	x	x	x
	Propane Tanks	x	x	x	x	x
	Scrap Metal	x	x	x	x	
	TVs	x	x	x	x	x
Accepted for a Fee	Antifreeze	x				
	Appliances	x	x	x	x	
	* Computer Parts & Components	x	x	x	x	x
	Tires	x	x	x	x	x
	Wood Waste	x	x			
	Yard Debris	x	x	x	x	

Computer parts, components and electronics from a business are not accepted for disposal. You can recycle these items at Deschutes Recycling located at Knott Landfill Transfer and Recycling Facility.

Figure 3-9: Inset from Deschutes County Recycling Brochure

HHW Brochure

The HHW brochure includes information about residential and commercial HHW management in Deschutes County. The brochure includes details on the following HHW management topics:

- Information on the County's HHW facility including location, schedule, HHW accepted and wastes that are not accepted. Information on business hazardous waste management services offered by the County's HHW contractor is also included in the brochure.

- Information regarding HHW that can be accepted at the County's transfer stations and the recycling center at Knott Landfill. These wastes include paints and stains, motor oil, rechargeable batteries, and automotive batteries.

- Information on the State of Oregon's PaintCare program, including details on paint acceptance at the HHW facility and recycling center at Knott Landfill. The brochure offers tips and suggestions for being efficient in managing painting projects to avoid excess paint consumption, and advice about safely storing paint products so that they may be re-used.

- Information on residential "sharps" management (described as needles and lancets). The brochure lists the County facilities that accept sharps and details the packaging requirements for the acceptance of sharps. For medical waste generated by businesses, the brochure makes clear that none of this can be accepted at any of the County's disposal facilities. The phone number for Bend Garbage and Recycling's commercial medical waste management service is provided for further information.

- Additional details encourage residents to take caution in how they manage HHW materials in their own homes, encouraging residents to shop for safe alternatives, follow information on labels carefully, properly store and re-use leftover products, offer them to neighbors or donate them to charitable institutions. Lastly, the HHW brochure encourages residents to be mindful of the environmental and personal health hazards associated with the improper disposal of HHW, including danger to landfill employees, home damage, and environmental contamination.

Secure Your Load Brochure

County Ordinance 13.36.040, the "Secure Load Ordinance," is outlined in a brochure that is distributed to residents and businesses in the County. The brochure lists several questions that one should pose prior to hauling waste anywhere, forcing drivers to consider the ramifications of an improperly secure load. For instance, one question asks drivers if they would feel safe following their own vehicle and another asks whether drivers feel like they need to drive extra slowly. Positive answers to these questions should reasonably raise alarm and suggest that a load may not be secure. The brochure includes pictures of secure versus unsecure loads and emphasizes the $10 rebate made available to those who securely deliver their waste (see Figure 3-10).

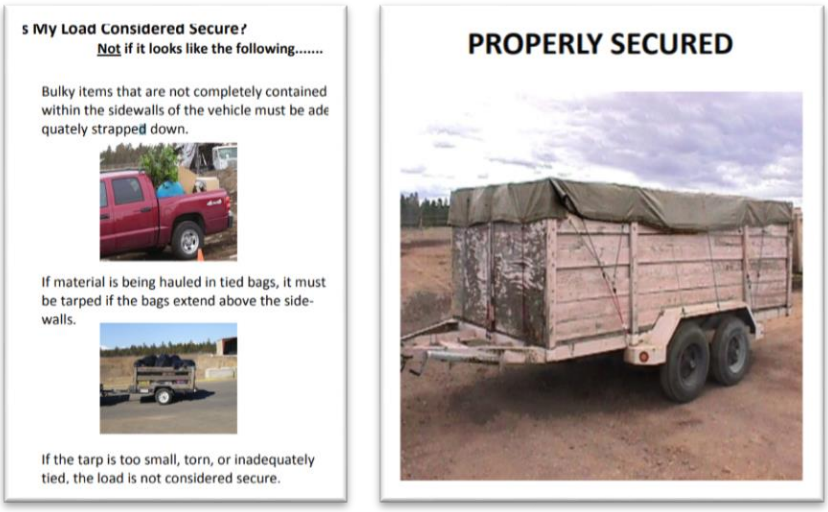


Figure 3-10: Inset from Deschutes County Secure Your Load Brochure

- **Key Customer Services Programs**

Brochures from each Deschutes County franchised collection company offer recycling preparation guides to help residents and businesses prepare materials for recycling, and offer information about collection frequency, pricing for material disposal and contact information. As such, the County is in compliance with ORS stating that "all documents distributed by collection companies and the County include phone numbers and contact information."

Bend Garbage and Recycling produces a quarterly newsletter (see Figure 3-5), *Curbside News*, which highlights community service efforts the company is involved with, information on discounts for select materials like compost products and yard waste disposal, upcoming scheduling changes due to holidays, advice to reduce and re-use waste, and how to prepare for recycling collection.

- **Purchasing and Production Practices**

The Environmental Center offers grants for around $500 for projects targeting waste reduction and increased recycling. In many cases this funding goes toward the expansion of composting programs at schools, although a variety of creative initiatives has been made possible through these funds. The REALMS school was awarded $700 to facilitate a food rescue program whereby students purchased a refrigerator to store leftover food so that it can be donated to food rescue organizations. The same school also put together a "Rubbish Renewed" fashion show with students designing garments from reclaimed objects and textiles. After an audit was conducted by The Environmental Center to evaluate wasted recyclables, one school program aimed at collecting redeemable bottles and cans requested $100 to buy a sink to dispose of remaining liquids in these bottles and cans.

- **Commercial Programs**

Commercial waste reduction programming is designed to meet the needs of local businesses and industries and inform generators of the proper way to handle material so that it can be collected and recycled sufficiently. In addition, the environmental and economic benefits of recycling are promoted. Other promotional efforts such as waste characterization audits, and recognition or rewards programs are in place to encourage commercial recycling efforts. For example, Bend Garbage and Recycling offers commercial waste audits to help companies realize how they can reduce financial costs stemming from waste disposal.

There is much progress for Deschutes County to realize in this sector. Per DEQ goals, commercial generators are expected to reach a 55% recovery rate from solid waste by 2025 while commercial generators of food waste or recyclables must source separate.

Neighbor Impact, a food bank in Central Oregon, is largely responsible for salvaging consumable food in Deschutes County. Presently, it is estimated that they have partnerships with 50 customers, primarily local grocery stores and Neighbor Impact recently acquired a refrigerated truck with the goal of increasing these efforts.

C/D Debris

ORS 459A.007 states that jurisdictions provide a recovery program that requires C/D debris be separated at the generation site or sent to a materials recovery facility for processing and recovery of recyclable materials. The statute also directs communities to promote sustainable C/D management by encouraging contractors and improvement projects to consider planning for waste reduction and re-use in the pre-construction planning phases.

Presently C/D is often directed straight to the transfer stations or Knott Landfill, making this stream an important area of focus for the County to consider moving forward. It is estimated that in 2016 perhaps as much as 31% of all waste received at Knott Landfill was from construction sites. Wood is one of the primary wastes that is generated from construction and demolition sites. Currently, clean wood waste (unpainted, untreated lumber) is accepted at the Negus Transfer Station in Redmond and Deschutes Recycling at Knott Landfill. This material is chipped and sent to boiler plants for use as fuel to produce steam and/or power. Additionally, Deschutes Recycling is working with a local wood waste processor for using chipped wood waste in the manufacture of sheet lumber products such as oriented strand board and particle board.

- **Electronics Recycling**

State law mandates that provisions for the recycling of covered electronic devices (CEDs) be offered for free. CEDs include computer monitors, keyboards, mice, personal computers, laptops and monitors, which area illegal to dispose of with general solid waste or municipal solid waste (MSW). Non-covered electronic devices (NCEDs) generated by households can be recycled for a fee at the Knott Landfill

Recycling Center. NCEDs include cell phones and telephones, microwaves, surge protectors, DVD and VHS players, stereos, speakers and cables, fax and copy machines. Any commercially generated electronics, covered or not, are considered to be hazardous waste, but can be accepted at the Knott Landfill Recycling Center for recycling.

Households and small businesses (less than 10 employees) or non-profits can drop off CEDs at the County's transfer stations and the recycling center at Knott Landfill County, while NCEDs are accepted at the Knott Landfill Recycling Center for $0.25 per pound.

- **Home Composting**

Presently the County provides disposal methods for yard waste and organic waste at all drop-off sites that accept organic waste. The County does not actively sponsor or provide compost or recycling collection bins at private events or community functions. Information regarding how households can compost is provided by the environmental center.

3.3.2 Reuse Programs

In terms of reuse programs, Deschutes Recycling works in partnership with local thrift stores to salvage reusable materials. A reuse brochure available at the Deschutes Recycling facility lists recyclable items accepted at the facility but primarily highlights the various organizations and thrift stores and what materials they accept, as well as the materials that they most need. A copy of the backside of these brochures can be seen in Figure 3-11. Additionally, Deschutes Recycling has allowed Habitat ReStore to park a small trailer at the wood waste drop area as an option for diversion of lumber so that it can be reused for building material (see Figure 3-12).

Reuse and repair cafes are currently hosted by The Environmental Center through their Rethink Waste Project, usually twice per year; although there is discussion of expanding this to a quarterly service to encourage County residents to repair broken items rather than purchasing new ones superfluously.

(Intentionally Left Blank)

Bend Thrift Stores

1) Bend Habitat Restore
(541) 312-6709
224 NE Thurston Ave
restorebend.org

2) Opportunity Foundation
(541) 389-0129
275 NE 2nd Street
opportunityfound.org

3) Goodwill
(541) 312-9070
61315 S Hwy 97
goodwill.org

4) City Thrift
(541) 678-5151
999 NE 2nd Street
bendcitythrift.com

5) Humane Society Thrift Store
(541) 388-3448
61220 S Hwy 97
hsco.org/hsco-thrift-store

Habitat Restore

Most Needed Items

- Furniture
- Home Decor
- Major Appliances
- Building Materials
- Doors with Frames
- Cabinets
- Vinyl Windows
- Garden Tools & Decor
- Scrap Metal
- Vehicals, Dead or Alive
- Tools
- Hardware and Electrical
- Sporting Goods
- Lighting
- Flooring
- Tile
- Plumbing
- Paint

Items Not Accepted

- Broken Items
- Cordless Drills & Batteries
- Flourescent Lights
- Dishwashers
- Clothing or Linens
- Unframed Mirrors & Glass
- Office Furniture
- Dishes or Books
- Mattresses/Boxsprings
- Baby Items
- Computers
- Fax or Copy Machines
- Hazardous Materials

St Vincent de Paul

We Also Take

- Single Shoes (to amputees for prosthetics)
- Aluminum cans (used to support homeless services)
- Fabric scraps, worn clothing, worn blankets, old pillows
- Fire extinguishers

St. Vincent de Paul accepts seasonal items that may vary. Give them a call if you have questions about what can or cannot be donated.

Items Not Accepted

- Chemicals
- Consignment furniture
- Console TVs/Stereos
- Copiers
- Doors/Windows/Blinds
- Building Supplies
- Fluorescent Lights
- Infant/Toddler Furniture
- Monochrome Monitors
- Office Chairs with fewer than 5 wheels
- Shag Carpets
- Storage Sheds
- Tires
- Tubs/Toilets/Sinks
- TVs

Goodwill

Most Needed Items

- Clothing & Shoes
- Small furniture
- Domestics (sheets, towels)
- Collectibles
- Jewelery & Antiques
- Books
- Household Items
- DVDs, CDs
- Records, Tapes
- Radios, Clocks, Lamps
- Accessories
- Computers
- Printers
- Monitors
- Vehicles
- Motorcycles
- Boats

Items Not Accepted

- Large Household Appliances
- Large Items that do not work
- Building Materials
- Encyclopedias
- Mattresses & Box Srings
- Certain Televisions
- Automobile Parts
- Paint & Chemicals
- Kerosene & Gas Heaters
- Recalled Items

*** State laws require mattresses be sanitized before resale, therefore most thrift stores will not accept donations of mattresses and boxsprings.

Figure 3-11: Deschutes Recycling Thrift Store Brochure

Figure 3-12: Habitat for Humanity Lumber Drop Off

3.3.3 Recycling Programs/Services

- **Residential Curbside Recycling Collection**

Residential curbside collection of recyclables is offered within the city limits of Bend, Redmond and Sisters as well as the urbanized communities in the unincorporated areas of the County. Expanding curbside recycling collection to the entire County is an option that is being explored and has been established in select, high-density areas in rural settings. In some communities, materials are collected separately, while other jurisdictions subscribe to commingled recycling services. Although collection frequency, container size and type, and setout instructions vary slightly, materials handled are uniform. The collection processes for single and multi-family residences, as well as the type of materials residents may include are described in greater detail in this SWMP in Chapter 4 covering Collection and Recycling/Processing.

- **Commercial Recycling**

ORS 459A.007 directs jurisdictions to establish recycling programs for commercial businesses with more than 10 employees and occupying over 1,000 square feet of real estate. This can include providing at least weekly collection of source separated recyclables. However, Deschutes County does not maintain a mandatory recycling program for businesses. Despite this, many businesses in Deschutes County have a recycling program. The number of businesses recycling is estimated at 100 and the materials being collected varies. An estimated 40 businesses are currently diverting food waste as well.

Generally, cardboard is a popular material to recycle, but franchised haulers do offer additional recycling options if they are requested. Franchised haulers work with businesses to specifically design programs that accommodate their needs. Haulers offer variable collection container services, ranging from 90-gallon roll carts to 40 to 50 cubic yard drop boxes (also known as roll-off containers). Typically, drop box service is offered to construction companies to collect recyclable materials such as scrap lumber, scrap metal, OCC, construction and demolition material, asphalt and concrete, wood pallets, saw dust, sod and grass stripping, wood and cedar shakes, and yard material. Smaller containers are most often used inside and outside office buildings to collect corrugated cardboard, white office paper, mixed paper, newspaper, and metal, glass and plastic containers.

It is also worth noting that ORS 459A.010.A-D states that industrial and manufacturing scrap materials that are immediately recycled or re-incorporated into new products do not count in recovery rates. This stream is sometimes referred to as "primary scrap," distinct from "secondary scrap" that refers to materials that have been recovered from the general waste stream. However, Deschutes County houses relatively few manufacturing or industrial plants, so this consideration is unlikely to have a significant bearing on the County's recovery rate.

There is a business sustainability awards program currently coordinated by The Environmental Center. This could parlay into a business technical assistance program

with waste audits which had been done in the past in the County, but not in the last five years.

3.3.4 Composting

Deschutes Recycling operates the largest composting facility in the County, located at Knott Landfill. In 2017, it is estimated that Deschutes Recycling processed approximately 130,000 cubic yards (35,000 tons) of loose organic material, which yielded 26,000 cubic yards of marketable compost product. There is a well-balanced mix of commercial and residential consumers of Deschutes Recycling's compost product, which is almost entirely locally based. Commercial customers typically include landscaping companies and garden stores, and several local businesses sell compost bags produced by Deschutes Recycling. Sunriver also provides a composting facility for its residents.

3.4 Needs and Opportunities for Increased Waste Prevention, Reduction, Reuse, and Recycling Activities

Deschutes County currently meets the requirements outlined in ORS 459A.007, which present the elements of a thorough waste reduction and recycling program. Those elements that the County currently satisfies should be maintained and continue to receive support. These include:

1. Continuing to develop and execute a coordinated promotion and education program with cities, franchised collection companies, The Environmental Center and other entities needed to support ongoing waste prevention, reuse and recycling efforts.
2. Continuing to fund these programs to, at a minimum, maintain the level of participation in reducing waste disposed in landfills.
3. Continue to evaluate program impacts and examine innovative approaches to inform the public and businesses to reach an ever-growing population and new employers.

Education in solid waste serves two primary functions: instructing customers on how to properly participate in and receive services, and messaging to encourage efforts to reduce and recycle, and create engagement in these and other sustainability actions.

As some jurisdictions have encountered budget constraints, there is pressure to reduce funding for the promotional services. ***However, without a continual and persistent emphasis on promoting and educating customers about waste prevention, reuse and recycling, the County risks a drop off in participation and the quality of the materials being recycled. With increasing pressure from markets for cleaner materials, outreach programs are essential to contributing the economic viability and sustainability of recycling in the County.***

With the new established goals for Deschutes County to achieve a recovery rate of 45% by 2025, expansion of the waste prevention, reduction, reuse and recycling

programs will be needed. Additionally, the need to reduce waste disposed in landfills is desirable for Deschutes County in the long run for several reasons. First and foremost is the fact that when Knott Landfill closes in about 10 years, the cost for disposal will certainly increase, whether a new landfill is sited in the County or waste is transported to an out-of-County landfill. Similarly, if more materials can be diverted from the landfill in the near future, the site life of Knott Landfill can be extended, which may have the effect of deferring cost increases to the solid waste system thus keeping rates from increasing.

For these reasons and considering the need to raise the recovery rate from 33% to 45%, the County should make additional strides to achieve a recovery rate of 45%, as directed by ORS 459A.010. To that end, guided by the elements listed in Table 3-2, and to support the mission of the County's DSW to divert waste from Knott Landfill, extend its site life and defer cost increases to the system, there are several needs and opportunities on which the County can capitalize. Areas where there appears to be the greatest opportunity include:

1. Target recycling program expansion in participation at multifamily developments[23], including hotels and resort communities for targeting the year-round tourist population.
2. Expand collection of vegetative waste with yard waste from residential properties and consider universal service.
3. Expand and develop new programs aimed at increasing recycling by businesses or commercial generators, including C/D.
4. Implement County-wide residential curbside single-stream recycling collection for all.

3.5 Alternatives for Increased Waste Prevention, Reduction, Reuse, and Recycling Activities

The specific waste prevention, reduction, reuse and recycling program alternatives outlined below must be coordinated with collection and processing as discussed in Chapter 4.

- **Standardize Waste Prevention, Reduction, Reuse and Recycling Messaging and Communications**

Recycle Right and other campaigns currently in place have made great strides in educating Deschutes County communities about solid waste issues; however, the rapid population growth coupled with the continual influx of tourists, makes consistent imagery, recycling container colors and messaging important to consider in making education investments.

[23] Starting in July 2022, all tenants of multi-tenant residential and commercial properties within cities and urban growth boundaries over 4,000 people will have new opportunities to recycle. DEQ has numerous resources available on its website.

The industry standard is $3.00 per household per year for education efforts to effect change in behavior, which would be approximately $500,000 for Deschutes County annually.

Given the environmental impact of printing along with the cost of print production, Deschutes County should expand its online and social media presence in its communications, thereby reducing the creation of printed materials in favor of creating dedicated web and social media portals. A web and social media update effort for the County and partner organizations could provide a comprehensive, easy-to-access platform for dynamic community engagement on recycling and waste diversion practices. Opt-in text messaging campaigns can also provide real-time access to residents with key program and event information. In this way, the County can utilize social media and neighborhood engagement platforms to promote information, tips, updates, and messages in a cost-effective manner.

Franchised haulers should continue their customer newsletter efforts, perhaps offering a paper-free option for those customers who choose it and keeping up app-based communication options as well.

Best practices in key outreach areas follow with viable opportunities for Deschutes County:

1. Reducing waste generation:
    a. Material bans (for example plastic bags or yard waste/food waste). There are many national and international examples of plastic bag bans.[24] Notably in the US, Massachusetts has a successful commercial food material disposal ban[25]. In 2019, the City of Bend will be implementing a plastic bag ban and the State of Oregon has established a plastic bag ban which will go into effect in 2020.
    b. Grasscycling and backyard composting. Marion County, Portland Metro, and the City of Seattle have successful programs in this regard, giving out backyard composting bins and providing information at events.
    c. Strong residential messaging such as waste-wise holidays, stop junk mail and opt out of phone books. Incorporated into newsletters and social media campaigns, these messages are important to reinforce.
    d. Food waste prevention and diversion through innovative food waste applications. Spoiler Alert is an application that allows food producers, wholesale and retail distributors to manage unsold inventory to enhance food recovery and waste diversion efforts and enables real-time food

[24] International locations with plastic bag bans include: Bangladesh, Rwanda, China, Taiwan, Macedonia and Kenya. US cities with plastic bag bans include Austin, Cambridge, Chicago, Los Angeles, San Francisco and Seattle. US Cities/Counties with plastic bag fees: Boulder, CO; Brownsville, TX; Montgomery County, MD; New York City; Portland, ME, and Washington D.C. The state of Hawaii has a plastic bag ban and California as a whole has a ban, labeling and recycling program requirements.

[25] Massachusetts passed a commercial food material disposal ban in October 2014 such that any business which produced more than a ton of food waste per month was not allowed to put it in a landfill. A report for Massachusetts Department of Environmental Protection found the disposal ban has created hundreds of well-paying jobs, increased the Gross State Product by some $77 million, and generated more than $5 million in state and local tax revenue. (https://www.mass.gov/guides/commercial-food-material-disposal-ban)

donations and discounted sales. GoMkt is a web-based platform that helps food retailers reduce food waste and increase recovery efforts by posting unsold inventory to users and food banks at heavily discounted prices.

2. Stimulating reuse:
   Expand opportunities to partner with community resale organization for drop-offs and community clean-up events to include a reuse component. The current partnership with Habitat ReStore having a trailer at Deschutes Recycling for reusable lumber could be staffed during peak times to further divert usable materials. Likewise, Goodwill or other community reuse organizations could be engaged in this manner at the transfer stations, especially during busy weekend drop-off times.

3. Ongoing education/community events:
   Both direct customer communication (primarily social media, as well as print media) and community outreach at public events are a fantastic combination for improving recycling and truly engaging the public in the benefits of household recycling/sustainability practices.

   Similar to the event efforts in Deschutes County, communities are making efforts to execute a "Zero Waste" program in conjunction with sporting venues, fairs or other special events.

   Kent County, Michigan, has a superior event recycling program called "SORT it out," shown in Figure 3-7, which grew out of their annual ArtPrize competition. Garbage, recycling and compost (optional as a third attachment) bins are attractive, light-weight, and economical.

Figure 3-13: Kent County, Michigan "SORT it OUT" event container program

Providing waste reduction and recycling opportunities and programs at public or private special events can be a boost to reduce waste and increase diversion tonnage as well as offer education for the community. These events allow the County a cost-effective means to get the message out about how to reduce waste and recycle more. They provide a key element of a comprehensive public awareness campaign. Lending County-owned recycling containers, signage, and training to local festivals and events may provide the tools needed by these groups to divert additional wastes as well as the awareness of recycling "away from home." Hauling services for event recyclables must be discussed and assured from franchised haulers to ensure that collected materials are delivered to appropriate processors and markets. Ultimately, a more coordinated program for all types of events would reduce County staff time in managing these periodic efforts and create a standardized system across many venues. Depending on the number and type of public events hosted by each jurisdiction in the County and the willingness to provide recycling opportunities, franchised hauler representatives could assist in planning standard recycling and/or composting collection for these events. Planning for event recycling requires understanding of vendor flexibility in the use of recyclable or compostable packaging and wares.

Continue Waste Reduction/Recycling Grants

Grants can be effective in introducing pilot programs and/or starting new services. These can also be advertised to gain additional promotional benefits.

Grant funding has generally been successful in allowing the expansion of waste- and sustainability-related events and programming. Waste-related grants provided to worthy community projects and educators have traditionally been made available by The Environmental Center, the DEQ, and DSW. Funding enables educators and program coordinators to implement additional recycling programs by providing capital to purchase bins or other tools and equipment. However, there may be additional constituents with ideas that can enhance the County's goals who simply lack the means or motivation to implement them.

The County, DEQ, and The Environmental Center can dedicate a portion of their grant funding in future years towards individuals who present ideas or projects that help the County achieve waste related goals. In addition to offering a newfound motivation to execute these ideas, it may also inspire others to consider how they might improve their own waste management behavior. An evaluation of projects and initial seed monies to spur waste reduction/recycling efforts can provide years of waste diversion for enthusiastic participants in a recycling program, which the County may never have known was desired or possible without the grant application.

Promote Increased Diversion of Electronic Devices from the Waste Stream

Presently, electronic waste can be brought to the transfer stations or Deschutes Recycling. There is no charge for CEDs, which are collected at the transfer stations and Deschutes Recycling. Currently, Deschutes Recycling at Knott Landfill is the only facility that collects NCEDs for recycling and assesses a fee for the service. The Waste Wizard application currently utilized by Cascade Disposal may be a useful tool in

expanding diversion of electronic devices since residents can be directed to bring certain waste streams to specific locations.

Encourage Hotels and Tourist Centers to Focus on Waste Prevention, Reduction, Reuse and Recycling

Year-round tourism is a main contributor to the cities and County-wide economy, and with the number of tourists rivaling, if not exceeding the number of residents in the County at any given time, it can be expected that tourists account for a higher portion of the waste generated, than is typical with other jurisdictions.

It can be difficult to maintain waste practices in an environment that is not one's home, which is often cited as a reason tourism and hospitality vendors struggle to enforce local sustainability initiatives among guests and their clientele. However, given the County's pristine natural environment, especially considering that it is the primary reason that Deschutes County exists as a tourist destination, encouraging this demographic of tourists to be mindful of the County's waste-related goals should be expanded. With the impact of tourists on food-service and hotel industries, looking to restaurants and hotels to source separate food waste in coordination with local haulers will simultaneously address a significant waste stream (food) as well as a challenging generator (tourists).

Analogous tourist destinations such as Vail, Colorado and Whistler, British Columbia, face similar challenges. In Vail, it is mandatory for all special events to incorporate recycling into their planning and must display recycling bins. Understanding that tourists may not be as conscious about efforts to reduce contamination in the recycling stream, Whistler also sets out bins specifically for polystyrene and plastic bags. Park City, Utah, another tourist destination, became the first city in Utah to ban plastic bags altogether in May 2017. Another example is the Big Sky Resort in Montana that highlights its recycling initiatives at participating hotels on their website (https://bigskyresort.com/corporate/sustainability).

As an option to move forward in this area, the County could coordinate a meeting with Visit Bend stakeholders, the local hospitality sector and franchised hauling companies. Resulting from this meeting could be a call for waste audits, which can reveal potential issues with respect to individual generators and allow haulers to design and modify collection routes to target certain materials, maximizing the quality of OCC, for example. In addition, this can allow restaurants and hotels to consider how they might improve their own operations and capitalize on efficiencies, and potentially earn official recognition for their efforts that they can use for marketing (see commercial/ multifamily recycling award program discussion below).

Expand Commercial/Multifamily Recycling and Food Waste Recovery

As evidenced in Table 2-13, food waste accounts for the largest portion of the waste stream in Deschutes County and was estimated to be **42,000 tons in 2016**. While organic waste as a whole is an area that the County can target to enhance their recovery rate, given **the rapidly growing tourist and hospitality sector in the County, directing commercial entities who produce a substantial amount of food waste to separate this material stream will likely have a marked effect.**

This effort would coincide with Element M in Table 3-2, which promotes such a requirement for nonresidential entities.

Both commercial and multifamily program development and expansion would require enhancing current education and promotion programs aimed at commercial businesses and multifamily units to recycle more materials. It would be necessary to work with the franchised haulers to offer expanded collection of source separated materials.

Together with The Environmental Center and coordinating with the franchised haulers and cities, the County could attempt to determine what barriers may exist in diverting additional tonnages for businesses and multifamily units not currently recycling or not able to utilize services for full recovery. Businesses could be directed to new services and connected with outlets like Habitat for Humanity, Secure Shred (for paper waste) and similar vendors who address materials commonly found in commercial waste streams.

Additional programming may include an official County accreditation of The Environmental Center's sustainability certification and/or additional waste auditing/awards program to motivate commercial generators to work with local stakeholders to enhance their recycling efforts. Waste audits conducted in conjunction with The Environmental Center and local haulers can be beneficial for several reasons. In addition to informing businesses about what materials they are generating in excess and how that impacts their economics, haulers may design or modify collection routes based on businesses that discard high volumes of a specific material or commingled recyclables.

This alternative requires additional resources and coordination to conduct audits and perform collections. To minimize the commitment of resources, target groups could be established for initial efforts. Certain types of businesses, particular waste generators, or specific geographic locations could be targeted to establish demonstration or pilot programs. Once a service has been shown to be successful, the program can be expanded to other businesses similar to the target. To accomplish these types of pilot demonstration efforts, the program requires close coordination between County resources and the franchised haulers as well as cooperation from businesses and multifamily units.

As a successful Oregon example, Portland has an integrated commercial/multifamily program.[26] Similarly, in Deschutes County, building from the commercial program, multifamily recycling outreach can tie into tourist destination resorts like Sunriver and Eagle Crest.

The focus for all promotional materials should be on business/property permanent signage (metal signs, container labels), as well as yearly (at minimum) employee or tenant printed education materials and supplemented with a complimentary social media campaign. For multifamily units, special attention should be given to tenants at move-in. Cultivation of recycling champions on-site has also proven effective.

[26] https://www.portlandoregon.gov/bps/58975; https://www.portlandoregon.gov/bps/41466

Options for implementing the commercial/multifamily outreach work plan include the following staffing options, separately or in combination:

1. Hire a commercial/multifamily waste auditor as a staff person within DSW.
2. Expand The Environmental Center or other organization funding allocation to do program development and waste audits. For this option, County dollars can go directly to program work as it is presumed that staff are in place whose roles could be expanded.
3. Utilize students from the Oregon State University Cascade campus and/or Central Oregon Community College. Explore a Community Environmental Services (CES) partnership as implemented Portland State University[27] to get experienced students as "boots on the ground" with businesses and multifamily property managers/management companies.

Residential Yard Waste/Food Waste

Discussed further in Chapter 4, residential yard waste collection should be made available regularly to all collection customers, accompanied by outreach and education to customers. Furthermore, this service should be provided to rural and urban customers alike. There are presently customers who are opting in to yard waste service in the urban areas and can add vegetative food waste; however, the service is not widely promoted.

Optionally, the County could move to seasonal collection of yard waste and not require collection during the winter or summer seasons, but the County should aim to divert more yard waste to the Deschutes Recycling compost facility and away from Knott Landfill. Given that organics is the largest uncaptured segment of what is currently disposed and adding to the commercial collection of food waste discussed above, residential food waste should be added universally to the yard waste roll carts once facility upgrades are in place to handle the capacity.

(Intentionally Left Blank)

[27] https://www.pdx.edu/ces/home: For the past 25 years, CES has provided research and service through Portland State University, giving students a chance to work in real-life waste management scenarios and prepare them for careers in the field, while providing excellent hands-on service to businesses, properties, and events managers in the Portland area.

Chapter 3

Table 3-3 presents the Waste Prevention, Reduction, Reuse and Recycling Needs and Alternatives Summary.

***Table 3-3 WR/R Alternatives Analysis* (EST ANNUAL DIVERSION: small >1K tons; medium 1K-10K tons; large >10K tons)**

			Analysis*					
Need/Alternative Identified	**Key Point**	**Expansion Program/New Program**	**Consistent With Hierarchy**	**Reduces Long-term Generation**	**Highest and Best Use**	**Cost Effectiveness** and Stabilizes Rates Long-term**	**Flexibility**	**Examples**
Standardize Waste Prevention, Reduction, Reuse and Recycling Messaging/Communications	Budget $3/Household/year	Expansion/New	Yes	Contributes to effective communication	Yes	Current programs work- more resources needed [1]	Programs are adaptable	Marion County
Reduce Waste Generation	Consider options most desirable to goals	Expansion/New	Yes	Yes	Yes	Not effective without enforcement [1]	Varies	California
Material bans (plastic bags; yard waste/food waste)	Political desire must be there	New	Yes	Yes	Yes	Difficult to measure impact [1]	No	Seattle; Massachusetts
Grasscycling/backyard composting	Good communication point	New	Yes	Yes	Yes	Requires ongoing training program [1]	Yes	Portland Metro
Residential messaging for opt-out programs	Residents appreciate	Expansion	Yes	Yes	Yes	Small impact [1]	Yes	Montgomery County, MD
Food waste apps to increase diversion of usable food	Great for residents and businesses	New	Yes	Yes	Yes	Effective [1]	Yes	New England

			Analysis*					
Need/Alternative Identified	**Key Point**	**Expansion Program/New Program**	**Consistent With Hierarchy**	**Reduces Long-term Generation**	**Highest and Best Use**	**Cost Effectiveness** and Stabilizes Rates Long-term**	**Flexibility**	**Examples**
Stimulate reuse	Build from thrift stores and donation centers (i.e. Goodwill)	Expansion	Yes	Extends useful life of products	Yes	Saves system cost [1]	Yes	Fauquier County, VA
Outreach and events diversion	Support event and venue diversion	Expansion/New	Yes	Yes	Yes	Requires resources [1]	Yes	Kent County, MI
Continue Waste Reduction/Recycling Grants	Allow for individual and group projects	Expansion	Yes	Yes	Yes	NA	Yes	North Carolina; Oakland, CA
Promote Increased Diversion of Electronic Devices from the Waste Stream	Increase awareness of collection points; utilize Waste Wizard or other application	Expansion	Yes	Yes	Yes	Yes [1]	Yes	Tampa and Hillsborough County, FL
Encourage hotels and tourist centers to focus on WR/R	Ties into commercial/multifamily program	New	Yes	Yes	Yes	Yes [1]	Yes	Vail, CO; Whistler, BC; Park City, UT; Big Sky, MT
Expand Commercial/Multifamily Recycling and Food Waste Recovery	Large opportunity for diversion; add staff, increase partner funding allocation, and explore University partnership	Expansion/New	Yes	Yes	Yes	Requires persistent promotion and education, rate incentive [2]	Yes	Seattle; Portland Metro

			Analysis*					
Need/Alternative Identified	**Key Point**	**Expansion Program/New Program**	**Consistent With Hierarchy**	**Reduces Long-term Generation**	**Highest and Best Use**	**Cost Effectiveness** and Stabilizes Rates Long-term**	**Flexibility**	**Examples**
Residential Yard Waste/Food Waste	Make service consistent across County	Expansion	Yes	Yes	Yes	Increase subscribers to pay, reduces waste transport distance [2]	Yes	Minneapolis, MN
Commercial/Demolition (C/D) program development	Estimated 30% of Knott Landfill is C/D but no outreach program in place	New	Yes	Yes	Yes	Yes [2]	Yes	Virginia

*Analysis Recap

1. ***To provide an integrated solid waste management system*** that addresses an effective combination of strategies and programs guided by the hierarchy adopted by the State to first, reduce waste at the source; second, to reuse and recycle materials; third, to compost; fourth, to recover energy: and last, to dispose of waste in landfills.
2. ***To continue educating consumers to promote practices and methods to reduce the long-term per capita waste generation rate*** and seek, through community outreach, a cooperative approach to assume individual responsibility to reduce waste.
3. To develop programs and support implementation of system improvements that seek to ensure materials recovered from the waste stream ***attain the highest and best use and are recycled***.
4. To develop a solid waste system that is based on ***sound financial principles, provides cost effective services and maintains rate stability over a long term***, while allocating costs equitably to all users. ***
5. ***To maintain system flexibility to respond to changes*** in waste stream composition, waste management technologies, markets for recyclables, public preferences, new laws and changing circumstances.

****Cost Effectiveness of Alternatives**

1. **Most cost effective** – The alternative will have an immediate (less than 2 years) and measurable impact towards meeting the County's goals to reduce waste disposed in landfills by reusing, recycling or diverting waste by achieving a higher use of the material

as a resource. The alternative does not require significant changes to current collection services or practices resulting in major capital investments. Also, the alternative cost does not exceed the current cost of disposing in the landfill. The impact to total system cost is minimal.

2. **Moderately Cost Effective –** The alternative will have measurable impacts towards reducing the waste disposed in landfills and may cost more than the current cost of landfilling. The alternative may require expansion of modifications to existing collection services requiring an increase in rates of more than 10% but less than 30%. However, the alternative will provide a long-term cost benefit by extending the site life of Knott Landfill thus delaying the need to purchase additional capacity either by operating a landfill in Deschutes County or other alternative. The alternative may also result in reducing long term costs by reducing the cost to transport to landfill sites out of the County. The alternative may also result in preserving jobs and financial resources spent in the County versus to outside entities.

3. **Least Cost Effective –** The alternative may increase collection cost by over 30% and/or may cost more than the current cost of disposal. The alternative may have long term benefits of reducing waste disposed in landfills and/or keeping long term system cost from increasing over other options. The alternative may also result in preserving jobs and financial resources spent in the County versus to outside entities.

3.6 Recommendations for Increased Waste Prevention, Reduction, Reuse, and Recycling Activities

As noted, Deschutes County currently meets the requirements outlined in ORS 459A.007, which present the elements of a thorough waste reduction and recycling program. Those elements that the County currently satisfies should be maintained and continue to receive support. These include:

- Continuing to develop and execute a coordinated promotion and education program with cities, franchised collection companies, The Environmental Center and other entities needed to support ongoing waste prevention, reuse and recycling efforts.
- Continuing to fund these programs to, at a minimum, maintain the level of participation in reducing waste disposed in landfills.
- Continue to evaluate program impacts and examine innovative approaches to inform the public and businesses to reach an ever-growing population and new employers.

For increased waste prevention, reduction, reuse and recycling, the new programs recommended and those sought for expansion through this SWMP include the following alternatives. All five recommendations listed below:

- Are consistent with State hierarchical priorities and goals to reduce waste disposed in landfills;
- Seek to attain highest use of resources to convert organics to soil amendment and enrichment;
- Require minimal investment to reduce waste disposed at Knott Landfill and attain long term stability in managing waste versus transport to more distant landfills;
- Do not rely on markets outside the geographical area; and
- Are flexible to expand or contract with minimal impacts to system.

Recommendation 3.1: Establish a standard WR/R program throughout the County for single family, multifamily and businesses which focuses on education and outreach.

Rationale – Consistency of messages, imagery and promotional tools will help to leverage program funding and deepen the impact of WR/R programming to all residents and businesses.

Recommendation 3.2: Expand and improve standards for a multifamily recycling program that includes a comprehensive education and outreach program to expand participation at multifamily developments.

Rationale – Multifamily recycling has traditionally been more challenging due to the transient nature of the population. Deschutes County is making strides in this area, however a more robust program is needed. As a successful Oregon-

example, Portland has an integrated commercial/multifamily program. Similarly, in Deschutes County, building from an enhanced business program, multifamily recycling outreach can tie into the tourist destination resorts in the area.

Recommendation 3.3: Expand business education and promotion to target expansion of recycling, focusing especially on hotels and resort communities to reach the tourist population. As part of the business education and promotion program, develop a program to target food waste recovery (see also Recommendation 3.4).

Rationale – Businesses generate more garbage and recycling than do residents, and year-round tourism is main contributor to the cities and County-wide economy. With the number of tourists rivaling, if not exceeding the number of residents in the County at any given time, it can be expected that tourists account for an appreciable portion of the waste generated. Furthermore, food waste is a large portion of the disposed waste stream; diverting food waste can produce a valuable soil amendment and also offset greenhouse gas generation.

Recommendation 3.4: Expand and develop additional materials to educate households, multifamily residences and businesses on how to reduce food waste and develop promotion of vegetative waste with yard waste and consider universal service.

Rationale – Discussed further in Chapter 4, residential yard waste collection should be made available regularly to all collection customers, accompanied by outreach and education to customers. Furthermore, this service should be provided to rural and urban customers alike. There are presently customers who are opting into yard waste carts in the urban areas and can add vegetative food waste, however, the service is not widely promoted.

Recommendation 3.5: Expand and develop new programs aimed at increasing recycling of C/D materials.

Rationale – ORS 459A.007 states that jurisdictions provide a recovery program that requires C/D be separated at the generation site or sent to a materials recovery facility for processing and recovery of recyclable materials. The statute also directs communities to promote sustainable C/D management by encouraging contractors and improvement projects to consider planning for waste reduction and re-use in the pre-construction planning phases. Presently C/D is often directed straight to the transfer stations or Knott Landfill for disposal, making this stream an important area of focus for the County to consider moving forward.

Coupled with the corollary collection and processing recommendations in Chapter 4, these three changes could add the additional 30,000 tons of recycling needed to meet the County's 45% recycling goal by 2025.

Chapter 4

4. COLLECTION AND RECYCLING/PROCESSING

4.1 Background and Existing Conditions

This chapter focuses on the current refuse collection programs servicing the residents and businesses in Deschutes County. Deficiencies needs or areas where changes could be made to meet the goals presented in this SWMP are identified. Alternatives for addressing changes or deficiencies are discussed in relation to the objectives stated below. Based on analysis and input from staff, SWAC members (includes franchised haulers) and the general public, recommendations are presented.

For purposes of this SWMP, "collection" and "waste transfer" refer to waste transport (by individuals or collection companies) directly to a disposal site or transfer station that subsequently processes or consolidates waste and delivers it to a disposal site.

This chapter also reviews the current facilities in Deschutes County that receive and process materials for the purposes of recovering and marketing those materials. Deficiencies for meeting future needs are identified and the existing infrastructure, capacity and capabilities for processing additional materials to increase materials recovery are evaluated.

In ORS 459.085, the responsibilities and capabilities of counties and cities with respect to the provision of collection services are outlined. Specifically, to county responsibilities, ORS states:

> *"With respect to areas outside of cities, a board of county commissioners may adopt ordinances to provide for:*
>
> *(a) The licensing of disposal sites as an alternative to franchising of service.*
>
> *(b) The regulation, licensing or franchising of salvage businesses or the operation of salvage sites where such action is found necessary to implement any part of a solid waste management plan applicable in the county. Such an ordinance shall grant the same authority and prescribe the same procedures as provided for other franchises or licenses under this section."*

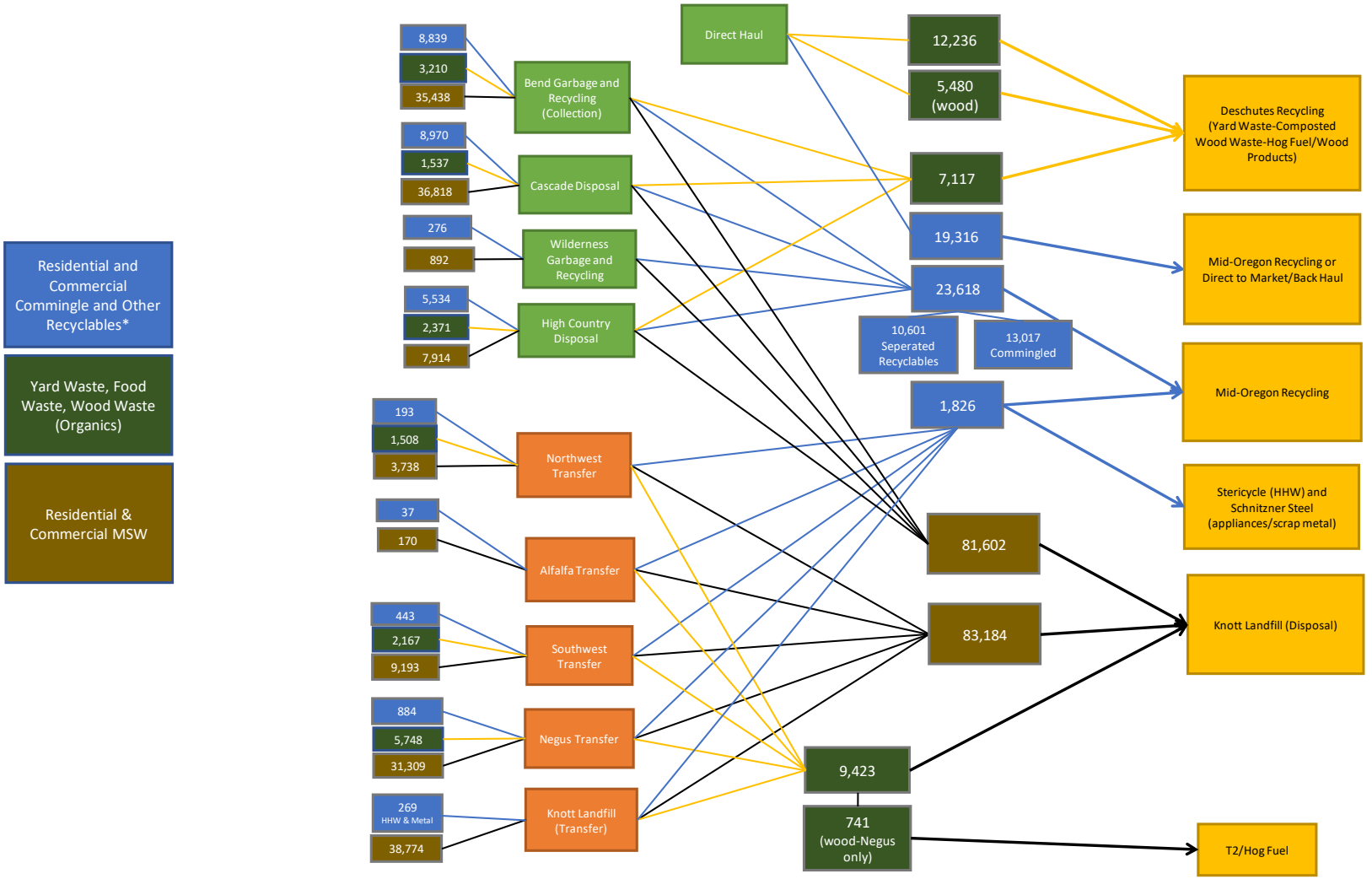
A priority of DSW is to provide services that meet the diverse needs of businesses and residences in urban and rural communities that are both effective and fair to all users. Providing convenience through a variety of services is a key part of attaining this goal. The County, cities and franchised haulers have various means for households and businesses to participate in recycling, including:

- Curbside Collection – provided to most of the County
- County Drop-off Centers – Five locations throughout the County (Knott Landfill and Negus, Northwest, Southwest and Alfalfa Transfer Stations)

- Other Drop-off Centers –Wilderness Disposal (La Pine), the City of Sisters, and Sunriver provide recycling drop-off facilities for their communities.
- Electronic waste is accepted at the Knott Landfill Recycling Center and all transfer stations. The transfer stations only accept CEDs. Deschutes Recycling at Knott Landfill will accept both CEDs and NCEDs.
- Special Material Collection Events – Twice each month, DSW offers HHW collection at Knott Landfill and annual HHW collection events in Redmond, Sisters and La Pine. Additionally, residents can bring yard debris to Knott Landfill and the transfer stations at no charge on designated dates at annual "Fire Free" collection events held each spring in preparation for the fire season.

Figure 4-1 presents the current flow of waste and quantities in Deschutes County from the franchised haulers collection, direct haul, transfer and processing in 2016.

(Intentionally Left Blank)



*Cardboard, glass, appliances/scrap metal, motor oil, auto batteries and ewaste

Figure 4-1: Deschutes County 2016 Waste Flow Diagram (in tons)

It should be noted that the sum of MSW delivered to Knott Landfill from the franchised haulers and the transfer stations (164,786 tons) in 2016 is 3,159 tons greater than the 161,087 presented in the 2016 DEQ report. Yard waste and wood/lumber collected by Cascade Disposal were reported in cubic yards and were converted based on the EPA's "Volume-to-Weight Conversion Factors." Accordingly, compacted mixed yard waste typically weighs 640 pounds per cubic yard, uncompacted mixed yard waste typically weighs 250 pounds per cubic yard, and wood and lumber were assumed to typically weigh 169 pounds per cubic yard.[28]

4.2 Existing Collection and Processing

4.2.1 Collection

ORS 459.125 allows the County and cities to enter franchised agreements with public or private entities to manage the collection, disposal, processing and marketing of solid waste and recyclable materials. Additionally, this ordinance grants the County the authority to regulate and oversee these operations as they occur within the County.

Franchised collection companies collect commingled materials, glass, organic waste (yard debris and food waste mixed with yard debris), and MSW from residences and businesses in Deschutes County and deliver them to facilities (as noted in Figure 4-1) within the County for intermediate processing. Within the County, these facilities organize and consolidate material streams so that they can be shipped out of the County for recycling. Other than disposal at the Knott Landfill, the only materials that are entirely processed within the County are yard waste and vegetative food waste, which are composted a County-owned facility at Knott Landfill operated by Deschutes Recycling.

There are approximately 180,000 residents in Deschutes County, covering 85,000 households (an estimated single-family count of 55,000 households and multifamily count of 30,000 households), as well as 6,500 employers with 60,000 employees.[29]

The County has franchised agreements with four different private companies for the collection of municipal solid waste from residences and commercial establishments (see Table 4-2). Each of these companies is franchised by the city it serves and with the County for unincorporated areas, under authority granted by ORS 459.125. This same legislation also gives Deschutes County the authority to:

> *"Regulate, license, franchised and certify disposal, transfer, and resource recovery sites or facilities; establish and collect license or franchised fees; and otherwise control and regulate the establishment and operation of all public or private disposal, transfer and resource recovery sites or facilities located within the County."*

[28] U.S. E.P.A. Volume-to-Weight Conversion Factors, April 2016.
[29] https://www.census.gov/quickfacts/fact/table/deschutescountyoregon/SBO001212#viewtop and https://www.huduser.gov/publications/pdf/BendOR_comp_15.pdf

Chapter 4

Curbside Collection

Franchised agreements grant each company the sole right to collect all solid waste and recyclables from a specified area as noted in Table 4-1. Waste haulers are obligated to provide a regular schedule for collection of garbage in all areas of the County and recyclables in urbanized areas.

Table 4-1: 2008 Private Solid Waste Haulers and Service Areas

Collection Service Provider	Service Area	Term of Contract
Bend Garbage and Recycling	North Bend	Rolling seven[30]
Cascade Disposal	South Bend and Sunriver	Rolling seven
High Country Disposal	Redmond and Sisters	Rolling seven
Wilderness Garbage and Recycling	La Pine	Rolling seven

Note: Deschutes County contracts with all four collection companies for service in the unincorporated areas of the County.

Service charges by the franchised haulers are regulated by cities and by the County with maximum rate schedules. As presented in rate schedules effective August 1, 2017, the County sets maximum solid waste rates for the following:

- Unincorporated Rural (Cascade Disposal, Bend Garbage and Recycling, and High-Country Disposal)
- Unincorporated Distant Rural (Cascade Disposal, Bend Garbage and Recycling, High Country Disposal, and Wilderness Garbage and Recycling)
- Rates for container rental with all franchised haulers and transfer services provided by Deschutes Transfer Company to DSW

The County maximum rates are set based on waste container volume. For a 35-gallon can, maximum rates range from $17.75 to $18.40 per month. Bulky services are available at an additional charge paid by the customer. Backyard or non-curb/roadside rates are also set. The solid waste rate sizes include 20, 35, 65, and 95-gallon cans (see Appendix A for full schedule of collection rates).

Along with solid waste, collection every other week for recycling in a 95-gallon cart for the cities of Bend, Redmond, La Pine and Sisters is included.

Yard waste service in a 95-gallon cart collected every other week is subscription only in the cities of Bend and Redmond. Residents can add vegetative food waste to the yard service. Bend Garbage and Recycling notes that for city customers, yard debris curbside recycling is a yearly subscription service for $4.90 per month. Acceptable yard debris includes grass clippings, brush, weeds, pine needles, plant prunings, and branches no larger than 2” in diameter and 36” in length. Raw fruit and vegetable scraps such as apple cores, banana peels, potato skins, zucchini, pumpkins, coffee

[30] Denotes a continuously renewing 7-year term for contracts, per franchised ordinance.

grounds and filters, tea bags, etc. are also acceptable.[31] All customers in the City of Sisters have yard waste service every other week.

Franchised haulers bill customers directly and pay DSW a 3% franchised fee, as well as a 3.5% fee to the City of Redmond and a 5% franchised fee to the City of Bend[32], in addition to disposal fees at Knott Landfill.

Cascade Disposal offers customers a tool called the "Waste Wizard" in which residents enter their address and find out what they should do with a certain material, as well as what their specific collection day is. As a convenient phone application, Waste Wizard is very popular with customers.

Curbside Recyclables

Cascade Disposal's promotional materials list the recyclables collected at the curb, collection calendars and other information as presented in 2. County-wide ReThink Waste and CAN Cancer logos also appear prominently on the Cascade Disposal website (Figure 4-3).

Figure 4-2: Cascade Disposal's 2018 City Customer Calendar and Education Materials (front side on left, back side on right)

[31] Commercial collection of food waste is being offered to interested customers, discussed in more detail below.

[32] http://www.codepublishing.com/OR/Bend/html/Bend11/Bend1116.html

Figure 4-3: Franchised Hauler Community Promotional logos

As a complete list, the following materials can be commingled into the recycling cart curbside in Deschutes County:

PAPER

- Newspaper
- Junk Mail
- Computer Paper
- Wrapping Paper (no foil)
- Shredded Paper (strips only)
- Cereal/Cracker Boxes
- Paper Egg Cartons
- Soda and Beer Cartons
- Shoe Boxes
- Paper Towel Tubes
- Phone Books
- Magazines
- Catalogs
- Paper Bags
- Corrugated Cardboard

PLASTICS

- Plastic Bottles & Tubs (6 ounces or larger)
- Rigid Plastic Plant Pots (4 inches or larger)
- Plastic Buckets (5 gallons or less)
- Milk Jugs (no need to flatten)

METALS

- Cans
- Jar Lids
- Beverage Cans
- Foil

- Pie Tins
- TV Dinner Trays (free of food & waste)

Glass and motor oil are collected separately in Bend and Redmond only.

Rates for Items Collected at Knott Landfill and the Transfer Stations

Knott Landfill rates and accepted items include the following:

Household garbage and construction debris
≤400 lbs - $22.00*
Each additional 100 lbs - $3.00

Asbestos (Friable)
≤2000 lbs - $100.00
Each additional lb - $0.05
Must have approved Special Waste Disposal Application prior to disposal

Asbestos (Non-Friable) is charged at regular garbage rate
Must have approved Non-Friable Asbestos Application prior to disposal

Contaminated Soil
$0.0175 per lb
Must have approved Special Waste Disposal Application prior to disposal

Alfalfa, Negus, Northwest, and Southwest Transfer Stations rates and accepted items include the following:

Household garbage or construction debris (limit of 4 cubic yards of construction debris)
≤1 cubic yard - $22.00*
Each additional cubic yard - $8.00

Yard Debris (accepted as garbage at Alfalfa Transfer)
Per cubic yard - $4.00

Wood Waste (accepted only at Negus Transfer Station)
Per cubic yard - $4.00

Appliances (limit 4 per customer, not accepted at Alfalfa Transfer)
Each - $8.00

Tires (limit 12 per customer)
Passenger car, pick-up and light truck - $2.00 each
Additional charge if on rim - $2.00 each
Heavy truck or equipment tires are not accepted

Sod is only accepted at the regular garbage rate at the Negus, Northwest and Southwest Transfer Stations (limit 1 cubic yard and is only accepted at

the attendants' approval based on transfer trailer status. Sod can be brought to the Recycling Center at Knott Landfill for $4.00 per cubic yard).

**A $10.00 rebate is given for loads properly secured in accordance with County Ordinance 13.36.040.*

Special Waste Collections

The Hazardous Waste Facility at Knott Landfill accepts a wide variety of hazardous waste, including paints and stains, solvents, fuels, antifreeze, aerosols, cleaners, poisons, pesticides, herbicides, fertilizers, oil filters, rechargeable batteries, fluorescent tubes and bulbs, propane tanks, pool and spa chemicals, thermometers, mercury thermostats and switches, etc.

HHW is accepted free of charge from residential users at the Knott Landfill Hazardous Waste Facility. The HHW Facility is open from 9:00 a.m. to 3:00 p.m. on the second and fourth Friday and Saturday of each month. For the months of November and December, the facility is open on the 2nd Friday and Saturday only.

Business Hazardous Waste is also accepted at the Hazardous Waste Facility from businesses regulated as Conditionally Exempt Hazardous Waste Generators (CEG). To qualify as a CEG, the business cannot generate more than 220 pounds of hazardous waste per month. CEGs must pre-register with the hazardous waste contractor by completing an application to participate. Fees are charged based on the type and amount of waste accepted.

Commercial and Multifamily Collection

There are an estimated 6,500 businesses and 30,000 multifamily households in Deschutes County.[33] Similar to curbside service, franchised haulers offer commercial and multifamily solid waste and recycling collection services upon request in their geographic service areas based on the maximum rates noted above. Some businesses have also requested food waste collection for vegetative material. Approximately 85 businesses at present are managing food waste in this manner. An estimated range of 75% to 95% businesses in the County have recycling services depending on the area. Multifamily properties are offering curbside services to their tenants. Food waste is delivered to the compost facility at Knott Landfill.

Summary of Franchised Hauler Collection

Table 4-2 presents the 2014-2016 tons of commingled recyclables collected by the franchised haulers from residential accounts. Note that of the approximately 80,000 tons of recycling reported to DEQ, franchised collection represents approximately 16 percent of recycling collection (13,017 tons).

[33] https://www.huduser.gov/publications/pdf/BendOR_comp_15.pdf

Table 4-2 Deschutes County Commingled Recyclables Collected by Franchised Haulers 2014-2016 (Tons)

Franchised Hauler	2014	2015	2016
Bend Garbage and Recycling	4,289	4,480	4,753
Cascade Disposal	4,450	4,658	4,805
High Country Disposal	3,225	3,318	3,409
Wilderness Garbage and Recycling	54	58	50
Total	**12,018**	**12,514**	**13,017**

In 2016, there was an approximate 8% increase in the amount of commingled recyclables collected in the County. Cascade Disposal and Bend Garbage and Recycling remained the leaders in collection of these materials, displaying a growth rate of 11% and 8% in this category respectively. High Country Disposal's growth was around 5% during this time while Wilderness Garbage and Recycling's collection rate fluctuated, maintaining an average of 54 tons per year.

Table 4-3 presents the 2014-2016 tons of source-separated/commercial recyclables collected by the franchised haulers. This adds another 10,602 tons to the 13,017 commingled tons reported in Table 4-2, for a total of 23,619 tons, representing 30 percent of all recycling reported in Deschutes County for 2016.

Table 4-3 Total Commercial Recyclable Material Collected by Haulers 2014-2016 (Tons)

Franchised Hauler	2014	2015	2016
Bend Garbage and Recycling	3,689	3,875	4,086
Cascade Disposal	3,198	3,608	4,165
High Country Disposal	2,067	2,319	2,124
Wilderness Garbage and Recycling	209	195	226
Total	**9,163**	**9,998**	**10,601**

4.2.2 Processing

DSW owns and operates Knott Landfill, which is the only operating landfill in the County. Knott Landfill also serves as a recycling drop-off location and houses the HHW

drop-off site and compost facility. Deschutes Recycling manages the recycling drop-off center and composting operations. In addition, the County manages four transfer stations: Negus Transfer Station, Northwest Transfer Station, Southwest Transfer Station, and Alfalfa Transfer Station. Addresses, hours of operation, and materials accepted at each of these facilities are listed in Table 4-4.

Table 4-4 Solid Waste Facilities in Deschutes County

Name	Address	Operating Hours	Accepted Materials
Knott Landfill	61050 SE 27th Street Bend, OR 97702	Nov. 1–Apr. 30 Monday–Saturday 7am-4:30pm May 1–Oct. 31 Sunday–Saturday 7am-5pm	MSW, C/D debris, asbestos, contaminated soil
Knott Landfill Recycling Center (operated by Deschutes Recycling)	61050 SE 27th Street Bend, OR 97702	Nov. 1–Apr. 30 Monday–Saturday 7am-4:30pm May 1–Oct. 31: Sunday–Saturday 7am-5pm	Commingled recyclables, cardboard, glass, paints and stains, auto batteries, motor oil, scrap metal, appliances, tires, electronic waste, wood waste, yard waste, and cooking oil
Knott Landfill Hazardous Waste Facility	61050 SE 27th Street Bend, OR 97702	2nd and 4th Friday and Saturday of month 9am-3pm (2nd Friday and Saturday of month in November and December)	Paints, stains, fuels, aerosols, cleaning supplies, pesticides, fertilizer, batteries, fluorescent tubes and bulbs, pool and spa chemicals, thermometers, propane tanks, fireworks, ammunition, residential sharps (hypodermic needles, lancets)
Knott Landfill Compost Facility (Operated by Deschutes Recycling)	61050 SE 27th Street Bend, OR 97702	May 1–October 31: Monday–Sunday 7am–5pm November 1–April 30: Sunday-Saturday 7am–4:30pm	Yard debris, clean wood waste, sod, clean dirt, residential and commercial program food waste only.

Name	Address	Operating Hours	Accepted Materials
Negus Transfer Station & Recycling Center	2400 NE Maple Avenue Redmond, OR 97756	Monday – Saturday 8am – 4pm	MSW, C/D debris, commingled recyclables, cardboard, glass, auto batteries, motor oil, scrap metal, appliances, tires, electronic waste, wood waste, yard debris
Northwest Transfer Station & Recycling Center	68200 Fryrear Road Sisters, OR 97759	Wednesday-Saturday 8am-4pm	MSW, C/D debris, commingled recyclables, cardboard, glass, auto batteries, motor oil, scrap metal, appliances, tires, electronic waste, yard debris
Southwest Transfer Station	54580 Highway 97 La Pine, OR 97739	Wednesday-Saturday 8am-4pm	MSW, C/D debris, commingled recyclables, cardboard, glass, auto batteries, motor oil, scrap metal, appliances, tires, electronic waste, yard debris
Alfalfa Transfer Station and Recycling Center	Walker Road, Alfalfa, OR 97701	Saturday 8:00 a.m.-4:00 p.m.	MSW, commingled recyclables, glass, auto batteries, motor oil, scrap metal, tires, electronic waste

As a supplement to residential and commercial collection service, each of the transfer stations in the County is also equipped with a recycling drop-off center. All transfer stations accept commingled recyclables, cardboard, glass, auto batteries, motor oil, scrap metal and electronic waste free of charge. Tires are accepted for a fee at all County facilities. Appliances are accepted for a fee at all County facilities with the exception of the Alfalfa Transfer Station.

The following items are not accepted at any of the County's transfer stations:

- Inert materials such as dirt, sod, concrete, rocks, and bricks*
- Hazardous materials
- Liquids
- Manure
- Ashes
- Asbestos
- Bulky items

*These materials are accepted at Negus Transfer Station

Other recyclables that are accepted for free at every disposal site but cannot be commingled include:

- Automotive batteries
- Barbeques (separated from gas tanks)
- Corrugated cardboard
- Glass bottles and jars
- Lawnmowers (fuel and oil must be drained)
- Motor oil
- Propane tanks
- Scrap metal

Recyclables

For recyclables processing in Deschutes County, franchised collection companies deliver commingled recyclables and glass directly to Mid-Oregon Recycling (located at 20835 NE Montana Way, Bend). Mid-Oregon Recycling is owned and operated by Bend Garbage and Recycling. This facility also receives recyclables (cardboard, glass and commingled materials) that are collected at the County's transfer stations and the recycling center at Knott Landfill. Mid-Oregon Recycling essentially functions as a transfer station and does not process recyclable materials. Rather, recyclables such as cardboard and commingled materials are baled and transported to material recovery facilities in the Portland area and the Willamette Valley. Presently some materials are being transferred to Pioneer Recycling Services located at 16810 SE 120th Ave, Clackamas, OR 97015. Glass is being taken to a recycling facility in Portland.

Figure 4-4: View of the Truck Entrance at Mid-Oregon Recycling

Chapter 4

Markets for Recycled Materials

Since curbside collection of source separated materials was universally established in Oregon in 1985, markets have continued to evolve and grow significantly in both the United States and abroad. Commingled materials collected from curbside programs include paper products such as corrugated cardboard, newspaper, mixed paper and various grades of plastics as well as tin and aluminum cans. Also, glass is collected and separated in bins or at drop off sites.

China, more than any other country, has been the largest purchaser of recyclable materials from processors. Recently, China has initiated a new policy to require all recyclable materials contain less than 0.5% contamination (called the National Sword). This stringent requirement more or less restricts most materials from entering China markets. As a result, there is a glut of recyclable paper products on the market. This has caused the market price for mixed paper to fall to less than $20 per ton in early 2018. Most recycling companies can tolerate fluctuating market prices. However, the disruption in markets caused by China's new policies are unusually severe, which may lead to franchised haulers needing to increase program prices. With the significant reduction in the price for paper coupled with lower demand that may continue, processors may not be able to weather these conditions.

In Deschutes County, the cost to collect, transport, process and ship recyclable materials to markets is built into the current collection rates. However, franchised collection companies rely on a certain amount of revenue for recycled materials.[34] Without dependable and robust market prices, many jurisdictions in Oregon and elsewhere are evaluating options ranging from temporarily landfilling recyclable materials, to levying a temporary surcharge, to discontinuing collection services for recyclable materials. As of March 2018, DEQ granted waivers to at least 12 franchised haulers and/or jurisdictions to temporarily dispose of materials because of financial hardships due to current market conditions[35]. Like Deschutes County, many of these communities must transport recyclable materials long distances to be processed and then shipped to markets.

The County and cities must work with the local franchised collection companies and Mid-Oregon Recycling to determine what actions might be taken to address this temporary condition. It is desirable to consider those options that continue curbside collection to existing customers. Although it is also desirable to expand programs to recycle more materials from multifamily and commercial customers, it may be necessary to delay expansion of such collection services until these market conditions improve.

This is truly an unprecedented time in Oregon and nationwide recycling history. Based on the analysis by Dr. Jeffery Morris of Sound Resource Group, Inc., it seems that the effect of China's new more stringent policies on recyclables should have a limited impact on recyclable paper markets in Oregon as India has developed into a significant trading partner with brokers in the Pacific Northwest for this material. Although the

[34] Since 2013, net revenue from all recyclables collected has been negative. Prior to 2013, with the exception of 2009, there had been commodity revenue to help offset collection costs.
[35] http://www.oregon.gov/deq/FilterDocs/mm-disposalconcurr.pdf

global market suffers whenever a major trading partner like China is eliminated, subsequently reducing demand for recycled commodities across the board, the impact on certain material streams will vary depending on how substantially they are traded with China relative to other countries.

Overall, the industry advocates that local governments take a long-term view of market conditions. Historically, there have been disruptions and large fluctuations in prices. The fact that there is great stability in the collection of recyclable materials provides a steady supply of materials, and there is demand for these materials in the United States and internationally. The largest challenge is reducing the amount of contamination in the various recyclable materials recovered from collection programs and Material Recovery Facilities (MRFs) to meet market specifications so these materials can be used effectively to make new products.

C/D Waste

It is estimated that about 30% of materials entering Knott Landfill are C/D waste. Presently, inert material (soil, rock, concrete, asphalt, etc.) can be taken to an inert fill site at the Negus Transfer Station in Redmond. Clean, unpainted and untreated wood waste can be taken to Deschutes Recycling and Negus Transfer Station for off-site use as boiler fuel and remanufactured wood products. However, there is no dedicated C/D landfill in the County and, with the exception of the clean fill and clean wood waste options noted above, these wastes must be disposed at Knott Landfill.

There is no information available on the composition of C/D waste disposed at Knott Landfill. Data from the Monterey Regional Waste Management District (District) is shown below in Table 4-5. The District has some characteristics similar to Deschutes County in that most C/D waste is generated by the housing market and the area experiences a strong tourism industry and turnover from rentals and new ownership. It also serves a similar population.

(Intentionally Left Blank)

Table 4-5 C/D Composition Data from Monterey Regional Waste Management District

Construction/ Demolition Composition Data		
Total C/D Waste Accepted - 70,000 TPY	**Average Available Materials to Recover**	
Goal is ≥ 70% Recovery	**Tons/Year**	**%**
Salvaged Materials for Reuse	632	0.9%
Rigid Plastics	1,417	2.0%
Aluminum Scrap	165	0.2%
Cardboard	1,517	2.2%
Co-mingled Containers	292	0.4%
Wood /Green Waste	12,116	17.5%
Metal Scrap	3,553	5.1%
Mixed Paper	1,313	1.9%
Total Re-sellable	**21,005**	**30.2%**
Asphalt /Concrete	2,498	3.60%
Hazardous Waste	7	0.0%
Mattresses /Carpets / Pads	275	0.4%
Sheetrock	149	0.2%
Roofing Material	505	0.7%
Tires	79	0.1%
Inerts and fines (Alternative Daily Cover)	23,909	34.5%
Total Non-Re-Sellable	27,422	
Adjustment to Non-Resellable	6,897	
Total Sort Line Diversion	55,324	79.8%
Landfill /Residue	14,046	
Total Material Processed	69,370	

This data suggests that as much as 30% of C/D waste is recyclable materials. Also, the District operates a processing line that recovers inert materials and fines. The District uses this material as landfill alternative daily cover, thus reducing the need for clean soil to provide daily cover for use at its landfill.

Yard Waste/Food Waste

Curbside collection of yard waste and vegetative food waste on a subscription basis is provided by the franchised hauling companies who deliver the material to the Knott Landfill compost facility.

Negus, Northwest and Southwest transfer stations accept yard waste from the self-haul public. This material is ground several times per year and transported to Knott Landfill for use as alternative daily cover.

Self-haul customers can also bring yard waste to Deschutes Recycling's compost facility at Knott Landfill where fees are charged at a volume-based rate (presently $4.00 per cubic yard). Rock, contaminated dirt, residential waste, plastic bags and other non-vegetative materials are not permitted at the compost facility. Deschutes Recycling is a member of the U.S. Composting Council and adheres to the standards listed in their Seal of Testing Approval Program to ensure quality compost output.

Deschutes Recycling provides a promotional brochure (see Figure 4-5) which includes information about their various compost products.

Figure 4-5: Outside Page of Deschutes Recycling Customer Compost Tri-Fold Brochure

Changing from turned windrow composting to aerated static piles has decreased the processing time to approximately six weeks at Deschutes Recycling. Piles are temperature and moisture monitored. Compost products from the Deschutes Recycling facility are sold to the County, local retailers and residents.

The following products are offered:

- SoilBuilder® Compost (5/8" screen)
- BioFine® Compost (3/8" screen)
- ReGrow® Compost (3/8" screen and contains composted food waste)
- Ground Cover

In 2016, Deschutes Recycling processed approximately 20,000 tons of yard waste, food waste and wood waste.

At the Lake Penhollow composting site, owned and operated by Sunriver Environmental LLC, under Sunriver Resort Limited Partnership, yard debris (grass, pine needles, leaves, brush, limbs and tree materials) is accepted, for a fee ($5/yard), and compost, wood chips and mulch are sold at the facility.[36] Utilizing an AgBag system for composting, the site serves the Sunriver, Crosswater, Caldera Springs and Vandevert Ranch communities of Central Oregon, and is open 25 hours per week, May through September, two hours per week in October, and is closed from November through April.

Food Waste

As presented in Table 2-13 in Chapter 2, it is estimated that about 42% of all waste disposed in landfills is made up of organics (food waste, wood, yard debris, soiled paper and miscellaneous items), of which over 50% is food waste. Overall, food waste represents 24% of all waste disposed. This information was been confirmed by the results of the recently published Waste Composition Report (2016-17) issued by DEQ in February 2018. The report contains additional details related to the sources and types of food waste disposed. Table 4-6 below presents the food waste data gathered by DEQ in 2016-17.

Table 4-6 Food Waste Disposed 2016-2017

	Residential	Commercial
All Food	**23.4%**	**24.6%**
Non-Packaging		
Vegetative Food	12%	13%
Non-Vegetative (Meats /Dairy)	3%	4%
Other Food /Packaging	8.4%	7.6%

The data show on a statewide basis that food waste is about 24% of waste disposed by both residential and commercial customers. Also, the largest amount of food waste is categorized as non-packaged vegetative waste. This food waste category is what franchised collection companies are targeting to have residential customers place in with their yard waste. This material can then be processed at the Knott Landfill compost facility. In 2017, approximately 1,000 tons of food waste was collected and composted. However, as the data in Table 4-6 suggests, about 13% of all waste disposed or 23,000 tons in 2017 is non-packaged vegetative waste. Expanding food waste collection could be a potential program to increase the County's recovery rate.

[36] https://www.sunriverwater.com/Compost-Site.html

The other food waste categories include non-packaged, non-vegetative waste which includes dairy products and meat. In Marion County and Portland, these wastes are also accepted because the facilities have been approved to compost these categories of food waste. Before these wastes can be accepted at the Knott Landfill compost facility, the compost methods would need to be refined and the DEQ permit would need to be revised.

4.3 Needs and Opportunities for Collection and Recycling/Processing

Following the review of collection and recycling/processing activities taking place in Deschutes County, the following needs and opportunities are evident.

Target Certain Types of Generators or Waste Streams to Increase Diversion by Expanding Basic Services

a) Expand collection of cardboard and scrap metal in the commercial and multifamily waste streams – In order to reach the DEQ target of 55% recycling in the commercial sector, Deschutes County needs to develop a commercial outreach and implementation program. Both of these commodities have an enduring market value and present great opportunity for targeted diversion from commercial and multifamily customers.

b) Expand residential curbside services – Currently, curbside collection of commingled recyclable materials is offered in the cities and urbanized portions of the County. These collection programs can be expanded to serve rural areas. Likewise, yard waste/food waste and glass are not currently offered consistently in the rural areas. In Bend and Redmond where yard debris service is available, it is offered on a subscription-only basis. All customers in Sisters have yard debris service. Consideration of making recycling and yard debris service universal within the County-wide rate structures could be advantageous for meeting recycling goals and creating the most efficient routing.

c) Expand the multifamily housing recycling program – More infill and multifamily dwelling units are being built to accommodate growth in the County and DEQ is requiring that all tenants have recycling services by 2022. Developing a focused education/promotion program in conjunction with enhanced methods to provide convenient services could contribute to achieving the County's recovery rate. This alternative has some key elements that are important to enhance the opportunity to make multifamily recycling successful.

    1. Multifamily complexes must provide space to temporarily store recyclable materials generated by the individual units. These spaces must contain and secure materials and provide easy access for collection companies. To achieve this, design guidelines in the cities and County must be standardized to provide both space for containers and room for trucks to service solid waste, recycling and compost bins/carts.

2. Regular educational materials will need to be distributed to inform existing and new tenants of recycling and waste reduction programs.
3. It is desirable to have some form of incentive built into the rates. Most complexes offer garbage service as part of the rent. Therefore, tenants are not typically incentivized.

d) Expand tourism recycling opportunities – The significant tourism industry in Deschutes County makes it necessary to focus on hotel and tourist destinations in order to meet recycling goals. Tourists outnumber residents in the County every month of the year. There are a variety of programs that can be explored including the tie-in with any new food waste program since restaurants serve visitors extensively. In addition, targeted business outreach to hotels and destinations for business technical assistance and recognition, as discussed in Chapter 3, is imperative.

Adjust Rates to Impact Behavior Changes and Fund Program Expansion

As presented in Table 4-7, Deschutes County has set maximum rates that franchised haulers can charge for curbside waste and recycling collection, which is based on the volume of a household's refuse cart. For example, a 35-gallon cart can range from $17.75 to $18.40 per month for collection (solid waste and recycling), but a larger cart comes with an increased collection cost. This is one mechanism through which the County can attempt to impact behavior change among residents. Increasing the cost of waste disposal with additional waste generated can have the effect of discouraging excess waste generation. In addition, offering similar disposal options for free or at a reduced rate generally motivates a household to utilize these services as well.

Rate incentive programs can work symbiotically if well designed. For instance, adjusting collection fees such that they rise equally or greater than the marginal difference between the volume of a 35-gallon container and a 65-gallon container will have a greater impact than simply raising the monthly collection rate by an arbitrary amount as container size increases.

(Intentionally Left Blank)

Table 4-7 Can and Roll Cart Service Rates – As of January 2010

Cart Volume	Rates for Weekly Pickup	Cost per unit ($/gallon)
20 Gallon		
Curb or roadside	$15.45	$0.77
Backyard or other	$17.55	$0.88
35 Gallon		
Curb or roadside	$17.75	$0.51
Backyard or other	$20.15	$0.58
65 Gallon		
Curb or roadside	$29.20	$0.45
Backyard or other	$33.80	$0.52
95 Gallon		
Curb or roadside	$36.65	$0.39
Backyard or other	$39.55	$0.42

At present, a 35-gallon container has a monthly cost of $17.75, meaning that the price of waste collection for a single family using a 35-gallon trash container is $0.51 per gallon. However, the monthly cost for a household with a 65-gallon container, 85% larger than the 35-gallon can, is $29.20. This translates to $0.45 per gallon, a per gallon rate that is approximately 12% less expensive than having a smaller cart. The County's current rate structure does have an incentive built in for smaller containers. Some cities use weight basis for setting rates and have resulting rates wherein a 65-gallon container costs twice as much as a 35-gallon, as in Seattle, Washington.

Adjusting rates so they better reflect the environmental costs of waste generation given the economic costs of collection will generate more revenue for DSW. Additionally, it is well-documented that raising the costs of garbage collection relative to the generation of garbage, while also offering recycling and yard waste disposal options, has the effect of increasing diversion from landfills and reducing waste generation overall.[37,38,39]

[37]Dijkgraaf E, Gradus R. (2009). Environmental activism and dynamics of unit-based pricing systems. Resource and Energy Economics, **31**, 13-23
[38] Ferrara I, Missios P. (2005). Recycling and Waste Diversion Effectiveness: Evidence from Canada. Environmental and Resource Economics, **30**, 221-238.
[39] Pickin J. (2008) Unit pricing of household garbage in Melbourne: improving welfare, reducing garbage, or neither? Waste Management and Research, **26,** 508-514

Target Recovery of New Materials

a) Divert More Dry Waste Materials for Processing at a MRF

This would require commercial businesses to separate food waste from dry, non-organic waste. The dry waste may be acceptable for processing along with the residential curbside materials at a MRF.

b) Focus on Food Waste[40]

Recent waste composition data published by DEQ shows that approximately 45% of materials disposed in Oregon landfills is comprised of organic material such as food waste, compostable paper, yard debris and wood waste. Food waste represents about 50% of all organics or 24% of the entire waste stream disposed. In 2017, 181,000 tons of waste was disposed at Knott and 43,000 tons of that waste was food waste. DEQ's 2016 statewide waste composition report indicates that half of food waste is not packaged (per DEQ waste sort categories), making it easier to collect since there is no plastic packaging to remove. According to the study, residential waste and commercial waste contain about the same amount of food waste on a statewide basis. This could vary in different wastesheds, and, perhaps due to the higher rate of tourism in Deschutes County, the commercial waste stream may contain a higher amount of food waste. However, for the sake of this evaluation it is assumed that both residential and commercial have similar percentages of food waste.

- Expand Residential Food Waste Recycling Program

  Based on DEQ's waste composition data, there may be as much as 21,500 tons of food waste in the residential stream. If more customers participate in placing food scraps in with yard waste, the material can be delivered to the compost facility instead of the landfill. As more food waste is received for composting at Knott Landfill, improvements to the compost facilities will be needed to more efficiently process the additional materials. With subscription-only yard debris program to which residents can add vegetative food waste, there is a great opportunity in Deschutes County for expansion by making yard debris part of universal service for all residents.

- Expand the Commercial Food Waste Recycling Program

  It is estimated that 21,500 tons of food waste is disposed by commercial customers at Knott Landfill. Expanding the commercial food waste program to more restaurants, cafeterias and other large

[40] In all organics program discussions, the Department of Solid Waste should consider connections to the City of Bend's current anaerobic digestion interest at the wastewater treatment plant.

generators can result in increasing the recovery rates and reducing what is disposed in the landfill. To do this will require programmatic changes to increase business technical assistance. The County is well poised to expand its current work with The Environmental Center and other organizations to increase investment in program design and deployment. The additional facility needs for organics are discussed below.

c) Consider a Textile Recycling Program

Textiles comprise part of the 4,800 tons of "other materials" disposed in Deschutes County in 2016, as presented in Table 2-13. Programs for textile recycling have wide public appeal and can be curbside or drop-off programs. In 2001, Fauquier County, VA became one of the first municipalities in the United States with a wide-scale municipal textile recycling program. In its first three years, approximately 125 tons of post-consumer textile waste (PCTW) per year were collected, generating more than $115,000 in revenue at market prices. From an industry report at that time, it was noted that PCTW was one of Fauquier County's highest recyclable revenue generators and resulted in a 10% decrease in overall recycling costs.[41] A textile program can be explored with local organizations such as Salvation Army and Goodwill.

The Secondary Materials and Recycled Textiles (SMART) Association is the organization of Wiping Materials, Used Clothing and Fiber Industries, operating since 1932. SMART maintains a searchable database by product category and state for textile collection programs.[42]

d) Investigate the C/D stream and target certain materials such as wood, metals and fibers

It appears that perhaps as much as 30% of the waste disposed at Knott Landfill is generated from C/D activities. Developing alternatives for recovering more materials and locating a separate disposal site for inert materials and C/D could increase the site life of the Knott Landfill if implemented in the near future. It may also provide long-term benefits to the system by avoiding the transportation to a disposal site located further from where C/D is generated.

It is critical that the County improve their efforts to divert C/D debris from the landfill. C/D debris is generally much heavier than MSW on a volumetric basis, and wood waste accounts for 10% of materials disposed.[43] In addition to composing a significant portion of the County waste stream, C/D debris is often larger and more difficult to compact. As such, it occupies valuable space in Knott Landfill. As mentioned in Element L in Table 3-2, DEQ offers an approach that could help the County divert C/D from Knott Landfill, which

[41] http://www.aiswmd.org/Resources/Documents/Textiles.pdf
[42] https://www.smartasn.org/
[43] See Table 2-13

will likely extend the life of the landfill and enhance the recyclables recovery rate. Techniques can include differential tipping fees at the landfill for C/D loads as well as adding a C/D processing line, discussed in more detail below.

One immediate recommendation is that DSW begin to track incoming C/D at its facilities to determine a more accurate estimate of its tonnage. However, assuming the 45,000 tons estimate is accurate, this may not be enough C/D material to justify a full-sized permanent processing facility. There are smaller, portable, manual picking lines specifically made for C/D recovery that may work well for this application. A picture of such a unit is shown in Figure 4-6. Portability may also be a benefit as DSW can experiment with its location within the County to target areas of substantial C/D activity.

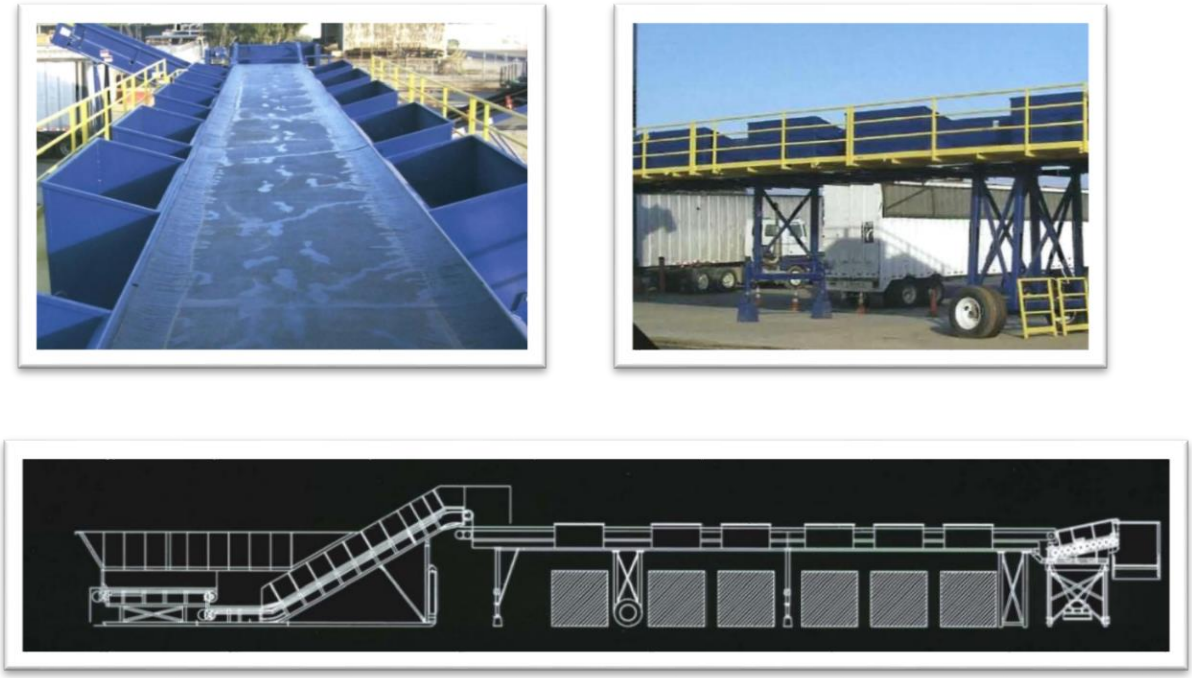


Figure 4-6: Example of a Portable C/D System
Source: Krause Manufacturing

Once the best location is determined and the actual amount of C/D materials is known, either incoming at the Knott Landfill or available in the region, a more permanent solution should be pursued. This could include DSW owning and operating its own C/D processing line at Knott Landfill, or establishing a public-private partnership with a private entity, wherein County land is utilized and leased for a given term to a private processor, giving the County a preferable rate for C/D processing.

A recovery line to remove fines and inert materials would allow for automated recovery of ferrous materials and manual recovery of OCC, wood, and non-ferrous metals. At the facility shown in Figure 4-7, trucks dump on the right side of the facility and C/D material is processed from right to left. To begin

processing, an excavator pre-sorts bulk items and feeds the balance of the piled C/D waste onto an apron conveyor which is elevated by an incline conveyor. Material drops onto a finger screen separating up to 8-inch sized material to be processed by magnet, star screen and manual sorting. Larger (8-inch plus) material proceeds along the conveyor to be manually processed and dropped into underlying bunkers or containers and hauled for marketing. The facility shown has a grinding operation for residuals, and an area where reusable building materials are segregated for donation to a local charitable building reuse center.

Figure 4-7: Example C/D Processing Infrastructure
Source: Fauquier County, VA

The facility depicted in Figure 4-7 was constructed in 2006 for a total cost of $4.5 million, including site work and bringing power to the site, and was designed to process 70 tons/hour (approximately 500 tons per day). Recovery of materials from new construction commonly ranges from 50-60%, and recovery from demolition projects varies up to approximately 50% depending on the type and quality of delivered materials. The facility has been able to support companies looking to construct Leadership in Energy and Environmental Design (LEED) certified buildings, as they can acquire LEED points by containerizing and hauling mixed C/D wastes to this facility. Many full-scale C/D systems are capable of processing more than 100,000 tons per year, so it is important to thoroughly understand the tonnage of C/D material generated in the region that can be diverted to such a facility before developing a permanent facility.

Processing Alternatives for Recycling Services

Currently, recyclable materials collected from curbside programs in Deschutes County are delivered to Mid-Oregon Recycling in Bend. Materials are reloaded and transported

to recycling facilities in the Willamette Valley and Portland area. Over the past three years, Mid-Oregon Recycling has shipped approximately 13,000 tons per year of baled residential commingled recyclables. Although market prices fluctuate, for the most part they were sufficient to pay the cost of transportation and process the materials.[44] There are at least six MRFs in Portland that can handle the County's commingled materials. Having several MRFs vying for materials provides competition such that Mid-Oregon Recycling can negotiate for these services as needed.

The key factor for securing the best market price is largely dependent on the quality of the materials being collected and the capability of the MRF to process the materials and meet specifications. One challenge the MRFs in Oregon have is ability to process commingled materials cost effectively and meet these specifications. As a result, Portland Metro is in the process of adopting new regulations aimed at setting minimum performance standards for MRFs. This is expected to result in MRF owners making investments in advanced processing technology to enhance the efficiency of operations and improve the quality of the materials recovered. Since a majority of the recyclable materials collected in the State are processed in Portland, outlying counties like Deschutes will most likely incur higher cost for processing recyclable materials due to transportation costs.

At this time, the County must wait to see what new regulations will be imposed and what the effects will be on processing and marketing costs. Of the total 2.2 million tons of recyclable materials collected in the State of Oregon in 2016, it is estimated that 400,000 tons of commingled recyclable materials were processed. Because these materials contain less than 10% residue that is landfilled, the high quality ensures that surely once again, there will be processers and markets for the materials.

Build a MRF in Deschutes County

The County and its collection companies must rely on MRFs that are located in Portland or the Willamette Valley. One option is to consider building a MRF to process waste streams to recover materials in Deschutes County. There are two concepts that might be considered. One is to build a MRF that can process the commingled single streams collected from residential, multifamily and participating commercial customers. The second is to build an integrated mixed waste/commingled process line.

Build a Commingled/Single Stream MRF

The MRF technology used to process commingled recyclables from residential and commercial customers has continued to evolve over the past 25 years. Single stream processing systems still include conveyors, screens, magnets, and eddy current separators to separate containers and paper and recover materials. Whereas most older systems relied on manual sorting to pick recyclables or remove contaminants, new MRF technology has adapted to more reliable automated processing. Also, new screening equipment is designed to reduce plugging and wrapping from plastics, wire, cables, etc., and can be easily maintained.

[44] Since 2013, net revenue from all recyclables collected has been negative. Prior to 2013, with the exception of 2009, there had been commodity revenue to help offset collection costs.

Advances are continually being made and new technologies developed to increase separation efficiencies and reduce labor costs. One such technology is optical sorters, which identify different grades of paper or various resin types in plastic and can instantly separate these from the other materials. Air density and flexibility separators are also used to sort two-dimensional and three-dimensional items. Figure 4-8 depicts key components of a typical MRF processing line.

Deschutes County is currently collecting 13,000 tons per year of commingled materials. Based on recent feasibility studies, the cost of equipment for a smaller MRF processing system is estimated to cost between $5 million and $7 million. When added to the cost of the building to house the system, estimated to be $12 million, the total capital outlay is about $17 million to $20 million. It may be possible to use existing structures to reduce the capital outlay.

In one recent study, the annual operating expense to process 20,000 tons including capitalized expenses (debt services) was $143 per ton. To process less waste would only increase this cost. The study concluded that to break even, considering average revenue for sales of materials of about $110 per ton, the MRF would need to process at least 30,000 tons of commingled materials annually, or more than twice as much as currently collected in the County.[45]

The benefits of processing materials in the County include providing more control over the system to supply materials that meet market conditions and creating local jobs to keep dollars within the County borders. However, materials would still need to be transported to markets or to an intermediate processor to consolidate for shipping. Thus, no transportation cost savings would be realized under this approach. In addition, the County and service providers would assume all market risk.

Build an Integrated Mixed Waste/Commingled MRF

An integrated mixed waste MRF system is designed to process both commingled single-stream recyclables and mixed waste. The mixed waste MRF system would use many of the same components as does a commingled or single stream recovery system. The main difference is that the integrated line would include additional screening in the front end designed to remove the wet organics fraction from the mixed waste stream. In a typical commingled waste stream, the amount of organics in the waste stream is minimal or none, so including screens to remove organics is unnecessary. However, in a mixed waste MRF, the waste streams have a significant amount of organics (estimated to be between 25% and 35%) that must be removed in the initial screening process to avoid contamination to fibers and containers that have a higher market value. Figure 4-8 also shows a typical mixed waste MRF with organics being removed immediately after the pre-sort screen.

[45] This does not include additional commercial source-separated recycling tons from the franchised haulers which could also be processed.

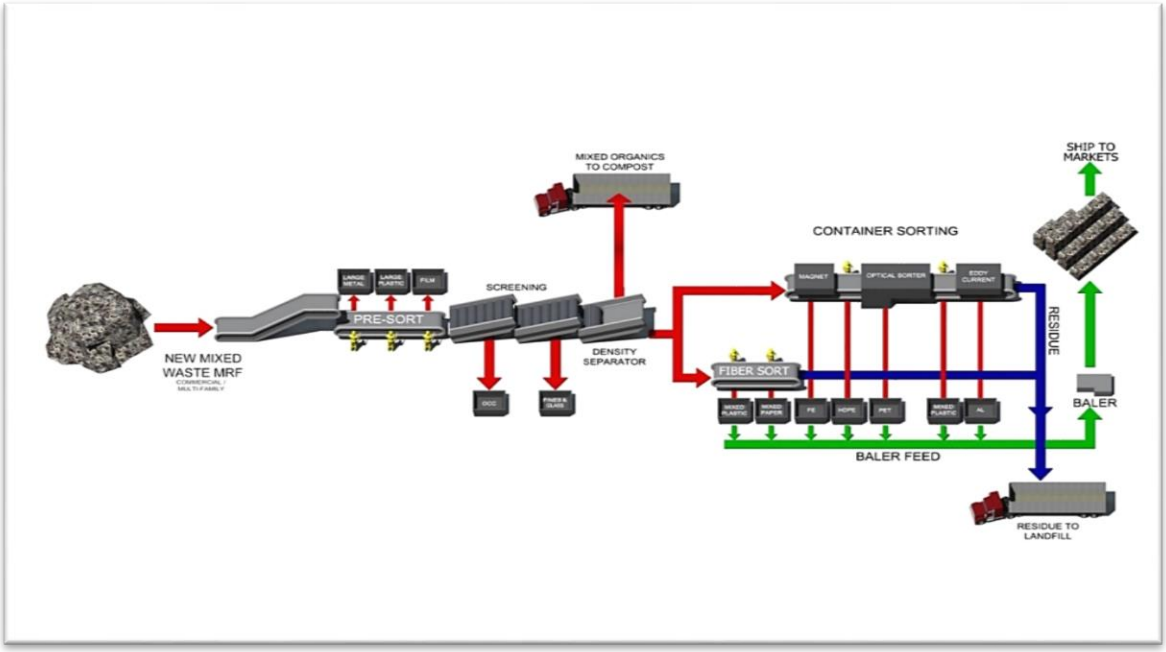


Figure 4-8: Integrated Mixed Waste and Commingled Conceptual Process Line

Some mixed waste MRFs are designed to remove the dense fines made up of food waste and wet mixed organic materials prior to the pre-sort. By removing the heavy organic fraction first, the material on the sort line is less dense, making it easier for sorters to remove larger items such as metal, wood, or other bulky items. It also improves the screens' ability to separate containers from paper, minimizing contamination and improving the ability for optical equipment to read the signatures of materials.

The industry has increased its interest in integrated mixed waste process lines to process more materials for several reasons. First, legislation is demanding higher recovery rates and targeting the commercial waste streams, which typically have appreciable quantities of paper and plastics that can be recovered. Second, the advanced mechanical and optical technology available today greatly reduces labor cost and is more reliable for producing quality materials. Third, advanced technology equipment increases the throughput or capacity of the system. This increased throughput rate or capacity allows more materials to be processed. As a result, mixed commercial and multifamily waste can be processed. There are a number of advanced mixed wastes MRFs operating in California and several more being planned.

For this option, the County could build an integrated mixed waste MRF to process the 13,000 tons of commingled materials plus commercial and multifamily wastes. Recent waste composition data from DEQ suggest that these waste streams contain about 25% of recyclable materials such as OCC, clean paper, plastics and metals. In Deschutes County, about 60,000 tons of commercial and multi-family waste was collected in 2016. This assumes that roughly half of all waste collected is from these generators. It would result in potentially recovering approximately 15,000 tons of

recyclable materials. Considering the mixed waste MRF may recover 80% of available materials, this would yield 12,000 tons of additional recovered materials. This is a conservative estimate since more advanced equipment can recover a higher percentage of these materials.

The cost of the equipment for a large mixed waste MRF processing system is estimated to be between $12 million and $15 million (in 2018 dollars). Also, the cost of the building is estimated to be closer to $24 million because the larger structure needed to receive and process more materials as well as house extensive equipment needed. The annualized debt service from an integrated mixed waste MRF would be $3.2 million. Operating cost may range from $4 million to $5 million annually. Total annual operating costs would average about $8 million to process 60,000 tons of commercial waste and 13,000 tons of commingled recyclables. The total unit cost is estimated to be about $110 per ton. This does include cost of disposal of the roughly 49,000 tons of residues from the MRF.

Revenue from the sale of materials would vary based on market conditions. The average market price for materials is about $50 per ton in February 2018. It should be recognized that revenue from the sale of recyclables from mixed waste will bring lower revenues typically than if derived from source separated materials. This does not include cost to deliver to markets.

This option is one approach towards increasing the recovery of materials and reducing waste disposed in landfills. However, with the cost to transport to markets and, as long as there is landfill capacity in the County, it does not appear to the best use of financial resources to build an integrated mixed waste MRF at this time. In the future, if the County were to dispose of waste out-of-County, this option may be considered.

Explore Composting Options[46]

Deschutes County could generate an additional 20,000 to 30,000 tons per year of mixed organic materials that would be delivered to a central compost facility. The material would be generated from two sources. About 10,000 tons per year would be comprised of the mixed organic fraction separated from residential and commercial waste processed at an integrated mixed waste MRF if it were built. Another 20,000 tons per year would be concentrated food waste collected by the franchised haulers from select commercial generators. The result is that 120 tons per day of mixed organics are expected to be delivered to the compost facility.

The material delivered to the compost facility will contain a certain level of contaminants that are not desirable for composting. To remove the primary contaminants, it is assumed some level of pre-processing will be needed. This system will vary depending on the characteristics of the materials being delivered. For the purpose of developing a conceptual plan and cost estimate, the pre-processing system will include the following:

[46] The Department of Solid Waste should align with the City of Bend wastewater treatment plant/brewery waste conversation underway now, including anaerobic digestion of the brewery spent grains with sewer waste.

1. In-feed conveyor
2. Presort station (manual sorting) to remove larger plastics, metal and other larger items
3. A screen or trommel to screen fines (2" to 4") from large items; mostly plastics and larger fiber

The larger items removed are expected to be landfilled but would most likely contain high BTU byproducts that could have energy value, which may be diverted if a waste-to-energy facility (WTEF) is available.

It is expected that organic materials delivered from the integrated mixed waste MRF will be largely glass-free as the system is assumed to have a state of the art glass recovery system. However, if glass is contained in food waste collected from the commercial routes, the compost product will need further processing to remove glass in order to meet market specifications.

A key element of the County's total recycling program is processing wood waste, yard debris and food waste at Knott Landfill. In 2016, about 30,000 tons of organic materials were composted. The compost facility processes incoming materials by grinding and screening the materials before placing them in windrows. The windrows are aerated and turned as needed to promote the composting process. Once the materials are composted, they are set out to cure and be screened to make different ground cover and soil amendment products.

Some of the collection programs to increase recycling are intended to collect more food waste and additional yard debris. If the amount of material continues to grow, it may be necessary to use a more advanced compost system. These technologies are designed to greatly reduce the time to complete composting and, perhaps more importantly, control potential odors generated by the composting process.

Aerated Static Piles System (AEP)

This approach uses blowers and piping to move air through the piles to perform the primary composting step. For some systems, this step is estimated to take about 18 to 22 days. The cost of some aerated static pile systems is higher because they use stainless steel ducting and pipes and there are larger motors capable of moving air in both the positive and negative direction. The material is removed and placed in secondary aerated static piles to complete the compost process for another 22 days. Although the system can include a bio filter, the aerated static piles in the primary phase are not fully enclosed.

Deschutes Recycling currently uses an aerated static pile system at the Knott Landfill compost facility. Processing time from placement in the aerated piles to moving to curing piles is approximately six weeks. The system in use was relatively lower in cost than many systems as it uses high density polyethylene and PVC pipe and readily available low-cost blowers.

In Vessel with Aerated Static Pile

This approach uses a stationary fully enclosed vessel system for the primary composting operation. Materials are loaded into the vessel, which provides an air and temperature control system to compost materials for 18 days. Once completed, the material is moved to a secondary aerated static pile bunker system to finish out the compost process for 22 days. The system is used particularly in sites in close proximity to neighbors as it is designed to better manage potential odors if located properly. It includes bio-filter to treat the exhaust air.

Both systems can be constructed on a 5-acre site assuming the site is relatively flat and rectangular in shape, with about 2 acres for stockpiling compost product for distribution. If the material has ready markets, then this area can be reduced. The cost to operate the compost systems as described is estimated to be $17 to $25 per ton. This does not include costs to build the systems, which range from $5 million for the aerated static pile system to as much as $8 million for an in-vessel system. These costs are based on systems designed to process 35,000 to 40,000 tons per year. There may be other options that may be considered, depending on the types of material received and the size of the site.

Table 4-8 presents the Collection and Recycling/Processing Needs and Alternatives Summary.

(Intentionally Left Blank)

Table 4-8 Collection and Recycling/Processing Alternatives Analysis

(EST ANNUAL DIVERSION: small >1K tons; medium 1K-10K tons; large >10K tons)

			Analysis*					
Need/Alternative Identified	**Key Point**	**Expansion Program/New Program**	**Consistent With Hierarchy**	**Reduces Long-term Generation**	**Highest and Best Use**	**Cost Effectiveness** and Stabilizes Rates Long-term**	**Flexibility**	**Examples**
Target OCC and scrap metal from commercial sources	DEQ commercial target of 55%	New	Yes	No	Yes	Can add to current collection[1]	No, only two materials	Royal Oak Recycling
Residential expansion of recycling, yard waste/food waste, glass	Consider universal service	Expansion	Yes	No	Yes	Can opt-in to subscribing to service [1]	Yes	Fort Worth
Multifamily program	Compliance with DEQ by 2022	New	Yes	No	Yes	Can expand current service [2]	Yes	Marion County
Tourism/hospitality focus	More tourists than residents in County	Expansion/New	Yes	No	Yes	Economic driver [2]	Yes	Clean the World
Rate Incentives	Use to impact behavior change	New	NA	Yes	Yes	Very effective[2]	Yes	Seattle
Target commercial dry waste	Ties into food waste program; dry waste could be processed with residential recycling	New	Yes	No	Yes	Can add to current collection[1]	Yes	San Francisco

Chapter 4

			Analysis*					
Need/Alternative Identified	**Key Point**	**Expansion Program/New Program**	**Consistent With Hierarchy**	**Reduces Long-term Generation**	**Highest and Best Use**	**Cost Effectiveness** and Stabilizes Rates Long-term**	**Flexibility**	**Examples**
Target food waste (curbside and commercial)	Highest opportunity; product can be used in-County	Expansion	Yes	No	Yes	Extends landfill life [2]	Yes	Cambridge, MA
Explore textiles	High favor with residents	New	Yes	No	Yes	Lower impact[1]	No	SMART
Add C/D program/processing	30% of material entering landfill now; Simple line could work at Knott Landfill	New	Yes	No	Yes	Extends landfill life [2]	Yes	Virginia
Build a MRF	-Commingled MRF -Integrated Mixed Waste Processing with MRF	New	Yes	No	Yes	Challenge to justify [3]	Yes	Monterey San Jose LA County
Upgrade compost facilities -connect to anaerobic digester effort in Bend	-Aerated Static Piles (ASP) -In vessel with ASP	Expansion	Yes	No	Yes	Expands current facilities [2]	Yes	Greeneville, SC

*Analysis Recap

1. ***To provide an integrated solid waste management system*** that addresses an effective combination of strategies and programs guided by the hierarchy adopted by the State to first, reduce waste at the source; second, to reuse and recycle materials; third, to compost; fourth, to recover energy; and last, to dispose of waste in landfills.

2. ***To continue educating consumers to promote practices and methods to reduce the long-term per capita waste generation rate*** and seek, through community outreach, a cooperative approach to assume individual responsibility to reduce waste.
3. To develop programs and support implementation of system improvements that seek to ensure materials recovered from the waste stream ***attain the highest and best use and are recycled***.
4. To develop a solid waste system that is based on ***sound financial principles, provides cost effective services and maintains rate stability over a long term***, while allocating costs equitably to all users.***
5. ***To maintain system flexibility to respond to changes*** in waste stream composition, waste management technologies, public preferences, new laws and changing circumstances.

*****Cost Effectiveness of Alternatives**

1. **Most cost effective** – The alternative will have an immediate (less than 2 years) and measurable impact towards meeting the County's goals to reduce waste disposed in landfills by reusing, recycling or diverting waste by achieving a higher use of the material as a resource. The alternative does not require significant changes to current collection services or practices resulting in major capital investments. Also, the alternative does not cost exceed the current cost of disposing in the landfill. The impact to total system cost is minimal.

2. **Moderately Cost Effective –** The alternative will have measurable impacts towards reducing the waste disposed in landfills and may cost more than the current cost of landfilling. The alternative may require expansion of modifications to existing collection services requiring an increase in rates of more than 10% but less than 30%. However, the alternative will provide a long term cost benefit by extending the site of Knott Landfill, thus delaying the need to purchase additional capacity either by operating a landfill in Deschutes County or other alternative. The alternative may also result in reducing long term costs by reducing the cost to transport to a landfill site out of the County. The alternative may also result in preserving jobs and financial resources spent in the County versus to outside entities.

3. **Least Cost Effective –** The alternative may increase collection cost by over 30% and/or may cost more than the current cost of disposal. The alternative may have long term benefits of reducing waste disposed in landfills and/or keeping long term system cost from increasing over other options. The alternative may also result in preserving jobs and financial resources spent in the County versus to outside entities.

4.4 Recommendations for Collection and Recycling/Processing

The purpose of the Collection and Recycling/Processing evaluation is to examine the alternatives to increase the recovery rate and reduce waste disposed in landfills, consistent with the guiding principles identified in this SWMP. Based on the discussion presented and the assessment of the needs and opportunities, the following represent recommendations for meeting the goals of the Deschutes County solid waste management system. Notably, the recommendations presented in Chapter 3-Waste Prevention, Reduction, Reuse and Recycling should be reviewed to ensure they are complimentary and consistent with the overall strategy to meet the goals of the SWMP.

These actions will not only have short term impacts but will fit into long term strategies to manage waste effectively by reducing what would be transported to a new landfill located further from where waste is generated.

All seven (7) recommendations below:

- Are consistent with State hierarchical priorities and goals to reduce waste disposed in landfills;
- Seek to attain highest use of resources to convert organics to soil amendment and enrichment;
- Require minimal investment to reduce waste disposed at Knott Landfill and attain long term stability in managing waste versus transport to more distant landfill;
- Minimizes the reliance on markets outside geographical area; and,
- Are flexible to expand or contract with minimal impacts to system

Recommendation 4.1: Expand the current residential collection of vegetative food waste with yard waste to increase participation.

> **Rationale** – Establishing a consistent collection program in cities and urbanized unincorporated areas of the County will allow consistent program communication, give the County the ability to evaluate rate incentives to encourage participation and implement promotion and education programs to support the collection system.
>
> This recommendation can provide immediate benefits to reduce waste disposed at Knott Landfill. Targeting food waste collection represents an expansion of existing programs and the existing compost facility can manage these additional materials at least in the short term. At the same time, a long-term strategy to implement a more aggressive sustainable compost system is needed. The results will have immediate impacts on the County's recovery rate.

Recommendation 4.2: Conduct an assessment of markets for products made from

compost resulting from expanded organics programs.

> **Rationale** - The study should confirm opportunities to market various soil amendment products that will result from expanding food and yard waste collection programs. The study can include other byproducts resulting from co–composting mixed waste organics with sludge from the City's Wastewater Treatment Plant and/or waste from breweries.

Recommendation 4.3: Evaluate the alternatives to enhance and expand composting facilities. The study should evaluate the most optimal location considering proximity to generators, markets and surrounding land uses.

> **Rationale** – The current compost facility at Knott landfill has limited space to expand. Relocating and expanding the current compost operations is a long-term strategy to implement a more aggressive sustainable organics management system.

Recommendation 4.4: Upgrade organics processing capacity and technology to efficiently handle additional yard waste/food waste, including meats and dairy, from residential and commercial sources and other organic waste streams.

> **Rationale** - Assuming permits are secured to process and compost meats and dairy waste, the composting facility can be upgraded and the organics collection program can be expanded.

Recommendation 4.5: Develop a business recycling and food waste collection program targeting businesses, hotels and resort communities.

> **Rationale** - The significant tourism industry in Deschutes County makes it necessary to focus on hotel and tourist destinations to meet recycling goals. Tourists outnumber residents in the County every month of the year. There are a variety of programs that can be explored including the tie-in with any new food waste program since restaurants serve visitors extensively. In addition, targeted business outreach to hotels and destinations for business technical assistance and recognition can be included with a general commercial technical assistance program.

Recommendation 4.6: Develop a multifamily recycling and food waste collection program.

> **Rationale** - More infill and multifamily dwelling units are being built to accommodate growth in the County and DEQ is requiring that all tenants have recycling services by 2022. Developing a focused education/promotion program in conjunction with enhanced methods to provide convenient services could contribute to achieving the County's recovery rate.

Recommendation 4.7: Evaluate and develop a plan to provide incentives for recycling of C/D material and alternatives to recycle materials from the C/D stream and minimize disposal of C/D wastes at Knott Landfill.

> **Rationale** – After assessing quantity and composition of C/D accepted at Knott Landfill, the County should consider alternatives to incentivize generators to reduce and reuse C/D materials. Currently, the only alternative for managing C/D waste is disposal at Knott Landfill. It is estimated that perhaps as much as 30% or more of what is disposed at Knott Landfill is classified as C/D waste. Although the cost to dispose C/D waste at Knott Landfill provides some incentive for generators to separate wood and inert waste, it is noted that an appreciable amount of C/D waste is being disposed at the landfill. Implementing a comprehensive C/D reuse, recycle and recovery program would reduce waste disposed at Knott Landfill in the short term, which will preserve space for disposal of MSW.

Recommendation 4.8: The County should complete a waste characterization study to better evaluate options for recovering targeted materials and for designing the programs and facilities needed.

> **Rationale** – The assessment and evaluation of options in the SWMP are based on statewide waste characterization data. This data is typical of other jurisdictions and represents a reasonable estimate of potential impacts form implementing the recommended programs. However, information obtained in preparing the SWMP also suggests there are the unique characteristics of the demographics of Deschutes County where such a study will provide needed information to help prioritize and develop the most cost effective programs for meeting the County's goals.

(Intentionally Left Blank)

Chapter 5

5. TRANSFER SYSTEM

Over the past 25 years, Deschutes County has developed a system of facilities to receive waste and recyclable materials delivered by self-haul public and contractors throughout the County. The system provides convenient locations to serve more remote areas of the County. This chapter describes the existing conditions and considers what changes are needed to address long term needs of the system.

5.1 Existing Conditions

The transfer station system is a key component of providing convenient service to all areas of the County. There are five transfer stations, four of which are remote to Knott Landfill, that receive and transfer solid waste, recyclables, wood waste, and yard debris from different areas within the County. The four remote stations are as follows:

1. Negus Transfer Station—Serves the City of Redmond, Eagle Crest and other unincorporated areas in the north region of the County.
2. Southwest Transfer Station—Serves the City of La Pine, Sunriver Resort, and other unincorporated areas in the southwest region of the County.
3. Northwest Transfer Station—Serves the City of Sisters, Black Butte Ranch, and other unincorporated areas in the northwest region of the County.
4. Alfalfa Transfer Station—Serves the eastern areas of the County.

These four transfer stations were all built adjacent to closed landfills and have been in operation for about 25 years. At present, all of the transfer stations are operated by County personnel except for the Negus Transfer Station, which is operated by a private contractor under contract with the County. At that facility, the County staffs fee collection operations in the gatehouse.

The 5th transfer station, the Knott Transfer Station, was placed into operation in 2007 as part of the North Area Development and is adjacent to the active Knott Landfill. This station only receives self-haul public and contractor vehicles. The waste is reloaded into transfer trailers and hauled to Knott Landfill for disposal. Franchised vehicles and large contractor vehicles go directly to the Landfill.

Figure 5-1 illustrates the location of each remote transfer station and their distances from Knott Landfill. The County contracts with a private contractor, Deschutes Transfer, for the hauling of all solid waste and certain recyclables from the remote transfer stations. At present, all solid waste from the four remote stations is transferred to Knott Landfill for disposal. Commingled recyclables, corrugated cardboard, and glass collected at the remote transfer stations are hauled to Mid-Oregon Recycling in Bend by Deschutes Transfer for reloading and transfer to recycling facilities outside Deschutes County. Appliances collected at the remote facilities are hauled to the Knott Landfill Recycling Center by Deschutes Transfer for processing and transfer to scrap metal recyclers. Scrap metal collected at the remote transfer stations is hauled by Deschutes Transfer directly to Schnitzer Steel in Bend.

Chapter 5

Motor oil, wood waste, yard debris, automobile batteries, electronics and tires collected at the remote transfer stations are hauled off site for recycling by other recyclers under contract with Deschutes County.

When Knott Landfill closes around 2029, solid waste collected at the remote transfer stations will have to be transferred to a new disposal site.

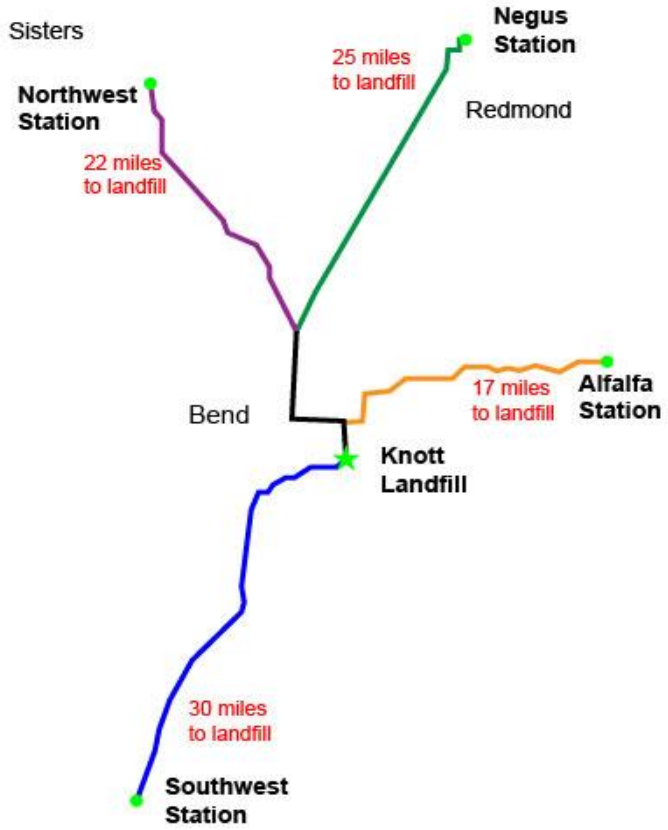


Figure 5-1: Transfer Stations and Distances from Knott Landfill

5.2 Transfer Station Operation Approach

For the most part, the design and operation of the four remote transfer stations is similar. Customers arrive at the gatehouse where the attendant determines the fees based on the volume of waste being disposed. Vehicles are directed to unload at a stall where the customer then unloads over a barrier into a bin or trailer that is parked below at a separate grade.

For recyclables, the attendant assesses fees if required (appliances, tires, wood waste and yard debris) and directs the customer to the appropriate area for unloading.

In general, the four remote transfer stations, which have been in operation for approximately 25 years, are in need of miscellaneous repairs and updating to handle

increased customer traffic and waste flows; however, they continue to provide the service required. All the operations are performed outside with no weather protection except for some structures which provide cover for some recyclables. Figure 5-2 illustrates the "Z-wall" type of construction which provides the required elevation break necessary for loading transfer trailers by franchised and self-haul vehicles.

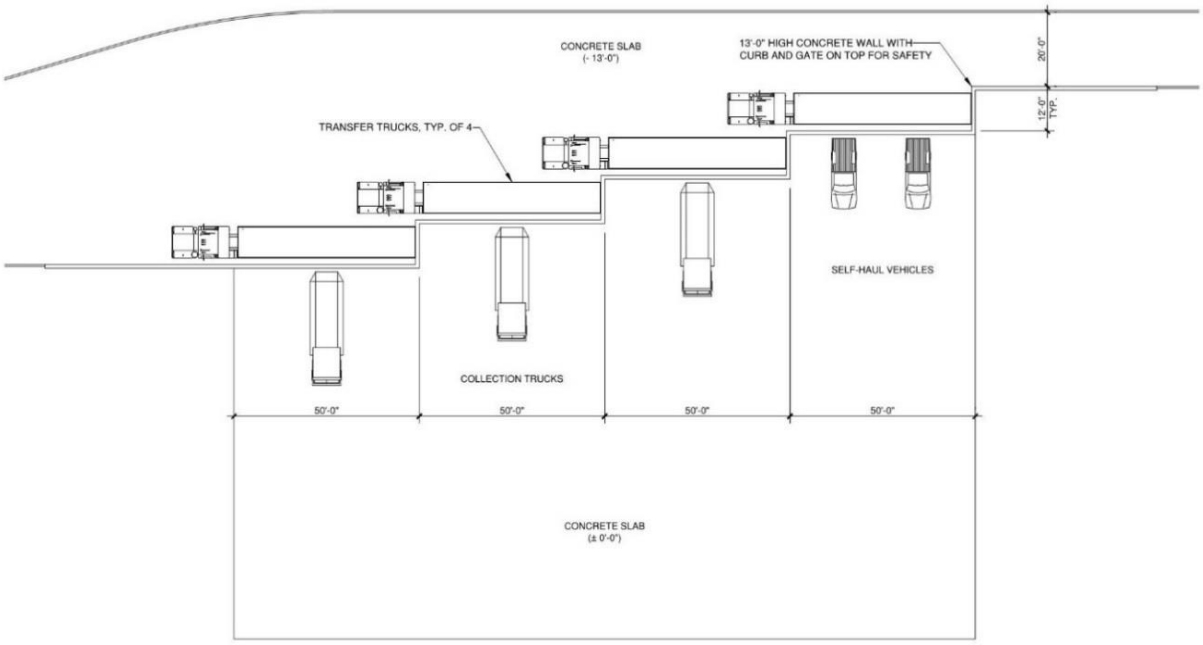


Figure 5-2: Typical "Z-wall" Construction

It is reasonable to say that this type of construction is not the standard for design and construction of new transfer stations in 2019. Concerns over safety for personnel and the public, weather protection and separation of wastes, have resulted in the type of transfer station using a flat floor for vehicles to unload onto. In 2007, the Knott Transfer Station was constructed using the flat floor design and operates in a fully enclosed structure. At the Knott Transfer Station, wastes delivered from self-haul vehicles are unloaded onto the tipping floor and then moved by a rubber-tired loader to the top-load area for placement into a transfer trailer. This same approach will also be utilized in the future when the franchised vehicles come to a transfer station to unload. Table 5-1 provides some detail about the County's transfer station operations, including locations, and hours of operation, based on a tour of the stations done in late 2017.

Chapter 5

Table 5-1: Deschutes County Transfer Station Operations

Transfer and Recycling Facilities	Knott Transfer Station	Negus Transfer Station	NW Transfer Station	SW Transfer Station	Alfalfa Transfer Station
Transfer Operations	County Operated	Joint County/Contract Operations (County staff collect fees. Deschutes Transfer staff conduct all other on-site operations)	County Operated	County Operated	County Operated
Hours of Operation	Winter: Mon-Sat, 7-4:30 Summer: 7 days/week, 7-5	Mon-Sat, 8-4	Wed-Sat, 8-4	Wed-Sat, 8-4	Sat, 8-4

5.3 Waste and Vehicle Volumes to Each Transfer Station

As mentioned in Chapter 2, the amount of waste disposed at Knott Landfill has increased by 22% over the past three years. This increase in customer traffic and waste volumes is evident at each of the transfer stations. Table 5-2 shows the annual weights of wastes managed at the transfer stations and the percentage increase over the past three years.

Table 5-2: Waste Volumes at Transfer Stations

Transfer Station	*2015 Tons*	*2016 Tons*	*2017 Tons*	*% Change*
Negus	28,502	31,309	34,948	23%
Northwest	3,429	3,738	3,630	6%
Southwest	8,203	9,193	9,788	19%
Alfalfa	165	170	184	12%
Subtotal Remote Transfer Stations	**40,299**	**44,410**	**48,550**	**20%**
Knott Transfer Station	**28,501**	**31,509**	**45,020**	**58%**
Total Transfer	**68,800**	**75,919**	**93,570**	**36%**

As important as the increase in waste volume received at each transfer station is the number of customers using these facilities. Table 5-3 shows vehicle traffic at the

Knott, Negus and Southwest Transfer Stations for 2015-2017. Traffic data for the Northwest and Alfalfa Transfer Stations are not provided because the volumes are significantly lower than the other three transfer stations. Northwest Transfer Station receives several loads weekly from High Country Disposal, the franchised service provider in Sisters. Most of the waste collected in Sisters by High Country Disposal is hauled to the Negus Transfer Station for reloading and transfer to Knott Landfill.

Table 5-3: Vehicle Traffic at Transfer Stations

Transfer Station	Vehicle Type	2015	2016	2017	% Change
Negus	Franchised	2,264	2,542	3,367	49%
	Self-haul	29,937	34,547	38,701	29%
	Total	**32,201**	**37,089**	**42,068**	**31%**
Southwest	Franchised	1,271	1,323	1,392	10%
	Self-haul	13,583	15,334	16,901	24%
	Total	**14,854**	**16,657**	**18,293**	**23%**
Knott	Franchised	0	0	0	
	Self-haul	87,870	97,084	110,991	26%
	Total	**87,870**	**97,084**	**110,991**	**26%**

These increases have had a significant impact on both Negus and Southwest Transfer Stations. The additional traffic requires more space for queueing vehicles, as well as additional stalls for customers to unload. These facilities will need some upgrades in the near future because they were not built for these traffic or waste volumes. The Knott Transfer Station can handle the increases. Volume increases have been low at the Northwest and Alfalfa Stations and no upgrades appear necessary in immediate future.

5.4 Recycling at Transfer Stations

All recyclables are received and collected separately at the remote transfer stations. As discussed in Section 5.1, Deschutes County contracts with Deschutes Transfer for the hauling of recyclables collected at the remote transfer stations. Commingled recyclables, corrugated cardboard, and glass collected at the remote transfer stations are hauled to Mid-Oregon Recycling in Bend for reloading and transfer to recycling facilities outside Deschutes County. Appliances collected at the remote facilities are hauled to the Knott Recycling Center for processing and transfer to scrap metal recyclers. Scrap metal collected at the remote transfer stations is hauled to Schnitzer Steel in Bend by Deschutes Transfer.

Motor oil, wood waste, yard debris, automobile batteries, electronics (TVs, computers, monitors, printers) and tires are hauled off site by other recyclers under contract with Deschutes County.

Table 5-4 provides the number of vehicles delivering recyclables only to the Negus and Southwest Transfer Stations over the past several years. Data on the Northwest and Alfalfa Transfer Stations are not included because of very low volumes.

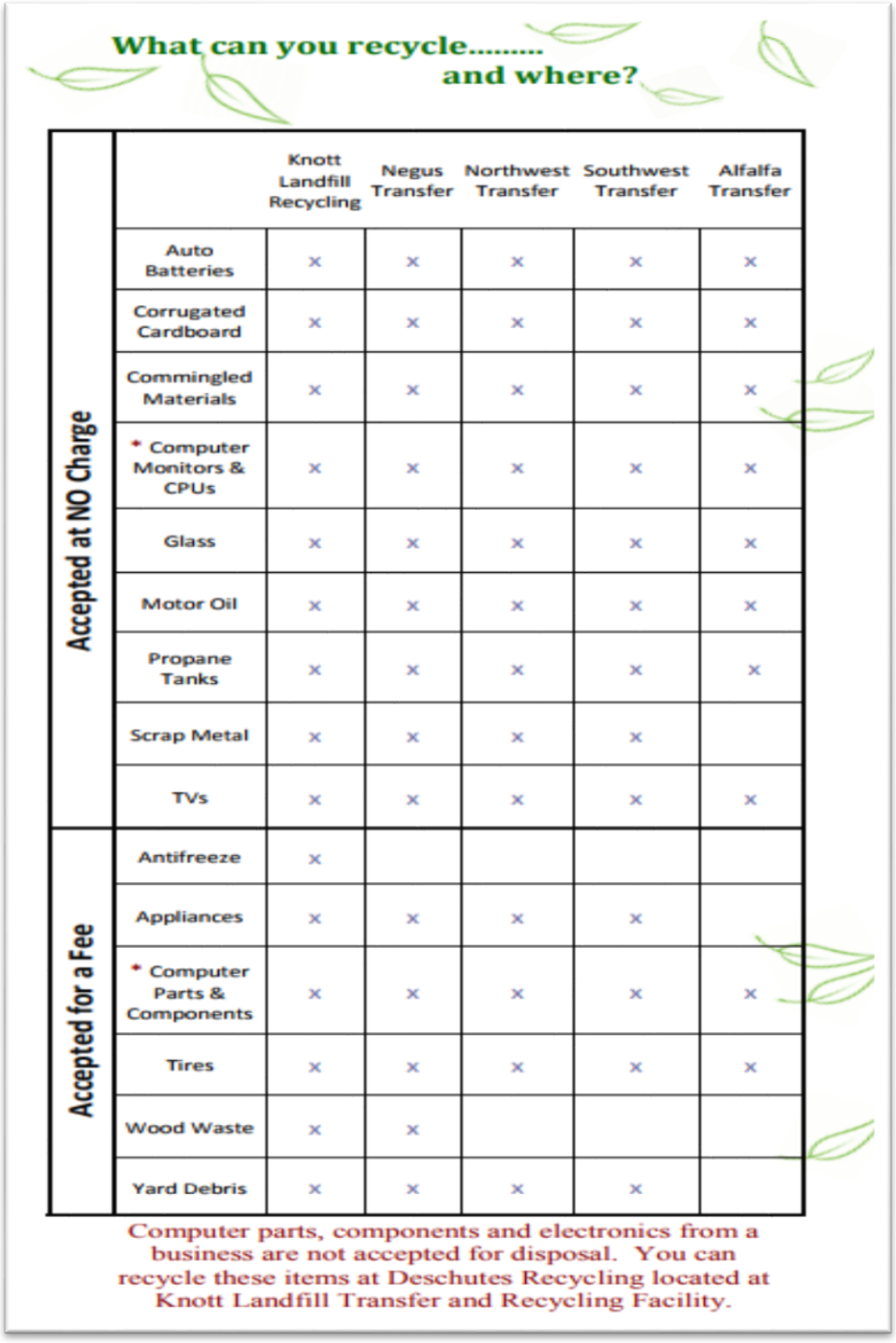
Table 5-4: Recycle Only Vehicle Count at Transfer Stations

Transfer Station	2015	2016	2017	2018
Negus TS	10,766	8,969	10,813	3,687*
Southwest TS	4,884	1,038*		

*Data was not collected through the entire year

The recyclables services provided at each transfer station are discussed in Chapter 3 and detailed in Figure 5-3.

(Intentionally Left Blank)



What can you recycle..... and where?

		Knott Landfill Recycling	Negus Transfer	Northwest Transfer	Southwest Transfer	Alfalfa Transfer
Accepted at NO Charge	Auto Batteries	x	x	x	x	x
	Corrugated Cardboard	x	x	x	x	x
	Commingled Materials	x	x	x	x	x
	* Computer Monitors & CPUs	x	x	x	x	x
	Glass	x	x	x	x	x
	Motor Oil	x	x	x	x	x
	Propane Tanks	x	x	x	x	x
	Scrap Metal	x	x	x	x	
	TVs	x	x	x	x	x
Accepted for a Fee	Antifreeze	x				
	Appliances	x	x	x	x	
	* Computer Parts & Components	x	x	x	x	x
	Tires	x	x	x	x	x
	Wood Waste	x	x			
	Yard Debris	x	x	x	x	

Computer parts, components and electronics from a business are not accepted for disposal. You can recycle these items at Deschutes Recycling located at Knott Landfill Transfer and Recycling Facility.

Figure 5-3: What Can You Recycle

Figure 5-4 shows the sign at the Negus Transfer Station, which provides information on materials acceptable for commingled recycling. The materials are temporarily stored under cover until they are transferred to Mid-Oregon Recycling.

Figure 5-4: Transfer Station Commingled Recycling Sign

Table 5-5: Tons of Recycled Material Collected in 2016

	Alfalfa	Knott	Negus	Northwest	Southwest	Total
Appliances			166	27	74	**267**
Batteries			7	2	4	**14**
Cardboard			114	24	63	**201**
Commingled	20		122	37	94	**273**
Electronics			100			**100**
Glass	8		78	27	45	**158**
Hazardous Waste		264				**264**
Motor Oil			23	2	11	**37**
Scrap Metal	9	4	230	71	138	**451**
Propane Tanks		0.84				**0.84**
Tires	0.06		43	4	14	**61.06**
Totals	**37**	**269**	**883**	**193**	**443**	**1,826**

These transfer stations provide a convenient location for the public to drop off recyclables, however, the amount of materials received and transferred was less than 2,000 tons in 2016.

5.5 Negus Transfer Station

Negus Transfer Station has been operating for over 25 years and serves the northeastern region of the County and the City of Redmond. The City and the area in whole has experienced significant growth over the last 10 years. As shown in Table 5-3, the number of vehicles using the facility has increased by 31%. Also, the franchised hauler serving the City of Sisters has been hauling wastes directly to Negus, further increasing the quantity of waste managed through this facility. In 2017, the facility transferred 35,000 tons of waste to Knott Landfill, which is an increase of 23% since 2015. The growth is such that the transfer station needs upgrading to efficiently manage the vehicle volumes and properly receive and transfer the waste delivered to the facility. Additionally, the age of the facility, coupled with the increases in traffic and tonnage have taken a toll on some of the facility infrastructure, necessitating some interim repairs.

Figure 5-5: Negus Transfer Station

The figure above shows the customers unloading into transfer trailers. The following pictures show the safety features to separate customers from the load out bays.

Figure 5-6: Negus Transfer Station Safety Features

5.5.1 Facility Needs

As Negus Transfer Station has undergone some improvements over the years, based on current waste volumes and expected growth, the County will need to implement further improvements to maintain a safe and efficient level of service. The following is a preliminary assessment of needs:

a. Possible expansion of the recycling center, including improved separation from the waste receiving area.
b. Separation of commercial vehicle traffic from the self-haul vehicles including separate unloading areas.
c. Covered or enclosed areas for vehicle receiving and unloading.
d. Improvements to facilitate inbound and outbound scales and a scale house.
e. Areas on site for receiving and storing food waste, C/D wastes, yard debris, and wood waste.

It is important to note that any upgrades must be done with no or minimal interruption to existing operations. The County should consider developing a facility plan to address the immediate needs as well as how this facility will operate in the future when the Knott Landfill is closed. These recommended upgrades to Negus Transfer Station should be done as soon as possible after adoption of this SWMP.

5.6 Southwest Transfer Station

This transfer station, like the other remote transfer stations, has been in operation for over 25 years and services an area of the County which has experienced significant growth over the last few years. In fact, the growth in waste and vehicle volumes is up over 10% for franchised haulers and over 20% for self-haul vehicles. Southwest Transfer Station needs to be upgraded to properly serve the southwest region of the County for the next 25 years, and this upgrade should be done within the next 5+ years. The upgrade should have the same features as discussed for the Negus Transfer Station:

a. Possible expansion of the recycling center, including improved separation from the waste receiving area.
b. Separation of commercial vehicle traffic from the self-haul vehicles including separate unloading areas.
c. Covered or enclosed areas for vehicle receiving and unloading.
d. Improvements to facilitate inbound and outbound scales and a scale house.
e. Areas on site for receiving and storing food waste, C/D wastes, yard debris, and wood waste.

As with Negus Transfer Station, all upgrades must be done with no or minimal interruption of the existing operations.

Before the upgrade is done, it is noted that this transfer station is only open for public operations for 4 days per week. The County may consider opening this facility six days per week, similar to Negus Transfer Station. This may redistribute some of the traffic and tonnage to reduce congestion loading experienced under the current operating schedule.

Figure 5-7: Southwest Transfer Station

5.7 Northwest and Alfalfa Transfer Stations

These two transfer stations have been operating for well over 25 years and have experienced minimum growth over the last several years. More growth at the Northwest Transfer Station would have been seen if the franchised hauler for the City of Sisters was taking more of the collected wastes to this facility rather than directly to Negus Transfer Station. Northwest Transfer Station is constructed with a Z-wall system like the County's other remote transfer stations and uses transfer trailers for receipt and transfer of waste. Alfalfa Transfer Station has a 2 bay Z-wall and uses drop-boxes to receive and transfer waste.

The County may consider if these transfer stations need to continue to be in operation as part of the long-term system. However, because they have been operating for many years and are established in their respective areas, there could be significant objection from the citizens in each area if closure were to be considered. This is a concern and could result in some illegal dumping in the future. If these stations remain part of the long-term system, there may be some safety improvements needed.

Figure 5-8: Northwest Transfer Station

5.8 Knott Transfer Station

The Knott Transfer Station began operation in 2007 and since opening, has only managed self-haul waste. The transfer station is a 30,000 sq. ft. totally enclosed building with two top loading trailer bays. The design of the transfer station provides some flexibility to secure waste from franchised collection trucks as well as self-haul vehicles. Based on current operations, this transfer station will satisfy the needs of the County at least until the Knott Landfill closes. Assuming the Knott Landfill closes in 2029, there are some different options for the use of this facility.

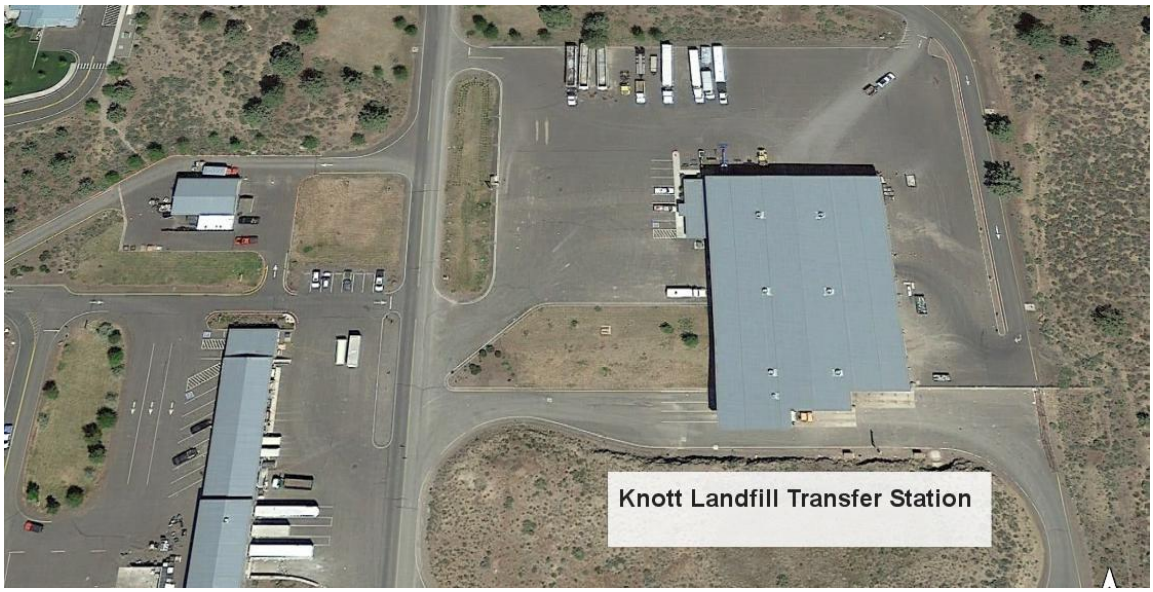


Figure 5-9: Knott Landfill Recycling and Transfer Station

5.8.1 Disposal at a New In-County Landfill

In the case where a new landfill is sited in the County, the function of the Knott Transfer Station may change, depending on the final location of the new landfill. The operation could include the following:

a. All self-haul vehicles would continue to deliver waste to the Knott Transfer Station.
b. All franchised collection vehicles servicing the Bend area would deliver waste to the Knott Transfer Station. Waste delivered by the franchised haulers would then be reloaded into transfer trailers and hauled to the new landfill if the landfill is more than 10 miles from the transfer station. If the new in-County landfill is closer than 10 miles from the transfer station, it is feasible that the franchised collection vehicles could haul directly to the new landfill.
c. Transfer trailers from the remote transfer stations could haul directly to the new landfill unless volumes are minimal and need to be reloaded at the Knott Transfer Station to be more efficient.
d. Most recyclables from the remote transfer stations would still be hauled to Mid-Oregon Recycling or the Recycling Center at Knott Landfill.

5.8.2 Disposal at an Out-of-County Landfill

The other option that will impact future waste collection and transfer operations in Deschutes County is the disposal of the County's waste at a landfill located outside the County. To ensure waste is transported most efficiently, waste will be reloaded into larger trailers for transportation to the disposal site. This may require additional modifications to the Knott Transfer Station to receive and transport waste. These changes may include the following:

a. Self-haul vehicles would continue to deliver waste to the Knott Transfer Station.
b. Franchised vehicles servicing the Bend area would deliver waste to the Knott Transfer Station.
c. Waste from Negus and/or Southwest Transfer Stations may be hauled directly to an out-of-County landfill. This assumes that some load densification, as is currently done at the Negus Transfer Station, would be performed at the facilities to maximize payload efficiency.
d. Waste from Northwest and Alfalfa Transfer Stations may be hauled to the Knott Transfer Station for reloading.
e. Most recyclables from the remote transfer stations would still be hauled to Mid-Oregon Recycling or the Recycling Center at Knott Landfill.

In addition to the above, it may be cost effective to install a compactor at the Knott Transfer Station to achieve maximum payloads in trailers for the long haul to the out-of-County landfill.

5.8.3 Other Operation Related Requirements

For either landfill alternative, there are some operational considerations, building revisions, and possible equipment additions which would be required if the franchised vehicles were to deliver waste to the Knott Transfer Station. Examples are:

a. How to properly manage the tipping floor when both the franchised and self-haul vehicles are entering and unloading in the same building.
b. Addition of some lighting to make it easier for vehicles coming directly in or backing in for safety purposes.
c. Addition of a compactor to maximize the payload going into the transfer trailers. In Oregon, the gross vehicle weight for highway vehicles is up to 105,000 pounds, so transfer trailers can be loaded with up to 30-35 tons of waste. Maximizing payload reduces transfer costs by making the transfer haul as efficient as possible.
d. Possible modifications or additions to the transfer station's structure to increase capacity.

5.8.4 Collection Considerations for Specific Wastes

As the County considers other options as part of this SWMP, there is a possibility that some types of waste could be collected separately and segregated at the County's transfer stations for further processing. Food waste, C/D waste, yard debris and wood waste are examples of wastes that could be utilized for future use and/or processing. In the case of the C/D waste, which can be disposed in an unlined landfill, the volumes generated in Deschutes County have become so large that they are reducing the life of the Knott Landfill. C/D waste could be disposed in an unlined landfill that does not require large capital investments in liners and landfill gas control systems. For the other identified wastes, there are conversion technologies which can be considered and have proven to be successful such as composting and anaerobic digestion (A/D) to produce fuels and/or electricity.

Therefore, consideration should be given to each transfer station site for space to receive and segregate these wastes as the facilities are being planned for upgrading.

5.9 Needs and Opportunities

As discussed in the Existing Conditions section, the County's remote transfer stations have been in operation for over 25 years. These facilities have been a key component for providing cost effective services to citizens and businesses throughout the County. However, the two primary remote transfer stations, Negus and Southwest Transfer Stations, have both experienced significant increases in traffic and waste volumes. The assessment of these facilities indicates that improvements are needed. The level of improvements at each station requires a much deeper evaluation to determine the investments needed to address immediate operations and establish the investments for the future system.

Chapter 5

5.10 Recommendations

Preparing a new site development master plan for both the Negus and Southwest Transfer Stations will allow the County to better plan for the capital investments required at each station to continue to provide convenient and cost-effective services. The following are recommendations for addressing the needs to upgrade and expand the remote transfer stations.

Recommendation 5.1: Develop a facility plan for the Negus Transfer Station in 2019 for making improvements to the facility by 2021 or as needed.

> **Rational –** Negus Transfer Station is a key facility for providing convenient and cost-effective services to the City of Redmond and northern portions of the unincorporated County. In keeping with the goals of the SWMP, improvements are needed to:
>
> 1. Receive and transport waste and recyclables more efficiently;
> 2. Provide convenient and accessible recycling services;
> 3. Provide flexibility for managing different waste streams;
> 4. Enhance safety for customers and workers; and,
> 5. Allow the County to plan for timely capital improvements to maintain long term rate stability.

Recommendation 5.2: Develop a facility plan for the Southwest Station within the next three years. Modifications to the facility can be made as the demand for enhanced services for managing increased waste volumes and traffic is required.

> **Rational -** Southwest Transfer Station is a key facility for providing convenient and cost-effective services to the City of La Pine, the community of Sunriver and southern portion of the unincorporated County. In keeping with the goals of the SWMP, improvements are needed to:
>
> 1. Receive and transport waste and recyclables more efficiently;
> 2. Provide convenient and accessible recycling services;
> 3. Provide flexibility for managing different waste streams;
> 4. Enhance safety for customers and workers; and,
> 5. Allow the County to plan for timely capital improvements to maintain long term rate stability.

Recommendation 5.3: Develop a facility plan for the Knott Transfer Station as necessary to address long-term disposal options, or within five years of closure of Knott Landfill.

> **Rational -** Knott Transfer Station is a primary facility for providing long term services for the entire County. Much of the infrastructure needed for managing waste over the long term is in place. The facility was designed to be expanded.

How this facility fits into providing long term transfer services will depend on the location(s) of future disposal and/or processing facilities. A facility plan should be prepared to determine what improvements/modifications might be required to manage waste after the Knott Landfill closes. This plan should be implemented in time to be operational when Knott Landfill is closed. In keeping with the goals of the SWMP, improvements are needed to:

1. Receive and transport waste more efficiently;
2. Provide flexibility for managing different waste streams;
3. Enhance safety for customers and workers; and,
4. Allow the County to plan for timely capital improvements to maintain long term rate stability.

Recommendation 5.4: Establish a capital improvement program for making investments in transfer station modifications over the next 10 years.

Rational – The County has established a capital improvement fund within the DSW enterprise fund. It will be important for long term financial planning and maintaining rate stability to identify and schedule the necessary capital improvements needed at transfer stations for the next 10 years.

(Intentionally Left Blank)

Chapter 6

6. ALTERNATIVE TECHNOLOGIES AND SOLID WASTE DISPOSAL

6.1 Background and Existing Conditions

6.1.1 Introduction

Since the passage of the Resource Recovery and Conservation Act in 1976, nationwide, there has been an ongoing effort to recover commodities such as paper, cardboard, plastic and glass containers. The options to prevent waste being generated and to expand reuse and recycling programs and services to reduce waste disposed in landfills have been presented in Chapters 3 and 4.

There has also been a persistent pursuit to develop alternative technologies that can recover energy value contained in the remaining waste stream for conversion into a renewable energy source. Alternative technologies include proven systems like mass burning similar to Marion County's Energy from Waste Facility (EfWF) and emerging technologies used to extract the energy from the waste stream.

For the past 47 years, Knott Landfill has served as primary disposal site for all solid waste generated in Deschutes County. Based on current and projected quantities of waste disposed, Knott Landfill is expected to reach capacity and cease operations by 2029 or in 10 years. In keeping with the State's waste management priorities, this chapter describes alternative technologies that might be considered to further reduce waste disposed in landfills. These technologies target the value of managing waste that cannot be recycled and to extract energy value and/or convert it to a renewable energy resource.

6.1.2 Existing Landfill Disposal

Knott Landfill is the only landfill in Deschutes County and is anticipated to close in 2029. It accepts both MSW as well as C/D waste as discussed in previous Chapters. The amount of waste received at Knott Landfill in recent years is shown in Table 6-1.

Table 6-1: Deschutes County Tonnage to Disposal Operations[47]

Year	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***
Annual Waste Disposed (tons)	**114,307**	**112,751**	**113,611**	**119,682**	**130,956**	**144,067**	**161,087**	**182,095**
% Change		***(1.4%)***	***0.9%***	***5.4%***	***9.4%***	***10.0%***	***11.8%***	***13.0%***

[47] Source: *2017 Material Recovery and Waste Generation Rates Report*

Chapter 6

The amount of waste disposed at Knott Landfill in 2017 was 181,000 tons, or an increase of 39 percent over the last three years. The growth in the amount of waste disposed can be attributed to several factors including population growth, increase in construction and overall improvement in the economy. Although Deschutes County continues to experience slightly higher population growth than the rest of Oregon, this increase in waste disposed is not expected to continue at this rate. To this point, the waste disposed through July 2018 is about the same amount as what was reported in 2017. Therefore, the waste projections to be used for planning purposes assumes waste generation will increase at a rate commensurate with the growth in population in Deschutes County.

By 2040, the amount of waste generated is estimated to grow to 336,000 tons. How much is disposed will be determined by how much can be recycled and/or converted to other resources. In Chapters 3 and 4, the SWMP identifies new programs and services that can reduce the volume of waste disposed over the next 10 to 12 years which may result in extending the site life Knott Landfill. However, even if the County achieves its diversion goals by 2025 it may extend the site life of the Knott Landfill by one or two years. Extending the site life by reducing the amount disposed is desirable and can provide additional time to implement alternatives.

Cost of Landfill Disposal

The County has operated Knott Landfill for more than 45 years. In 1996, Cell 1, the first Subtitle D compliant lined cell was completed at Knott Landfill and MSW landfilling operations were moved to Cell 1 at that time. Non-MSW disposal operations continued in the unlined area at Knott Landfill through 2008. The new cells constructed from 1996 forward include bottom primary and secondary liners and a leachate collection and recirculation system. A landfill gas collection and monitoring system was installed in 2001. The landfill gas collection system is expanded on a regular basis as waste disposal operations proceed.

When the landfill was converted to a Subtitle D compliant facility, the County established a closure and post closure fund as required by the State. This fund will ensure adequate funds are dedicated to properly close all active landfill areas and pay the expenses for monitoring the site for 30 years after closure or until the time the landfill is deemed stable.

The cost to operate Knott Landfill is $35 of the $55 per ton tip fee charged by the County; the other $20 of the tip fee funds recycling, public education and other programs administered by DSW. In 2016 the Department's total cost to operate Knott Landfill was $5,962,000. The breakdown of the different expense categories associated with operating the landfill is shown in Table 6-2.

Table 6-2: Knott Landfill Expenses 2016

Knott Landfill Operating Expenses	2016 (Actual)
Operations	$ 2,662,000
Fees and Permits (DEQ)/Insurance	$ 400,000
Transfer to Funds	$ 2,500,000
- Capital Reserves	
- Equipment Reserves	
- Closure and Post Closure	
Contingency (7%)	$ 400,000
Total Annual Operating Expenses	**$ 5,962,000**

Depending on the quantity of waste disposed daily, the actual operating cost typically does not vary significantly. For example, if a landfill receives 600 tons versus 500 tons of waste per day, the operating expenses for placing and compacting the waste will not appreciably change. The reason is that fixed operating costs are a higher percentage of overall expenses and therefore the unit cost or per ton rate to operate is not greatly impacted by the amount of waste disposed. For instance, the capital expenses to build new landfill cells as well as the planned closure and post closure expenses are fixed costs and are already prorated on a per ton basis. Thus, when waste volumes increase, there is more revenue to pay for fixed costs resulting in lowering the unit cost to operate the landfill. For this reason, regional landfills that accept large amounts of waste can charge a lower tip fee compared to smaller landfills. The following table shows how the actual tip fees vary depending on the annual amount of waste disposed.

Table 6-3: Total Annual Operating Expenses

Total Annual Operating Expenses	Year	$ 6,000,000	$/Ton
Annual Waste Disposed	2016	161,000 tons	$37.27
Annual Waste Disposed	2017	181,000 tons	$33.15
Average Disposal Cost			**$35.21**

Each year, DSW prepares a budget and makes an estimate on how much waste will be disposed in the coming year. There are some inflationary expenses such as labor and fuel prices, but most expenses are relatively stable.

In considering future disposal options, the County can compare the estimated cost to the current tip fee of $35 per ton for landfill operations.

Chapter 6

6.2 Waste Stream Projections

In Chapter 2, estimates of how much waste might be generated and disposed were presented. This information represents background data that can be used to analyze alternatives and determine future disposal needs.

Using the waste generation projections, estimates were made of the amount of waste that could be processed using an alternative technology and/or may need to be disposed in a landfill. In projecting the estimated waste to be disposed beyond 2030, the analysis will assume that the per capita generation rate will continue to be 2,800 pounds. This will be multiplied by the population projections using the latest growth rate for period leading to 2030 as prepared by the Population Research Center at Portland State University.

Table 6-4: Deschutes County Waste Disposal Projections

Year	Population	Per Capita Generated (tons)	Waste Generated (tons)	Waste Recycled (tons)	Recovery Rate	Waste Disposed (tons)
2015	170,606	2,663	227,333	83,381	36.7%	143,952
2016	174,701	2,727	240,844	79,757	33.1%	161,087
2017	178,893	3,022	270,326	89,000	32.9%	181,326
2018	183,187	3,000	274,780	90,677	33.0%	184,103
2019	187,583	3,000	281,375	92,854	33.0%	188,521
2020	190,734	3,000	286,101	94,413	33.0%	191,688
2021	194,739	3,000	292,109	96,396	33.0%	195,713
2022	198,829	3,000	298,243	98,420	33.0%	199,823
2023	203,004	2,900	294,356	97,138	33.0%	197,219
2024	207,267	2,900	300,538	99,177	33.0%	201,360
2025	210,826	2,900	305,698	100,880	33.0%	204,817
2026	214,832	2,800	300,764	99,252	33.0%	201,512
2027	218,913	2,800	306,479	101,138	33.0%	205,341
2028	223,073	2,800	312,302	103,060	33.0%	209,242
2029	227,311	2,800	318,236	105,018	33.0%	213,218
2030	230,412	2,800	322,577	106,450	33.0%	216,126

Table 6-4 shows that by 2025 the waste disposed is estimated to be over 200,000 tons and 216,000 tons by 2030. This assumes that the County's recovery rate of 33% does not increase over the existing rate. This assumption is conservative as it is expected that the expanded programs and services recommended in the plan will result in diverting more waste. For planning purposes, these conservative projections will be used for evaluating alternative technologies and planning for future facilities.

6.2.1 Needs and Opportunities

The County, working with cities and private collection companies, has provided the infrastructure needed to manage solid waste in a most effective manner. With Knott Landfill, the residences and businesses have become reliant on having an in-County disposal site that greatly supports a most cost-effective system. For example, the current tip fee at Knott Landfill is $55 per ton, one of the lowest rates in Oregon and perhaps the entire Pacific Northwest. One reason other counties have higher rates is because several jurisdictions have elected to transport waste from 50 miles to 200 miles to regional landfills.

With Knott Landfill having a finite capacity, it will close in approximately 10 years. There are strategies that may extend the site life as mentioned, but eventually an alternative must be in place prior to the actual closure date. Looking at projections, the County will generate between 300,000 and 400,000 tons of waste per year. Making a conservative assumption that the recovery rate remains constant, the County will need to dispose almost 220,000 tons per year by 2030. While this presents a challenge, it also provides opportunities that may not be feasible in other parts of the State. Deschutes County is growing and besides the attraction to relocate to the area, the amount of tourism and annual visitors contribute to an active and vibrant economy. Therefore, the County is expected to experience a higher rate of growth than perhaps other parts of the State. The amount of waste that is forecasted to be generated may make certain alternatives more cost effective for Deschutes County compared to other jurisdictions that do not generate quantities of waste to pay for these alternatives.

Many communities throughout the country have found themselves in a similar situation. The difficulty in locating a new landfill or having enough waste to support building a new landfill has led many jurisdictions to consider alternative technologies to manage their waste. Others have made commitments to manage waste as a resource and to reduce disposal at landfills.

The amount of time before Knott Landfill closes provides an opportunity to examine the status of the technologies that may be practical in meeting the goals stated in this planning effort. In the following section, a review of the technologies that are in commercial operation will be discussed. Even if a technology is determined to be an option, a future landfill disposal alternative must also be identified. These future disposal alternatives will also be discussed.

6.3 Alternatives and Evaluation

6.3.1 Alternatives Technologies for Conversion/Reduction of Municipal Solid Waste

The following provides a description and status of the various technologies currently used for managing waste. Some technologies may not be cost effective or practical for Deschutes County.

6.3.2 Mixed Waste Processing

As discussed in Chapter 4, Mixed Waste Processing Facilities (MWPF) are designed to accept and process commingled recyclables (if a single-stream collection system exists) and the MSW stream itself. Many national manufacturers of separation equipment are recognizing the potential opportunities of MWPF systems and tout their MSW experience in their marketing materials. Figure 6-1 shows the conveyor layout of a MWPF in Milpitas, CA.

Figure 6-1: Newby Island Resource Recovery Park in Milpitas, California
(Source: Bulk Handling Systems)

According to the latest yearbook (2010-2017) by the Governmental Advisory Associates, Inc. there are 28 MWPFs or MRFs with a mixed waste processing line in the United States. The primary focus of these facilities is to divert recyclable materials. Due to the regulatory requirements in California for waste diversion and reducing the amount of organics disposed in landfills, 21 of the operating MWPFs are in California.

These facilities are generally highly automated and use similar equipment to that used for single stream MRFs, with a bag opening operation as an additional step. The processing system equipment sequence typically includes a pre-sort station for the recovery of inadvertently accepted non-processable materials, followed by a bag opener (shredder with a large product size on the order of 16-inches), multiple screening operations, and separation operations that can utilize air separators, eddy current separators, magnetic separators, and optical sorters. The objective is to maximize the recovery of recyclable materials, including paper, aluminum, ferrous metals, and plastics. Depending on the proximity to a glass market or processor, a mixed glass product may also be recovered.

In Chapter 4, it was determined the cost of building a MWPF in Deschutes County for the purpose of recovering more commodities from the commercial waste stream was not cost effective. However, processing mixed waste is also required to extract materials for feedstock for certain technologies. In other parts of the country and in Europe, these processing facilities are designed to create a renewable energy byproduct. Therefore, in considering alternative technologies to create bio-fuels, refuse

derived fuels and/or to extract energy value from the waste stream, some level of processing will be required.

6.3.2.1 Construction and Demolition Recycling

In the effort to improve overall recycling or diversion percentages within jurisdictions or municipalities, the dense tonnages associated with C/D wastes have always been a prime target for recovery. This concept was introduced in Chapter 4, but the current section provides more context in terms of the technology as an alternative to disposal.

The common C/D processing equipment of a screen or two and some manual sorters now includes more sophisticated air separation and even infrared optical units to better separate materials for more recovery or potential development of new markets. While the technology is improving to process C/D materials, most within the industry stress the importance of markets and outlets for the commodities that are targeted for recovery.

One of the most sophisticated C/D facilities that has been recently constructed is the Zanker Recycling Demolition Processing Facility located in San Jose, CA. The system won the Solid Waste Association of North America (SWANA) gold award for recycling systems in 2016. The system is rated for 60 tons per hour (TPH) but consistently operates at 75 TPH. The facility serves an approximate population of 6 million people in an area with strict recovery regulations regarding all waste. A view of the facility is shown in Figure 6-2.

Figure 6-2: View of Zanker Demolition Processing Facility

The system at the Zanker facility utilizes three types of screens, four different air classifiers and three separate magnets to achieve a material recovery of over 70 percent. The infeed stream consists mostly of materials from the demolition of local houses and businesses. The facility recovers clean fill, metals, concrete and brick, and wood as well as utilizing the fines as alternative daily cover (ADC). Table 6-5 presents the material recovery rates for Zanker with and without counting ADC.

Table 6-5: Material Recovery Numbers from Zanker Demolition Facility

Material types	Counting Alternative Daily Cover Use	Without Alternative Dai Cover Use
Construction Waste	73.9%	54.4%
Wood Waste Yard Waste Brush	96.7%	94.7%
Demolition Mobile Homes Wood shingles with paper	73.6%	24.8$
Sheetrock	91.5%	89.1%
Asphalt shingles Tar and gravel roofing	41.4%	13.4%
Concrete Stucco and Plaster	99.1%	94.5%
Miscellaneous Bulky Miscellaneous	54.4%	8.5%

6.3.2.2 Engineered Fuel Production

Engineered fuel (EF) is a manufactured product created when MSW is processed through mechanical, biological, and/or thermal processes to produce a higher quality fuel. While similar in concept to Refuse Derived Fuel (RDF), EF is processed to meet a set standard for quality, which, when met, exempts the EF from further regulation as waste. EF is typically transported to an energy consumer located some distance from the EF production facility, and the energy consumer is not regulated as a MSW handling or disposal facility.

The Federal Environmental Protection Agency regulates the use of waste-derived fuels under its Non-Hazardous Secondary Materials (NHSM) program. In this program, when non-hazardous waste is processed to produce an EF product, that product may be "de-wasted" when used as an alternative to conventional fossil fuels. Federal de-wasting does not, however, preempt applicable state solid waste regulatory requirements. Adoption of EF therefore has been slower in the United States.

EF can be used in solid fuel industrial boilers as a substitute for coal. In addition to the potential for economic savings, the organic fraction of the EF creates greenhouse gas reductions. An industrial EF combustor/boiler will be very similar in design to a fluidized bed RDF boiler (see Figure 6-3).

(Intentionally Left Blank)

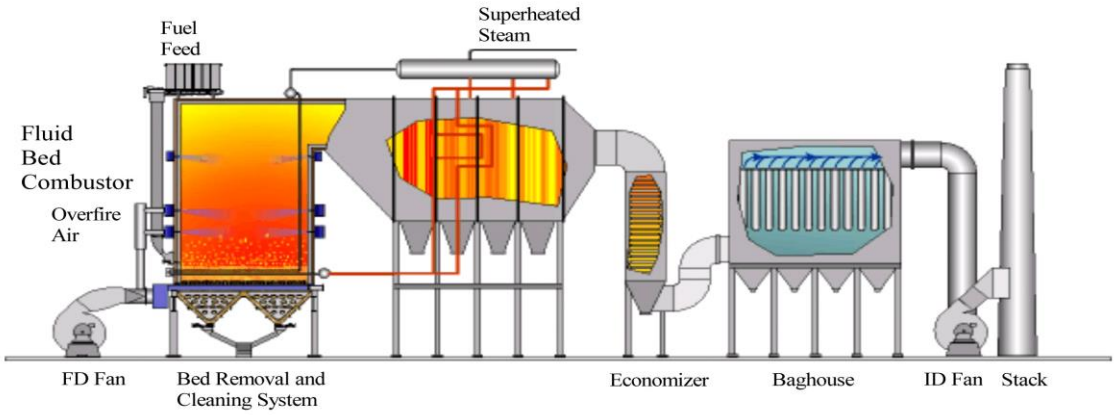


Figure 6-3: Industrial Fluidized Bed Boiler
(Source Outotec)

Non-boiler applications for EF include using it as a coal substitute in cement kilns or other industrial thermal uses. In 2016, an EF/cement kiln project was announced in Berkeley County (Martinsburg), WV. The fuel production facility will be designed to process up to 120,000 tons per year (500 TPD) of MSW into an EF for use at the Essroc cement kiln located in the county. The fuel production facility will be owned and operated by Entsorga North America, a privately-held company. The reported construction cost of the fuel production facility is estimated to be $19 million dollars. The Essroc cement facility will undertake a modest capital project to construct an EF receiving, storage, and handling system, with tipping fees reported in the mid $50/ton range. Production of EF includes steps similar to a MRF to extract recyclables and non-combustible materials from the feedstock. An additional step would be shredding and/or pelletization to homogenize the fuel product. The final fuel product can be in the form of pellets (see
Figure 6-4) or in the form of fluffy material (see Figure 6-5).

(Intentionally Left Blank)

Figure 6-4: Pelletized EF/RDF
(Photo courtesy of WastAway)

Figure 6-5: Shredded and Fluffy EF/RDF
(Photo courtesy of neo-eco Recycling)

Some of the companies making and installing EF/RDF processing equipment are as follows:

- Vecoplan
- Bulk Handling Systems
- Stadler
- Machinex
- CP Group

Some of the companies in the U.S. market that produce EF/RDF as a final product of their processing lines include:

- Envision Waste Services
- Repower South
- Vexxor
- SpecFuel
- WastAway

6.3.2.3 Composting

Also discussed briefly in Chapter 4, composting is a natural process whereby microorganisms break down organic matter in aerobic conditions. This section will cover the details on composting as an alternative waste processing technology for mixed waste processing and its connection to anaerobic digestion.

The composting process starts with grinding the incoming material and mixing it with a bulking agent and composting inoculum. This material goes through three stages of processing: active composting, curing and screening, as outlined in Figure 6-6 below. The full cycle lasts up to 150 days. Five factors that influence the composting process are moisture, oxygen, temperature, carbon to nitrogen balance, and particle size. The type of waste used for composting determines the carbon to nitrogen balance and particle size. Large composting facilities must screen waste received to ensure non-organic material (contamination usually found in food waste deliveries) is not present. Prepared waste material then goes through the composting process where moisture, oxygen, and temperature are controlled to create a product. Yard waste such as green waste, plant material, and woody waste traditionally have been the most common feed materials for composting. The addition of food waste is now more prevalent, and more facilities have started to accept it into the process. Biosolids have also been used as a feed source for composting.

(Intentionally Left Blank)

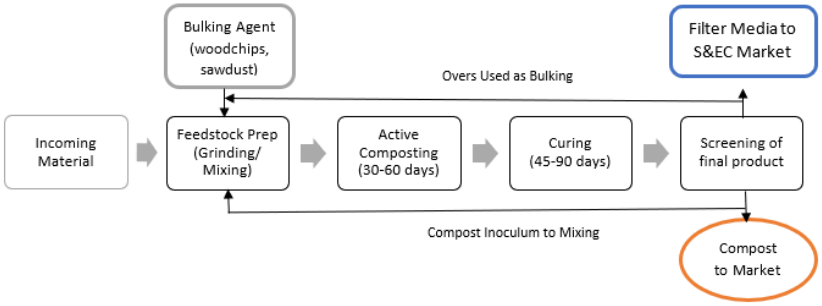


Figure 6-6: Composting Process Flow Diagram[48]

Figure 6-7: Windrow Composting

Traditional windrow composting utilizes piles that are placed in long rows, the size of which is determined by turning abilities (see Figure 6-7). For small facilities, piles must be turned manually using shovels, end loaders, top turners, or pull behinds. End loaders are not as efficient at mixing evenly and require a smaller pile size to be effective. For large scale facilities, either top turners or towed turners are ideal to allow for better mixing and larger piles. Top turners are driven over the pile and towed turners are towed at a distance behind a tractor over the pile. Proper mixing is important so that conditions are consistent throughout the pile to make sure that the whole pile reaches temperatures high enough to kill pathogens and to produce a consistent product. The pile size can also create concerns with the composting process. Smaller piles have less insulation, creating a concern that temperatures high

[48] State of Composting in the U.S.- Institute for Local Self-Reliance, July 2014

enough to kill pathogens will not occur. Larger piles create a concern for anaerobic conditions near the center of the pile where it is harder for air to circulate, requiring more turning of the pile. Aerated turned piles are suitable for yard waste and some food waste.

Due to the difficulties of maintaining aerobic conditions, turning the correct amount, and the limitations of traditional windrow composting, technology has shifted towards adding air to the pile using aeration systems. Aeration systems are advantageous because they require less space for similar throughputs since they don't need to be turned. When designed correctly, aerated piles will maintain aerobic conditions throughout the pile. Because of this, an aeration system also has a shortened composting duration compared to a traditional windrow system (see Figure 6-8).

Figure 6-8: Aeration Pipes for Aerated Static Pile Composting

Aerated static piles (ASP) require a system to supply oxygen to the composting pile, such as an aeration floor. There are multiple aeration floor systems that can be used including piping systems, trench systems, and a combination of piping and trenching. Aeration blowers are used to force air (positive aeration) or pull air (negative aeration) through the pile from the aeration floor. The feed waste moisture and porosity for ASP composting is important since it is difficult to alter moisture or porosity once the pile is created. The feed waste usually requires bulking so that the porosity is great enough that oxygen can get through the whole pile from the aeration floor. The amount of bulking agent used is dependent upon the particle size and moisture content of the feed stock; smaller particle size and greater moisture content both require the use of more bulking agent. Common bulking agents include woodchips, crop residue, bark, and leaves.

Some composting systems utilize both forced aeration and turning. Feed material will be processed using an aerated static pile method. The compost will then be placed into piles for curing, where the compost is turned. Both forced aeration and turning can be used simultaneously, however, it is not very common. To incorporate both forced aeration and turning, a larger space is required.

ASPs can remain open or be covered to help control the composting process. Insulation provided by a cover helps to ensure that a temperature high enough to kill pathogens is maintained throughout the pile. Two types of covers used are finished compost and textile covers. Finished compost, at least six inches thick, on top of piles can be used as coverage that reduces water infiltration, which reduces leachate generation while keeping moisture in the material and insulating the pile. The temperature of the pile is greatest in the center and decreases near the edges of the pile.

ASP is the system used at Deschutes Composting, discussed further in Chapter 4. As a corollary national example of an ASP project, a California landfill recently converted its windrow composting operations to an ASP composting facility. Redwood Landfill previously accepted approximately 150 tons per day of green waste (yard clippings and residential food waste) but was permitted to increase its daily feedstock to 514 tons per day, which included green waste as well as commercial food waste. To increase production without substantially increasing area, composting time had to be dramatically reduced. The aeration system includes a system of pipes, blowers, and biofilters to force air into the composting and the ability to produce a vacuum.

Figure 6-9: Textile covered composting piles-GORE Cover for Organic Waste Treatment
(Courtesy of Gore)

Textile covers provide additional benefits to finished compost coverage (see Figure 6-9). The textile covers shed water, reducing leachate and helping in storm water management, maintain a breathable environment to allow airflow into the pile, and capture odors. Several covers also offer oxygen-controlled systems and provide oxygen and temperature monitoring to aid in process control. Pile covers are a more economical option than full coverage structures such as canopies or buildings, particularly when odor and run-off are of concern. Pile covers can also be used on a temporary basis when rainfall, odor, or other events are anticipated for both static and turned piles.

Figure 6-10: In-Vessel Composting

Shipping containers, silos, rotating drums, tunnels, and trenches can all be used for in-vessel composting. Aeration is forced in the vessel to maintain aerobic conditions and proper decomposition. Forced aeration occurs through moving paddles or piping systems that bring air to the material. Depending on the system, the vessel can be covered or remain open. Co-composting is an example of an aerated in-vessel system where biosolids and wood waste are combined to make compost. The aerated in-vessel system is good for organics.

Different qualities of composts have different certifications or grades. Three different composting products can be produced and sold. Each product has one of three grades: Grade 1, Grade 2, or Waste Grade. Each grade has different levels of standards that must be maintained. Grade 1 compost has the strictest level of standards, and the standards loosen as the product moves from Grade 1 to Grade 2 to Waste Grade. Waste Grade compost does not have set standards but is classified as compost that exceeds any Grade 2 standard requirements. Compost produced from biosolids has stricter standards, since it has a higher potential risk for odor, contaminants, and pathogens. Similar to grades, the different certification levels for compost are based on quality; the higher the quality, the higher the certification level. Each grade and certification of compost can be used for different uses including compost, stormwater management, and landscaping. Grade and certification specifications can be found through the U.S. Composting Council.

Based on the report published by the Institute for Local Self-Reliance and Biocycle in October 2017, there are 4,713 composting facilities in the U.S. that process approximately 21.1 million tons of organic material annually. Most of these facilities are in California, Florida, Iowa, Washington and New York. The material processed at the existing composting facilities is predominantly yard waste, at 57% of the incoming feedstock.

Many policies on the state level have been enacted to encourage or require diversion of source separated organics. Back in the 1990s, more than 20 states instituted yard waste landfilling bans that resulted in more than 20 million tons of organic waste being diverted from landfills every year. More recently, a handful of states have instituted food waste disposal bans whose impact we are yet to see. In addition to landfilling bans, waste diversion laws and goals help increase the diversion of organics from landfills to composting or other processing facilities.

As discussed further in the next section, composting is often used with anaerobic digestion as both processes can be designed into a complementary organics management system.

6.3.2.4 Anaerobic Digestion

Anaerobic digestion (AD) is a biochemical process, facilitated by microorganisms, that decomposes organic material to biogas and digestate in an oxygen depleted environment. The performance of AD systems is sensitive to rapid changes in the environment, due to the specific needs of the living conditions that the microorganisms require. The composition of the organic material, the rate at which it is introduced to the microorganisms, and the temperature of the system must be maintained relatively consistent throughout the process. Frequent or rapid variation of these factors can reduce the efficiency of the biochemical conversion process and can result in damage or destruction of the microorganism population. AD is a technology developed for treatment of wide range of organic materials, including source-separated food waste, biosolids, organics from MSW, residues from food processing and packaging industry, manure, etc.

The primary characteristics of the waste stream that must be defined to select the appropriate AD technology include the volume of the waste stream, the total solids (TS) content, the volatile solids (VS) content, and the chemical oxygen demand (COD). The volume and TS content of the waste stream primarily dictate the type of technology that is most appropriate to maintain uniform contact between the organic material and the microorganisms. Approximate TS content ranges for which the common types of AD system are appropriate are summarized in Figure 6-11. The VS content and COD primarily dictate the size of the system, and in some cases, the need to apply multiple AD technologies to properly treat the waste stream. The performance, operational requirements and cost of the waste treatment process vary significantly, depending on the characteristics of the waste stream and the type of AD technology. A brief description of several common types of AD systems is included below.

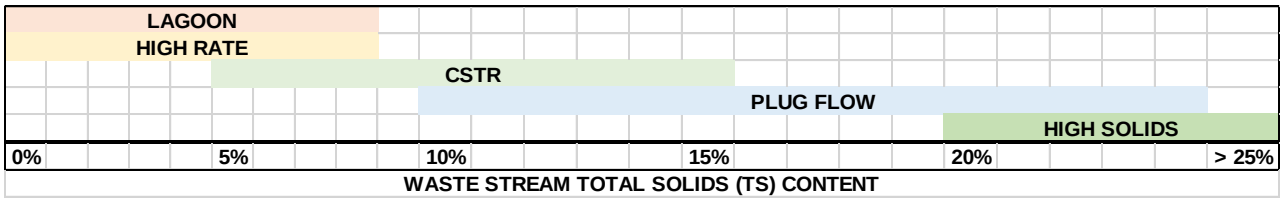


Figure 6-11: Approximate TS Ranges Suitable for Common Types of AD Systems

Lagoon type AD systems can be considered the most simple type of AD system, comprised of an in-ground waste storage vessel, typically earthen, with a plastic or concrete liner and a flexible cover to contain the biogas. A photo of a typical lagoon AD system is shown in Figure 6-12. Depending on the characteristics of the waste stream, mixing devices may be installed to maintain contact between the waste stream and the microorganism population and prevent accumulation of solids on the bottom of the lagoon. These systems are most applicable to low TS liquid waste streams (typically less than 8%), and are typically installed in agricultural waste applications, such as the treatment of flushed swine or dairy manure. These systems allow for the treatment of dilute waste streams at a relatively low capital cost. Lagoon systems are less efficient in cooler climates, as maintaining optimum temperature is inherently difficult due to heat loss to the surrounding soil and the amount of energy required to heat the water in dilute waste streams.

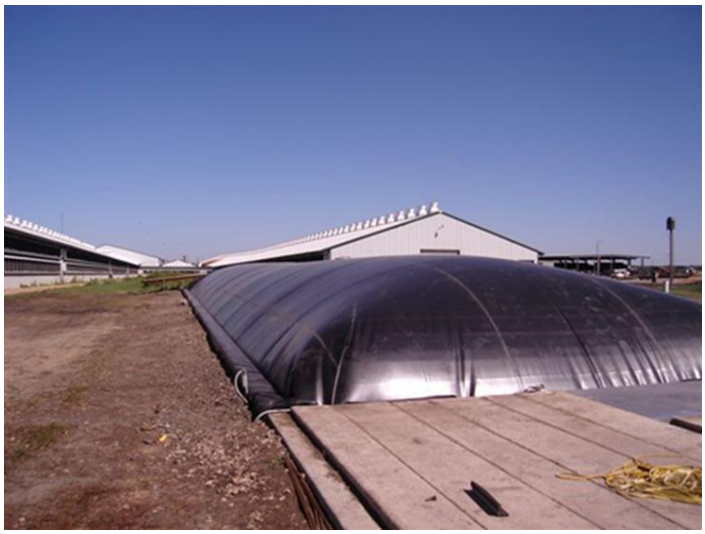


Figure 6-12: Typical lagoon AD system
(Photo courtesy Environmental Fabrics, Inc. www.environmentalfabrics.com)

High rate AD systems are technologically more advanced and most suitable for low TS liquid waste streams (less than 8%) with higher VS content and COD. These systems are comprised of a tank or vessel containing a fixed population of microorganisms, typically attached to physical structures such as grates, baffles, or a bed of granules. An exterior view of a typical high rate digester is shown in Figure 6-13.

The waste stream flow is directed through this vessel, and the organic material is converted to biogas as it flows through the microorganism population. Because the microorganism population is fixed in the vessel and is not removed with the waste stream, these systems allow for lower hydraulic retention time (HRT), thus they require smaller vessel volumes, relative to other types of AD systems. High rate AD systems are typically installed in industrial and municipal applications, for the treatment of waste streams including food and dairy processing wastewater and secondary treatment of municipal wastewater. These facilities can accept pumpable feedstock.

Figure 6-13: Typical High Rate AD System
(Photo courtesy Applied Technologies, Inc., www.ati-ae.com)

The most ubiquitous type of AD system for liquid or semi-solid waste streams is the Continually Stirred Tank Reactor (CSTR) or "complete mix digester". CSTR AD systems are comprised of a tank or vessel with a gas-tight cover and a mixing or agitation system. Two typical CSTR vessels are shown in Figure 6-14. These systems operate over a range of about 5% to 15% TS, depending on the waste stream characteristics and specific equipment and mixing technology. These systems are also known as "suspended growth" reactors, as the waste stream and microorganisms are kept in suspension by the mixing devices. The mixing process serves to maintain uniform temperature throughout the vessel, keep the solids in suspension and assures that contact is maintained between the waste stream and the microorganisms to allow for efficient conversion. These systems are installed in a wide range of waste treatment and energy generation applications, processing materials including dairy manure, restaurant and grocery store food waste, and corn silage. There are more than 8,000 CSTR AD systems operating in Europe, packaged by many different vendors.

Figure 6-14: Typical CSTR AD System
(Photo courtesy BIOFerm USA, Inc., www.biofermenergy.com)

Plug flow type AD systems are suitable for the treatment of liquid or semi-solid waste streams with TS content of about 10% to 25%. These systems are comprised of a tank or vessel in which the waste stream is combined with the microorganism population, and the mixture is conveyed between distinct inlet and outlet points. A schematic of a general plug flow digester is shown in Figure 6-15. There are many configurations of plug flow-type AD systems with various devices for mixing and conveying the waste stream.

Because the waste stream is not completely mixed in plug flow AD systems, care must be taken in the selection and design of these systems to avoid the accumulation of solids in the vessel. These systems are most effectively installed in higher TS applications such as municipal wastewater sludge treatment, where the waste stream is relatively homogenous, and the consistency of the material presents a challenge to the effective application of CSTR technology.

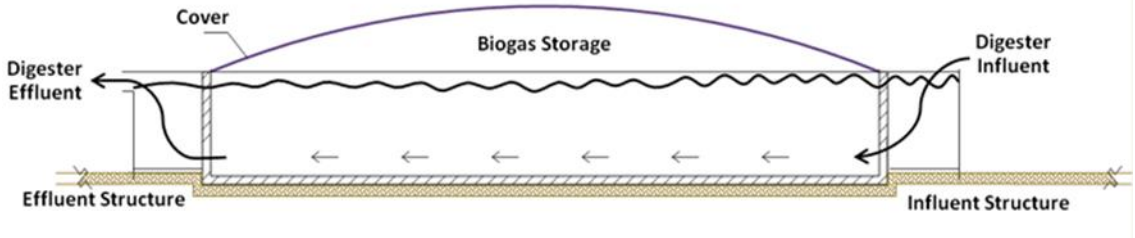


Figure 6-15: Typical Plug Flow AD System Schematic
(Photo courtesy of Renewable Energy Institute www.plugflowdigester.com)

New advancements in the plug flow design have allowed processing mixed food and yard waste as a feedstock. These plug flow systems have shafts that turn and help the mixing of the materials and the movement through the digester. An example of plug-flow digester with shafts is shown in Figure 6-16.

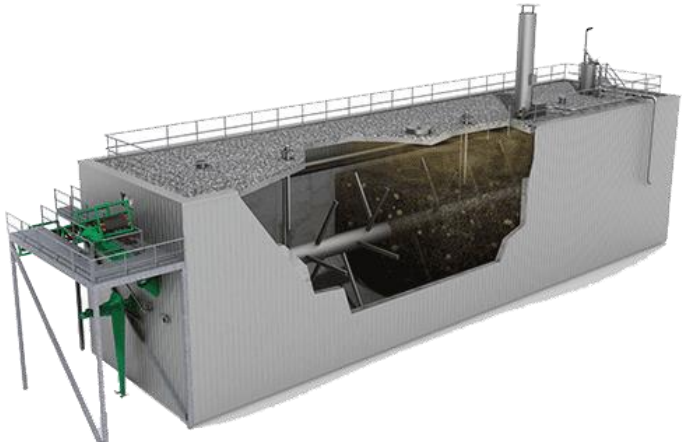


Figure 6-16: Plug Flow System with Mixing Shafts
(Picture courtesy of Hitachi Zosen Kompogas)

High solids or dry-type AD systems represent a relatively new and emerging sector of AD waste treatment technology. These systems are being installed to process waste streams that form a pile, typically with TS values greater than 20%, including municipal organic waste, grocery and produce waste, and stackable agricultural waste. An example of a waste stream suitable for treatment in a high solids AD system is shown in Figure 6-17. High solids AD systems are operated as batch-type processes in which the waste stream is piled in vessels (also called chambers) with drains in the walls or floor using a bucket loader. The vessel is sealed and the waste pile is irrigated with liquid containing a microorganism population. During the AD process, some of the physical structure of the waste material breaks down, releasing liquid, which is used to irrigate the subsequent batches.

Figure 6-17: Typical Waste Stream Suitable for a High Solids AD system
(Photo courtesy BIOFerm USA, Inc.)

Several high solids AD technology suppliers also offer, as part of their process, composting capabilities that can be installed within the same plant. Subsequent to the digestion process, the waste stream receives an aerobic treatment; in some cases, part of this treatment takes place in the same vessel/chamber where anaerobic digestion occurred. These solutions are very convenient when quality compost has the potential to provide a significant share of the revenue in addition to the biogas generated during the AD part of the process. Figure 6-18, Figure 6-19 and Figure 6-20 show AD systems overview as well as the interior of a chamber where anaerobic and aerobic treatment occurs in different steps of the process.

Figure 6-18: High Solids AD with Integral Composting Operation
(Image courtesy of Turning Earth, LLC)

Figure 6-19: Chamber of a High Solids AD with Integral Composting Operation 1
(Images courtesy of Aikan)

Figure 6-20: Chamber of a High Solids AD with Integral Composting Operation 2
(Images courtesy of Aikan)

There are many AD technology vendors and project developers in the U.S. According to the American Biogas Council, there are 184 operating AD plants that process food waste as a feedstock. Table 6-6 provides a list of the most important ones, based on their experience and the number of operating plants in the U.S. and abroad.

Table 6-6: Most Significant AD Companies in the U.S.

Provider	Processes	Facilities
Quasar Energy Group	Wet Anaerobic Digestion	14 operational plants across the U.S.
Zero Waste Energy	Dry Anaerobic Digestion	Monterey, San Jose, South San Francisco, CA
CR&R-Eisenmann	Dry Anaerobic Digestion	Perris, CA
General Electric	Wet Anaerobic Digestion	Acquired Monsal technology with operating facilities in Europe
BioFerm	Wet and Dry AD	5 plants in North America
Organic Waste Systems	Dry Anaerobic Digestion	30 operating plants in Europe and Asia
Thoni	Dry Anaerobic Digestion	Plants in Europe licensed to Martin GmbH
Hitachi Zosen Kompogas	Dry Anaerobic Digestion	75 facilities worldwide

6.3.2.5 Mass Burn

Mass burn combustion technology, commonly referred to as waste-to energy (WTE), involves burning or incineration unprocessed MSW in the presence of oxygen, releasing heat, which is used to produce high temperature and pressure steam in a

boiler. The steam is directed to a turbine generator, which produces electricity for plant operation and sale to the electrical grid or for industrial processing. Marion County Oregon's Covanta facility and Lee County, Florida's existing WTEF are both examples of a mass burn combustion unit.

Large capacity units, generally greater than 250 tons per day (TPD), are referred to as commercial-scale facilities. Combustor and boiler components for these facilities are manufactured at remote fabrication shops into panels or sections. The sections are typically of the maximum practical size that can be economically transported to the project site. At the project site, the sections are assembled into complete and functional units. Due to the extensive amount of field work required, the unit ancillary subsystems such as fans, burners, air ducting, insulation, power and control wiring are also installed at the project site. The unit is first tested after it has been fully assembled, which can take 12 or more months to complete at a cost of several million dollars. The balance of plant equipment including air emission controls, power generation, and plant utilities are constructed simultaneously with the combustor/boiler.

General process diagram for a commercial mass-burn WTEF is shown in Figure 6-21.

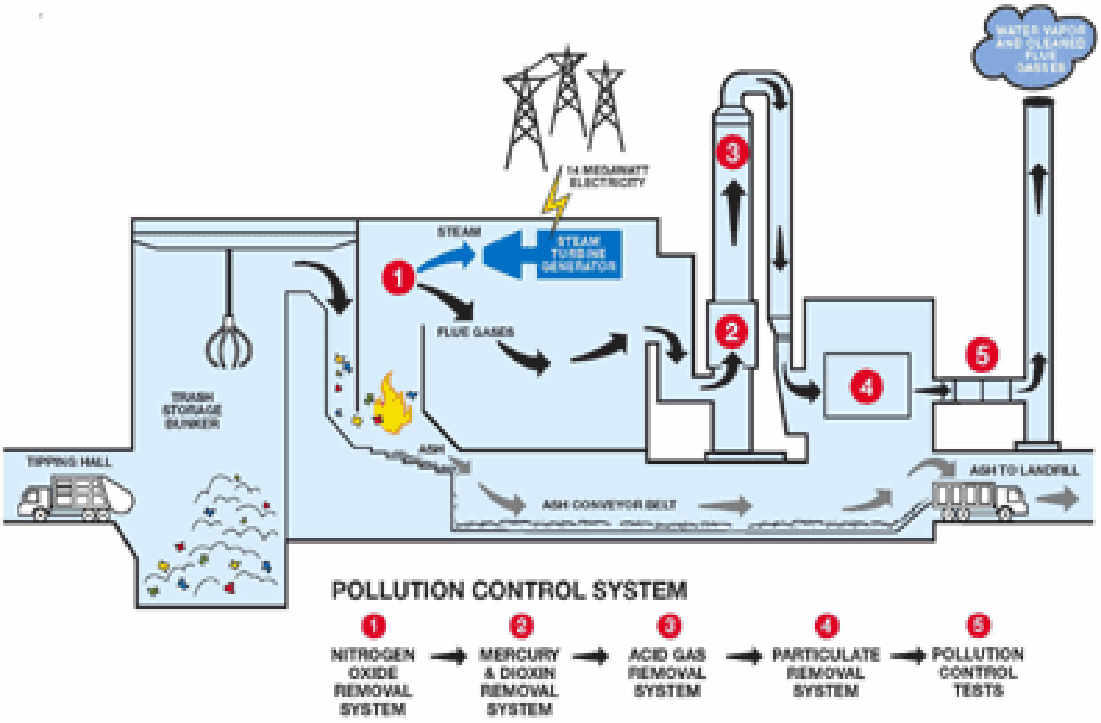


Figure 6-21: WTE Process Diagram
(Courtesy of ecomaine)

Several U.S. and international companies sell field-erected mass burn combustion units as either an equipment supplier or as a full design, build, and operate WTEF

services company. Several of the full-service companies will also provide for private facility financing and ownership.

6.3.2.6 Mechanical-Biological Treatment

Mechanical Biological Treatment (MBT) facilities are widely relied upon in Europe. The impetus for the construction and operation of these types of facilities has been regulations and economic incentives. Significant taxes are placed on solid waste that is landfilled in Europe; therefore, solid waste must be processed to maximize the recovery of materials prior to landfilling any remaining material.

These European MBT facilities involve both mechanical and biological treatment processes to recover recyclables and process the remaining material through three basic alternative approaches that rely on biological treatment of the material. The biological treatments can be grouped into the following categories: bio-drying, composting, or anaerobic digestion.[49]

The MBT plants in Europe process only residual waste remaining after source separation of recyclables and organics is completed. They can be configured in different ways to achieve different goals: increased recycling, diversion of organic material from landfills, and energy recovery through production of RDF. A generic illustration of a potential MBT facility is shown in Figure 6-22. The European facilities are constructed in conjunction with an energy user for the bio-dried fuel product or an established market for the compost product. The MBT facilities that incorporate an anaerobic digester produce a biogas that is commonly used in a combined heat and power application. There is a higher cost of disposal where these facilities are constructed and operated in Europe.

In the United States, the term MBT facility is a relatively recently used acronym. Certain aspects of an MBT facility have been constructed, such as a material recovery facility, mixed waste processing facility, an in-vessel composting facility, or an anaerobic digester. The application of MBT technology as a waste processing facility was introduced by Entsorga North America at an MBT facility being constructed in Martinsburg, WV that employs Entsorga's bio-drying technology.

(Intentionally left blank)

[49] "Mechanical Biological Treatment of Municipal Solid Waste", prepared in the United Kingdom by the Department for Environment Food & Rural Affairs, February 2013.

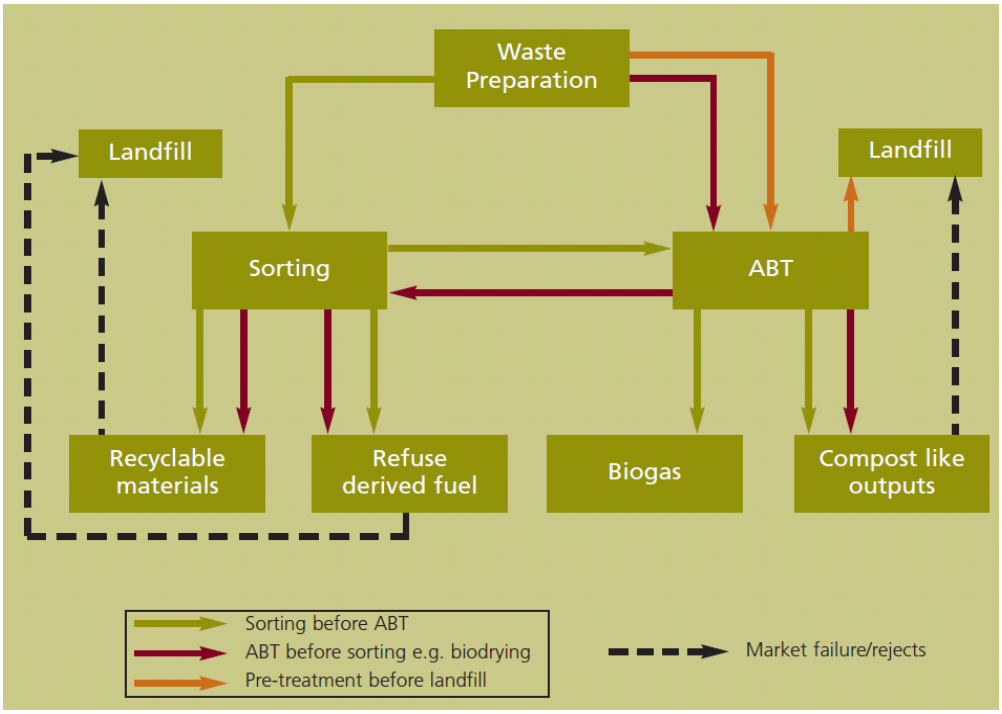


Figure 6-22: An Illustration of the Potential MBT Options
(Source: DEFRA UK)

In 2017, Fiberight LLC started construction of a 600 ton per day MBT facility utilizing its proprietary technology in Bangor, Maine. The facility is expected to begin commercial operations in the fourth quarter of 2018.

A limited list of suppliers and/or operators of MBT facilities is as follows:

- Biffa Group Limited
- Entsorga Italia
- Fiberight LLC
- Shanks Group, LLC
- Veolia
- Sacyr Valoriza

6.3.2.7 Pyrolysis/Gasification

Gasification and pyrolysis are thermal conversion technologies that operate with different amounts of air present in the system. Gasification occurs in the presence of limited amounts of air that allows partial combustion of the material. Pyrolysis occurs in the complete absence of air.

Gasification leads to a mixture of combustible gases (hydrogen, carbon monoxide, carbon dioxide and some trace compounds) called syngas as a final product. Syngas is a valuable commercial product used to create synthetic natural gas, methane, methanol, dimethyl ether and other chemicals. It can also be used directly to produce energy as a surrogate for natural gas.

Pyrolysis leads to synthetic liquid fuel similar to crude oil and syngas. Synthetic liquid fuel can be mixed with crude oil and further refined to gasoline and other petroleum products.

Both technologies have been successful in processing biomass and homogeneous industrial waste products. Their application in the field of MSW processing is under development. Gasification, in particular, has been applied worldwide on different feedstocks and shows potential for processing MSW. The basic stages of the gasification process are shown in Figure 6-23.

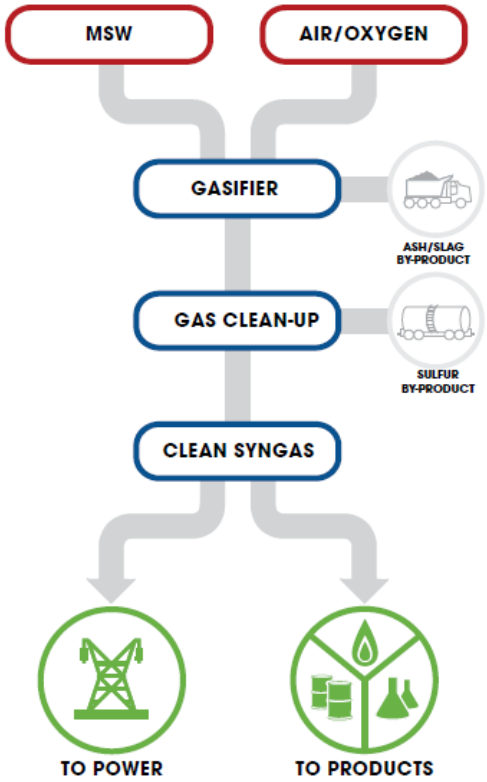


Figure 6-23: The Gasification Process[50]

6.3.2.8 Gasification for Electricity Production

Gasification is the thermal conversion of any carbon-based material with a small amount of air or oxygen in a heated chamber, into syngas. The syngas may have a heating value of 200 to 500 Btu per cubic foot and can be either used as a fuel for energy production or further processed to a wide variety of fuels and chemicals.

[50] Gasification Technologies Council, 2011.

In the gasifier, the feedstock is converted through several sequential processes. First, the feedstock is homogenized into smaller particles. Then it is inserted into the gasifier with a controlled amount of air or oxygen (and steam for some gasifiers). Feedstock passes through several temperature zones where a sequence of reactions occurs before the syngas is removed from the chamber. The temperatures in a gasifier typically range from 1,100 to 1,800 degrees Fahrenheit. Solid residue is removed from the bottom of the reaction chamber.

Traditional gasification systems come in several primary variations, each with advantages for particular feedstock or product applications. The basic design of each system type is built around the reaction chamber with insertion of feedstock, but each has a different heating mechanism, air entry and syngas removal location, as illustrated in Figure 6-24.

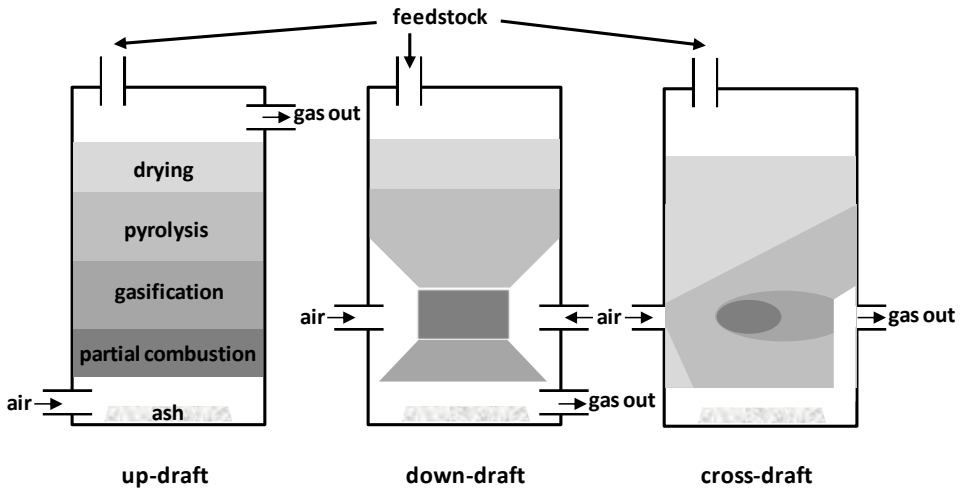


Figure 6-24: Gasification System Types

Other gasifier types, including plasma gasifiers, do not rely on a different gasifier structure or arrangement of air inlets and syngas outlets, but rather on type of heat source used.

Four different types of gasifiers are described in more details in the following sections.

Updraft (counter-current flow gasifying agent and feedstock)
An updraft gasifier has stacked zones clearly defined to dry, pyrolyze, gasify, and partial combust the feedstock.

In this type of system, the air is introduced from the bottom of the chamber and rises counter-current to the downward movement of the waste through the conversion zones. The gases produced move upwards and are removed from the top of the chamber. This upward movement of the air and gas improves the efficiency as the rising hot gases help to control temperatures, aid in drying of the feedstock, and improve the mixing of the gases in the chamber. Possible disadvantages of updraft

systems are having tar present in the raw gas (which causes blockages), and inefficient loading for some large or heterogeneous feedstocks.

Fluidized bed gasifiers are one type of updraft gasifier. In these gasifiers, feedstock is suspended in oxygen-rich gas (effectively creating fluid-like movement of the gas and feedstock within the chamber). The suspension improves the heat transfer rate between the gas and the feedstock and allows ash to fall out of the suspension instead of being carried up with syngas. Fluidized bed systems can gasify feedstocks with potential to form corrosive ash without damaging the chamber. In addition, they support a higher fuel throughput than other gasifier types. This type of reactor may also be referred to as a circulating fluidized bed or transport reactor.

Downdraft (co-current flow gasifying agent and feedstock)
In downdraft gasifiers, the air is introduced at a mid or top part of the chamber and the syngas is removed from the bottom part of the chamber. Heat is added from the top of the chamber, and the gas temperature increases as it moves downward. The gas leaves the chamber at very high temperatures. This heat can be harnessed for use in heating the upper portion of the chamber. On the way out of the chamber the gas must go through the ash (in the form of char), which reduces the amount of tar in the syngas.

Entrained-flow gasifiers are a type of downdraft gasifier. In these gasifiers, the feedstocks and air are introduced high in the chamber so the oxidant and the feedstock blend as they move downward. Gasifiers of this variety operate at high temperatures and are efficient for conversion of coal or other easily pulverized materials too low-tar syngas, because the reactions occur along the entire length of the chamber.

Crossdraft
In crossdraft gasifiers, the air inlet and the gas outlet are on the opposite sides in the middle of the chamber. This type of gasifier is less common as it produces high-temperature syngas at a high velocity that does not have as efficient CO_2 reduction as other gasifier types. The types of feedstocks for these systems are limited by the system design to low ash fuels, such as wood, petroleum coke, and charcoal.

Crossdraft gasifiers have several advantages, including the production of high carbon monoxide, low hydrogen and low methane syngas content when used on dry fuels, and a fast startup time desirable for some applications.

Plasma
Plasma gasification is used in industries that require disposal of hazardous wastes at high temperature. High temperature (up to 10,000 degrees Fahrenheit) is created by a plasma torch in the gasifier.

Two different plasma gasification configurations are available, based on the part of the gasification process at which the plasma torch is applied. The first type is plasma-assisted gasification, and the second is the plasma coupled with traditional thermal gasification.

The first type has the plasma torch(s) in the gasification chamber where the heat generated breaks apart the chemical bonds in the feedstock and forms gas. Inorganic,

rejected materials are collected at the bottom of the gasification chamber as a glass-like inert material potentially suitable for construction or other aggregate applications. Most plasma torch gasifiers are arranged similarly to an updraft system, as illustrated in Figure 6-25, where feedstock is inserted near the top of the chamber, air or oxygen inserted in the middle or bottom of the chamber, and syngas is removed from the top of the chamber. The feedstock moves downward and into the intense heating zones created by the plasma torches. This type of system helps to prevent tar formation, as the syngas remains at a very high temperature (upwards of 1000°C) as it exits the chamber.

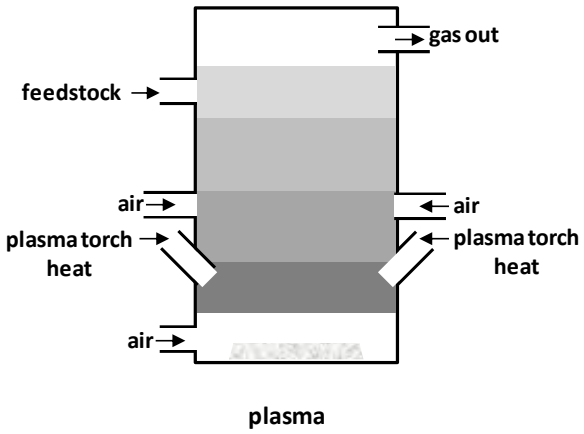


Figure 6-25: Plasma Gasification

The selection of an optimal gasifier type for a particular application depends on variables such as the size, moisture content, and calorific value of the feedstock and the desired product type and quality.

6.3.2.9 MSW to Biofuels

One promising solid waste management technology is use of MSW as a feedstock in the production of renewable transportation fuels (Biofuels). A leading company in this evolving sector is Enerkem. Headquartered in Montreal, Canada, Enerkem has developed a proprietary thermochemical process for commercial production of ethanol. Enerkem's process involves feedstock preparation, gasification, cleaning and conditioning of syngas, and catalytic synthesis. Figure 6-26 illustrates the Enerkem process.

(Intentionally left blank)

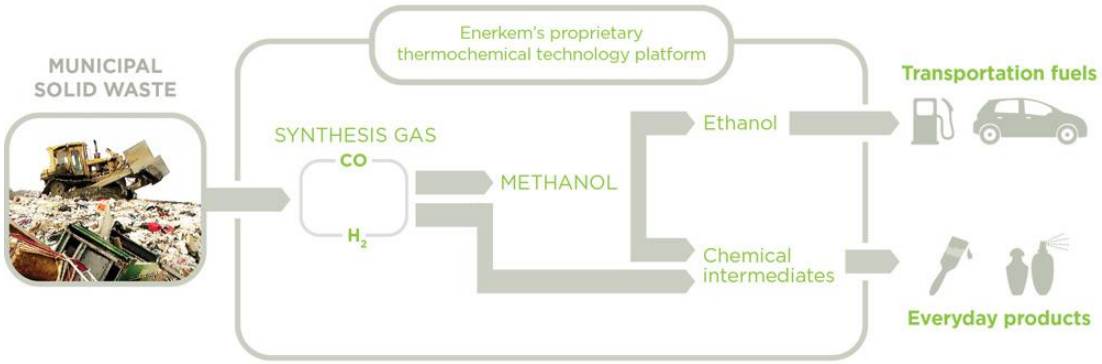


Figure 6-26: Enerkem Process[51]

Currently, Enerkem operates two research and development facilities, both of which produce ethanol:

- Sherbrook, Quebec (Canada) - Pilot plant operating since 2003
- Westbury, Quebec (Canada) - Demonstration facility operating since 2009 with processing capacity of 1.3 million gallons of ethanol annually.

Enerkem's first commercial production facility is located in Edmonton, Alberta, Canada, and began initial operation since 2015 and produces methanol.

6.3.3 Technology Summary

Of the multiple alternative processing technology options discussed in this Section, the following are recommended for further consideration by Deschutes County.

Anaerobic Digestion with ASP Composting. The County could consider sponsoring or contracting with a facility that processes source separated food waste via AD and which further processes the digester digestate with other organic waste via composting to produce renewable energy and compost. Such a facility could produce valuable renewable energy and soil amendments and lessen the County's reliance upon landfill management options. AD is highly compatible with ASP composting operations as the digestate output is readily composted with woody organic material for a nutrient-dense compost product.

Food waste can rapidly decompose in the landfill, converting into methane gas, a high potency greenhouse gas. While landfills, including Knott Landfill, are fitted with landfill gas capture and treatment systems, much of the methane generated from food waste may escape even with the landfill gas capture system installed.

Mechanical Biological Treatment with Alternative Solid Fuel Production. The County could sponsor a facility to process its waste through an MBT facility. Such a facility could provide a second chance to recover traditional recyclable materials which were inadvertently discarded in the MSW stream while producing an alternative solid

[51] Enerkem, 2011.

fuel suitable for industrial use from the non-recyclable waste. The County would need to find large scale solid fuel consumers such as cement kilns and industrial boilers willing to purchase the solid fuel. This could lessen the County's reliance upon landfills and could potentially reduce overall greenhouse gas emissions to the extent biogenic fractions of the solid waste fuel (wood, paper, organic textiles, etc.), offset the use of fossil fuels such as coal, natural gas and oil.

MSW to Biofuels. The County could consider sponsoring an MSW to biofuels facility. Such a facility could produce cellulosic ethanol for use as a transportation fuel or fuel blending stock. The volume of MSW generated within the County is likely not sufficient to support a biofuels project by itself, but a recent study of the economically available forestry biomass waste[52] indicates that the combined MSW and forestry waste streams would be more than sufficient to support such a facility. Such a facility could not only provide Deschutes County with a long-term waste management solution, but also provide an outlet for low value forestry waste which currently has no economically-viable market. The facility could spur hundreds of millions of dollars in private sector infrastructure investment creating hundreds of jobs in the solid waste management and forest products sectors.

An MSW to biofuels facility would reduce Deschutes County's greenhouse gas emissions in multiple ways by reduced landfill methane and CO_2 emissions and eliminating the need for long-haul trucking of MSW to remote landfills. Additionally, when used as a transportation fuel, cellulosic ethanol has a greenhouse gas profile at least 60 percent less than its fossil fuel alternatives, gasoline and diesel.

Table 6-7 summarizes the capital cost and tip fee for the alternative processing technologies profiled above. The costs assume approximately 250,000 tons MSW per year, but further market analysis would be required to gather specifics for Deschutes County, including forestry waste assumptions.

Table 6-7: Alternative Processing Technology Summary

Alternative Technology	Capital Cost	Approximate Tipping Fee
Organics (AD with ASP)	$45 million $5 million pre-processing $35 million facility–(80,000tpy) $5 million post-processing	$50-$70/ton
MWP/EF	$50 - $100 million	$60-$70/ton
MWP/Energy Recovery (Biofuels)	$250 - $300 million	$60-$70/ton

Deschutes County's current cost for disposing of waste is $35 per ton. Comparing this cost to the approximate cost to operate the technologies at $50 to $70 per ton shown

[52] TSS Consultants, CENTRAL OREGON BIOMASS SUPPLY AVAILABILITY ANALYSIS prepared for the Central Oregon Intergovernmental Council, June 2016.

in Table 6-7, it does not seem practical to move forward with these alternatives. Also, for these technologies to be feasible, there must be a stable market for the energy produced by them.

When Knott Landfill closes, the cost for disposal will most likely increase due to the transportation cost as any new disposal site will be further from the population centers. As communities across the country continue to build these alternative technologies, more experience will be gained for the County to draw upon. In addition, circumstances related to the price of energy or alternative fuels may change to where there will be opportunities to market the products locally. For example, California has an established renewable energy tax incentive credit program that has prompted the development of AD facilities to make compressed natural gas. Canada has a program that provides carbon emission offset credits from renewable energy. As such, the Durham Regional Waste Authority recently built a WTEF outside Toronto, Canada. These projects are beneficiary of the renewable energy programs.

6.4 Findings and Recommendations

In recent years, there has been increased demand to recover more materials from the waste stream and to explore ways to turn waste into a resource. This effort has been supported by efforts to seek clean renewable energy sources. The result has been technologies that have been in operation in Europe for many years, like AD, that are now operating in the U.S. Also, several technologies that have been in the developmental stage for many years are now in operation or are being implemented. These technologies seek to transform the cellulose matter prominent in MSW into bio-fuels or to remove the glass, metals and other inert materials to make a clean fuel product.

This Chapter examined the status of the alternative technology industry and whether these technologies may be viable options for managing waste generated in Deschutes County. The following represents the findings based on the review of these technologies and considering the information available to date.

1. Further study to include an alternative technology for managing waste in Deschutes County does not appear feasible at this time.

2. Markets for the renewable energy or fuel products are not readily available at this time.

3. Knott Landfill is expected to close in 10 years. This provides the opportunity for the County to monitor conditions and to reassess the potential of implementing an alternative technology in three to five years.

4. The County should only consider those technologies/vendors that have a proven record of successfully operating a commercial scale facility.

Recommendation 6.1: The County should *continue to monitor and assess the status and feasibility of alternative technologies as a part of the Solid Waste System in three to five years.*

7. LANDFILL DISPOSAL OPTIONS

Introduction

This SWMP has identified strategies to reduce waste, recycle more materials and consider possible technologies to decrease the amount of waste disposed in landfills. However, there is still waste that must be properly disposed in a Subtitle D landfill. When Knott Landfill closes, which is anticipated to be in about 10 years, the County will need to have an alternative disposal option in place. The two primary options are to transport waste to existing regional landfills or to site and build a new in-County landfill.

7.1 Background

When the Resource Conservation and Recovery Act (RCRA) was re-authorized in 1992, it adopted new regulations governing where landfills can be located and how they would be designed and operated. The part of the federal regulations pertaining to MSW landfills is section "Subtitle D". The state of Oregon adopted these regulations, which are defined in OAR 340-94-001. These regulations require landfills be designed with liner systems and leachate and landfill gas controls systems. They also require owners of Subtitle D landfills to set aside funds to close and monitor landfills during the post-closure care period, which is typically required to be 30 years. Existing landfills that continued to operate had to transition out of current operations and build new landfill cells that were compliant with the new regulations.

The financial burden to make substantial capital investments in new landfill cells and set aside funds for closure and post closure care caused many smaller landfills to close. For many communities that did not generate large amounts of waste, the expense to meet new Subtitle D requirements was not cost effective. Therefore, to make it cost effective for a jurisdiction to comply with Subtitle D regulations, they needed to obtain long term commitments for wastes from other jurisdictions. Difficulty in securing long term agreements for waste prevented many communities from making the investment in new landfills.

As landfills were closed, some jurisdictions were faced with the task to locate a new landfill site. Both Portland Metro (the regional solid waste authority for the Portland Metropolitan area) and Marion County spent several years siting new landfills on the west side of the Cascade Mountains, and neither jurisdiction was successful. It is important to note that, although both jurisdictions had located sites that were physically suitable for a new landfill, they were not successful due to public opposition or because of challenges related to State and local land use laws.

The failure to site landfills in the more populated areas west of the Cascade Mountains encouraged support to building larger landfills designed to serve several communities in the arid climate east of the Cascades. The new landfills were permitted along the Columbia River Gorge, which has favorable geologic and hydrologic conditions for building Subtitle D landfills. They also provided convenient access via alternative transportation methods such as rail and barge as well as by truck.

By the early 1990s, larger communities, such as Portland Metro and Vancouver and Seattle, Washington chose to contract out the transportation and disposal of their wastes. As a result, several regional landfills were developed in the Columbia Gorge. Since the development of these landfills in the 1990s, there have been no new Subtitle D landfills sited in Oregon. There have, however, been many expansions to existing Subtitle D compliant landfills.

7.2 County Authority for Waste Disposal

As presented in Chapter 1, ORS 459.085 designates authority to each county in the State. It specifies that both cities and counties have the authority to adopt ordinances and regulations regarding the management and execution of programs and services to collect recyclables and wastes in their jurisdictions.

With respect to areas outside of cities, a board of county commissioners may adopt ordinances to:

a. Own and operate disposal sites and license disposal sites as an alternative to franchising of service.
b. Regulate, license or franchised salvage businesses or the operation of salvage sites where such action is found necessary to implement any part of a solid waste management plan applicable in the county.

In summary, both cities and counties are responsible to ensure basic solid waste collection, recycling and disposal services are provided to all residents and businesses.

The State supports local governments working cooperatively to prepare a SWMP and coordinate services in the most efficient approach. ORS 459.065 states local governments may enter into intergovernmental agreements as follows:

a. For joint franchising of service or the franchising or licensing of disposal sites.
b. For joint preparation or implementation of a solid waste management plan.
c. For establishment of a joint solid waste management system.
d. For cooperative establishment, maintenance, operation or use of joint disposal sites, including but not limited to energy and material recovery facilities.
e. For the employment of persons to operate a site owned or leased by the local government unit.
f. For promotion and development of markets for energy and material recovery.
g. For the establishment of landfills including site planning, location, acquisition, development and placing into operation.

As part of preparing this SWMP, a key step has been to review and update intergovernmental agreements, especially as it relates to moving forward with implementation of the recommendations. Therefore, the planning process is designed to obtain input from cities, other stakeholders and the public as it is being prepared.

ORS 459 has several citations that govern management of solid waste. The ORS citations above describe the authority of local governments to manage solid waste within their jurisdictional boundaries and for local governments to work together on solutions and services. There are additional citations that relate to waste reduction and recycling and landfill disposal sites.

First, through SB 263, the State regulations for waste reduction and recycling were amended and codified in ORS 459A. This amendment to the original "Opportunity to Recycle Act" enacted new recovery rates for all counties (also referred to as wastesheds). For Deschutes County, the recovery rate was set at 45% by 2025.

Second, listed are the regulations related to new landfill disposal sites. In ORS 459.017 it states (bolded language emphasizes State responsibilities):

1. The Legislative Assembly finds and declares that:
    a. The planning, location, acquisition, development and operation of landfills is a matter of statewide concern.
    b. Local government units have the primary responsibility for planning for solid waste management.
    c. **Where the solid waste management plan of a local government unit has identified a need for a landfill, the State has a responsibility to assist local government and private persons in establishing such a site[53].**
2. It is the intent of the Legislative Assembly that any action taken by the Environmental Quality Commission to establish a landfill under ORS 459.049 be recognized as an extraordinary measure that should be exercised only in the closest cooperation with local government units that have jurisdiction over the area affected by the proposed establishment of a landfill.

Furthermore, ORS 459.047 identifies how the State will work with local governments to site, permit and implement any new landfill disposal site. In summary, the State recognizes the complexity and challenges in locating a new landfill disposal site and will offer assistance where needed.

7.3 Existing Landfill Disposal

Knott Landfill is the only landfill in Deschutes County and is anticipated to close in 2029. It accepts both municipal solid waste (MSW) as well as construction and demolition waste (C/D) as discussed in previous chapters. The amount of waste received at Knott Landfill is shown in Table 7-1.

Table 7-1: Deschutes County Waste to Disposal Operations[54]

	2010	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***
Annual Waste Disposed (tons)	**114,307**	**112,751**	**113,611**	**119,682**	**130,956**	**144,067**	**161,087**	**182,095**
% Change		***(1.4%)***	***0.9%***	***5.4%***	***9.4%***	***10.0%***	***11.8%***	***13.0%***

[53] Emphasis added to acknowledge importance of SWMP
[54] Source: *2017 Material Recovery and Waste Generation Rates Report*

The amount of waste disposed at Knott Landfill in 2017 was 181,000 tons, an increase of 39% since 2014. The growth in the amount of waste disposed can be attributed to several factors including population growth, increase in construction activity and overall improvement in the economy. Although Deschutes County continues to experience slightly higher population growth than the rest of Oregon, this increase in waste disposed is not expected to continue at this rate. To this point, in 2018 DSW reported that 182,000 tons were disposed. Therefore, the waste projections to be used for planning purposes assume waste generation will increase at a rate commensurate with the growth in population in Deschutes County.

By 2040, the amount of waste generated is estimated to grow to 336,000 tons. How much is disposed will be determined by how much can be recycled and/or converted to other resources. In Chapters 3 and 4, this plan identifies new programs and services that can reduce the volume of waste disposed over the next 10-12 years, which may result in extending the site life of the Knott Landfill by one or two years. In Chapter 6, several alternative technologies that can convert waste into resources and reduce that which is landfilled were evaluated. These technologies, however, do not appear to be viable today. Perhaps, in the future, conditions may change that the County can consider their feasibility.

Cost of Landfill Disposal

The County has operated Knott Landfill for more than 45 years. In 1996, Cell 1, the first Subtitle D compliant lined cell, was completed at Knott Landfill and MSW landfilling operations were moved to Cell 1 at that time. Non-MSW disposal operations continued in the unlined area at Knott Landfill through 2008. The new cells constructed from 1996 forward include primary and secondary liners and a leachate collection and recirculation system. A landfill gas collection and monitoring system was installed in 2001. The landfill gas collection system is expanded on a regular basis as waste disposal operations proceed.

When the landfill was converted to a Subtitle D compliant facility, the County established a closure and post closure fund as required by the State. This fund will ensure adequate funds are dedicated to properly close all active landfill areas and pay the expenses for monitoring the site for 30 years after closure or until the time the landfill is deemed stable.

The County charges a tip fee of $55 per ton for the cost to manage the solid waste system. Of this amount, $35 pays for the cost of operating Knott Landfill. The remaining $20 of the tip fee is used for operation of the four transfer stations and to fund recycling, public education and other programs administered by DSW. In 2016, the Department's total cost to operate Knott Landfill was $5,962,000. The breakdown of the different expense categories associated with operating the landfill is shown in Table 7-2.

Table 7-2: Knott Landfill Expenses 2016

Knott Landfill Operating Expenses	2016 (Actual)
Operations	$ 2,662,000
Fees and Permits (DEQ) / Insurance	$ 400,000
Transfer to Reserve Funds	$ 2,500,000
- Capital Reserves	
- Equipment Reserves	
- Closure and Post Closure	
Contingency (7%)	$ 400,000
Total Annual Operating Expenses	**$ 5,962,000**

Depending on the quantity of waste disposed daily, the actual operating cost typically does not vary significantly. For instance, if a landfill receives 600 tons versus 500 tons per day, the operating expenses for placing and compacting the waste will not appreciably change. The reason is that fixed operating costs are a higher percentage of overall expenses and therefore the unit cost or per ton rate to operate is not greatly impacted by the amount of waste disposed. The capital expenses to build new landfills cells as well as the planned closure and post closure expenses are fixed costs and are already prorated on a per ton basis. Thus, when waste volumes increase, there is more revenue to pay for fixed costs resulting in lowering the unit cost to operate the landfill. For this reason, regional landfills that accept large amounts of waste can charge a lower tip fee compared to smaller landfills. The following table shows how the actual tip fees varies depending on the annual amount of waste disposed.

Table 7-3: Total Annual Operating Expenses

Total Annual Operating Expenses		$ 6,000,000	$/Ton
Annual Waste Disposed	2016	161,000 tons	$37.27
Annual Waste Disposed	2017	181,000 tons	$33.15
Average Disposal Cost			**$ 35.21**

Each year, DSW prepares a budget and makes an estimate on how much waste will be disposed in the coming year. There are some inflationary expenses such as labor and fuel prices, but most expenses are relatively stable.

In considering future disposal options, the County can compare the estimated cost to the current tip fee of $35 per ton for landfill operations.

7.4 Waste Stream Projections

In Chapter 2, estimates of how much waste might be generated and disposed were presented. This information represents background data that can be used to analyze alternatives and determine future disposal needs.

Using the waste generation projections, estimates were made of the amount of waste that could be processed using an alternative technology and/or may need to be disposed in a landfill. In projecting the estimated waste to be disposed beyond 2030, the analysis will assume that the per capita generation rate will continue to be 2,800 pounds. This will be multiplied by the population projections using the latest growth rate for period leading to 2030 as prepared by the Population Research Center at Portland State University.

Table 7-4: Deschutes County Waste Disposal Projections

Year	Population Projections	Per Capita Generated (tons)	Waste Generated (tons)	Waste Recycled (tons)	Recovery Rate	Waste Disposed (tons)
2015	170,606	2,663	227,333	83,381	36.7%	143,952
2016	174,701	2,727	240,844	79,757	33.1%	161,087
2017	178,893	3,022	270,326	89,000	32.9%	181,326
2018	183,187	3,000	274,780	90,677	33.0%	184,103
2019	187,583	3,000	281,375	92,854	33.0%	188,521
2020	190,734	3,000	286,101	94,413	33.0%	191,688
2021	194,739	3,000	292,109	96,396	33.0%	195,713
2022	198,829	3,000	298,243	98,420	33.0%	199,823
2023	203,004	2,900	294,356	97,138	33.0%	197,219
2024	207,267	2,900	300,538	99,177	33.0%	201,360
2025	210,826	2,900	305,698	100,880	33.0%	204,817
2026	214,832	2,800	300,764	99,252	33.0%	201,512
2027	218,913	2,800	306,479	101,138	33.0%	205,341
2028	223,073	2,800	312,302	103,060	33.0%	209,242
2029	227,311	2,800	318,236	105,018	33.0%	213,218
2030	230,412	2,800	322,577	106,450	33.0%	216,126

Table 7-4 shows that by 2025 the waste disposed is estimated to be over 200,000 tons and 216,000 tons by 2030. This assumes that the County's recovery rate of 33% does not increase over the existing rate. This assumption is conservative as it is expected that the expanded programs and services recommended in the plan will result in diverting more waste. For planning purposes, these conservative projections will be used for evaluating options and planning for future facilities.

7.5 Needs and Opportunities

The County, working with cities and private waste collection companies, has provided the infrastructure needed to manage solid waste in a most effective manner. With Knott Landfill, residences and businesses have become reliant on having an in-County disposal site that greatly supports a most cost-effective system. For example, the current tip fee at Knott Landfill is $55 per ton, one of the lowest rates in Oregon and perhaps the entire Pacific Northwest. One reason other counties have higher rates is that several jurisdictions have elected to transport waste from 50 miles to 200 miles to regional landfills.

With Knott Landfill having a finite capacity, it will close perhaps as early as 2029. There are strategies that may extend the site life as discussed in Chapter 6, but eventually an alternative disposal site must be in place prior to the actual closure date. Looking at projections, the County will generate between 300,000 and 400,000 tons of waste per year. Making a conservative assumption that the recovery rate remains constant, the County will need to dispose almost 220,000 tons per year by 2030. While this presents a challenge, it also provides opportunities that may not be feasible in other parts of the State. Deschutes County is growing and, besides the attraction to relocate to the area, the amount of tourism and annual visitors contribute to an active and vibrant economy. Therefore, the County is expected to experience a higher rate of growth than perhaps other parts of the State. The amount of waste that is forecasted to be generated may make certain alternatives more cost effective for Deschutes County compared to other jurisdictions that do not generate enough waste to pay for these alternatives.

The amount of time remaining before Knott Landfill closes provides an opportunity to evaluate options and implement strategies to reduce waste disposed in the landfill. At the same time, given the time needed to site a new landfill or build facilities needed to support other options, it is prudent to develop a strategy for managing waste when Knott Landfill is closed.

7.6 Disposal Options

7.6.1 Long-Haul Waste to Out-of-County Landfills

One option for handling waste from Deschutes County after the closure of Knott Landfill would be to export the waste to landfills outside of the County. There are several regional landfills currently operating in the States of Oregon and Washington. These regional landfills were developed in the 1990s in response to the requirements of RCRA Subtitle D. In both Oregon and Washington, there was also a push to develop new landfill capacity in arid climate areas east of the Cascade Mountains. The purpose was to reduce exposure to impacts from precipitation and the potential for contaminating groundwater if the landfill liner systems fail. Communities like Seattle, Washington also subscribed to the fact that the increased cost to transport and landfill waste east of the mountains would create an incentive to recycle more materials. Simply put, by recycling more material, communities would save money by avoiding the cost to transport waste long distances.

Regional Landfills

Landfills are considered regional in the State of Oregon if they receive more than 75,000 tons per year from jurisdictions outside the local county. There are currently five regional landfills operating in Oregon and one in Washington. These are as follows:

Landfills Located East of the Cascade Mountains

1. **Columbia Ridge Landfill, Arlington, OR** – Owned & operated by Waste Management

2. **Finley Buttes Landfill, Boardman, OR** – Owned & operated by Waste Connections

3. **Wasco County Landfill, The Dalles, OR** – Owned & operated by Waste Connections

4. **Roosevelt Regional Landfill, Roosevelt, WA** – Owned & operated by Republic Services

Landfills Located West of the Cascade Mountains

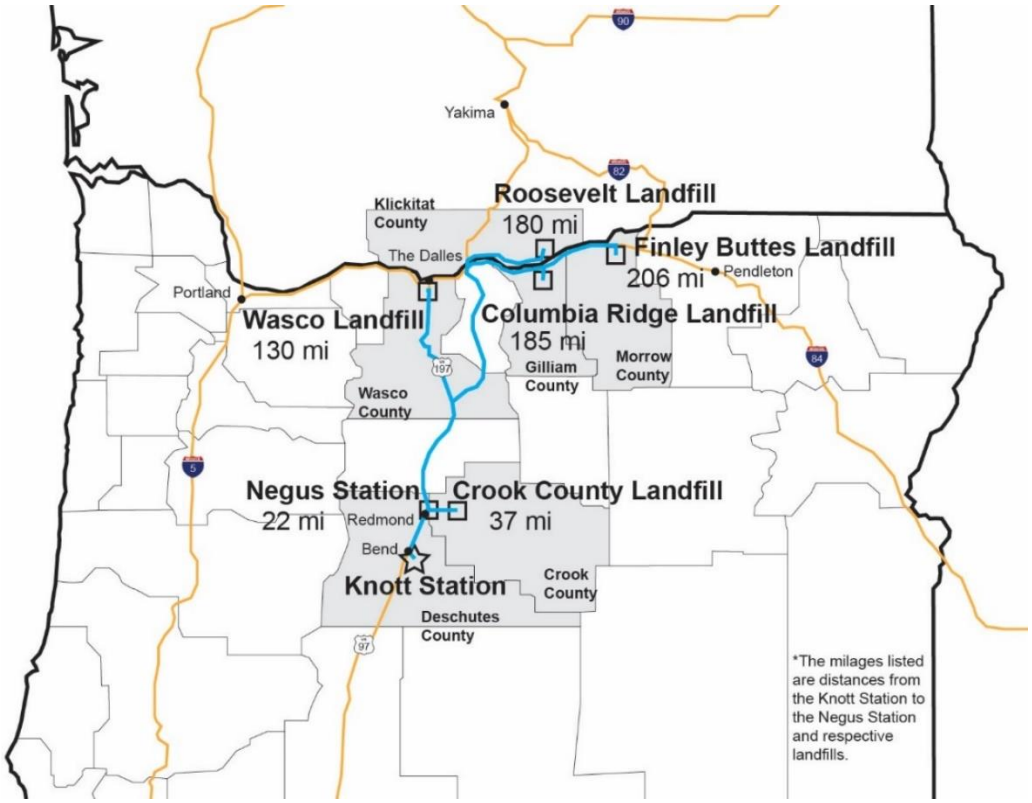
5. **Coffin Butte Landfill, Corvallis, OR** – Owned & operated by Republic Services

6. **Dry Creek Landfill, Medford, OR** – Owned & operated by Rogue Disposal

The combined capacity of these privately owned and operated landfills is well over a few hundred years. In addition to Knott Landfill, there are a few publicly owned and operated landfills. These landfills are located in Lane County and Crook County. Lane County only handles waste generated in their county including the cities of Eugene and Springfield. Crook County currently serves only its county residents but has expressed interest in receiving waste from outside their County.

A key consideration for any community to dispose of waste is the cost of transporting waste to these regional sites. The locations of the five landfills considered in this discussion and their respective one-way distances from the Knott Transfer Station in Bend are shown in Figure 7-1. Not shown on the map are the two regional landfills located west of the Cascade Mountains. Both Dry Creek Landfill in Medford and Coffin Butte Landfill just north of Corvallis are approximately 200 miles from Bend. However, transporting waste over the Cascade Mountains, particularly in the winter months, may not be practical, so these two facilities have been excluded from this analysis. Negus Transfer Station is also shown in the figure because it is closer than the Knott Transfer Station to all existing landfills, making it possible to directly haul waste from Negus Transfer Station to the regional landfills. This would save transporting waste 22 miles from the Negus facility south to the Knott Transfer Station that would otherwise be needed.

Figure 7-1: Location and Distances to Proximate Landfills and Transfer Stations



The map shows the closest Subtitle D landfill is in Crook County. The closest regional landfill is 130 miles from Bend, located in Wasco County near The Dalles. Three other regional landfills, located near the Columbia Gorge, range in distance from 185 miles for Columbia Ridge to 208 miles for Finley Buttes

There are several methods for transporting waste to landfills. The main transportation methods are: truck, rail and barge. For distances under 300 miles, transportation of waste by truck tends to be the most cost effective. Since the distances to all five landfills are around or below 200 miles from the Knott Transfer Station, this analysis will focus on the costs of transporting waste via truck from Deschutes County to the proximate landfills.

In order to haul waste from Deschutes County to the out-of-County landfills, the transfer stations in Deschutes County would need to be renovated. For the purposes of this analysis, the cost to renovate the Knott and Negus Transfer Stations is $4,000,000 and $8,000,000 respectively. Additionally, the cost of operating these transfer stations would be $12 per ton each.

The cost of transporting waste from these transfer stations will vary based on the landfill chosen. Recently, Metro received bids for transporting waste from their transfer stations in Portland to the Columbia Ridge Landfill in Arlington, OR. The contract Metro

has with a private hauler has a cost of $653 per container and using an average of 32 tons per container results in $20.41 per ton in transportation fees. The proposal includes a provision that Metro pay the cost of fuel at $4 per ton and therefore, Metro assumes risk for changes in fuel costs. This yields a total cost of $24.41 per ton for Metro to transport waste 175 miles to the Columbia Ridge Landfill.

This bid price translates to about $0.14 per ton-mile and is based on traveling over 80% of the time on Interstate 84, a major freeway. Transfer trucks transporting waste from Deschutes County to regional landfills will use a combination of County, State and federal highways and will travel through small towns. This may increase the total haul time and impact costs, even though the total miles are similar. Regardless, this cost represents the most recent information from a public bid process and will be utilized to compare options for transporting waste from the Knott and Negus Transfer Stations to the prospective landfills. Actual cost will be established using a competitive bid process.

At the Knott Transfer Station, it is probable that a compactor will be installed to maximize the payload for each trailer. With a transfer station compactor, waste is placed in a compaction unit where it is compressed to a high density before being loaded into a transfer trailer. With a compactor, payload can be precisely controlled to maximize transportation efficiency. Typically, a transfer trailer can be top loaded with a payload of 24 to 26 tons. However, a compactor can produce a payload of 30 tons to as much as 34 tons of waste in each a trailer, thus maximizing transportation efficiency and minimizing the total number of transfer trips needed. Using Metro's cost to transport waste of $0.14 per ton-mile which includes fuel, the cost to transport waste 185 miles from Deschutes County to the Columbia Ridge Landfill is estimated to be about $26 per ton

The County could also transport waste from Negus Transfer Station to Columbia Ridge Landfill, a distance of about 165 miles. Using the $0.14 per ton-mile, transportation cost would be about $24 per ton. If the County did not use a compactor, the payloads per each trip would be 25 tons versus 32 tons in comparison with loads utilizing a compaction system.

Disposal fees at the regional landfills will vary depending on how much waste is committed and the timeframe for that commitment. It is estimated the disposal fee will range from $22 to $35 per ton. In addition, most regional landfills are required to pay a host fee for out-of-County wastes. Host fees are a fee paid to the local city or county jurisdiction where a landfill is located. Metro is required to pay a $6 per ton host fee at Columbia Ridge Landfill. This cost will be added to the estimated cost of disposal.

This represent the best information that is available and will be used for planning purposes and evaluating alternatives. The actual price to dispose will most likely be determined through a public procurement/bid process.

The transfer station operating and renovation costs and waste disposal costs for both transfer stations to all five regional landfills are summarized in Table 7-5. For the Negus Transfer Station, only the Wasco and Crook County landfills are considered because hauling only 25 tons per trailer would be more costly for the other landfills being evaluated due to longer transportation distances.

Table 7-5: Transfer Station Operation, Transportation and Disposal Costs for Out-of-County Long-Haul

Knott Transfer Station			
Landfill	**Transportation Costs ($/ton)**	**Landfill Disposal Costs & Host Fee ($/ton)[1]**	**Total Transportation/ Disposal & Host Fee ($/ton)**
Wasco Landfill (135 miles one-way)	$19.00	$28.00-$31.00	**$47.00-$50.00**
Columbia Ridge Landfill (185 miles one-way)	$26.00	$30.00-$33.00	**$56.00-$59.00**
Finley Buttes Landfill (206 miles one-way)	$29.00	$30.00-$33.00	**$59.00-$62.00**
Roosevelt Landfill (180 miles one-way)	$25.00	$30.00-$33.00	**$55.00-$58.00**
Crook County Landfill (35 miles one-way)	$8.00[2]	$40.00[3]	**$48.00**
Negus Transfer Station			
Wasco Landfill (110 miles one-way)	$16.00	$28.00-$31.00	**$44.00-$47.00**
Crook County Landfill (18 miles one-way)	$6.00 [2]	$40.00 [3]	**$46.00**

[1] Assumes a host fee of $6 per ton for all regional landfills. Host fees may vary by jurisdiction.
[2] The cost to transport from Deschutes County transfer stations was adjusted considering time to travel rural highways and through congested areas.
[3] Crook County tip fee is based on the current published gate rate of $35 per ton plus a $5 per ton host fee.

The closest regional landfill that can provide 50 years or more of capacity is the Wasco County Landfill at a distance of about 135 miles. However, the other regional landfills are all within 200 miles and therefore, the cost to transport waste is reasonably close in comparison.

The cost to dispose at these landfills has two components. First, is the actual cost the operator will charge to accept a jurisdiction's waste, often referred to as a tip fee. This can vary depending on the volume commitment and the terms of the contract. A commitment to accept 200,000 tons per year for 20 years may have lower costs than the same tonnage for a shorter period of maybe five years. This is because the landfill has more certainty with the longer term and can better plan for the cost of the services with a longer commitment period. Also, a large portion of the costs to operate a landfill is fixed, thus more waste that is contracted for disposal may result in a lower

fee. The second component would be the host fee that is often a condition placed on the landfills. The current host fee is assumed to be $6 per ton, but this can vary from site to site. Also, host communities do have the ability to raise their fees without input from out-of-county users. This is a risk that can be negotiated as part of the disposal contract.

Based on the distance to the regional landfills and using the most recent transportation cost produced from a public proposal (Metro), the cost to transport Deschutes County's waste to regional landfills ranges from $16 to $29 per ton from the Knott Transfer Station. Based on current data shown in Table 7-5, it is estimated that the cost to transport and dispose of waste at a regional landfill could range from $47 to perhaps $60 per ton. Each of the regional landfills are active in soliciting more wastes from jurisdictions. This market condition would appear to be advantageous to the County as these landfills would compete to provide the best price.

Crook County Landfill

Besides transporting waste to landfills located along the Columbia Gorge, another option is to dispose of Deschutes County's waste at the Crook County Landfill. This landfill is an approved Subtitle D landfill that currently receives all waste from Prineville and Crook County. In 2017, the landfill disposed of 36,000 tons of waste.

Crook County is open to receiving waste from jurisdictions outside their jurisdiction. Previously, the landfill accepted waste from Jefferson County. In 2009, Jefferson County elected to transport their waste to the Wasco County Landfill. The current tip fee to dispose of waste at the Wasco County Landfill is $35 per ton plus a host fee of $5 per ton. This is similar to the cost to operate Knott Landfill and Deschutes County would need to transport waste almost 40 miles from the Knott Transfer Station to the Crook County Landfill. Another option could be to transport waste from Negus Transfer Station to Crook County, which is 15 miles.

The option to dispose of some, but not all, of Deschutes County's waste at the Crook County Landfill would need to be evaluated further to determine how much waste could be disposed and for how long. This could also be a strategy that might help extend the site life of Knott Landfill beyond the anticipated 2029 closure date. Reducing waste disposed at Knott Landfill can extend the time before it reaches capacity, but the County would lose revenue and the unit cost to operate Knott Landfill would increase. For instance, if 30,000 tons each year were transported to Crook County at a cost of $40 per ton, the loss of revenue to Deschutes County would be about $1,200,000 per year, plus the cost to transport waste to Crook County. The cost to transport waste to Crook County may offset the current cost to haul from Negus Transfer Station to Knott Landfill, but this would need further analysis. Since the cost to operate a landfill has a large percentage of built in fixed costs, when the waste volume deceases, the unit price to operate Knott Landfill would most likely increase. From Crook County's perspective, sending more waste to their landfill could benefit their overall cost of operations and perhaps provide a lower tip fee.

This option can be further explored, but only if Crook County is willing to accept an amount of waste from Deschutes County that is both practical for the overall Deschutes County system and beneficial for both jurisdictions. However, disposal of all of Deschutes County's waste at the Crook County Landfill is not a long-term solution as it would greatly impact the capacity and site life of the Crook County Landfill.

7.6.2 Option - Site and Build a New In-County Landfill

The County, in cooperation with the cities, has the option to site, design and build a new in-County landfill when Knott Landfill closes. For Deschutes County, siting a landfill in a more remote setting may be successful. In the late 1990s, the County conducted a preliminary search and located potentially suitable sites for a new landfill. However, this effort was discontinued when a further evaluation of expanding Knott Landfill was determined to be feasible. Now that Knott Landfill will be closing, this option is being considered.

Siting a New Landfill

The rules and regulations for siting and permitting a new Subtitle D landfill are specified in the OAR 459. Based on these requirements, there are several steps in the process to be completed before a final permit can be issued by DEQ.

Step 1 – Establish a need for the new landfill
DEQ requires a jurisdiction to adopt a SWMP that formally establishes the need to site and build a new landfill to manage municipal solid waste and to serve its jurisdiction. DEQ will not accept an application without the need being fully recognized.

Step 2 – Identify potential areas/sites that meet location criteria
There are several approaches for proceeding with siting a landfill. The jurisdiction can identify potential areas and proceed to identify perspective sites based on established location criteria. A Phase I Site Characterization may also be conducted to identify sites that are suitable in this initial step. Also, as part of this step, a thorough review of the jurisdiction's land use regulations may also be conducted to establish those uses that are most suitable under the current zoning rules. Identifying the appropriate zoning to comply with local land use requirements is an important step towards receiving a Land Use Compatibility Statement (LUCS) that will be needed to obtain a DEQ permit. In this step, a public meeting might be held to gain input into the areas that are most suited for building a new landfill.

Step 3 – Complete Phase II Site Characterization consistent with DEQ permitting requirements on the preferred site(s)
Upon identifying areas that satisfy the location criteria, a jurisdiction can proceed to develop and carry out a formal siting study to identify preferred sites. The siting criteria should list the desired features and parameters for the new landfill. This process should include public input during the site selection process. A Phase II site characterization report will need to be completed to select a preferred site and provide sufficient data and site information to obtain permits.

As this step is completed, the jurisdiction can submit information to DEQ and seek preliminary approval under OAR 340-093-0090. This step allows DEQ to provide comments or concerns prior to the jurisdiction spending funds on completing the detailed engineering reports. Preliminary approval does not prevent DEQ from denying or conditionally approving a completed permit application. Nor if denied, does it prevent the applicant from proceeding to complete the application and address the concerns of DEQ.

Step 4 – Complete permit documents and DEQ application
After selecting the preferred site(s), the jurisdiction can move forward with preparing the permit application. This entails preparing detailed engineering plans, environmental monitoring and operations plans, closure and post closure studies and provide for financial assurance requirements. All the technical reports and studies will be part of the overall permit application submitted to DEQ. The jurisdiction must also provide a LUCS prior to DEQ approval.

Step 5- Complete permit application process
After the permit application documents are submitted to DEQ for review, DEQ will provide comments and the jurisdiction will need to respond within a specified time established in the statutory review process. This step will also entail public meetings to obtain comments prior to issuing a final permit.

These represent the basic steps a jurisdiction must take to site and build a new landfill. Local jurisdictions can develop an approach that includes public involvement and completion of the permit documents that satisfy their local conditions. It is important to work closely with DEQ and other agencies that may be impacted or other stakeholders in obtaining a permit.

Siting Criteria

In siting a new landfill, there are certain restrictions on the location that are required to be addresses prior to spending resources on an extensive siting process. The Subtitle D location restrictions address the following:

- Airports and airport safety
- Flood plains
- Wetlands
- Fault areas
- Seismic impact zones
- Unstable areas
- Critical habitat
- Sensitive hydrogeologic environments

A preliminary review of these criteria appears to indicate that there are areas within the County that will satisfy these location restrictions. A formal review should be conducted prior to proceeding with an extensive siting process.

Another key siting criteria is protection of groundwater. An analysis of potential impacts to groundwater will be required as part of the site characterization process. As an example, groundwater at Knott Landfill is over 700 feet deep, which could be considered a desirable attribute for groundwater protection. The overall geologic conditions present in parts of Deschutes County are more favorable for siting a landfill than other areas.

Based on the requirements and various steps a jurisdiction must complete, the process to site a landfill is quite extensive. It requires field investigations to characterize the site and several technical and engineering studies to be completed and approved by DEQ and perhaps other agencies that may have jurisdiction. When documents are submitted, they are reviewed in house by DEQ and appropriate state agencies. DEQ also provides time for public comments and conducts public meetings. During this

process, appeals can be made to higher authorities or decision makers for a final action. Thus, it is difficult to predict the total time needed to complete the landfill permitting process and procure a permit. A key land use action that must be completed by the sponsoring jurisdiction is to approve the LUCS. This approval is subject to appeals to the Land Use Board of Appeals (LUBA) and can be a protracted process.

It has been noted that no new landfills have been permitted in the State of Oregon for more than 20 years. Part of the reason for this is the fact that a majority of Oregon's population resides west of the Cascades which is subject to greater amounts of precipitation. High amounts of precipitation can pose challenges for groundwater protection and management of leachate. The State has preferred that new landfills be built in arid climates east of the mountains. Most communities do not generate sufficient wastes to justify the cost to build a Subtitle D compliant landfill and with the existing capacity at regional landfills available to accommodate those communities, no new landfills have been sited.

Based on past experience going back to the early 1990s, it should be assumed that it may take two to three years to site and permit a new landfill. However, this schedule does not account for legal challenges and/or appeals to agencies that have approval authority. As an example, the Riverbend Landfill in Yamhill County is the most current landfill permitting project in Oregon. The landfill owner applied for an expansion to the landfill on an adjacent property in 2011. As of October 2018, the process has taken almost eight years and is currently on appeal to the State Supreme Court for a decision. This landfill is located near several residences and is close to farm land.

If the decision is made to move forward with the option to site a new landfill, a period of three to five years considering extra time associated with appeals should be assumed for completing the permitting process. Additional time will be needed to build the supporting facilities (access roads, gatehouse/scales, maintenance buildings, etc.) and the initial landfill cells. These could take two years to design and construct. Conservatively, six to eight years may be needed to have a new in-County disposal site ready to accept waste.

Physical Description of a New Landfill

The commitment to site and build a landfill should be considered an investment to provide ongoing services for a long period. Such a facility will provide a stable long-term solution for Deschutes County and perhaps other parts of central Oregon. Using waste generation projections, a preliminary analysis was prepared that indicates between 400 and 500 acres would be needed to provide approximately 100 years of service. This does not necessarily mean the entire site will be built out at the onset, as it can be built and filled in phases. However, in seeking a future landfill site, it is desirable to have the capacity to manage the County's waste for the long term. The amount of property needed should account for providing a buffer for adjacent properties. The size of the buffer area depends on the location and mitigating impacts to neighbors, if required.

In considering the amount of land required for a new site, it should be assumed the landfill can be excavated to a depth of 50 to 100 feet and filled to a height of 100 feet above the surrounding grade. This approach is not only more cost effective to operate, but also results in reducing the overall footprint needed for the facility.

Traffic is usually not a major consideration as most likely, waste will be delivered by transfer trailers like those currently used at the County's transfer stations. This helps to reduce the number of vehicle trips that would be needed to deliver waste to the new landfill. The site should also have safe access to highways or County roads. Dedicated service roads to access the landfill working areas can be constructed as needed.

Cost to Site/ Build and Operate an In-County landfill

To properly dispose of MSW, the County would need to site, construct and operate the new landfill in accordance with the Subtitle D regulations. Since the County has operated Knott Landfill in conformance with these regulations for over 20 years, it certainly has the knowledge and experience needed to continue this practice. Currently, the cost to operate the landfill is about $35 per ton. This includes all direct and indirect expenses such as closure and post closure funds, capital reserves and fees.

Siting a New Landfill

As previously noted, a new landfill has not been sited in the state of Oregon for more than 20 years. Thus, the costs to complete the entire process are best estimates assuming the procedures presented in the previous section are followed. Since there are several opportunities to appeal decisions during the process, it is difficult to estimate the total time required and what additional efforts will be needed to respond to any appeals. However, the cost to produce the technical reports and engineering documents needed to secure a permit are defined and these costs are known.

With this background, the estimated cost to site the landfill are:

Landfill Siting Process (includes public meetings)	$ 300,000
Site Characterization Reports	$ 1,000,000
Preliminary Engineering and Permit Documents	$ 1,200,000
Permitting Contingency (20%)	$ 500,000
Total	**$3,000,000**

Included in the estimate is a contingency to address the need to conduct additional public meetings, provide additional technical studies and/or respond to permit agencies and possible appeals. These funds will be expended over the entire siting and permitting process which might be three to four years, or possibly longer depending on appeals.

Landfill Development/ Construction Cost

A new landfill must be designed to comply with the regulations established by the OAR 390-94-001 that are consistent with RCRA Subtitle D. Key environmental and engineering features for siting and building a new landfill are installing groundwater monitoring and landfill liner systems to protect groundwater. Other elements include leachate and landfill gas management and control systems.

All the physical improvements and control systems will be established in the preliminary engineering documents submitted to DEQ. Upon receiving a permit, final design of the landfill elements, as well as necessary support facilities, can be prepared.

These engineering plans must be approved by DEQ prior to start of construction. In this initial phase, the County will need to excavate and build the first landfill cells as well as construct the necessary infrastructure to support operations. This will include access roads, scales, employee facilities and maintenance shops. The estimated costs to complete the engineering and build the facilities to start operation are listed below.

Support Facilities (includes access roads, scales, employee facilities, maintenance shops, utilities, etc.)	$ 4,000,000
Initial Landfill Cells	$ 2,000,000
Leachate Management System	$ 1,000,000
Environmental Monitoring Systems	$ 1,000,000
Subtotal	$ 8,000,000
Engineering/Construction Services/Administration	$ 1,400,000
Contingency (15%)	$ 1,600,000
Total Estimated Construction Cost	**$ 11,000,000**

This estimate assumes that 10 to 15 acres will be constructed in the first phase over a two or three year period. The entire landfill is expected to be approximately 400 to 500 acres in area. These estimates are based on the most recent costs to construct landfill improvements of similar facilities throughout the State.

The total cost to site and construct a new landfill is estimated to be about $14,000,000 with a 15% contingency. It is assumed that the County will issue some form of bonds to fund these initial improvements, which would be retired over a 20-year period.

Operating Expenses and Projected Cost Per Ton

The cost to operate a new landfill is expected to be similar to the current cost to operate Knott Landfill. As shown in Table 7-2, the current cost to operate Knott Landfill including reserves, closure and post closure funds is about $6,000,000 per year, or about $33 to $35 per ton. Projecting these expenses and adding the annualized debt service for the capital to build the new landfill results in a projected cost of $38 per ton in 2029 dollars. This represents a present worth value in 2018 dollars of $34 per ton. Adding the cost of the land, assumed to be $1 per ton paid over time, the estimated cost to start up and operate the landfill is $35 per ton. Once the debt service on the initial capital investment of $14,000,000 is retired, landfill expenses may be reduced by $4 per ton. This suggests that the long-term disposal cost for operating an in-County landfill is about $30 per ton in 2018 dollars. Assuming a suitable landfill site is located within 25 miles of the Knott Transfer Station, transportation cost could range from $6 to $8 per ton, depending on the route.

7.7 Evaluation of Disposal Options

Given the remaining capacity of Knott Landfill, the County has some time before making a final decision on a future disposal site. However, whether the County elects to transport waste to a regional landfill or pursue siting and building a new in-County landfill, investments in the solid waste system will be needed. As discussed in previous chapters of this SWMP, there are several recommended actions for implementing

strategies to reduce waste disposed in landfills. There are also several emerging technologies that are commercially viable that can be used to convert or transform waste into renewable energy resources. Some of these technologies are not currently feasible for the County, but perhaps conditions could change in the future that would prompt a reconsideration of an alternative technology. However, the County cannot fully rely on these strategies to dispose of all waste and must plan to have an option ready when Knott Landfill closes for disposing of waste that cannot be recycled or converted.

In this chapter, three options were discussed:

1. Transport waste to an out-of-County regional landfill
2. Transport a portion of Deschutes County's waste to the Crook County Landfill
3. Site and build a new in-County landfill

At this time, Crook County is interested in accepting only a portion of Deschutes County's waste. Thus, this option will be evaluated as part of the strategy to transport waste out-of-County. Disposing of some of the Deschutes County's waste at the Crook County Landfill might be an interim strategy to extend the site life of Knott Landfill. However, based on the information received from Crook County to date, this strategy is not cost effective and does not provide immediate benefits to Deschutes County. The two primary alternatives are compared in the following table.

(Intentionally Left Blank)

Table 7-6: Evaluation of Disposal Options

Primary Factors	Transport Out of County	New In-County Landfill
1. Implementation Considerations	• Regional landfills are permitted and have available capacity • County transfer stations will need to be modified to accommodate long haul transportation	• Siting a new landfill has proven to be both environmentally and politically difficult and unpredictable for communities
2. Sound Financial Principles	• Proximity of several regional landfills provides competition that can result in lower fees • Impacts to local economy as revenue and jobs are created in other jurisdictions	• County and cities control rates • Revenue and jobs stay in Deschutes County
3. Cost Effectiveness	Estimated cost to transport and dispose varies $47-$60/Ton	Estimated costs $35 disposal + $ 7 transport $42/ton (Assumes landfill is 25 miles or less from Knott Transfer Station) **Note:** After initial debt is retired 2040, the operating cost will be reduced by about $4/ton
4. Rate Stability	• Disposal contracts can be written to provide certainty of cost • Factors outside control of County could impact fees (Host fees, fuel prices, road mile taxes, etc.)	• Based on history of tip fees at Knott Landfill, disposal costs are predictable and stable
5. System Flexibility	• Flexibility can be part of contract; may have impacts on tip fee • If minimum waste supply is committed, there may be possible impacts to County or cities to implement alternatives	• County controls waste and disposal system and can make changes as needed (Example: if local jurisdictions implement new diversion programs) • County retains ability to manage waste without contractual issues
6. Reliability	• Disposal is reliable • Transporting waste to regional landfills may encounter interruptions • In general, regional landfills have good track record for environmental compliance	• Transportation and disposal are reliable • Transporting waste on certain roads may encounter short term interruptions • County has control and can manage environmental risks • County can control nature of waste is disposed in the landfill
7. Environmental Considerations - ***7.1 Impact from Landfilling:*** - ***Greenhouse gas (GHG) emissions***	• Disposing of waste in a regional landfill has the same impact as disposing waste in County	• Disposing of waste in County has the same impact as disposing waste at a regional landfill

- ***7.2 Impact from Transportation:*** Waste Disposed **2030** – 216,000 tons/year 6,800–7,000 trips/year **2040** – 250,000 tons/year 7,800–9,000 trips/year	• In 2030, 2-2.1 million truck miles and emissions along local roads and highways 97 and 197 • In 2040, 2.3–2.7 million truck miles and emissions along highways 97 and 197	• In 2030, 340,000-350,000 truck miles and emissions along local roads and highways • In 2040, 390,000-450,000 truck miles and emissions along local roads and highways
- ***7.3 Impact on Land***	Existing regional landfills are permitted and will continue to fill designated sites with or without Deschutes County waste	• County will need to disturb 400-500 acres* • County may adopt mitigating measures as necessary ***Note:** Existing quarry sites might provide opportunity to restore disturbed land

The comparison of the options shows that either transporting to an on out-of-County landfill or building a new in-County landfill will provide a dependable long-term disposal solution. Both options will require investments to build the facilities needed to support future operations however, more capital is required to site and build an in-County landfill. Both options are reliable and provide for an environmentally safe solution for disposing of waste. For instance, DSW has operated Knott Landfill for over 25 years in compliance under the more stringent disposal regulations adopted in 1995. DSW has installed advanced leachate controls and a recirculation system. Landfill gas is collected and flared to control LFG emissions and ensure destruction of air contaminants. Regional landfills that service several jurisdictions have a notable record of compliance and service.

Another consideration is the fact that the regional landfills sited and permitted in the early 1990's are located in arid climates east of the Cascade Mountains where there is little precipitation (less than 16" of rainfall per year). Regional landfills are also located in areas where the depth to groundwater is several hundred feet below the surface. Additionally, they are located in rural areas with few residences and/or they provide buffer areas. These same conditions are prominent in Deschutes County and therefore it is fair to assume that suitable sites can be located to meet these criteria. Finally, DSW has demonstrated their capabilities to operate the Knott Landfill in a cost-effective manner. As an enterprise fund, DSW has provided a well-managed system and maintained stable tip fees to residents and businesses.

When considering the key guiding principles for developing the solid waste management system, there are several other factors that support the option to site a new in-County landfill as the best option.

The first key factor is having flexibility for managing the County's waste stream. Owning and operating an in-County landfill provides maximum flexibility to make decisions on how best to manage waste. Decisions on implementing programs to reduce waste disposed or to divert waste can be made without having potential contract issues. For out-of-County landfills, contracts can be written to minimize impacts from changing the amount of waste transported and disposed. However, owners of regional landfills typically want some certainty and commitment of the waste

they will be managing. This commitment is understandable since they need to plan their operations.

The second factor is the impacts of transporting waste over 130 miles to the regional landfills located along the Columbia Gorge. Currently, waste is delivered to these sites using a variety of transportation modes such as rail and barge in addition to trucks. Also, most of the wastes transported to these landfills travels the majority of the distance along I-84, an interstate highway. Thus, the distance to the landfill may be similar for some users in comparison to transporting from Deschutes County, but the time to transport waste to a regional landfill is not impacted by travelling through city business centers or small towns. The primary transportation route from Deschutes County will be US 97 and SR 197. The nearly 7,000 trucks trips annually (about 30 per day) must drive through several cities and towns along the route. Although these roads represent the primary truck routes for transportation of goods in central Oregon, they still must travel through business centers of several cities and towns. As these cities and towns increase in population, the travel time will be impacted. Rail haul may be a consideration; however, it has not proved to be cost effective when transporting materials over a short distance.

Another impact consideration is the wear and tear on highways and emissions from the transfer trucks. Annually, trucks will travel over 2 million miles on these highways to a regional landfill. Disposing of waste at an in-County landfill reduces this impact.

A third factor is cost. Based on the preliminary evaluation of similar long-haul agreements, it is estimated to cost between $5 per ton to perhaps as much as $18 per ton more to transport waste to a regional landfill than to a new in-County landfill. Most of this additional cost results from the added transportation expenses. However, the County has disposed of 180,000 tons of waste per year and has operated a modern Subtitle D complaint landfill at a cost that is competitive with these regional landfills. The preliminary cost estimate prepared for the SWMP shows that a new in-County landfill can be operated at a cost that will be similar to or slightly more than the regional landfills that dispose of much higher volumes of waste.

Other factors that could impact the future costs to dispose of waste at a regional landfill may include the fees charged by those communities hosting the disposal facility. Also, Deschutes County is one of the fastest growing areas in the State and the amount of waste to be disposed may increase at higher rate than projected. This will result in more truck trips to transport waste and the time to travel to the regional sites will be impacted as other cities and towns along the route experience more growth.

7.8 Recommendations

With Knott Landfill expected to be at capacity in 10 years or possibly less, the County must develop a plan to ensure that a disposal system is in place to serve residences and businesses. The County must begin to plan for this event as the time needed to obtain permits and build the infrastructure needed will take several years.

Recommendation 7.1 – The County should proceed to site and permit a new in-County landfill to be operational when the Knott Landfill closes. The landfill should be capable to handle all waste streams generated in the county.

> **Rational** - The SWMP has identified and recommends several actions for County and cities to take to reduce the amount of waste disposed in a future landfill. It also recognizes that alternative technologies are continuing to develop that may at some point prove to be feasible for extracting additional resources from the waste stream and creating some form of renewable energy. Progress on these technologies can be monitored. However, the best approach for managing and disposing waste that cannot be recycled or diverted is to continue to operate an in-County landfill. It provides flexibility and maximizes control for managing the County's waste streams, avoids impacts resulting from transporting waste long distances over highways and will be cost effective in the long run.

Recommendation 7.2 - The County should begin a formal process to site and permit a new landfill by 2021.

> **Rational** – The timeframe to conduct a process to select a preferred site may take from three to five years. Once the site is permitted, final engineering, obtaining construction permits and building the initial landfill cells is expected to require and additional three years. Using these assumptions, the site may be available in approximately eight years.

Recommendation 7.3 – Consider privatization of development and operations of the new landfill.

> **Rational** – Refer to privatization discussion in Appendix A.

(Intentionally Left Blank)

8. ADMINISTRATION AND FINANCIAL MANAGEMENT

8.1 Introduction

In the State of Oregon, counties and cities have the responsibility and authority to provide comprehensive services for managing solid waste. Deschutes County executes this mandate by placing the primary responsibility to oversee these services and operate necessary facilities with DSW. This chapter reviews the County's funding to determine what changes may be needed to meet the goals presented in this SWMP. It will also consider the adequacy for managing the needs of the solid waste management system, and to determine if resources are sufficient to implement the recommended strategies as presented in this SWMP.

8.2 Background and Existing Conditions

8.2.1 Solid Waste Administrative Agencies

Counties and cities are provided the authority and responsibility for managing solid waste under ORS 459.125. This statute gives counties the authority and responsibility for designing, constructing and operating facilities necessary for the safe and efficient handling of solid waste. Counties may elect to own and operate facilities or contract with private sector vendors or other jurisdictions to provide the services. Deschutes County provides services through a combination of owning and operating certain facilities and contracting with private sector vendors. In addition to operations, the County provides a leadership role in planning and implementing solid waste management services throughout the entire County. It is also responsible for ensuring that State-mandated programs are in place to provide required services or to meet goals.

The County's annual budget states the mission of the Department of Solid Waste is to:

"Provide environmentally sound and cost-effective solid waste management services that are in compliance with all laws and regulations to the citizens of Deschutes County."

The County executes this mission by providing the necessary facilities needed to operate an efficient solid waste system and working effectively with local jurisdictions, private industry and citizens to provide coordinated solid waste management services throughout the County.

Department of Solid Waste

Background

The County delegates the responsibility for managing solid waste operations to DSW. DSW has been the primary provider of disposal sites for all wastes generated in the County for over 50 years. At one time, there were several disposal sites operated in the County that provided convenient locations where customers could dispose of waste. When new regulations were adopted in the 1990s, the County, like many jurisdictions throughout the country, were forced to close landfills that could not

comply with these new standards. In response, the County constructed a network of transfer stations to provide convenient sites to receive waste and recyclables from customers and transport all waste to Knott Landfill in Bend. To respond to the new regulations, the County made significant capital investments to install liner systems and environmental controls for protection of groundwater and to close old unlined areas of site. Under DSW leadership, these actions resulted in developing a solid waste system that has been compliant with all regulations and providing cost effective and environmentally safe services for over 25 years.

Although the County is the primary agency for providing the infrastructure needed for provide solid waste services, operation of these facilities is conducted through a public/private partnership. DSW is directly responsible for operating Knott Landfill as well as the gatehouses at all transfer stations. DSW is also responsible for the operation of the Northwest, Southwest and Alfalfa transfer stations. Operation of the Negus Transfer Station and the waste and recyclables transfer system is conducted by private companies through contract agreements.

In addition to owning and operating facilities, the County provides collection services to all unincorporated areas of the County through franchised agreements with four different collection companies. Cities have separate franchised agreements with these same companies that serve their respective jurisdictions. The County and the cities work cooperatively with franchised haulers to ensure that solid waste is managed in an integrated, comprehensive and coordinated approach. This includes cities, other public agencies and private businesses. The County has continued to foster a public-private partnership that has led to a solid waste management system that provides cost-effective services throughout the entire County. Thus, the County provides a leadership role in setting policy and operating facilities while maximizing the use of the private sector to implement and carry out direct services on a daily basis.

In addition to County owned and operated facilities, Mid-Oregon Recycling provides a facility that receives and processes the commingled and other recyclable materials collected from residences and businesses. These materials are baled and transported to MRFs in the Willamette Valley and Portland. Deschutes Recycling operates the recycling center and compost facility located at Knott Landfill.

DSW Organization

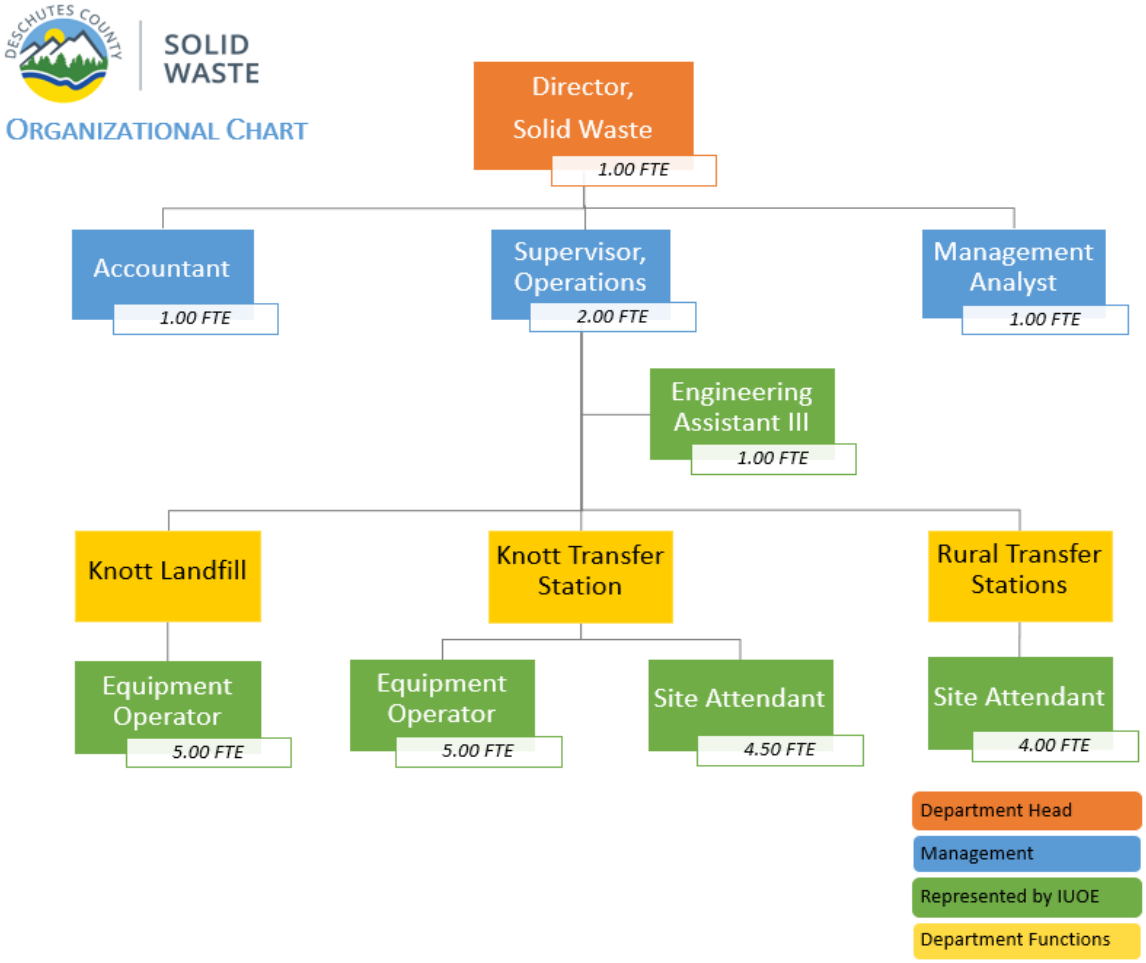
DSW functions as a separate department responsible for operating the transfer stations and Knott Landfill. Their responsibilities also include policy development, facilities management and administration, and direct operations. DSW operates the system as an enterprise fund, which is completely funded by tip fees, franchised fees, and the sale of recyclable materials. As an enterprise fund, no general tax funds are used for operating or managing the solid waste system.

The Director of Solid Waste is responsible for overseeing all aspects of facility operations including compliance with regulations, execution of County policies and approved services, preparation of budgets and management of financial resources. The Director reports directly to the County Administrator.

To operate the transfer facilities and Knott Landfill, the Director manages a staff that includes administrative support, supervisors, gatehouse and site attendants and

equipment operators. The current staff includes 24 full time equivalent (FTE) employees and six part-time contract employees. Figure 8-1 shows the organizational chart for DSW.

Figure 8-1: DSW Organization



Incorporated Municipalities

There are four incorporated cities (Bend, Redmond, Sisters and La Pine) that have the same authority in Oregon for the management of solid waste, as does the County. State law allows cities to license, contract, or franchised with private vendors for solid waste collection. They also have the authority to own and operate solid waste facilities (ORS 459.065).

Cities have the authority to approve rates and program options within their incorporated boundaries. Cities with populations over 4,000 have responsibilities under SB66 to ensure the implementation of recycling and waste reduction education programs. Solid waste programs are partially funded by a franchised fee collected by private collection companies.

Cities in the County have entered into franchised agreements with private companies to provide collection of recyclables and solid waste in their jurisdictions. Cities determine the service standards for residences and businesses and set rates. Cities have also entered into intergovernmental agreements that support the County to provide transfer stations and disposal services.

The current relationship between the cities, Deschutes County and the franchised companies has resulted in the operation of an integrated and coordinated collection and disposal system that provides a high level of service and that addresses statewide mandates and regulations.

Oregon Department of Environmental Quality (DEQ)

DEQ is responsible for overseeing State solid waste policy as stated in ORS 459.015. This authority includes ensuring local governments enact effective programs consistent with statewide goals, work cooperatively to provide services and coordinate solid waste management throughout the State. In addition to monitoring local solid waste management, the agency provides educational and technical assistance to government agencies, community and business groups, and citizens. This assistance includes public information materials, workshops, seminars, and compilation and management of solid waste data. DEQ can provide funds to assist local governments in planning and implementing solid waste management programs.

DEQ also supports research and demonstration projects to encourage waste prevention and resource recovery. It provides grants to assist jurisdictions in implementing specific programs and is responsible for the development and oversight of regulations for managing solid and hazardous waste.

8.2.2 Solid Waste Enforcement

DEQ has the lead responsibility for enforcing solid waste management and air quality regulations and permitting at all solid waste-related facilities in the state of Oregon. Deschutes County is responsible for monitoring and enforcing local illegal dumping regulations.

The following sections describe the enforcement responsibilities for solid waste management.

- **Solid Waste Facilities.** DEQ issues solid waste permits for each facility that handles solid waste, including compost facilities, within the state of Oregon. It conducts periodic inspections of the County's waste handling facilities, including landfills, transfer stations, and recycling centers. It also conducts investigations of abandoned waste sites and requires the principle responsible party to correct or remediate any contamination resulting from such facilities.

- **Water Quality.** DEQ issues water quality permits for leachate management and permits for stormwater runoff under the National Pollution Discharge Elimination System (NPDES). Currently, there are no water quality permits required at the County's solid waste facilities.

- **Hazardous and Special Wastes.** DEQ issues permits for facilities that manage hazardous and special wastes including construction/demolition landfills. DEQ conducts regular inspections of these facilities and develops regulations and guidelines for the proper management and disposal of hazardous and special wastes.

- **Illegal dumping.** The County's Community Development Department's Code Enforcement Division investigates and responds to illegal dumping incidents in Deschutes County through site inspections and response to complaints. It works with property owners to clean up and close illegal dumpsites and issues fines as necessary to enforce County regulations.

8.2.3 Financing and Funding Sources

The County has the primary responsibility to ensure that the necessary infrastructure for providing cost-effective collection and disposal services is available to all residences and businesses. The underlying foundation enacted by the State legislature is to provide for the health and safety of citizens of Deschutes County. DSW is responsible for managing and ensuring the delivery of these services through a combination of working with different agencies, private businesses and private sector vendors. It ensures that revenue resources are adequate to provide these services. Its overall purpose is to provide citizens and businesses in cities and the County with an environmentally responsible and convenient system for managing solid waste through quality, cost-effective and uninterruptible services.

Funding Obligations

DSW operates as a public utility through an enterprise fund. The revenue needed to meet the expenditure requirements of the program is funded primarily through tip and franchised fees. A small portion of revenue is derived from the sale of recyclable materials. As an enterprise fund, there is no reliance on federal, State or local taxes. An enterprise fund mandates that financial obligations for delivery of services, as well as the associated environmental risk, be in place. This often includes the need for contingency resources and/or reserves.

The purpose of any utility is to provide uninterrupted service to its customers. DSW assures this through three functions. First, it generates the revenues necessary to operate the service system. Second, it provides the capital and reserves required for system improvements. Third, it prepares for contingencies to minimize interruptions in service and provides rate stability.

The Enterprise Fund

The Solid Waste Division was originally part of a larger Public Works Department that was responsible for road construction and maintenance in addition to operation of solid waste sites. This Department operated with revenues from statewide transportation funds, transfers from the County's general fund account and revenues from tip fees collected at the solid waste facilities. In the mid 1990s, a decision was made to establish a separate Solid Waste Department and enterprise fund that would operate solely on revenues from services provided. Many public works utility operations, such as wastewater or water districts, typically use enterprise funds.

Chapter 8

The enterprise fund may manage its revenue resources to provide for operations including purchasing equipment and internal financing for capital projects. As an enterprise fund, the County can issue bonds and repay the debt through user fees.

DSW completed a financial plan in 1998 that was used to establish strategy to mostly finance capital improvements and establish reserves for the purpose of maintaining stable rates and minimizing the need for sudden rate increases. This is a result of the County's overall guidance to provide a fiscally responsible and managed approach for these services. Revenues in excess of annual expenditures are typically placed into dedicated reserve funds. These reserve funds are intended to be used for capital investments, either for new facilities or replacement of existing facilities, resources for closure and post-closure maintenance of Knott Landfill, and contingency funds. Dedicated reserve funds (described later in this chapter) are in place to ensure that disposal fees remain stable and allow capital project funding without incurring large amounts of additional debt.

This financial strategy has been effective in minimizing incremental or sudden rate adjustments. The current disposal rate or tip fee is $55 per ton and was approved in July 2017. The previous tip fee of $50 per ton was in place for seven years, from 2010 to 2017. DSW was able to avoid rate adjustments, despite a decrease in disposed solid waste between 2010 and 2013 at Knott Landfill, by maintaining appropriate fund balances.

Revenue Requirements and Expenditures for Facility Operations and Management

The revenue requirements to fund the County's solid waste management programs and provide services are reviewed on an annual basis. DSW establishes these revenue requirements by examining its needs in several categories, consistent with the requirements of managing an enterprise fund. This includes all internal operations conducted by DSW and those operations that are contracted with private companies. Primary budget line items include:

1. Personnel Services – Includes all direct labor and employee overhead/benefits

2. Materials and Services - Include all supplies and the materials required to operate facilities and services that are contracted. These include:
    - Transportation of waste and recyclables from transfer stations
    - Transportation of recyclable materials to processing facilities
    - Education and promotional services for waste reduction and recycling
    - Transfers to the general fund to compensate for administrative support services such as legal, accounting, purchasing, and other support functions.

3. Capital Outlay – Represents expenditures for equipment and items over $50,000

4. Transfers to Funds – These represent distribution of revenue to reserve funds for closure and post closure of Knott Landfill, system-wide capital improvements and equipment.

5. Debt Service - Includes payment of debt (principle and interest) for bonds issued to make large capital investments. Specifically, the County issued a $14 million bond in 2006 to construct new facilities at Knott Landfill including scales and a scalehouse, an administrative office, a household hazardous waste facility, a recycling center and a transfer station. In 2016, the County re-financed approximately $5.2 million of the original bonds. Therefore, the budget reflects the appropriation of capital funds, but no new debt was incurred.

The annual budget prepared by DSW considers not only the direct operating needs of the Department but also addresses the changes required to meet State regulations and the service needs of the cities and franchised collection companies. DSW budgets for transfers from reserve funds to offset expenditures to close portions of the landfill, purchase equipment and make capital improvements. Also, in 2018 and in the 2019 budget, DSW established an operating contingency of about $600,000 or 4% of the total budget. This policy is consistent with standard practice for public utilities or enterprise funds. The amount of contingency will vary for each utility operation depending on the risk associated with generating the projected revenue. Since 80% or more of DSW's revenues are from tip fees at facilities, they rely extensively on projected solid waste quantities to be disposed at Knott Landfill. Historically, solid waste volumes have varied from minus 3.35% to plus 11%.

Table 8-1 shows the actual expenditures for fiscal years (FY) 2016 and 2017 along with the expected revenue requirements for FY 2018 and FY 2019.

Table 8-1: Actual and Projected Expenditures – FY 2016-FY 2019

Revenue Requirements (Expenditures)	FY 2016 Actual	FY 2017 Actual	FY 2018 Budget	FY 2019 Adopted
Personnel Services	$1,967,190	$2,049,320	$2,278,466	$2,504,623
Materials & Services	$3,483,735	$4,334,705	$4,859,217	$4,772,159
Debt Service and Bond Re-finance	$6,219,266	$ 858,512	$ 861,102	$ 860,938
Capital Outlay	$ 74,313	$ 127,449	$ 125,000	$ 173,000
Transfers Out	$1,726,539	$3,075,000	$2,580,000	$4,688,023
Contingency	-	-	$ 569,886	$600,000
Total Requirements	$13,471,043	$10,444,985	$11,273,671	$13,598,743

Figure 8-2: Projected Expenditures for FY 2019

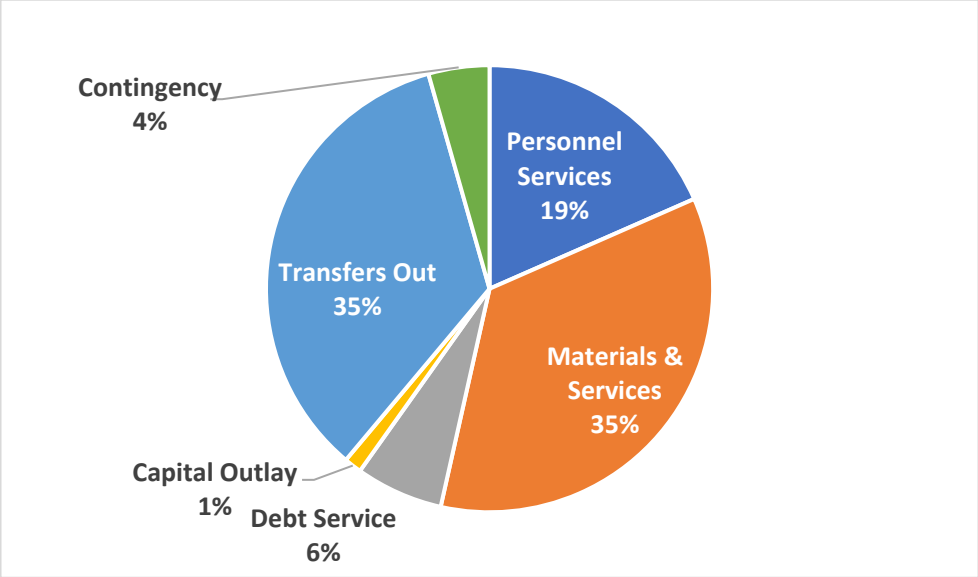


Figure 8-2 shows that about 54% of the DSW budget is expended on operations and another 35% in transfers representing financial obligations associated with operating Knott Landfill. One expense item that could be impacted by recent events relates to the costs for transporting and processing recyclable materials. Over the past 10 years, markets for recyclable materials collected under State-mandate collection requirements to households were stable. For example, the average price per ton of recovered materials from MRFs ranged from $120 per ton to as much as $160 per ton. Since 2016 however, prices have been severely disrupted due to China's increased restrictions for purchasing recyclables. Currently, market prices now average about $50 per ton for all materials with the price for mixed paper, the largest commodity in the recycled stream, being worth less than $10 per ton. Jurisdictions across the United States have had to make rate adjustments to address significant commodity price reductions. Some communities in Oregon have discontinued collecting certain items and others have received exemptions from DEQ to dispose of certain materials because of the depressed values of those materials. Since revenues are used to offset the cost of transportation and processing recyclables, when market prices decline, these expenses must be made up by ratepayers. To date, the franchised haulers, cities and the County have maintained the current collection system and rates despite the recent market challenges.

This issue will mostly impact collection rates to residences, but DSW does pay the expenses to transport the recyclable materials collected at its facilities to processors in the Willamette Valley and Portland. If the recycling processors charge more, DSW's budget may be impacted since they pay for the transportation of recyclable materials to processors and also absorb the cost of depressed market prices.

Chapter 8

Based on a review of the past few years, DSW's budget is largely expended on direct operating services for the transfer stations and Knott Landfill. The allocation of expenditures to services is shown on Table 8-2.

Table 8-2: Allocation of Expenditures to Operations

Service	Cost Allocation
Disposal of Solid Waste – Knott Landfill	60%
Operation of Transfer Stations	26%
Recycling Marketing/ Transportation/Special Waste (HHW)/Composting	5%
Debt Service	9%

Note: *The actual allocation of expenditures to operations may vary from year to year.*

Reserve Funds

A key feature of DSW's financial program is the establishment of dedicated reserve funds. DSW reviews these funds annually to verify the amount being collected and placed in reserve is sufficient to meet the needs of their operations over the next five years. As such, revenues are transferred into reserves to maintain the required amounts. If funds are needed for capital improvements or projects such as the closure of landfill cells, money can be transferred into the operation budget. However, these funds can only be appropriated and spent with approval of the Board of County Commissioners.

Currently there are four different reserve funds. These are described in Table 8-3.

Table 8-3: Projected Reserve Fund Balances - FY 2019

Reserve Funds	FY 2019 Fund Balance
Landfill Closure Fund – *Established to make final improvements required to close the landfill once it is completed.*	$4,037,938
Landfill Post Closure Fund – *Established to collect funds dedicated for monitoring and maintaining the landfill after it closes.*	$1,057,948
Capital Projects Fund – *Funds set aside to make improvements and expansions to existing facilities or to build new facilities.*	$3,104,840
Equipment Fund – *Funds needed to purchase large equipment needed for operations.*	$543,175
Total Reserve Funds	**$8,743,901**

DSW uses these funds to execute its basic services in accordance with State and federal regulations and to maintain rate stability. The total amount generated in each fund must be reviewed at least annually to verify that sufficient funds are available to meet anticipated and unforeseen obligations and liabilities. As solid waste is one of the most heavily regulated industries, it is necessary for DSW to update the funding requirements as part of their operations.

Although DSW does provide a capital projects reserve fund, it does not currently have sufficient funds to finance construction of major facility improvements. As the SWMP has identified investments needed in existing transfer stations and potentially siting and constructing a new landfill, DSW will need to consider the appropriate approach for raising the capital to make these investments. In 2006, DSW issued bonds used to construct needed facilities at Knott Landfill. These facilities were designed to not only meet immediate needs but also to provide for services when Knott Landfill closes. Additional capital will be needed over the next 10 years to construct the infrastructure required to provide cost effective long-term disposal and resource recovery services.

Revenue Sources

DSW generates most of its revenue from fees for services. This includes the tip fees charged to customers and fees charged to the franchised collection companies. Table 8-2 presents the actual revenues generated in FY 2016 and 2017. As mentioned previously, in 2016 the County re-financed bonds that shows up in the budget as new revenue. However, no new debt was incurred.

As shown each year, DSW carries forward a beginning fund balance, referred to as "Beginning Net Working Capital". These revenues are a result of funds not expended during the previous year's budget and/or increased revenues from waste quantities that were higher than projected in the previous year. These fund balances range from an expected 5.5% in FY 2018 to perhaps almost 13% budgeted in FY 2019. The net working capital is part of the annual budget used to offset revenue requirements in the current FY.

Table 8-4: Actual and Projected Revenues – FY 2016–FY 2019

Revenue Sources	FY 2016 Actual	FY 2017 Actual	FY 2018 Budget	FY 2019 Adopted
Beginning Net Working Capital	$1,163,893	$1,810,265	$ 615,872	$1,730,130
Charges for Services	$8,755,712	$9,780,396	$10,614,998	$11,795,572
Interest Revenue	$ 24,335	$ 31,959	$ 20,000	$ 44,000
Other Non-Operational Revenue	$ 10,801	$ 12,801	$ 10,801	$ 11,041
Sale of Assets, Land or Equipment	$ 40,673	$ 47,242	$ 12,000	$ 18,000
Refinance Bonds – Capital Issuance of Long-Term Liability	$5,285,895	-	-	-
Total Resources	$15,281,308	$11,682,663	$11,273,671	$13,598,743

For FY 2019, almost 87% of the projected revenues are generated from charges for services. For this reason, DSW must be diligent in monitoring the incoming waste streams and balancing expenditures. Many factors outside the control of DSW can impact the revenues projections. During the recent recession, solid waste quantities were depressed due to reduced construction activity as well as a slower overall economy. Other factors that possibly impacted the amount of waste generated in Deschutes County was a reduction in tourism during this same period. This occurred between 2012 through 2014 when solid waste disposed at the landfill decreased. Over the past three years, DSW has experienced an increase of 26% in solid waste quantities.

Despite these unique circumstances, the financial strategies and operations of the enterprise fund by DSW have resulted in stable rates. The current rate of $55 per ton is 40% less than most other large jurisdictions in the State. Other communities that operate similar enterprise funds include Marion County at $87.45 per ton and Lane County at $78.77 per ton. While these jurisdictions operate well established and stable solid waste systems, this comparison demonstrates the ability of DSW to operate a cost-effective system.

8.3 Needs and Opportunities

The County has provided a leadership role in providing the facilities necessary to support efficient management of solid waste services. Over the past 25 years, Knott Landfill has been improved and expanded to meet the disposal needs of the County. It also includes a system of four transfer stations which provide collection facilities that offer convenient and cost-effective infrastructure to receive and transport waste and recyclables for communities outside the Bend area.

In addition to owning and operating facilities, DSW has worked effectively in partnership with the cities, franchised collection companies, The Environmental Center and other entities to expand programs and services to respond to growth and the ever-changing regulations that impact how solid waste is managed. This stewardship is apparent by the fact that collection and disposal rates are amongst the lowest in the state. At the same time, the service providers have adopted new programs to promote waste reduction and reuse as well as new services to recycle more materials.

For the past 25 years, the system has relied on having a disposal site, Knott Landfill, to manage solid waste in a convenient, cost effective and environmentally safe manner. As discussed in previous chapters of this SWMP, when Knott Landfill reaches capacity in the next 10 years, a new disposal alternative must be in place. There are several improvements to existing programs and services as well as the addition of new programs and services that have been recommended that will present new challenges to the solid waste management system. These include:

1. Currently the County has achieved a recovery rate of 33%. New goals set by the State recommend the County increase its recovery rate to 45% by 2025. These are not mandatory goals, but they suggest that certain programs need to be expanded and/or new services be provided.

2. To address the increase in the recovery rate, the SWMP identifies several modifications and expansion of collection services. This will take a coordinated effort between the cities, County and franchised collection companies.

3. Expanding collection programs for food waste from residents and commercial businesses will also require more advanced composting systems and possibly relocating the current composting operations.

4. As new recycling programs and services are considered, a uniform and standardized education and promotion program will be needed.

5. Both the Negus and Southwest Transfer Stations need improvements to address increases in customer traffic and waste volumes.

6. A new disposal site must be located or chosen over the next six to seven years to provide sufficient time to make the necessary investments to have facilities operating when Knott Landfill closes.

While there are significant program and service enhancements that need to be made over the next five to ten years, the County and its partners have time to execute an incremental approach to make the improvements needed to sustain a convenient and cost-effective system. The recommendations made in this SWMP provide a roadmap for implementing a systematic approach. However, it will require leadership from the County and active participation of the cities, agencies, franchised collection companies, and others to effectively develop the details and implement these system changes.

8.3.1 Management Considerations

A coordinated effort between the County and cities is needed to address changes to the solid waste system and maintain cost-efficient service to all citizens and businesses. New resource recovery goals imposed by the State will mean changes to collection services, which will require that facilities be expanded or adapted to handle the enhanced collection services. Implementation of the actions recommended in the SWMP will require all parties to participate in making key decisions that affect their constituents. For instance, expanding recycling services for collection of food waste, expanding multi-family and commercial recycling programs, and planning and constructing the facilities needed for future operations are amongst the many actions to be taken over the next five to ten years. Coordinating these actions to continue to build an effective integrated solid waste system will require participation by all stakeholders.

The SWAC, representing a cross section of local government, franchised collection companies, technical experts and the general public has played an important role in shaping the direction of the SWMP. In deliberating over the recommendations, the SWAC has identified the need to establish a task force or other committees to further develop the details for implementing the recommended actions.

8.3.2 Financing and Funding Considerations

Over the past 25 years, DSW has operated as an enterprise fund largely built on a pay as you go model with exception of issuance of bonds in 2006. A portion of these bonds will be retired by 2026 and the remaining amount in 2033. As the County considers the options for disposal after Knott Landfill closes, there are several financial scenarios to evaluate including:

1. If the County elects to transport waste out of Deschutes County, the cost to dispose of solid waste is estimated to increase from $35 per ton to more than $50 to $60 per ton in today's dollars. This increase is for the incremental cost to transport and dispose of solid waste at an out-of-County facility. Additional costs will be incurred at existing transfer stations to provide the infrastructure to load transfer trailers for long haul transportation operations. The total expense to operate this system will most likely range from $70 to $80 per ton. This tip fee may also be subject to host fees the regional landfill will charge, which is assumed to be $5 per ton for planning purposes.

2. If the County elects to site and construct an in-County landfill, the cost to dispose of waste is estimated to be similar to current cost of $35 per ton. Also, some transfer stations will require improvements to accommodate growth and provide short term surge capacity. Under this option, system operating costs are estimated to be about $60 per ton.

These projected revenue requirements only consider the cost of operating transfer stations and transporting solid waste to a landfill. It does not include any new expenses for waste reduction and recycling programs, increases in expenses due to new regulations and cost to manage special waste streams (tires, HHW, C/D, etc.). Other capital investments that can impact future rates include the possible siting and construction of a new compost facility to handle food waste, yard waste and other organics.

DSW prepared a financial study in 1998 that established funding strategies and reserve funds that have been effective in maintaining a stable rate system. A new financial plan should be developed to address the new facility needs and other program options recommended in the SWMP.

8.4 Alternatives and Evaluation

Moving forward with implementing the recommendations in this SWMP will require changes in the management approach to engage stakeholders in setting priorities and developing specific actions. Also, the cost of the services to all County residents and businesses will increase as the system transitions from disposing of solid waste at Knott Landfill to a new site. This section presents the alternatives to address the management and financial needs.

8.4.1 Administration/Management

The County has been the primary owner and operator of facilities and therefore has played leadership role in developing the infrastructure needed to provide cost effective

management of solid waste. With the adoption of this SWMP, there will be a need to manage the transition from the system that relied on Knott Landfill to seeking an alternative disposal site. Also, as collection services are adapted to implement new programs and services, facilities will need to be modified and new facilities developed. Many communities have faced similar challenges brought on by the need to transition the solid waste system on a County-wide or regional approach. The following presents some alternatives that might be considered.

Maintain Existing Management Structure

The County has effectively provided the leadership role working with cities and franchised collection companies. During the past 25 years, most of the changes to facilities and services have been the result of new regulations and or policies adopted by local jurisdictions. The SWMP has established a roadmap for moving forward. However, the recommendations will impact all citizens and businesses in both the cities and the County.

The County will continue to play a leadership role with DSW having the responsibility to organize, plan and oversee implementation. This will require additional resources from DSW or possibly some restructuring of responsibilities within DSW. Since several recommendations will require decisions by local jurisdictions, they will impact franchised collection companies. Their involvement will be crucial to planning and developing the best approach for moving forward with enhanced collection programs and services. Thus, under the current management structure, there are a few alternative management models or approaches to consider.

1. Establish a Solid Waste Steering Committee – This committee can be comprised of elected officials from each jurisdiction or possible a key division manager from each jurisdiction. The Steering Committee would be responsible for representing the interest of their jurisdiction as recommendations for changes to services are considered. The County would represent its constituents while local governments represent theirs.

2. Appoint a Special Task Force to plan and implement programs – Under this model, a Task Force would be given the responsibility to address certain needs of the system. It is a way to involve decision makers, experts in technical fields and representatives of the general public during the implementation process. As an example, establishing a Task Force to develop a comprehensive program for providing recycling to multi-family dwellings could be considered. This has been a challenge for many communities and a tailored approach is needed to provide these services effectively. Each jurisdiction must consider what works best for their situation. Another Task Force might be appointed to oversee the siting of a new landfill if this disposal alternative is selected.

3. Establish an ongoing SWAC – The SWAC would provide guidance and involve stakeholders in developing alternatives and actions for implementation. Many counties have established ongoing committees as a method to involve stakeholders in development of their solid waste system. In many cases, the SWAC may have different levels of responsibilities and authorities granted by the Board of County Commissioners. Involvement of a SWAC has proven to be

effective in developing consensus and support for implementing solid waste programs and services.

There are numerous examples where these management models are being used. Clark County, Washington for example has a regional steering committee and a SWAC. The steering committee is a policy group involving the participating cities, while the SWAC is a cross section of stakeholders and the public. The SWAC is involved with implementation of the recommendations adopted in Clark County's Regional Solid Waste Management Plan. Other communities rely heavily on SWACs to provide input and guidance for developing new programs and services.

As the County moves forward with implementation, the use of a Steering Committee and/or SWAC may be an effective way to involve the local jurisdictions and stakeholders with implementing the SWMP.

In addition to establishing a framework for local government participation, the County should consider renewing the intergovernmental agreements with each city. It is critical that the County work closely with these partners to develop consensus prior to making large investments in the solid waste management system.

Regional Management Approaches

As regulations became increasingly more stringent requiring extensive environmental controls, jurisdictions had to consider options for processing, transporting and disposing of solid waste. It became desirable and, in some cases, necessary to work on regional solutions. Regionalization of solid waste management services, where the system extends beyond the boundary of one political jurisdiction, provides the potential to offer administrative and economic benefits over what a singular jurisdiction may not be able to achieve otherwise. This is especially true for capital-intensive system elements such as transfer stations, MRFs, landfills and alternative technologies like WTEFs.

Throughout the country, there are several forms of regional organizations ranging from singular purpose agencies like a Joint Powers Board, to separate agencies such as Special Districts and Authorities. These management approaches may be a consideration as one approach for moving forward with implementation of the SWMP and developing the future solid waste system.

Joint Powers Board

When two or more jurisdictions have a stake in the development of a system in which policies and investments will impact constituents of each of those parties, establishing a separate decision-making authority may be desirable. What differs from a system that relies on intergovernmental agreements is it recognizes each jurisdictions' desire to have a vote on certain actions. The Board can be made of elected officials from each jurisdiction or delegates. The Board may have a limited authority, as agreed upon, such as approval of the annual budgets and/or setting rates. This authority is usually restricted to certain functions that serve both parties. Policies, programs and services

related to collection and recycling do not necessarily need to be part of this agreement.

Operations of the common facilities can be carried out by the employees of the County, but under direction of the Joint Powers Board. As such, the agency can work similar to the existing enterprise fund including using existing County and/or city support services.

The advantage of the Joint Powers Board is to isolate the enterprise fund from purposes other than solid waste services. Also, since the participating jurisdictions will be paying indirectly through its residents and businesses for system improvements, elected officials may desire a more control over decisions affecting the system. In some cases, the commitment of solid waste volumes to build the needed facilities may be necessary to sell bonds to finance capital intensive projects.

A few examples of Joint Powers Boards include the Spokane Regional Solid Waste System and Santa Fe Solid Waste Management Agency.

1. The Spokane Regional Solid Waste System was originally formed in 1988 by an intergovernmental agreement between Spokane County, the City of Spokane, and other regional cities and jurisdictions. Under that agreement, the City of Spokane took on the ownership and operation of County-wide solid waste disposal system.

   This agency operates with elected officials from both the cities and the County as Board members. Its establishment was necessary due to adoption of the Resource Conservation and Recovery Act (RCRA), which required closing all city and County landfills. These landfills were prohibited from continuing to operate under the new RCRA regulations as they were located above a sole source aquifer. In order to sell bonds to finance the closure of all landfills and build a WTEF, the regional system agency was formed.

   On November 17, 2014, a new intergovernmental agreement was initiated. Under the new agreement, the ownership and management of the solid waste system was transferred from the City of Spokane to Spokane County. The exception to this transfer was the ownership of the WTEF and the Northside Landfill, which ownership of was retained by the City of Spokane. The agreement specifies that Spokane County direct waste flows from the transfer stations to the WTEF.

2. The Santa Fe Solid Waste Management Agency is comprised of three elected officials from Santa Fe County and three from the City of Santa Fe. The agency operates like a public utility or enterprise fund. It operates the County landfill and contracts directly with the City to operate the recycling and transfer station. It contracts with the City to provide purchasing and some legal services and uses the City benefits system for its employees. This agency was formed to site, build and operate the new county landfill. It works closely with both jurisdictions to provide facilities and support for waste reduction and recycling services.

These Joint Powers Boards have operated for several years and all the circumstances that created the arrangements may not be the same today as they were when they were formed. However, they have operated successfully to provide equitable and cost-effective services that have satisfied the participating jurisdictions. It should be noted that they have flexibility to evolve as shown by the changes made to the Spokane Regional Solid Waste System. The most common incentive is the commitment of solid waste volumes to support the investments in facilities, the ability to finance these investments and to operate most cost effectively by consolidating waste streams to support operations.

Establish a Regional Authority or Special District

The establishment of a special district or authority in the State of Oregon is not common for solid waste services. However, there are many examples of regional or special water and wastewater districts. In the State of California, there are several examples of special solid waste districts or authorities. The impetus for establishing these regional districts is largely driven by the need to pool waste streams in order to build and operate solid waste facilities most cost effectively. These special districts are standalone organizations that own and operate transfer stations, MRFs, and landfills. The boards are typically comprised of elected representatives of the participating agencies under some agreed formula. The agency has ability to finance, build and operate facilities to serve all participating jurisdictions.

Different from the Joint Powers Boards, Special Districts are totally autonomous and, depending on state statutes, may have authority to levy taxes. This is the case in the State of Washington where statutorily, a solid waste Special District (referred to as a Disposal District) can tax citizens and businesses within its approved boundaries. Currently there are a few Disposal Districts operating in the Washington State.

Some examples of Regional Authorities operating are as follows:

1. Monterey Regional Solid Waste Management District - This Board is comprised of elected official from seven cities and Monterey County. It operates all recycling and disposal facilities and manages about 250,000 tons of solid waste per year while its member agencies maintain responsibility for franchised collection programs and services. The District's facilities include:
    - Regional compost site managing food, yard and agricultural waste and digestate from an anaerobic digester
    - Mixed waste and commingled MRF
    - Regional reuse center (Last Chance Mercantile)
    - Landfill disposal facility
    - C/D MRF

    By working together, the District can ensure that facilities are available to handle the programs and services offered by its member agencies.

2. South Bayside Waste Management Authority – Located halfway between San Francisco and San Jose in San Carlos, California, the Authority serves 11 cities and San Mateo County. Established in 1982, the primary

function of the Authority is to operate a MRF and transfer station that serves all member jurisdictions and to provide a cost-effective system to transport solid waste to a regional disposal site. In 2010, the Authority coordinated a complete transition of its solid waste collection system and retrofitted existing facilities by constructing infrastructure needed for its member jurisdictions to comply with new regulations.

There are several other examples of special districts operating throughout the United States. Many were established for the purpose of building the infrastructure needed to manage solid waste using the most effective approach. In some cases, they may operate as a separate government entity like Portland Metro, which provides services in the Portland regional area. However, many operate under the authority of a board comprised of elected officials representing member agencies.

These alternative management structures provide some options that might be considered, depending on the factors that are important to the County and the cities.

8.4.2 Finance and Funding

The County has a proven financial management system in place via an enterprise fund for the management of the solid waste system. The enterprise fund provides a sound operating base and reserves for maintenance, capital improvements and meeting regulatory requirements.

Based on its historic performance and given the funding requirements in the immediate future, it is not expected that the County would need to modify the basic enterprise fund approach. It is recommended that the County continue to rely on its current mix of revenue sources to fund future facility and program improvements. A new financial plan would address scenarios such as:

- What increases are needed in tip fees and franchised fees to meet new revenue targets to fund improvements? For example, a resource recovery surcharge could be added to tip fees over a defined period to generate a targeted amount of new revenue.

- Can or should franchised fees be adjusted to supplement revenue sources needed for new facilities and programs.

- Should the County issue new bonds to fund system capital improvements?

Table 8-5 provides an illustration of the amount of new revenue that could be generated through a per ton resource recovery surcharge on landfill tip fees. This surcharge would be in place for a defined period and could be adjusted up or down depending on the revenue targets set for new facilities and programs. If the County added a special capital investment fee, assumed to be $5 per ton for this example, it may raise an estimated $11 million for new facilities over a ten year period.

Table 8-5: Internal Financing (Pay-as-you-go)

Year	Population	Waste Disposed (tons)	Capitol Reserve $5/Ton
2020	190,734	191,688	$958,440
2021	194,739	195,713	$978,565
2022	198,829	199,823	$999,115
2023	203,004	197,219	$986,095
2024	207,267	201,360	$1,006,800
2025	210,826	204,817	$1,024,085
2026	214,832	201,512	$1,007,560
2027	218,913	205,341	$1,026,705
2028	223,073	209,242	$1,046,210
2029	227,311	213,218	$1,066,090
2030	230,412	216,126	$1,080,630
Estimated Total Revenue Generated for Capital			**$11,180,295**

To determine the amount of capital investment needed, DSW should prepare a capital improvement plan for the next ten years. This plan should consider how much is needed to fund improvements based on the cash flow requirements. Also, the amount needed should take into account that DSW already generates funds needed to construct new landfill cells. However, once the final cell is constructed, the reserve funds currently generated from rates could be allocated to fund other capital needs.

These funds would be managed similar to the existing reserve funds. They can be restricted and budgeted on an annual basis to make improvements based on the approved capital improvement plan. This approach provides flexibility and avoids paying interest on bonds and will cost ratepayers less than using some bonding instruments. Also, the reserve fund can earn interest to help reduce contributions.

County Bond Financing

In 2006, using its ability to issue bonds for public purposes, DSW used $14 million in bond funds for capital improvements made to develop new facilities at Knott Landfill including a new entrance road, scale complex, administrative office, HHW facility, recycling center and a transfer station. These bonds are being paid by DSW through tip fees. The County has the capacity to continue to use these bonds if needed. However, future rate payers will need to pay off the principal and interest over a period of 15 to 20 years depending on the terms of the bond requirements.

Revenue Bonds

Since DSW derives its revenues from tip fees, an alternative financing method is to issue revenue bonds to pay for improvements and new facilities. These bonds are sold on the open market. However, the combination of higher interest rates, coverage requirements, and bond reserves make revenue bonds financing more expensive than using the County's bonding capacity. Because these bonds pledge future revenues from tip fees as collateral for the debt, this form of financing requires that a commitment of solid waste volumes be made to pay off the debt by all parties.

General Obligation Bonds (New Taxes)

General obligations bonds issued to finance of the County's solid waste system is an option with limitations. This approach places DSW's budget in a competitive pool with other County programs. It would be developed and approved as part of the overall general fund subject to revenue requirements consistent with the County's tax and fee structure. Solid waste activities could compete with other projects for available funds. All system revenues would be directed to the jurisdiction's general fund. Also, general obligation bonds may require a vote from the County's residents.

The most common form of tax would make solid waste services part of the property tax. Under this approach, every unit pays its portion of the solid waste management program. Tip fees can be used to supplement the program revenues. For instance, the property tax portion can be used to pay facility debt service, program management and administration, and basic waste prevention and recycling education programs. Tip fees would be collected at solid waste facilities for direct services.

This approach would ensure that all constituents pay for general services. Therefore, users of the system would not be required to subsidize those generators who elect to haul their waste to facilities outside the system. This would help stabilize tip fees and possibly delay or prevent increases over a longer period.

The downside to this approach is that adding new taxes is complicated and certainly unpopular. It is much easier to raise tip fees than to approve new taxes, even if the actual tax is a small percentage of the total property tax.

8.5 Evaluation and Recommendations

The County, cities and service providers have worked cooperatively and effectively to operate a well-managed and integrated solid waste management system for all businesses and residents. The system provides a full range of necessary services that are compliant with State mandated requirements at rates that are equitable to all constituents. To continue with a solid waste management system that provides cost effective services, it is important to maintain or enhance the level of coordination between all stakeholders. Currently, there is no formal or consistent forum in place to facilitate the level of coordination needed to support implementation of the SWMP.

Currently, the County and cities have in place intergovernmental agreements that provide authority to the County to manage and dispose of waste. Cities retain the authority to oversee the collection services provided for their constituents. These agreements provide a necessary foundation for continuing the development of an integrated solid waste management system.

Several options for managing and operating a regional or County-wide system are discussed in this chapter. Whether the system is managed by the County or through the authority established by forming a Joint Powers Board, the primary element that binds the parties to work cooperatively and effectively is the intergovernmental agreement. As long as these agreements satisfy each jurisdiction's needs for servicing their communities, there is no need for changing the management system.

A SWAC, established for the sole purpose of developing the SWMP, has provided the necessary guidance and input to formulate the strategy to meet the future needs of the solid waste system. The adopted SWMP sets forth a road map to make improvements in an incremental but strategic manner over time. However, implementation of the recommendations will require updates and/or changes to policies and programs, further technical and feasibility analysis to select the best strategies for new services, and physical changes to the infrastructure that will require commitment of financial resources. Establishing a process to provide an ongoing dialog to develop the details and monitor the progress of these actions is essential to successfully implement the SWMP.

Recommendation 8.1 – Given the need to implement the necessary changes to the solid waste management system over the next ten years, the County should meet with the cities to reaffirm commitments and update, as necessary, the intergovernmental agreements. The agreements should also address the cities participation in the process for implementing the recommendations adopted in the SWMP.

> **Rational -** The current intergovernmental agreements recognize the commitment to support and rely on the County to own and operate solid waste facilities to dispose of waste generated in their jurisdictions. As the County endeavors to move forward with recommendations to the solid waste management system and to site a new in-County landfill, having the support and commitment to this arrangement is necessary. Also, in considering the agreements, cities should determine what role they wish to have in shaping the future solid waste management system.

Recommendation 8.2– The County should establish a formal process that provides for continued involvement of cities, other stakeholders, businesses and the general public in implementing the recommendations of the SWMP. This process may include establishing an ongoing advisory group and/or assigning task force committees to oversee development and implementation of specific programs.

> **Rational –**Whereas, the SWMP provides a road map and direction for shaping the future services of the solid waste management system, there are still many details to be determined. These changes will impact collection programs and services that are directed by the County and each city. Also, as changes to these services are made, the County, working with the private sector, must make improvements to the system infrastructure to ensure facilities can handle materials and waste streams most efficiently. Having the continued involvement of the key stakeholders and others will only enhance the ability to oversee the successful implementation of the SWMP.

Recommendation 8.3 – The County should consider the current DSW organization and determine the resources that are needed to carry out implementation of the recommendations adopted in the SWMP. This will require perhaps some additional staff as well as financial resources.

Rational – DSW currently operates with a staff of 24 FTE positions that operate four transfer stations and Knott Landfill. This is a fairly lean, but efficient, organization that must continue to maintain the current level of services while taking on additional responsibilities to work with cities and service providers to make changes to implement new programs, enhance facility operations and make capital improvements to existing facilities. The ability of DSW staff to take on new responsibilities should be evaluated to determine what changes might be made to execute the recommendations adopted in the SWMP.

Recommendation 8.4 – DSW should prepare a financial study of current rates to determine the impacts of implementing the improvements identified in the SWMP and develop a Capital Improvement Plan for a five to seven year period aimed at maintaining a stable financial strategy.

Rational – Operating as an enterprise fund, DSW has managed the rates and the financial resources needed to provide services to all constituents in a fair and equitable manner. DSW has also established dedicated reserve funds that are used to stabilize and minimize the impacts to rates and for making scheduled capital improvements for operating Knott Landfill and providing disposal capacity. The SWMP identified improvements to transfer stations and compost facilities and the siting and construction of a new in-County landfill that could cost between $20 to $30 million over the next ten years. DSW can prepare a Capital Improvement Plan to consider investments to be made over a five to seven year period that can updated annually. Forecasting and scheduling these new investments and evaluating the options for how these improvements can be financed will result in developing a strategy that results in the most cost-effective approach.

Recommendation 8.5 – Consider privatization of all aspects of the solid waste system as changes and programs are implemented, as referenced in *Appendix A*, as has been the practice of the solid waste system historically.

Rational – Refer to privatization discussion in Appendix A.

(Intentionally Left Blank)

APPENDIX A – PRIVATIZATION

(Intentionally Left Blank)

The Role of the Private Sector in the Deschutes County Solid Waste System

Purpose: This paper describes the current role (2019) of the private sector in providing comprehensive recycling and solid waste services to the residents and businesses of Deschutes County and discusses how the private sector role will be considered as the County moves forward with implementing the recommendations of the SWMP.

Background

The current Deschutes County solid waste management system operates under a partnership with local jurisdictions and a regulated arrangement with private companies to deliver recycling, collection and transportation services. The County owns and operates the only landfill for disposing waste. These roles are further described throughout the Solid Waste Management Plan (SWMP).

The private sector has had a significant role in the solid waste system for many years. Private companies have always provided curbside collection of waste from residents and businesses. Over the years, the private sectors participation in the system has increased and now includes:

- Curbside collection of waste, recyclables and yard debris from residents and businesses under a franchise system.
- Transfer of waste and recyclables from rural transfer stations to Bend also under the franchise system.
- Operation of the recycling center and compost operation at Knott Landfill is a public/private partnership where the County provides infrastructure and operational assistance while a private company operates the facility.
- A private company through a contract with the County provides operation assistance at Negus Transfer Station in Redmond.
- A private non-profit company through a grant agreement with the County provides education and promotion of recycling and waste reduction.
- A private company through a contract with the County operates the Household Hazardous Waste facility at Knott Landfill
- Other private companies such as The Broomsmen independently provide recycling services at events such as concerts and various festivals.

The Solid Waste Department is aware of the benefits that the private sector can bring to the system and has strived when developing facilities to enable consideration of private operations. The facilities that were constructed at Knott Landfill in 2005 included a large transfer building and recycling/composting facilities. Both of those facilities have offices, employee lunch/break facilities and have utilities metered separately to facilitate operation by private companies if the County should choose to do so. As mentioned above, the recycling facility at Knott Landfill operates in such a fashion.

Implementation of the SWMP and the Role of the Private Sector

This Solid Waste Management Plan did not specifically address the role of the private sector in the solid waste system as part the recommendations made for changes/improvements to the system over the next 10 years. The SWMP sets the direction in which the system should move and includes recommendations to achieve that vision. It does not provide specific operational details on how those recommendations will be implemented. The SWMP points out that the solid waste system in Deschutes County provides a very high level of service to the community at a very reasonable cost considering the breadth of services provided. The County believes that this is due in part to the relationships and roles of the public and private sectors in the system. With consideration of the responsibilities stated in ORS 459.085 relating to the responsibilities to manage sold waste and consistent with the goals and guiding principles adopted in the SWMP, the County intends to continue in this manner, and will consider private ownership and/or operation at appropriate points in the implementation of the SWMP over the next ten years. Specifically, it is anticipated that consideration of the private sector will occur at the following point.

- The SWMP calls for efforts to increase diversion of construction and demolition material from the waste stream. This will likely include a significant investment in infrastructure to separate valuable commodities from that waste stream. The question of public or private ownership and/or operation of that infrastructure will be considered.
- The SWMP calls for construction of a new transfer station in Redmond. Once completed, operations will change significantly, as the site moves from a small rural facility to a modern facility that includes enhanced recycling opportunities and a compost operation. The County will consider private operation of part or all of that facility.
- The Southwest Transfer Station located between Sunriver and La Pine will also be improved in the future and the County will consider the private sector there as well
- The County attempted to site a new landfill in the mid 1990's which was unsuccessful for a variety of reasons. Through that process, however it was clear that there was interest from private companies to be involved in a new landfill. The County intends to fully consider the private sector as we move towards the development of a new landfill in the county. Private companies could assist the County in a number of ways including assistance with siting, permitting, construction and operation of a new facility.

When considering the private sector, a number of factors need to be considered such as:

- Ability to adapt to changes in County/City policies and programs
- Ability to react to changes in regulations
- Flexibility to adapt to waste diversion opportunities
- Capability to take advantage of competition in the marketplace
- Ensures equity of services
- Associated risk assigned to ownership options
- Associated risk with market conditions
- Appropriate control of cost and establishment/regulation of rates

- Other factors that ensure safe, efficient and reliable services as deemed important by the Board

As established under ORS 459.085 the County has the authority to ensure proper management of solid waste services including meeting the mandates of the States waste reduction and recycling policies. This legislation empowers the County as well as local jurisdictions to oversee and determine how best these services are provided including the role of the private sector. Deschutes County believes that the solid waste system is strongest when the public and private sectors work together to provide services. The County provides stability and ensures adequate programs and facilities are available to manage our waste safely and efficiently and meets the state requirements. The private sector provides flexibility and brings significant experience and expertise to the table.

APPENDIX B – RATES

(Intentionally Left Blank)

Exhibit A
Maximum Rates for the Collection of Solid Waste within the Unincorporated Distant Rural Collection Area Served by Wilderness Garbage and Recycling Services

Can and Roll Cart Services - Effective January 1, 2010

Class of Service	Rates as of 1-Jan-10
One pickup of one can each week:	
20 gallon can:	
curb or roadside	$ 15.45
backyard or other	$ 17.55
35 gallon can:	
curb or roadside	$ 17.75
backyard or other	$ 20.15
65 gallon can:	
curb or roadside	$ 29.20
backyard or other	$ 33.80
95 gallon can:	
curb or roadside	$ 36.65
backyard or other	$ 39.55
One pickup of additional can each week:	
35 gallon can:	
curb or roadside	$ 12.10
backyard or other	$ 14.25
Special services:	
35 gallon can special pickup (rate per pickup)	$ 11.25

Bulk Rate for the Collection of Bulk Refuse:
$13.60 per yard "or" a service fee of $67.00 per hour for 1 truck and driver ($96.60 per hour for 2 men) plus disposal fees.

If the need for a type of service arises that is not now foreseen or specifically covered by this rate schedule, then the charge for such service shall be:

1. Uniform and non-discriminatory between customers of a collector;
2. Commensurate with the rates generally charged in unincorporated Deschutes County;
3. Subject to approval by Deschutes County.

Exhibit A - Continued

Maximum Rates for the Collection of Solid Waste within the Unincorporated Distant Rural Collection Area Served by Wilderness Garbage and Recycling Services

Container Services - Effective January 1, 2010

Service Provided	Number of Services per Week					
	1	2	3	4	5	6
1 Cubic Yard Container	$ 111.01	$ 199.10	$ 287.24	$ 375.36	$ 463.48	$ 551.58
1.5 Cubic Yard Container	$ 151.16	$ 277.56	$ 403.94	$ 530.34	$ 656.70	$ 783.13
2 Cubic Yard Container	$ 195.71	$ 362.14	$ 528.59	$ 695.00	$ 861.43	$ 1,027.86
3 Cubic Yard Container	$ 269.95	$ 496.80	$ 723.67	$ 950.55	$ 1,177.41	$ 1,404.29
4 Cubic Yard Container	$ 337.71	$ 623.64	$ 909.61	$ 1,195.58	$ 1,481.55	$ 1,767.46
5 Cubic Yard Container	$ 406.78	$ 748.90	$ 1,091.07	$ 1,433.23	$ 1,775.38	$ 2,117.54
6 Cubic Yard Container	$ 471.67	$ 865.97	$ 1,260.25	$ 1,654.57	$ 2,048.86	$ 2,443.16
8 Cubic Yard Container	$ 577.40	$ 1,060.63	$ 1,543.83	$ 2,027.05	$ 2,510.26	$ 2,993.48

Compactor Rates:

Compactor containers will have a disposal charge at 3.0 times the uncompacted rate. The service fees shall be the same as those charged for uncompacted containers.

Exhibit B

Maximum Rates for the Collection of Solid Waste Within the Unincorporated Rural Collection Area Served by Brownrigg Investments, Inc., Bend Garbage and Recycling Company, Inc., and High Country Disposal Company, Inc.

Can and Roll Cart Services - Effective January 1, 2010

Class of Service	Rates as of 1-Jan-10
One pickup of one can each week:	
20 gallon can:	
curb or roadside	$ 14.85
backyard or other	$ 16.55
35 gallon can:	
curb or roadside	$ 17.75
backyard or other	$ 19.70
65 gallon can:	
curb or roadside	$ 27.55
backyard or other	$ 30.65
95 gallon can:	
curb or roadside	$ 33.80
backyard or other	$ 36.10
One pickup of additional can each week:	
35 gallon can:	
curb or roadside	$ 10.25
backyard or other	$ 11.95
Special services:	
35 gallon can special pickup (rate per pickup)	$ 12.45

Bulk Rate for the Collection of Bulk Refuse:
$12.50 per yard "or" a service fee of $60.50 per hour for 1 truck and driver ($87.10 per hour for 2 men) plus disposal fees.

If the need for a type of service arises that is not now foreseen or specifically covered by this rate schedule, then the charge for such service shall be:

1. Uniform and non-discriminatory between customers of a collector;
2. Commensurate with the rates generally charged in unincorporated Deschutes County;
3. Subject to approval by Deschutes County.

Exhibit B - Continued

Maximum Rates for the Collection of Solid Waste Within the Unincorporated Rural Collection Area Served by Brownrigg Investments, Inc., Bend Garbage and Recycling Company, Inc., and High Country Disposal Company, Inc.

Container Services - Effective January 1, 2010

Service Provided	Number of Services (Pickups) Per Week					
	1	2	3	4	5	6
1 Cubic Yard Container	$ 92.12	$ 166.02	$ 239.97	$ 313.76	$ 387.79	$ 461.70
1.5 Cubic Yard Container	$ 125.99	$ 232.29	$ 338.52	$ 444.79	$ 551.08	$ 657.38
2 Cubic Yard Container	$ 163.32	$ 303.37	$ 443.41	$ 583.45	$ 723.48	$ 863.52
3 Cubic Yard Container	$ 226.22	$ 418.12	$ 610.09	$ 802.03	$ 993.98	$1,185.91
4 Cubic Yard Container	$ 283.92	$ 526.67	$ 769.45	$1,012.25	$1,254.98	$1,497.74
5 Cubic Yard Container	$ 342.69	$ 634.00	$ 925.30	$1,216.58	$1,507.87	$1,799.19
6 Cubic Yard Container	$ 398.14	$ 734.75	$1,071.36	$1,407.97	$1,744.57	$2,081.16
8 Cubic Yard Container	$ 489.90	$ 904.90	$1,319.88	$1,734.87	$2,149.87	$2,564.86

Compactor Rates:

Compactor containers will have a disposal charge at 3.0 times the uncompacted rate. The service fees shall be the same as those charged for uncompacted containers.

Exhibit C

Maximum Rates for the Collection of Solid Waste within the Unincorporated Distant Rural Collection Area Served by Brownrigg Investments, Inc., Bend Garbage and Recycling Co., Inc., and High Country Disposal Co., Inc.

Can and Roll Cart Services - Effective January 1, 2010

Class of Service	Rates as of 1-Jan-10
One pickup of one can each week:	
20 gallon can:	
curb or roadside	$ 15.95
backyard or other	$ 18.15
35 gallon can:	
curb or roadside	$ 18.40
backyard or other	$ 20.85
65 gallon can:	
curb or roadside	$ 30.35
backyard or other	$ 35.00
95 gallon can:	
curb or roadside	$ 38.05
backyard or other	$ 41.00
One pickup of additional can each week:	
35 gallon can:	
curb or roadside	$ 12.60
backyard or other	$ 14.80
Special services:	
35 gallon can special pickup (rate per pickup)	$ 11.70

Bulk Rate for the Collection of Bulk Refuse:
$14.10 per yard "or" a service fee of $71.50 per hour for 1 truck and driver ($100.15 per hour for 2 men) plus disposal fees.

If the need for a type of service arises that is not now foreseen or specifically covered by this rate schedule, then the charge for such service shall be:

1. Uniform and non-discriminatory between customers of a collector;
2. Commensurate with the rates generally charged in unincorporated Deschutes County;
3. Subject to approval by Deschutes County.

Exhibit C - Continued

Maximum Rates for the Collection of Solid Waste within the Unincorporated Distant Rural Collection Area Served by Brownrigg Investments, Inc., Bend Garbage and Recycling Co., Inc., and High Country Disposal Co., Inc.

Container Services - Effective January 1, 2010

Service Provided	Number of Services (Pickups) Per Week					
	1	2	3	4	5	6
1 Cubic Yard Container	$ 114.12	$ 205.36	$ 296.65	$ 387.91	$ 479.14	$ 570.39
1.5 Cubic Yard Container	$ 155.86	$ 286.97	$ 418.05	$ 549.17	$ 680.26	$ 811.40
2 Cubic Yard Container	$ 201.97	$ 374.68	$ 547.41	$ 720.12	$ 892.86	$ 1,065.57
3 Cubic Yard Container	$ 279.37	$ 515.67	$ 752.01	$ 988.35	$ 1,224.67	$ 1,461.00
4 Cubic Yard Container	$ 350.29	$ 648.85	$ 947.44	$ 1,246.03	$ 1,544.63	$ 1,843.19
5 Cubic Yard Container	$ 422.52	$ 780.44	$ 1,138.42	$ 1,496.37	$ 1,854.33	$ 2,212.31
6 Cubic Yard Container	$ 490.58	$ 903.85	$ 1,317.11	$ 1,730.40	$ 2,143.69	$ 2,556.97
8 Cubic Yard Container	$ 602.65	$ 1,111.24	$ 1,619.79	$ 2,128.36	$ 2,636.93	$ 3,145.51

Compactor Rates:

Compactor containers will have a disposal charge at 3.0 times the uncompacted rate. The service fees shall be the same as those charged for uncompacted containers.

Exhibit D
Rates for container rental and transfer services provided by Deschutes Transfer Company to the Department of Solid Waste

Rates Effective January 1, 2010

Refuse Transfer Rates		
Northwest Transfer Station		$304.00 per load
Southwest Transfer Station		$304.00 per load
Alfalfa Transfer Station		$150.00 per load
Negus Transfer Station		$12.41 per ton
Recycling Drop Box Transfer Rates		
Black Butte Ranch Recycling		$180.00 per load
Bend Demolition Recycling		$90.00 per load
Eagle Crest Resort Recycling		$135.00 per load
Northwest Transfer Station Recycling		$135.00 per load
Sisters Recycling		$135.00 per load
Sunriver Recycling		$120.00 per load
Southwest Transfer Station Recycling		$135.00 per load
Wilderness Disposal Recycling		$168.75 per load
Negus Transfer Station Recycling	Appliance	$4.23 per ton
	Cardboard	$95.55 per ton
	Commingle	$34.66 per ton
	Glass	$18.87 per ton
	Scrap Iron	$60.02 per ton
Container Rental Rates		
40 yard Security Box		$87.50 per month
30 yard Drop Box		$70.00 per month
40 Yard Drop Box		$51.50 per month

APPENDIX C – PUBLIC PARTICIPATION INFORMATION

Deschutes 2019 Solid Waste Management Plan Public Outreach /Involvement Process

A key element of preparing the Deschutes County Solid Waste Management Plan (SWMP) was to actively promote public participation and seek input from the broader public as the plan was being prepared. This outreach program was comprehensive. It included setting up a Solid Waste Advisory Committee (SWAC) with broad representation including immediate stakeholders such as cities, recyclers and franchised collection companies and setting up a dedicated website that posted regular updates of the draft SWMP as it was being prepared. All SWAC meetings were open to the public who were invited to participate at meetings. The County issued regular announcements to all parties that visit their website.

Summary of Solid Waste Management Plan Outreach:

- Solid Waste Management Plan website (https://www.deschutes.org/solidwaste/page/solid-waste-management-plan)
  - Deschutes County Fact Sheet
  - Solid Waste Management Plan document draft
  - Links to the Recycling and Disposal Options surveys
  - Links to the SWAC and public meetings
  - Other resource information

- Solid Waste Advisory Committee Meetings website (https://www.deschutes.org/solidwaste/page/solid-waste-advisory-committee-meetings)
  - Calendar Dates
  - Location/Directions
  - Agendas
  - Meeting Minutes
  - Presentations
  - Links to the draft SWMP and public meetings

- Public Meetings:
  - **Recycling Public Meeting – 6/25/18 6:00 – 7:30 p.m.**
  - **Disposal Public Meeting – 1/31/19 5:00 – 7:00 p.m.**

  Publicity:
  - Solid Waste website
  - Deschutes County website – news release, banner board, calendar
  - Deschutes Services Building meeting notification board
  - County Public Information Officer social media blasting

  - Notifications at SWAC and other meetings
  - Other communication efforts

- Community Outreach Efforts:
  - Meeting requests – Timm Schimke, Director of the Department of Solid Waste (DSW) presented at different community events such as Sisters Rotary and various City Council meetings
  - Media interviews – Multiple media outlet interviews with Timm Schimke

- Emailed correspondence including calendar invites and material (attachments and website links):
  - SWAC email distribution list – comprised of committee members, staff and consultants
  - SWAC Interested Parties email distribution list – comprised of people requesting to subscribe at meetings, in the office or via survey responses

- Surveys:
  - Solid Waste Recycling Survey (http://deschutes.org/swsurvey)
  - Solid Waste Disposal Options Survey (http://deschutes.org/disposaloptions)
  - Telephone survey conducted by independent polling and research firm
  - KTVZ television station poll

Results from Surveys

DSW, in conjunction with the SWAC, conducted two special public meetings. At each meeting a survey was issued to obtain feedback from the public about the direction for the future solid waste services described in the SWMP. The survey was also published on the County's website to reach more people. The surveys were designed to gauge the public's general sentiment and input related to the Waste Reduction and Recycling Program and future landfill disposal options. The following information is a summary of the results and comments received.

Appendix C - Deschutes County Recycling Survey Responses

(Intentionally Left Blank)

SUMMARY

2/26/2019

RESPONSES:

196 Surveys
155 Comments
93 Page 1
62 Page 2
63 Interested Party Distribution List Additions From Survey Responses

---

Survey asks about recycling and composting habits (page 1) and ways to extend the life of the landfill by reducing waste and recycling more (page 2)

- *Majority of respondents have curbside recycling, about half subscribe to curbside yard collection, and under half compost at home*
- *Most recycle at work; very few work places compost*
- *All but a small percentage are in favor of educating on buying products with less packaging waste*
- *Over half of the respondents strongly agree or agree in having curbside yard/food waste collection as part of their bill*
- *Majority agree in having businesses recycle/separate food waste and requiring multifamily complexes to recycle and compost (while offering some type of rate incentive)*

Over 150 comments submitted with a general theme of:

- *being able to recycle styrofoam and more plastics*
- *providing more recycling and composting education*
- *making recycling easy*
- *offering recycling and yard/food waste services in unincorporated areas*
- *expanding composting availability at home and in the community*
- *accepting all/most food waste*
- *putting in place programs for construction material*
- *requiring hotels and other businesses to have recycling available*

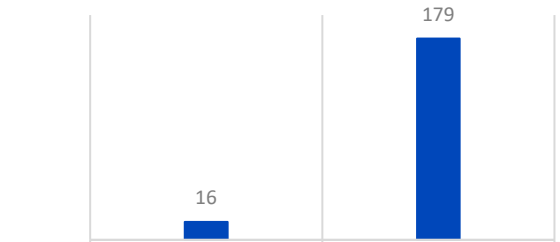
Deschutes County Department of Solid Waste

Solid Waste Recycling and Composting Survey Results

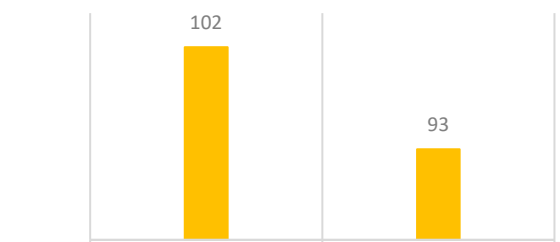
Total Responses
196

1.1 - Curbside Recycling: Y/N
1.2 - Curbside Yard: Y/N
1.2.a - If Yes, Add Food Waste: Y/N
1.2.b - If No, Add Svc: Y/N/NS (Not Sure)
1.3 - Compost: Y/N
1.4 - Curbside Collection #: N (Never) - 4
1.5 - Self-haul: OF (Often), OC (Occasionally), R (Rarely), N (Never)
1.6 - Recycle at Work: Y/N
1.6.a - Compost at Work: Y/N

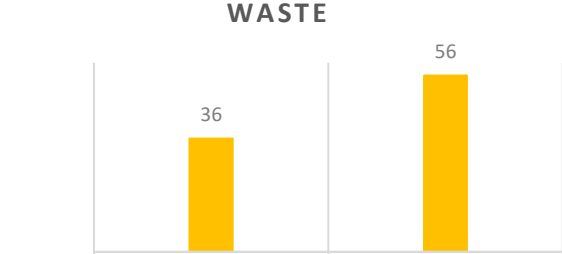
1.1 - CURBSIDE RECYCLING



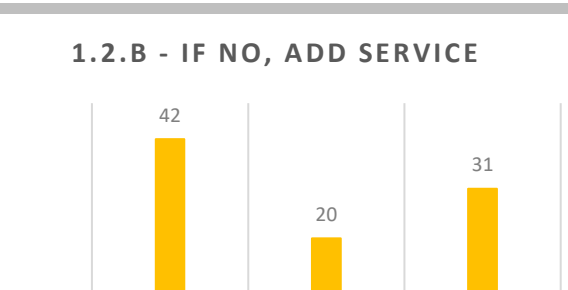
1.2 - CURBSIDE YARD



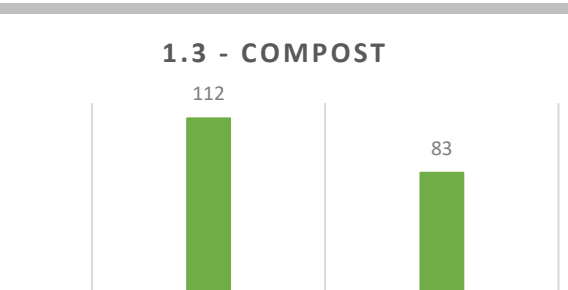
1.2.A - IF YES, ADD FOOD WASTE



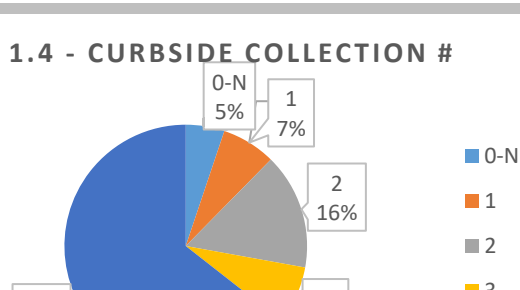
1.2.B - IF NO, ADD SERVICE



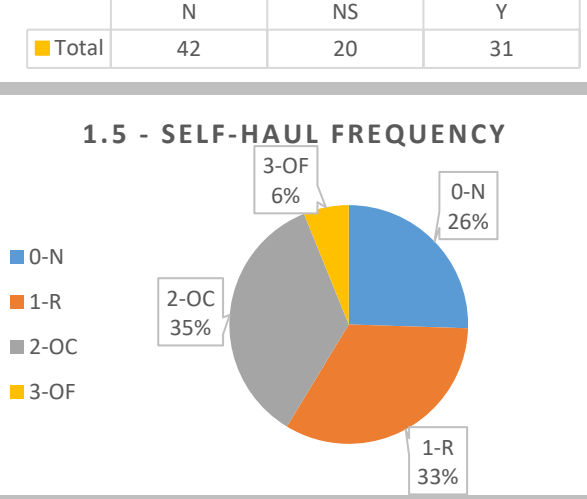
1.3 - COMPOST



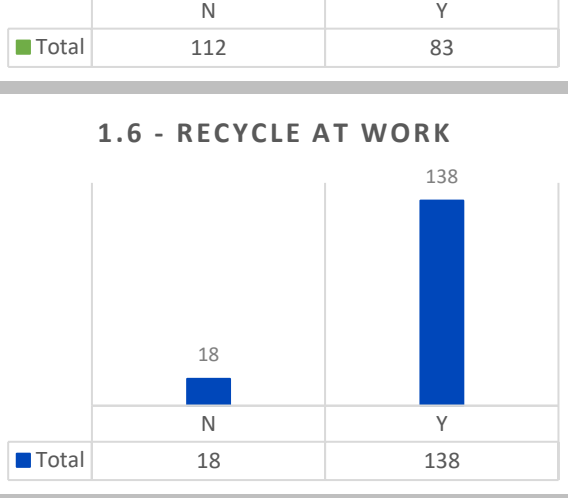
1.4 - CURBSIDE COLLECTION



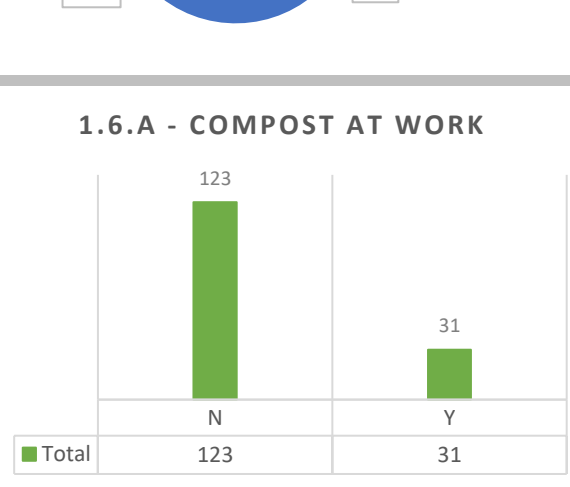
1.5 - SELF-HAUL FREQUENCY



1.6 - RECYCLE AT WORK



1.6.A - COMPOST AT WORK



- I'm considering food waste to include any veggies or fruit that have expired or the cut off ends. I do not add cooked food to my compost. I used the description on Bend Garbage & Recyclings website to determine this as acceptable.
- I would like to be able to recycle styrofoam and peanuts.
- I feel like there is so much more that can be recycled that we have to throw away. Try to be very conscious of packaging when shopping, try to buy in bulk. As a family of 3 we do have the smallest trash can and usually when we put it out it isn't full. Would like to compost at home but I'm grateful that we can put food waste in our yard waste can.
- By food in compost, only raw vegetables, fruits, coffee grounds and egg shells.
- I use about 1-2 bags of medium-sized kitchen trash per week (usually 1). I answered as if I were the person collecting, but I live in an apartment with communal trash bins.
- Community composing would be great! Wish there was more we could recycle in our community.
- We have to sort and haul our recycling at work. I would love to be able to recycle more ie. clamshell containers.
- We would like to be able to recycle more things than what we are allowed now and we would like to be able to compost more things. When we lived in Bellingham Wa. There were more options. I would also like to see programs put in place for construction and the school district, so that they are not creating sooooo much waste. I have worked at both and it is crazy how much perfectly good things get thrown away!
- I rent my home and since it is a duplex the bins are shared and the landlord includes these services in our rent (and won't add on yard debris service).
- I would love to see solid waste disposal and recycling fees included in our taxes rather than paid for a quarted as they are now. What a shame that dumpsters are locked and we don't have garbage cans readily available for use by visitors on the street. Publicly available garbage and recycling would be more in keeping with the "Be Nice, You're In Bend" ethos.
- Recycling of plastic could be done 'by number' and include a greater variety of items.
- Why don't we have a power generating incinerator? Many euro countries do this.
- Worm composting is so easy. I've been doing it for years. No smell. No fuss. Those happy worms compost kitchen food waste 24/7 365 days a year. It would be great to see our region (county & city) actively supporting worm composting - at home & at work places.
- More guidance about appropriate recycling and composting would be very helpful.
- We put out trash for pick up usually every other month so answer above is not correct. With reduction in items now accepted for recycle our trash use might increase. We try not to purchase items in non-recyclable containers.
- Need more plastic clamshell recycling days. Possibly a clamshell recycling container provided by the County to increase awareness and recycling.
- We don't have enough garbage to fill even the small can each week so I put my yard debris there rather than pay for a third yard debris container.
- The only food waste I put out to the curb is items that I can't currently compost (meat, bread, fats etc). I am really interesting in solid waste management. I find zero waste lifestyles really interesting and I am trying to transition to one. I am so close but still working on it. I am always looking for new zero waste ideas.
- I would love to be able to use curbside composting.
- Frustrated at how little is able to be recycled in Bend as compared to my company office in California.
- Strong supporters of recycling and composting.
- I have very little yard waste so not sure adding that service would be helpful but adding a composting service would be terrific. The compost bins in the Northwest Community Garden were recently removed so now I have no place to compost and I don't want a compost bin in my yard because of it's possible rodents could be attracted to it.
- Please enable Bend Garbage to expand area served for curbside yard waste collection.

- Trash disposal is too cheap and it doesn't give incentive to people to recycle. I bring trash and it weighs 30 pounds max, every few months and it costs me $12 or something. People next to me are paying $40 and piling cardboard, wood, etc out of their vehicle into the pile for the landfill. I realize that you think making it more expensive would mean more sofas and wrecked belongings would go to the roadsides, but there are fines and laws for that. Make a bigger incentive for recycling please and make trash more, much more expensive. Glass isn't picked up in my neighborhood and since the west side recycle transfer station closed, I have to drive all the way out to the landfill with glass to recycle, so I just do it all there, no more curbside.
- I currently haul yard waste to the landfill for composting once or twice a year for a cost of $4/disposal. It is a hassle to drive to the landfill to dispose of hazardous waste and metal, but I do it. It would be nice if used batteries, especially AA, could be recycled. Recycling of plastic has become a worldwide problem. The county may need to consider a separate bin for plastic so it does not become contaminated by other recycling, if that is a problem. The county should evaluate the feasibility of a tax or limits on plastic packaging, straws, and bags.
- The current service is excellent. But as a new resident, I have not noticed much outreach from the waste company to show what goes in the bin. Yes, there is stuff online, but what about people who do not want to make the effort to look things up? What about graphics on the cart? Flyers? T.V. ads? Facebook ads? I an guessing there is a lot of contamination in the recycling.
- We do not put meats, dairy products or other non-vegetable food items in yard debris bins. Yard debris should not be commingled with solid waste but composted and reused.
- Would be great if we could recycle glass and compost at my place of employment.
- I just moved here from NC. I am very surprised there is not a compost service in place. I know you can put raw fruits and veggies in the yard bin, so that's at least one step in the right direction. However, something more could be implemented. Secondly, what can and cannot be recycled is unclear. Many residents are confused on what should and shouldn't be recycled.
- I would love to see more efforts to moving Bend/Deschutes County toward zero waste systems (like in San Francisco: https://www.youtube.com/watch?v=Cg3OA1s8-SI), including an official curbside compost collection (like in Portland) in addition to the currently-offered yard debris collection, and textile recycling collection receptacles (https://gemtextrecycling.com). I believe more public outreach on what can be accepted for recycling is needed. When I lived in Portland, we received regular mailings on recycling. I've found that most people in Bend have no clue what can and cannot be recycled in our curbside bins. I would be interested in forming a citizen task force to research effective municipal zero waste strategies. Please let me know if this would be helpful. Thank you!
- People are lazy whatever will make composting/recycling the easiest is best because people don't want to do anything more than is necessary. I have compost/worm composting and maybe one plastic grocery bag of trash per month. I try to recycle everything I can.
- We also recycle plastic film at the grocery store, use fabric shopping bags and occasionally take our Styrofoam to Portland (until they stopped taking it) We try very hard to repair and re-use items and avoid buying things we don't need. We love our community and our earth and try hard to keep it clean.
- I throw my garden compost in the trash because my HOA doesn’t want to see composting bins in yards. I throw away my garden compost because I don’t have room for another trash can. I’ve started bringing my deposit bottles to recycling center myself and keeping the money for myself. I think it sucks you don’t recycle clamshell plastics - a lot of places do.
- Our garbage can is set out when full, which takes ~ 10 -12 weeks.
- I think Bend should ban single use plastics like grocery bags, straws, plastic cups. We also should have community composting. Thank you.

- Currently making a push at work to educate staff on what can and can not be recycled, ie. clam shells = no, cracker box = yes
- I would like to see stronger recycling programs in the school district.
- It would be great to have a more robust composting system, including the "compostable" cups, plates, clamshells (Volcano Veggies), etc. that many businesses use, but that we can't actually efficiently compost.
- Too many people put trash in the recycle bin. Several of my neighbors do, they don't want to pay for excess garbage. I read that somewhere they won't pick up the recycle bin if it has trash. Does the driver have to get out and check each bin??? I think they should send the recycle truck out first and have them leave recycle bins with garbage. Than have the garbage truck pick up the recycle can as garbage along with the garbage can and charge for 2 cans of garbage. But that's too much work for the drivers unless they have an easy way to record the extra pickup, AND look in the recycle can. But people will just scatter recycling on top to make it look like a proper recycle can.
- Interested in composting options when i dont have a yard to do it
- We both work from home so we recycle. Have tried composting in the past and failed. We are open to trying it again.
- We must get better at this. We must get better at developing alternatives to our waste. If we develop alternatives and make garbage expensive enough, the vast majority of people will reduce their waste. Humans are not good at dealing w/future crisis. 2029 seems so far away. Unless strongly encouraged by financial reasons or forced by policies & laws we won't do anything until too late. The planet deserves better. Thanks.
- I'd love to have more recycling bins at work and recycling information to share with my staff.
- I would love having more composting options available.
- Increasing deposit has resulted in more can, plastic bottle, and glass self haul recycling in my household.
- Recycle bins are not large enough. Also, to promote less waste I should only pay for when I set my garbage can out, if I skip a week I should get a credit or something…
- I would like to become more knowledgeable about what materials are recyclable and what is not
- I would love it if there was a formal composting program. It would also be great if more types of plastics were recyclable.
- I would use and be willing to pay for a curbside compost program. We don't have room to use compost in our yard.
- PLEASE add more plastics to recycling.
- I wish yard waste pick up was free for all just like recycling is
- Garbage is terrible. Recycling is awesome. But sending recycled product on a worldwide trip somewhat defeats the point of recycling. Encourage local business to use/produce products from recycled material? A local contest?
- We compost at home!
- Please offer more recycling of plastics. Work with stores to reduce packaging or for the buggies lieu Costco, Trader Joe's, Walmart, Fred Meyer, etc to truck clamshells and other stiff consumers can't avoud buying to a proper recycling facility in the empty trucks going back to Eugene or pdx.
- Any help with at home composting would be great
- I have such a small yard that yard debris collection and home composting isn't needed. But I would do curbside compost collection if that was feasible.
- Oregon should make it easier.. it used to be we could go to any grocery store to return our cans/bottles now we only have one place to go in Redmond and Bend.. No more choices of where to go.. also the one place to go has become kind of a trashy place.. I would not send my wife or children or mother there alone!!
- we definitely need a city-wide food waste compost option

- It would be great to have more workshops, support on best practices for composting at home. We have a compost tumbler and are interested in how to make the best soil from it. Would be great to hear how others are reducing waste locally to get inspiration, tips, and more.
- We should have compost curbside pick-up and/or access to discounted at-home composters
- Please consider adopting a compost/food waste curbside collection program. Currently, our Yard Debris bin allows for "fresh food" to be included, so one would hope it could be possible to expand that to include all/most food waste. The City of Portland initiated a program a few years ago and has seen great success in waste reduction.
- I would love to have curbside compost pickup but need to look into the cost of a yard waste container if it were only used for food scraps. I also try to only put my garbage and recycling bins out when they are full or super stinky in hopes that by me not placing it on the curb, that will be one less stop for the dump truck and hopefully save on gas. Not sure if this theory is true but if it is it would be great to have a push to educate the public to do the same. Perhaps people could have an option for their trash to only be picked up every 2 weeks instead of every week so that you could build this efficiency into your system.
- Getting the 10 cent bottles and cans into the DEPOSIT - REFUND stream is becoming increasingly difficult. Recycling should be easy and precise.....a no-brainer if taught at schools and throughout our society. Simple - Easy and efficient - even if it costs EXTRA.....
- I am on the Bend Climate Action Steering Committee. We are responsible for creating a workable Climate Action Plan for the community to increase renewable energy use and decrease our carbon and other GHG emissions. Out committee is very interested in the significant role waste management will have on our overall success for years to come. :)
- Would love to be able to add food waste to curbside.
- Work - We tried composting without success due to lack of compliance (wrong stuff in) & lack of greens/browns. I'd do yard waste if there was a reduced option instead of every month. Too expensive for amount of yard debris I have.
- Would love a small curbside compost option
- If Bend could pass legislation making takeout containers (coffee and drink cups, food packaging) either more expensive or banned, that would help a lot. Americans can do more, and the changes to established habits may be painful at first, but in the grand scheme, no big deal.
- I've been "homeless" for 6 years and the amount of waste - I have found - is appauling. Vote for me as Mayor of Bend so WE can help clean up our community and to propagate positivity and critical thought locally to begin…
- I would like to see appropriate bins for collection in my apartment complex.
- Curbside service - Live in unincorporated Bend and do not have this service - must take to transfer station
- Glass & yard debris pickup in the county would be awesome.
- I would love to not have to pay extra for yard waste. It reduces our garbage volume & waste to landfill significantly!
- Hope its working
- Work compost - Soon. I know that awareness of what can be recycled is pretty minimal among my peers.
- Would really like to see composting bins so all food waste & certified compostables etc. can be composted in a bin at home. i.e. more than just current yard waste
- More info/signage, perhaps on bins, on what's acceptable and what's not. Also include info with bills - maybe quarterly so people really look at it with lots of visual images.
- Would be nice to have curbside recycling and yard/food waste collection available at outlying communities in the county (where curbside garbage is already offered)
- Regarding yard waste recycling - I have a lawn maintenance service that maintains the yard. They haul away the yard waste. I assume that they dispose of it properly.

- Compost at home: We didn't know that was available. We will compost in the future. Self-haul recycling: Most often batteries, hazardous waste, e-waste, etc.
- Sure wish we had the option of weekly recycling pickup. My recycling bin is overflowing every other week, and often I have to drive to the Knott recycling station in between. My garbage bin is usually only about half full each week. In Portland, garbage was every other week and recycling was weekly...that worked well, I found. Also wish I could recycle used motor oil curbside like Portland does...but, I wonder if I'm one of few who change their own oil these days :-).
- The city of Guelph in Ontario Canada has an excellent waste management program. Might be something worth checking out.
- New residential communities - new homes - the builders don’t give residents enough space for all the trash & recycle bins - there’s no way I could fit another can and... I do NOT want to SMELL residential food waste in my home or neighborhood
- Would love to have glass recycling in rural Deschutes County!
- I wish Knott Landfill had Terracycle (www.terracycle.com) boxes at the transfer stations that we (as a community) could add to, and increase our recycling/decrease waste streams.
- Glass and compost bins at work would be great. I wish plastic clamshells were recyclable. Why aren't they?
- I would love curbside composting, and more education about what can and can't be recycled here.
- We are interested in learning about any industrial composting options available to us as a business.
- We need to be able to recycle clamshell, or push for reduced use of clamshell in grocery stores.
- Would like a compost recycling available at home and work
- It would be great to see bend doing better with composting food. There are so many farms that could be linked up with that valuable resource. Last time I was in bend , they didn't recycle glass which is crazy. I just moved back and hopefully that has changed.
- The majority of people recycle incorrectly and need training. There needs to be a lot more information put out there as to what is and is not recyclable, and why it matters. Also, there should not be an extra charge for yard waste recycling. People don’t do it for that reason. The same for charges for bringing recyclables to the transfer station.
- We need to make waste management more expensive so more people recycle and compost. People need to be trained on how easy it is to do the right thing for the environment and our community!

Deschutes County Department of Solid Waste

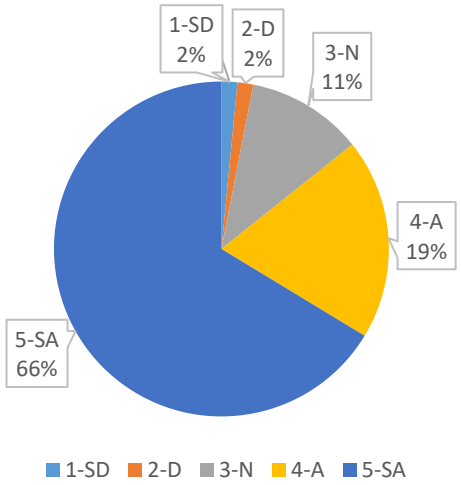
Solid Waste Recycling and Composting Survey Results - Landfill Longevity

Total Responses
196

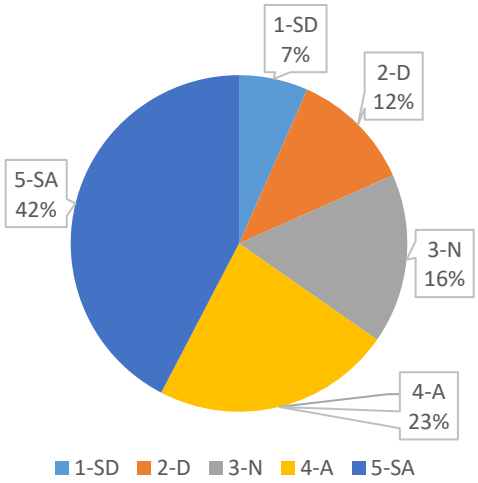
5-SA = Strongly Agree, 4-A = Agree, 3-N = Neither Agree/Disagree, 2-D = Disagree, 1-SD = Strongly Disagree

2.1 - Educate on Buying Less Packaging
2.2 - Include Curbside Yard
2.3 - Require Business Recycling
2.4 - Offer Business Incentives
2.5 - Require Multifamily Recycling
2.6 - Offer Multifamily Incentives

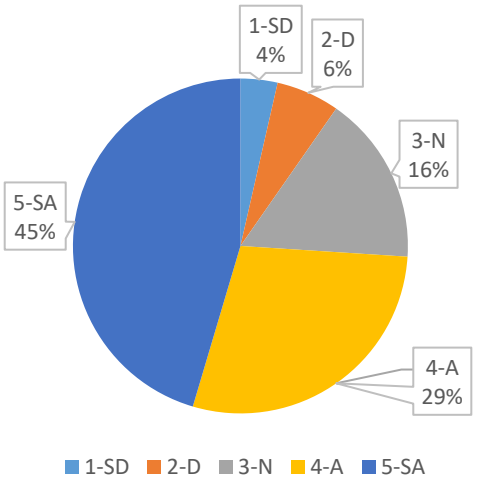
2.1 - EDUCATE ON BUYING LESS PACKAGING



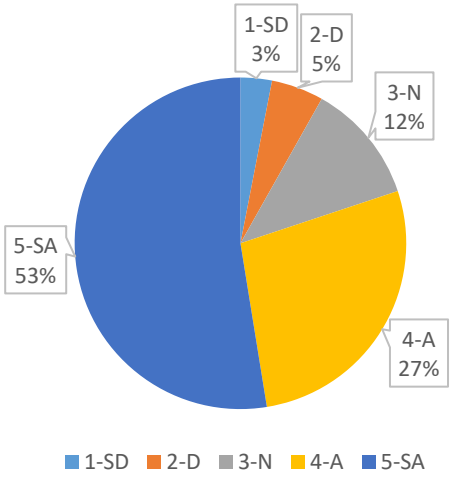
2.2 - INCLUDE CURBSIDE YARD W/ BILL



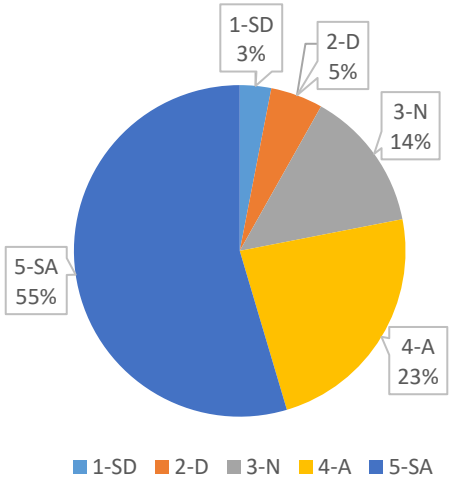
2.3 - REQUIRE BUSINESS RECYCLING/FOOD SEPARATION



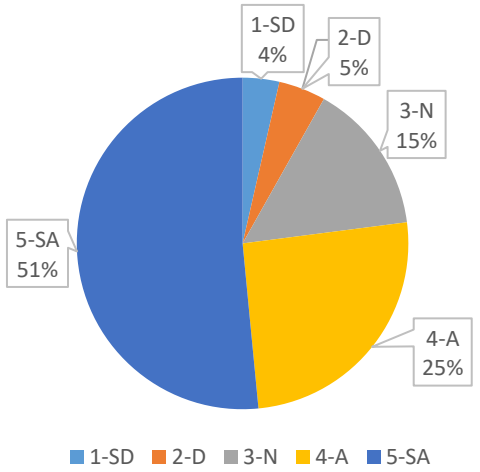
2.4 - OFFER BUSINESS INCENTIVES



2.5 - REQUIRE MULTIFAMILY RECYCLING



2.6 - OFFER MULTIFAMILY INCENTIVES



- By adding food waste to recycling program, won't that fill up the landfill quicker? Food waste should be collected more than once per week because it is going to stink!!
- Where does the composting and yard waste go? Why does that save space, when regular trash pickup does not?
- Hotels should be required to have recycling available.
- Restaurants should be given incentives that they can also use in advertising. Like a special logo and or sticker that they can show proudly for being zero waste etc. The more incentives and the easier things are made through programs the more people on board with creating less waste. Thanks!
- Since a large portion of our waste in the landfill is construction waste, I think thoughtful consideration should be put towards financial incentives and/or regulation, policy, building codes, permits, etc to really make a dent in extending the life of our landfill and conserving resources (environmental and financial). I only think all residents should have yard waste/food waste as part of their bill if this includes ALL food waste, like how businesses currently can compost.
- It would be nice to have a way to more easily identify and sort the types of plastics. Also if more plastics were accepted lies would go in the landfill. When I lived in Bozeman. Mt they had these wonderful dumpster around town for recycling that has sista sections for the sudent items. It was how I recycled living in my apartment complex.
- Incentivize, don't mandate
- I think it would be best to tackle people recycling the right things and not putting garbage in the recycling before trying to tackle adding food waste composting. Maybe incentives are supplied for recycling or composting only if it is done right. That might be to hard to track though.
- I think it is incumbent on businesses and property owners and managers to institute these policies. It should not become a burden to low-income residents. There should also be better education and infrastructure for hazardous waste disposal.
- Perhaps residential, business and multifamily complexes should be given rate incentives for recycling and composting. We also need to develop recycling businesses that can process recyclables locally.
- Provide the container, and they will come.
- There are so many variances to the above questions it's difficult to answer with the above options. Is it cost effective for you?, how do you drill EVERYONE it's beneficial to recycle everything we can?...SO many questions.. We support recycling 200% but I'm still uncertain myself of the fine points of plastic recycling.. It's not easy and LOTS OF PEOPLE need more info on it CONSISTENTLY!!
- Yard waste/food waste should not be required. I like having the option. I think it would be great to learn more about the relationship between who is creating the food scraps and who benefits from the compost. Once it is composted at the landfill, who is buying and using it?
- With our affordable housing shortage, we should not single out and burden multi-family housing with requirements or fees.
- I have tried food composting and found it to require a lot of time and attention but I'd be more than willing to separate it for collection!
- I think that curbside composting should be offered and available for all of Bend, businesses and residential but not required for anyone. I also think that reducing packaging and waste should be a main goal for everyone.
- We should have programs in the Deschutes schools that education children about recycling, reusing, and reducing.
- We should ban single use plastic bags!
- I'm currently in the Bend/Deschutes County JMA, and am served by Bend Garbage. For some reason, I'm offered recycling in a blue bin, but not recycling of yard waste. This should be changed to allow for more composting material to be gathered. As of now my only option is to take it to the landfill in general, a wasteful process.

- We should get a county ruling to outlaw plastic bags, utensils and straws etc which cannot be recycled and end up on the roadsides. Follow lead of Seattle and Portland, we can do it. Maybe weigh the amount of recycling that people take to the landfill collection station and then weigh their trash when they haul that and give a credit if they are big on recycling and small on trash. I see a lot of metal and wood going into the trash. Make the landfill last forever!
- We compost in our backyard and so don't need compost pick-up. We don't have enough yard waste for weekly pick-up. Would it be practical to have free community dumpsters for yard waste and compost, perhaps at the edge of parks? A likely problem might inclusion of garbage and too many plastic bags.
- This is a necessity.
- how would compliance with recycling and composting requirements be ensured?
- Need to make it EASY to recycle and compost or no-one will do it.
- I compost and have worm composting on my own and use it in my yard to enrich the soil so I can eventually have a garden. I wouldn't want to be charged for this service. But think it is a good idea for people who won't do it themselves.
- This is tough to answer because I have mixed feelings. I feel that everyone should recycle and compost, however requiring them to do it can backfire because they wont do it correctly or conscientiously. Education and promotion is the key. Perhaps requiring a trial period of three months when a person signs up for new service would allow them to see if they are willing to recycle and compost correctly. Providing rate incentives are nice, but the process is costly so who will pay for it?
- Food waste in the landfill helps everything else in the landfill to decompose better. It also provides the fuel to create the methane that runs the power plant on the landfill. Completely separating out the food waste changes the character of the landfill and the decomposing lifetime of the trash in the landfill.
- You haven’t mentioned prices. A lot of people are being crushed by taxes and fees in Deschutes. I don’t think it’s fair to force this on anyone except a business. Why don’t you fine companies in Oregon that have excess pancaking and ARE THE PROBLEM??? You’re punishing the end users but not the people who create the problem.
- Recycling and composting is something we ALL should be doing as it’s called personal responsibility. I’m sure more people would partake in composting and recycling if there weren’t additional fees. Maybe have it as an “all-in-one” package. You pay your monthly fee and with that it includes trash, recycling AND composting. It must be easily accessible for customers to use it. If it’s not they won’t.
- yes, yes, yes to recycling and educating/promoting waste reduction is HUGE
- Composting food waste in the yard debris bin only includes raw plant material, if I understand it correctly (apple cores, carrot tops, etc.). It would be great if the facility could compost meat bones, cooked leftovers, etc. I assume this is possible, but I'm not sure what it entails. Portland has a composting system...what do they do that might be worth copying?
- People are LAZY!! In multifamily complexes they will choose the easiest place to throw their trash, no one can hold anyone else accountable - unless there are cameras and everyone can see who are the offenders and they get chided into complying.
- I would like to do compost but in this new home with no garden i would like to know what options i could have
- If you give businesses and multifamily complexes incentives to recycle & compost you should give individuals incentives too!
- Would it be possible to require grocery stores and restaurants to donate food instead of throwing it away? There’s so much perfectly good food being wasted. It makes no sense.
- When you say require multifamily to compost, I assume you mean require them to separate food waste that will be part of the collection program

- Instead of teaching consumers what packaging to buy, the manufacturers should package in fully recyclable products. That way there's no question if it can be recycled or not
- I lived in an apartment building and saw lots of people try to recycle things that aren't recyclable. I think there needs to be more signage in apartment buildings about what is/isn't recyclable. This is particularly an issue as lots of people move to bend from other areas that have different recycling rules
- I agree with requiring recycling. I do not agree with requiring composting.
- "Require" is a word that provides no wiggle room. Incentivize offers a benefit to both parties.
- Why not charge a fee for recycling to be done for folks. Take a look at what rainbow disposal in Huntington Beach does. There's a fee and the facility sorts. It's apakling how much waste there is. Responsible packaging and consumerism is critical to our future.
- the ones I said "Strongly DISAGREE On.. I feel apartment complexes and businesses would raise their rates which would directly affect the average person.. apartment complexes as you guys well know already charge an arm and a leg.. so that is why I strongly Disagree.. and I strongly Disagree about all residents should have curbside/food waste collection bill.. due to the fact Some Do not use that service.. it's like the State of Oregon recently passing a law where everyone gets a trasnportation tax deducted from their pay checks now.. Surprise.. guess why we are disgusted with the government???. you guys do that I Gurantee the Deschutes county leaders will be hearing a ton of negative comments over it!!!!. also.. maybe poor planning on deschutes counties fault for the land fill.. why should us as residents have to do something about it.. if it was a lack of planning of the deschutes county leaders?
- I always think that incentive programs work best. I don't think burden should be placed on multifamily complexes as they usually tend to be lower income..but I see the point in trying to control areas that may not have the space to compost on site. It still seems discriminatory to me.
- Comment on the "all residents should have curbside yard/food waste collection." I already have that and it is already on my bill. Not sure why you're asking that question. Also, the garbage and recycling bill comes every other month, not monthly.
- A strong education program, along with incentives will be among the key factors to engage our community in reducing their waste and recycling more, among other actions. Mandatory requirements will likely be a disincentive. Due to my committee position, I've chosen the neutral route on the last five questions. Good luck.
- Multifamily complexes need to have a way to give a rebate to tenants for recycling and composting. They would need to have someone monitor what goes in the right bin since many choose not to be responsible. This is a challenge. There needs to be a colorful laminated poster showing what goes in what bin and what not to recycle/compost.
- Some businesses are awfully small to handle this or even generate enough/any compost. Require a certain size business maybe? Or food-based business only?
- Curbside yard waste/food waste collection - Only if we use the service.
- Vote early and vote often. Let's make this change NOW :-)
- "Require" sometimes pisses people off. But I think it would force change. But maybe giving incentives to do it would be more effective than requiring it? Like you have to pay more if you don't do it.
- I don't really understand multi-family complex question. I think there should be big rate incentives for building (construction) waste reduction. Or, some other program to collect & reuse/recycle construction waste. i.e. separate bin for re-store/habitat re-usable materials & rate reduction or rebate for amount in said bin.
- Curbside yard waste/food waste collection - If they don't have a yard they shouldn't have yard waste
- All residents should have curbside yard waste/food recycling as part of their monthly bill: If in a practical sense that is required to make yard waste/food recycling work, then I think it should be a requirement.

- First step is to reduce, then reuse then recycle. Would love to know if there is a program for black pastor plant containers.
- What we really need is a waste energy plant
- Multi family complexes with stink to high hell with composting! It’s 90-100 degrees way too often - what about the poor homeowner that gets stuck living next to the compost pile??!! Home value? Health? Vermin?
- I didn’t realize there were multi-family units that *don’t* provide recycling bins!
- For things which we cannot recycle locally, we should look into systems/programs where we can send it away (www.terracycle.com), and place the boxes in strategic locations around town.
- Disagree: Those of us who compost shouldn't have to pay for food and yard waste collection since it's a service we wouldn't use.
- Offering rate incentives for recycling and separating food waste for composting sounds good, but I don't recommend it unless there is a corresponding economic benefit to the County.
- All education messages should include information about the costs of opening a new landfill. We should also consider adding a small fee toward the future cost of the landfill since it is inevitable that we will need to source one. Saving today for this future expense would be financially prudent.
- The reduction of packaging waste is crucial, but would be more effectively dealt with at the level of when the packaging is put on, rather than at the consumer level. We need legislation to reduce wasteful packaging, especially plastic packaging, and the counties should be lobbying the Oregon legislature to get this done.

Appendix C - Deschutes County Disposal Survey Responses

(Intentionally Left Blank)

Deschutes County Department of Solid Waste

Solid Waste Disposal Options Survey Results

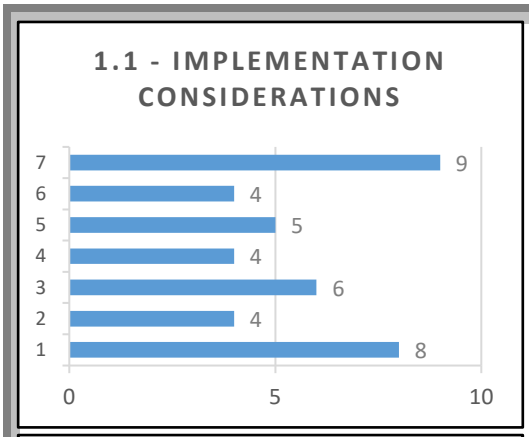
Total Responses: 42

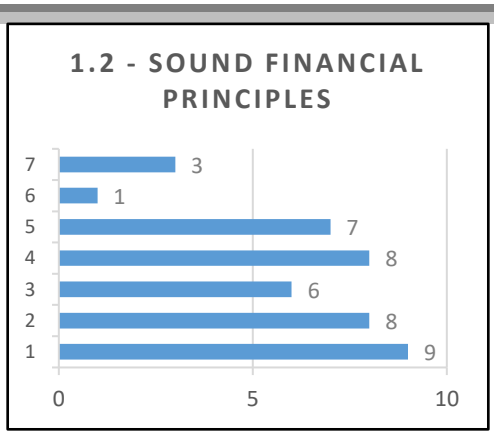
1 - Rank by order of importance: 1 = most, 7 = least

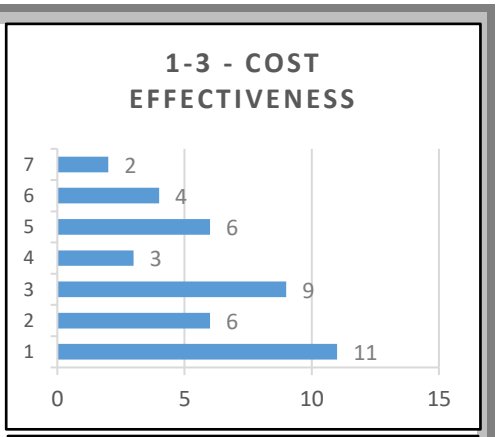
1.1 - Implementation Considerations
1.2 - Sound Financial Principles
1.3 - Cost Effectiveness
1.4 - Rate Stability
1.5 - System Flexibility
1.6 - Reliability
1.7 - Environmental Considerations

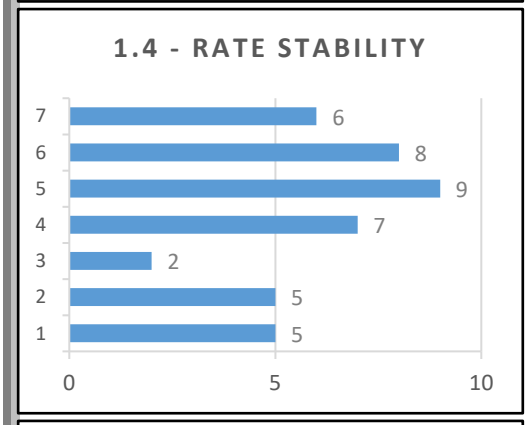
4 - Overall Option Like Best: T (Transport Out of County) / L (New In-County Landfill)

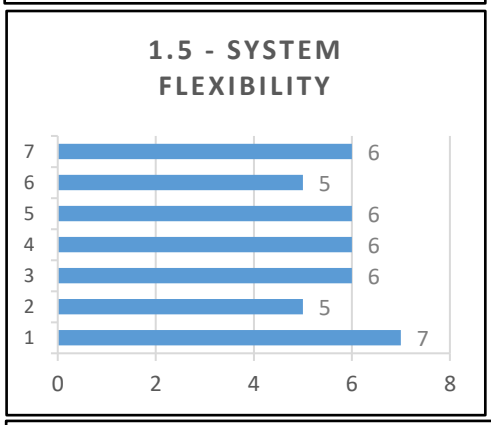
Ranking *1 = Most* *7 = Least*	1.1 - Impl Cons	1.2 - Sound Fin Princ	1.3 - Cost Effectveness	1.4 - Rate Stability	1.5 - System Flexibility	1.6 - Reliability	1.7 - Env Cons
1	8	9	10	5	7	5	***16***
2	4	8	6	5	5	6	***9***
3	6	6	***9***	2	6	8	3
4	4	***8***	3	7	6	4	4
5	5	7	6	***9***	6	***9***	2
6	4	1	4	***8***	5	5	4
7	***9***	3	2	6	6	5	4
Responses	**40**	**42**	**40**	**42**	**41**	**42**	**42**

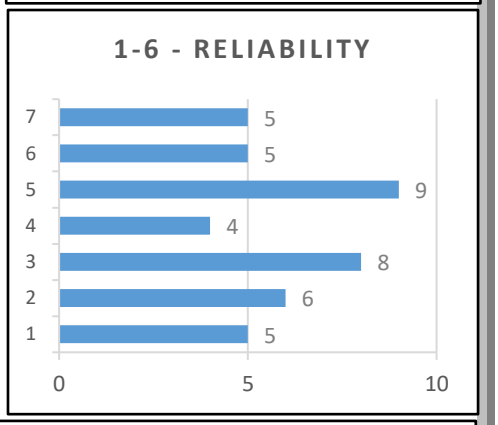


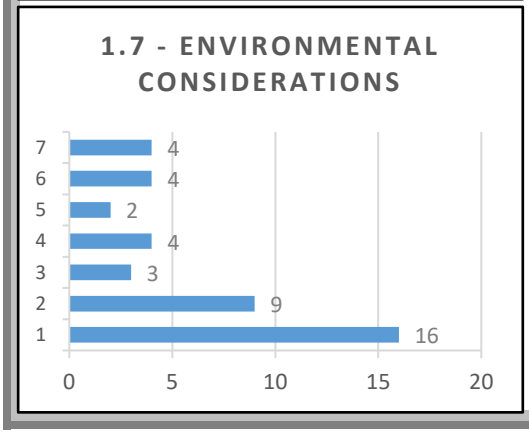


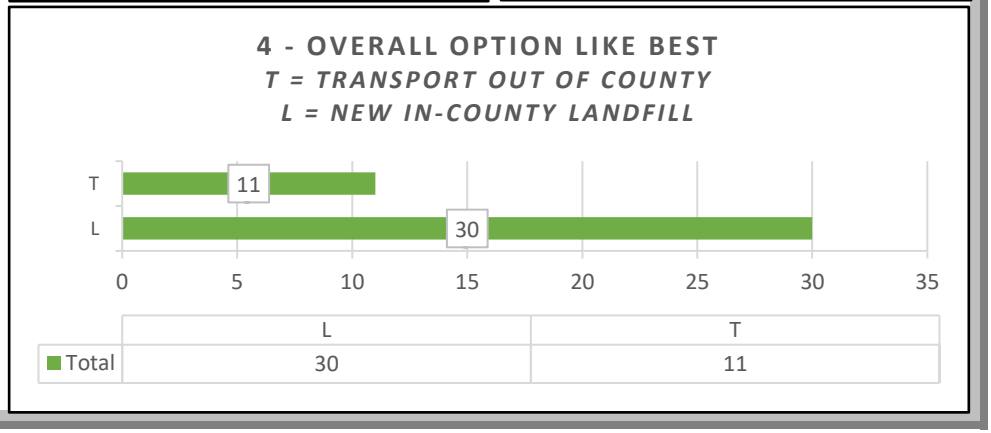












- Encourage more recycling esp. of items that will produce methane
- Still thinking about that!
- Infrastructural changes - make it easier for "green" disposals. Also, education!
- Increased environmental restrictions and the extra cost.
- I'm wondering if in this process, plans or proposals have been recommended/suggested to address the enormous waste that happens on our school campuses?
- Transfer stations need to be open 7 days a week and safe.
- Loss of public land.
  Incentives and penalties to reduce packaging, food waste, construction waste.
  Money from reuse of the existing Knott Road site. Money from its development could pay for a new site or transfer of solid waste to another site.
  More competition in garbage, recycling and yard waste collection to reduce that cost to residents.
- Resiliency in case of emergencies. The roads north to Columbia river landfills may be closed in case of earthquake, fire, or severe weather.
- Increased fill rate of out of county landfills.
- No
- landfill alternatives
- No, I don't have anything to be considered about this landfill.
- building a new land fill
- burning
- Hopefully longevity and other plans will put in place incase of more build up prior to the development of other facilities.
- I know Deschutes County on its own doesn't generate enough trash to have an EFW (Energy From Waste facility) but what if we took trash from other counties? It is estimated that Central Oregons population to double in the next 15 years...Would that be enough trash to make this viable option? In 2016 in Jefferson, Crook, Deschutes and Klamath counties, combined for more solid waste (252,811 pounds) than Marion County (243,100 pounds) (source: 2016 Material Recovery and Waste Generation Rates Report). EFW in Marion County processes 550 pounds per day/200,750 per year. The counties surrounding us are already shipping their solid waste elsewhere. Why not ship their solid waste to Bend to our new EFW facility? If we build an EFW it's one and done... Just ideas, because at some point, the next landfills will get full, will close and we'll have to go through this all over again.
- WTE technology is emerging and was not fully explored in the documents prepared during this planning process.
- How many jobs would be impacted if we send our trash out of the county?
- Continue to think about waste reduction, composting options and education for users.

- If we end up hauling long distance then we need to use trucks that run on methane or biodiesel
- Keep our trash here & emphasize waste reduction & sustainability.
- Curious about expanding recycling & composting for residents. The less in the landfill, the better.
- My comment would be that given past projects (i.e. parkway) a new landfill would hit major appeals and cost overruns.
- Have you thoroughly looked at rail transfer to existing large landfills elsewhere?
- None. I attended the open house and it was very well down.
- None
- is there other options?
- I don't have any comments or questions.
- making a new land fill to help keep trash safe
- If decided upon to develop a new Landfill in County how will the land be acquired and decided upon prior to either constructing or developing new facilities? What precautions will be put in place to address near by pedestrians?
- In the environmental section, GHG emissions are stated as having local impacts. GHG emissions are fairly ubiquitous and should be viewed from the lens of a total system.
- How many jobs does Knott landfill provide the county?

- As much as possible we need to take care of our own problems & wste. We need better & more methane recovery. It's very iffy to think you can get land from BLM. Public land should stay public & not be used as a landfill.
- Local control & accountability
- We shouldn't ship our waste elsewhere! 350K mi vs 2.1 million miles is huge.
- Transportation emissions
- I think that it would be better from all aspects to transfer to an existing landfill that has the capacity.
- Keep it local!
- Concerned about having reliable, cost effective solid waste options.
- The out of County option utilizes existing landfills thereby negating the need to use valuable land to create a new landfill here in Deschutes County. It eliminates the need for acquisition, start-up, and operating costs based on a future capacity requirement. It also eliminates the need for additional bond debt to acquire and construct a Deschutes County landfill. It also allows much more flexibility to adjust for solid waste volume in the future.
- Rate stability and being able to take items to the dump.
- I prefer rail transport out of county if overall greenhouse gas emissions are less or equal to truck and private vehicle transfer to a new landfill in Deschutes County. Otherwise, it depends on the new site and environmental/public values. I value open public lands, such as BLM, and don't think we should take away that land from public use.
- Local landfill is the long term lowest carbon emission solution. A local landfill results in a more stable cost structure through the landfill life. Deschutes county is a favorable hydrogeologic environment for the long term storage of waste. A local landfill provides the most flexible solution for processing alternative waste streams. Additionally, a local landfill helps the community maintain mindfulness of the impact of waste disposal.
- Less greenhouse gases from driving garbage far away. Less trucks on the highway. But we must reduce the waste through more vigorous construction and demolition recycling.
- Well, trash is trash, so neither choice seems like a particular “win,” but the matrix dictates that regional sites have a good history of compliance, and there’s less for Deschutes County to deal with if we truck it out. But then the highway miles/emissions are a bad deal under that plan, so.....hopefully smarter minds than mine will come to the most optimum decision.
- More control for the county and better job opportunities for locals
- It can keep jobs and there would be way less commuting
- this option is the best beacuse a in county landfill its keep all the cost down and its safer do do this
- Easer
- Supports local development
- It will be more jobs available if we do build New In-County Landfill, and it won't have to cost more if we do have to transport out of county.
- new land fill
- its more safe than transport
- While little more costly managing less facilities could be more beneficial to both pedestrians and general land management.
- Local control should be the primary consideration. Deschutes and adjacent counties are a geographic island .....perfectly capable of managing its waste disposal challenges without undue reliance on remote and unpredictable influences over the next 50 years or longer.
- I feel 1) it's our trash, we should be responsible for it, 2) Better for the environment (fuel, road repair, oil, etc.) keeping the truck traffic 1/16 - 1/8 of out of County 3) Keeping job local.

- First reason is the lower cost to the system for an in-county landfill, and the second reason is the much lower environmental impact to ship to a local landfill.
- Transportation out of the county allows for the county to be flexible as new technologies emerge in MSW management (e.g. WTE). If the county constructs a new landfill, it will create the "feed the beast" hurdle as future technologies become more feasible.
- Cost effectiveness.
  Significantly more truck miles for out-of-county option.
- It is more practical. However, it will have to be done in such a way that the surrounding use will not be impacted.
- We need as many jobs as possible in the county. If we transport out of the county, it seems we'd be taking jobs away from current residents.
- Self-sustaining and reliable model. It provides long term financial stability for rate payers. There is a lot of uknowns especially for funding and variables outside of couny control if we transport out of county. Gas prices will likely rise, and other agencies will have control of our garbage bills. The county has time to identify and construct a location prior to Knott end of life. We should start charging now to collect funding to be able to do that.

Top Line Results

Survey of Registered Voters Deschutes County, Oregon

Dates Conducted: 6/24/2019 through 7/3/2019

Survey Type: Live Interview Telephone

N = 505N

Margin of Error at 95% Confidence Level: +/- 4.3%

Weighting: Age & Gender

Q0. Are you speaking on a landline or cellphone?

	Count	Percent	Cumulative Percent
Landline	83	16.5	16.5
Cellphone	422	83.5	100.0
Total	505	100.0	

We would like to start by providing you some background information on the Knott Landfill, the only landfill in Deschutes County.

Currently, the Knott Landfill is estimated to reach its capacity in ten years. One of the biggest questions facing County officials is what will happen once the landfill is full.

A committee of local residents and stakeholders have been studying a variety of disposal options, but two main choices have emerged:

The first option is to build a new landfill in Deschutes County. The second option is to transport our trash out-of-county to a large landfill near the Columbia River Gorge.
In terms of costs, currently, Deschutes County spends about $35 per ton of trash to maintain garbage at the Knott Landfill.

If we build a new landfill, costs are estimated to increase to $42 per ton. If we transport trash out of county, costs are estimated to increase to $47 - $62 per ton. These are estimated rates which can be difficult to forecast because of unpredictable factors like fuel prices, taxes and other fees

Q1. How important is the financial impact of this decision to you? Is it…?

	Count	Percent	Cumulative Percent
The most important factor	89	17.6	17.6
One of many important factors	260	51.6	69.2
Neutral	79	15.7	84.9
Not an important factor	30	6.0	90.9
The least important factor	41	8.2	99.1
Not Sure / Don't Know	5	.9	100.0
Total	505	100.0	

total % important	69.2
total % not important	14.1

A landfill impacts the area where it is located and requires mitigation of impacts such as emissions, litter and odor. If we build a new landfill, these impacts will remain in Deschutes County. If we transport trash out of county, impacts from our trash will affect other jurisdictions.

Q2. Please indicate to what extent you agree with the following statement: Trash that is generated here should stay here. Do you…?

	Count	Percent	Cumulative Percent
Strongly Agree	233	46.2	46.2
Agree	193	38.2	84.5
Neutral	67	13.2	97.7
Disagree	9	1.8	99.5
Strongly Disagree	3	.5	100.0
Total	505	100.0	

total % agree	84.5
total % disagree	2.3

Truck transportation has been identified as a significant source of carbon emissions. If we transport trash out of county, there will be more emissions because of the miles trash will travel to be disposed of. If we transport trash out of the county, we estimate over 2 million miles will be traveled each year. If we assume a new landfill will be sited 30 miles from Bend, we estimate about 350,000 miles will be traveled each year.

Q3. Please indicate how important the transportation impacts of this decision are to you, Is it…?

	Count	Percent	Cumulative Percent
The most important factor	94	18.6	18.6
One of many important factors	297	58.7	77.4
Neutral	55	10.9	88.3
Not an important factor	27	5.3	93.6
The least important factor	30	5.9	99.5
Not Sure / Don't Know	2	.5	100.0
Total	505	100.0	

total % important	77.4
total % not important	11.2

If we build a new landfill, jobs and revenue from trash disposal stay here. If we transport trash out of county, revenue and jobs are created in other places.

Q4. Please indicate how important the economic impacts of this decision are to you. Is it…?

	Count	Percent	Cumulative Percent
The most important factor	146	28.8	28.8
One of many important factors	270	53.4	82.3
Neutral	55	11.0	93.3
Not an important factor	17	3.4	96.7
The least important factor	17	3.3	100.0
Total	505	100.0	

total % important	82.3
total % not important	6.7

If we build a new landfill, 400-500 acres of land will need to be developed. This development could displace other uses and may impact neighboring parcels of land even in remote areas of the County. If we transport trash out of county, there won't be an impact to local land within the county.

Q5. Please indicate to what extent you agree with the following statement: I would be comfortable displacing other uses so that a landfill could be built locally. Do you…?

	Count	Percent	Cumulative Percent		
Strongly Agree	172	34.1	34.1	total % agree	77.1
Agree	217	43.0	77.1	total % disagree	7.4
Neutral	74	14.6	91.7		
Disagree	29	5.8	97.5		
Strongly Disagree	8	1.6	99.1		
Not Sure / Don't Know	4	.9	100.0		
Total	505	100.0			

Please rank the following impacts from most important to least important based on your values on a 1 to 10 scale, where 1 is least important and 10 is most important:

Q6A. Impacts on my monthly trash bill / disposal rates

	Count	Percent	Cumulative Percent		
1-Least important	51	10.0	10.0	total % ranked 1-5	50.8
2	18	3.6	13.7	total % ranked 6-10	49.1
3	37	7.4	21.0		
4	23	4.6	25.7		
5	127	25.1	50.8		
6	42	8.3	59.1		
7	55	10.9	70.0		
8	52	10.3	80.3		
9	21	4.2	84.5		
10-Most important	78	15.4	99.9		
Not Sure / Don't Know	1	.1	100.0		
Total	505	100.0			

Q6B. Environmental impacts

	Count	Percent	Cumulative Percent		
1-Least important	18	3.5	3.5	total % ranked 1-5	23.1
2	8	1.6	5.2	total % ranked 6-10	75.4
3	14	2.8	8.0		
4	9	1.9	9.9		
5	67	13.2	23.1		
6	24	4.8	27.9		
7	44	8.8	36.7		
8	100	19.8	56.5		
9	55	11.0	67.4		
10-Most important	157	31.1	98.5		
Not Sure / Don't Know	7	1.5	100.0		
Total	505	100.0			

Q6C. Impacts to local jobs and the economy

	Count	Percent	Cumulative Percent
1-Least important	9	1.8	1.8
2	6	1.2	3.0
3	8	1.5	4.5
4	17	3.3	7.9
5	57	11.3	19.1
6	29	5.8	24.9
7	66	13.1	38.0
8	107	21.3	59.3
9	61	12.2	71.4
10-Most important	141	28.0	99.4
Not Sure / Don't Know	3	.6	100.0
Total	505	100.0	

total % ranked 1-5 19.1
total % ranked 6-10 80.3

Q6D. Impacts to land and local development

	Count	Percent	Cumulative Percent
1-Least important	13	2.5	2.5
2	14	2.7	5.2
3	25	5.0	10.3
4	31	6.2	16.5
5	121	24.0	40.4
6	39	7.8	48.3
7	84	16.7	64.9
8	84	16.5	81.5
9	25	5.0	86.5
10-Most important	63	12.5	99.1
Not Sure / Don't Know	5	.9	100.0
Total	505	100.0	

total % ranked 1-5 40.4
total % ranked 6-10 58.6

Q7. Overall, which option would you support? Building a new landfill in Deschutes County OR transporting our trash out-of-county?

	Count	Percent	Cumulative Percent
Building a new landfill in Deschutes County	469	93.0	93.0
Transporting our trash out-of-county	15	2.9	95.9
Not Sure / Don't Know	21	4.1	100.0
Total	505	100.0	

Lastly, we have a few questions about you that are needed for statistical purposes. Your responses will remain anonymous and strictly confidential. Q8. Are you....?

	Count	Percent	Cumulative Percent
A residential customer	390	77.3	77.3
A business customer	2	.4	77.7
Both a residential and business customer	80	15.9	93.6
A self-hauler	24	4.7	98.3
I never use a recycling or transfer station or the landfill	8	1.7	100.0
Total	505	100.0	

Q9. What is your age?

	Count	Percent	Cumulative Percent
18-34	102	20.2	20.2
35-44	95	18.8	39.0
45-54	85	16.9	55.9
55-64	90	17.8	73.7
65-74	87	17.2	90.9
75-84	41	8.1	98.9
85+	5	1.1	100.0
Total	505	100.0	

Q10. What is your gender?

	Count	Percent	Cumulative Percent
Female	249	49.4	49.4
Male	255	50.6	100.0
Total	505	100.0	

Q11. What is the highest level of education you have completed?

	Count	Percent	Cumulative Percent
Bachelors Degree	192	38.0	38.0
Some College	166	32.8	70.8
Post Graduate	70	13.8	84.7
High School Graduate	71	14.0	98.7
Some High School	1	.2	98.9
Prefer not to answer	5	1.1	100.0
Total	505	100.0	

Q12. What is your approximate annual household income?

	Count	Percent	Cumulative Percent
Less than $30,000	45	8.9	8.9
$30,000 to $39,999	31	6.1	14.9
$40,000 to $49,999	32	6.3	21.2
$50,000 to $59,999	40	7.9	29.1
$60,000 to $69,999	34	6.7	35.8
$70,000 to $79,999	35	7.0	42.8
More than $80,000	228	45.2	88.0
Prefer not to answer	61	12.0	100.0
Total	505	100.0	

Municipality

	Count	Percent	Cumulative Percent
Bend	260	51.5	51.5
La Pine	2	.5	51.9
Redmond	72	14.3	66.3
Sisters	5	1.0	67.3
Unincorporated	165	32.7	100.0
Total	505	100.0	

City - Mailing Address

	Count	Percent	Cumulative Percent
Bend	362	71.7	71.7
La Pine	26	5.2	76.9
Redmond	94	18.6	95.5
Sisters	12	2.3	97.8
Sunriver	2	.4	98.2
Terrebonne	9	1.8	100.0
Total	505	100.0	

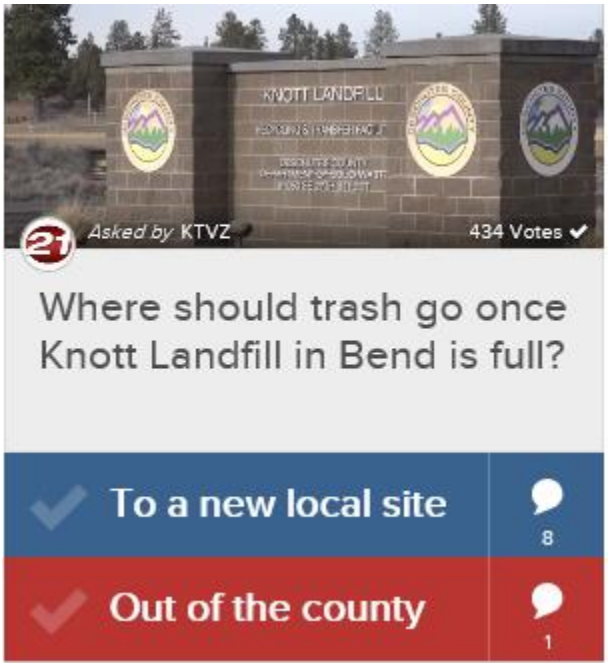
State House District

	Count	Percent	Cumulative Percent
53	207	40.9	40.9
54	217	43.0	84.0
55	38	7.5	91.5
59	43	8.5	100.0
Total	505	100.0	

State Senate District

	Count	Percent	Cumulative Percent
27	424	84.0	84.0
28	38	7.5	91.5
30	43	8.5	100.0
Total	505	100.0	

https://www.ktvz.com/news/deschutes-county-sets-public-meeting-on-trash-disposal-options/989286403



As of 3/12/19 (per Katie at KTVZ):

424 votes

89% - To a new local site

11% - Out of the County