Marion County

Solid Waste Management Plan

CITIES

HAULERS

COMMUNITY

COUNTY

Working towards a greener future

November 2009

PREPARED BY

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in association with

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GLOSSARY

Anaerobic biodegradation	The breakdown of organic matter by natural processes that do not use oxygen.
Btu	British thermal unit
BI	Brown's Island Demolition Landfill (see facility description in Chapter 2)
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
CO	Compost Oregon
Coffin Butte	Coffin Butte Regional Landfill
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
Disposed waste	The total amount of waste delivered to the WTEF or disposed of at a landfill, in or out of the County, as reported to ODEQ by the operators.
EarthWISE	Earth Workplace Initiative for a Sustainable Enterprise
EDD	Oregon Economic Development Department
EPA	Environmental Protection Agency
FTE	Full-time equivalent position
FWF	Far West Fibers
FY	Fiscal year
Franchised haulers	See **service providers**
Garten	Garten Services, Inc.
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.
kWh	Kilowatt-hour
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. 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.
MRRF	Marion Resource Recovery Facility, previously called Marion Recycling Facility, Inc. (see facility description in Chapter 2).
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.
NMCDF	North Marion County Disposal Facility (see facility description in Chapter 2).
NPDES	National Pollution Discharge Elimination System
OAR	Oregon Administrative Rules
OCC	Old corrugated cardboard recovered and recycled
ODEQ	Oregon Department of Environmental Quality
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 or volume of waste they generate each week as opposed to each household paying the same collection fee.
PURPA	Public Utility Regulatory Policy Act
PVC	Polyvinyl chloride
PWES	Public Works – Environmental Service Division
RFP	Request for Proposals
RI/FS	Remedial Investigation and Feasibility Study
Recovery rate	The percentage of materials recovered, relative to the amount of waste generated. The recovery rate, as determined by the statewide goal, is calculated by adding **DEQ** approved credits to the **recycling rate**. More information, including specific credits allowed, can be found in Oregon Revised Statutes, Chapter 459A – Reuse and Recycling (see References).
Recycling rate	The percentage of materials recycled, relative to the amount of waste generated (compare to **recovery rate)**.
Residuals	Unrecoverable material received at the recycling centers.
SCOOP	Saturated collection of office paper
SKRTS	Salem–Keizer Recycling and Transfer Station
SWM	Solid waste management
SWMAC	Solid Waste Management Advisory Council (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 Management Advisory Council	A committee comprised of 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**.
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
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
Tipping 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 and reloaded into larger trailers for transportation to its final destination such as the WTEF or a landfill.
UAC	University Ash Consortium
WCI	Western Climate Initiative
WTEF	Waste-to-Energy Facility (see definition)
WTERT	Waste-to-Energy Research and Technology Council
WWR	Wood Waste Reclamation (see facility description in Chapter 2).
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	The facility located in Brooks that burns municipal solid waste and produces electricity. The facility reduces the volume of waste by 90% and results in producing ash residue (see facility description in Chapters 2 and 6).
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, avoid, or eliminate the generation of wastes.

Waste stream	The entire spectrum of wastes produced by all waste generators.

Marion County, Oregon
2009 Solid Waste Management Plan Update

SUMMARY

S.1 Introduction

The 2009 Solid Waste Management Plan update (SWMP) provides a complete review of the Marion County solid waste management system. It considers the current infrastructure and determines what improvements and investments are required to continue to provide comprehensive waste reduction, recycling, collection, and disposal services. It makes recommendations to help guide the development of future programs and services. This Summary provides an overview of the process used to update the SWMP for Marion County. It includes a summary of the key strategies and recommendations contained in the SWMP.

Since the 2002 SWMP was adopted, the County, working with local jurisdictions, businesses, citizens and the franchised haulers has continued to focus on reducing waste and steadily increasing the recycling rate. In 2006, 2007, and 2008 Marion County recorded the highest recycling rate in the state. This progress was realized by working cooperatively to carry out several programs and services aimed at promoting waste prevention, reuse and recycling while implementing new collection services.

Now that revenue bonds used to pay for construction of the Waste-to-Energy Facility (WTEF) have been retired and with the operating agreement with Covanta Marion, Inc. due to expire in 2014, the County decided to update the SWMP. The development of the SWMP was managed by the Department of Public Works – Environmental Services Division (PWES). An independent consultant team of J.R. Miller and Associates (JRMA) and Gershman, Brickner & Bratton, Inc. (GBB) was retained to prepare the SWMP. Their primary responsibility was to review the current system and practices, determine needs and opportunities for changes, present and evaluate alternatives and formulate recommendations.

The focus of public input and review of the SWMP is the Solid Waste Management Advisory Council (SWMAC). This 16-member Council is appointed by the Board of Commissioners and represents a wide range of public interest groups and stakeholders. Their role was to provide a public forum to receive comments and offer input and guidance in developing the SWMP. The SWMAC will review the Final Draft SWMP and send it to the Board for adoption.

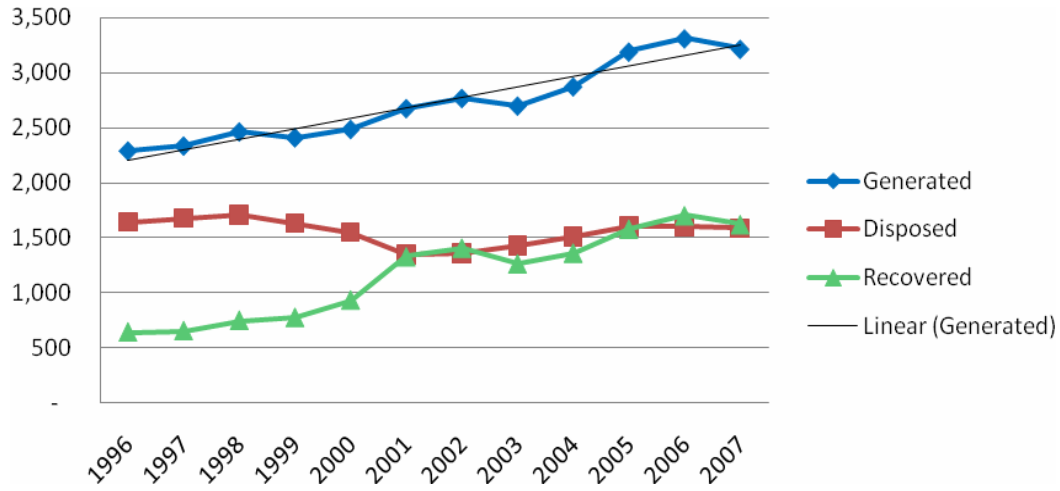
An overview of the 2009 SWMP is presented in this Summary while details and background information are contained in the various Chapters of the SWMP. The full 2009 SWMP is available from the Marion County PWES website, located at www.co.marion.or.us/pw/es.

S.1.1 State of the Solid Waste Management System in Marion County: Progress made since the 2002 SWMP

The recommendations in the 2002 SWMP continued to emphasize the need to prevent waste generation and recycle more materials to reduce waste disposed. PWES is responsible for managing over 20 different education and promotion programs to provide essential outreach and a consistent message about reducing waste. The progress made by these efforts is a result of a coordinated effort among the County, cities, franchised haulers, businesses and interest groups to reduce, reuse and recycle.

The impact of these programs can be seen by examining data provided by the Oregon Department of Environmental Quality (ODEQ). They monitor the amount of waste disposed and recycled by each county. ODEQ then calculates the per capita rates of waste disposed and materials recycled by dividing these data by the county's population. As shown in the figure below, for Marion County, since 2002, the per capita waste disposed increased 17%. However, the per capita waste recovery rate also increased 15% during this time. The total Marion County per capita waste generation rate has increased 16% since 2002.

Figure S-1 - Marion County Rates Per Capita[1]



In summary, although Marion County generates more waste now than in the past years, it is recovering and recycling more and disposing less. Since the waste generation rate reflects the sum of both waste disposed and recycled, an increase in this rate can reveal either more materials recycled or more waste disposed or both. The important fact is that the linear trend line shows Marion County is increasing the rate of waste generation, whether the type of material is handled by a recycling program or a disposal option. Fortunately, the trend also shows that Marion County residents, businesses, and institutions are beginning to recycle at least as much if not more material than they sent for disposal. However, in order to meet the statewide goal of no increase in per capita waste generation since 2005 and no increase in total waste generation by 2009, Marion County will need to step up efforts aimed at curbing waste generation in all sectors.

[1] 2007 ODEQ Materials Recovery Report, Marion County

The 2002 SWMP recommended expansion of commingled collection of recyclable materials throughout the urbanized portions of the County. The new collection services allowed the franchised haulers to convert to semi- or fully-automated collection equipment to improve efficiencies. Each household was provided with three collection containers, one for each of mixed recyclables, yard waste, and garbage. The result is that more households participated in the curbside pickup of mixed recyclables and more materials were collected, processed, and recycled.

As shown in the following table, between 2003 and 2007, there was a 26% increase in the amount of commingled recyclable materials collected from the residential commingled curbside collection program in Marion County. Likewise, the amount of yard waste recycled increased by 20%. The total amount of all materials recycled resulting from existing programs and new services implemented since the 2002 SWMP was adopted increased by 21%, from curbside services, commercial programs, drop-off sites, and transfer stations.

Table S-1 - Impacts of 2002 SWMP Recommendations on Marion County Tons/Year[2]

Material	2003	2007	% Difference
Commingled Materials	16,005	20,196	+26%
Yard Debris	36,938	44,308	+20%
Total Recyclables	90,980	110,282	+21%

During this period the population in Marion County only grew by about 7%. Clearly, the programs and services implemented since 2002 have made a dramatic impact in raising the County's recovery rate to 56.5 %, the highest in the state.

Another important fact is that of the over 500,000 tons of waste generated in Marion County in 2007, only 23% is discarded in landfills. However, only about 55,000 tons per year (tpy), or 11%, is municipal solid waste (MSW) disposed in municipal waste landfills and about 2% is inert waste discarded at Brown's Island Demolition Landfill (BI). Another 50,000 tons, or about 10% of total waste generated, is ash residue from the WTEF which is disposed at the North Marion County Disposal Facility (NMCDF) ashfill. This landfilled ash does not contribute to greenhouse gas emissions since no decomposition occurs.

The mainstay of Marion County's waste processing system, which reduces waste disposed in local landfills, is the WTEF. This facility has continued to provide reliable service and meet all required performance and environmental standards. It produces renewable and uninterrupted electric power sufficient to supply an equivalent 13,000 households annually.

PWES operates the solid waste program as an enterprise fund. Since completion of the 2002 SWMP, there has been no rate increase and the solid waste utility continues to manage resources and expenditures to meet its obligations and maintain a stable revenue source.

S.1.2 Purpose and Goals of this 2009 SWMP

The guiding principle for the 2009 SWMP is the same that has been followed in previous planning efforts. Marion County views solid waste as a resource to be managed consistent

[2] 2007 Annual Report, Marion County Department of Public Works, Environmental Services Division.

with state-adopted hierarchical standards. The County strives to conserve resources through behavioral changes and recognizes the integral link between solid waste management, the environment, and, ultimately, the quality of life. The 2009 SWMP presents a comprehensive long-term approach to solid waste management in the County. Updating the SWMP provides citizens and decision-makers in the County with a mechanism to implement, monitor and evaluate solid waste facilities and programs in the future. Recommendations developed for the 2009 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.

The County's primary goal is to provide:

> ***"Guidance for continued development and implementation of an integrated solid waste management system that has been developed through a cooperative effort of local governments, citizens and industry. The SWMP should achieve development of a system which is environmentally sound, technologically feasible, cost-effective, locally controlled and publicly acceptable; and provides for an overall reduction in long-term per capita waste generation and toxicity."***

Achieving this goal requires the SWMP attain a balance between cost-effectiveness and environmental responsibility, as well as being technologically feasible and accepted by the public. To ensure that this will be obtainable, the SWMAC and public participants developed specific objectives that the solid waste management system should strive to achieve. These objectives are:

- To provide an integrated solid waste management system that achieves an effective combination of strategies and programs guided by the principles adopted in the state hierarchy to reduce waste at the source, reuse and recycle materials, compost, recover energy, and apply land disposal.

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

- To promote an approach for managing solid waste that supports continuation of building a more sustainable future.

- To develop programs and support implementation of facilities that ensure materials recovered from the waste stream attain the highest and best use and are recycled.

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

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

- To provide services that meet the diverse needs of businesses and residents in urban and rural communities and are both effective and fair to all users.

- To maintain a cooperative approach among the cities, County and other local governments by providing opportunities for regional networking to ensure successful implementation of the SWMP.

- To ensure ongoing public input opportunities through the development and implementation of the SWMP.

One of the components of Marion County's primary goal is to protect the environment by emphasizing waste reduction. To achieve this, the County must establish a target waste recovery rate and reach or exceed that level by the year 2009. The statewide goal established by ODEQ sets Marion County's recovery rate at 54 % for 2009 (Oregon Revised Statute (ORS) 459A.010). The County has exceeded this goal by achieving a recycling rate of 57.6% in 2006 and 56.5% in 2007.

This 2009 SWMP was prepared to provide guidance on solid waste management issues over a 10-year planning period (2010-2019). However, it should be recognized that solid waste practices, regulations, and technologies are dynamic in nature and will result in a need to update and revise the SWMP on a regular basis in the future.

S.1.3 2009 SWMP Update – Highlights

S.1.3.1 Overview

The recommendations of the 2009 SWMP focus on advancing the goal to reduce or prevent waste and achieve an increase in the recovery rate. Even though the County has steadily increased the amount of materials recycled, the SWMP identifies new services targeting the commercial waste stream and food waste to continue to reduce dependency on landfill disposal. It will take time to plan and develop the optimal strategies for implementing these new services. Recognizing the timeframe required to meet these goals, the SWMP also addresses the need to maintain a stable and cost-effective collection and disposal system. It recommends the County begin negotiations with Covanta Marion, Inc. on a new agreement for continued operation of the WTEF in Brooks, Oregon.

The County has the primary responsibility to manage the solid waste system. The day-to-day administration and management are carried out by PWES. It operates similar to a public utility under an enterprise fund. As part of the SWMP update process, the status of the enterprise fund was reviewed, and it was determined to be fiscally sound. In addition to keeping rates or tip fees stable (the tip fee has not been raised in the past 17 years), the County has established operating reserves, reserves for future capital improvements, and reserves for funding known liabilities as well as unknown contingent environmental liabilities.

S.1.3.1 Implementation Strategy

What has made the Marion County solid waste system successful is its consistent commitment to provide a comprehensive and coordinated approach to delivering cost-effective services. This could not be accomplished without the continued cooperation of the cities, businesses, citizens and franchised haulers. The 2009 SWMP contains 19 specific

recommendations that deal with each component of the solid waste system. These recommendations provide a road map for continuing the development of an integrated approach for managing solid waste. Therefore, it is inherently important that the cooperative relationship and focus on common goals be continued to achieve the results identified in this SWMP.

S.1.3.2 Reduce / Prevent waste

The County currently budgets over $800,000 per year to execute a comprehensive set of programs aimed at promotion and education to reduce waste. It contains over 20 different programs to educate people on how to reduce waste and promote programs to recycle. Many of these programs have been in place for many years, and several have evolved to address various needs. The SWMP recommends the County re-evaluate its current programs and services to examine ways to introduce new methods and strategies to engage households and businesses to reduce waste. This will include examining new techniques such as community-based marketing and Internet connectivity to reach a broader base of people with educational materials and promotions. This can include ways to reinforce consumer responsibility.

The expected results of these efforts are to adopt new strategies that may engage more people to reduce waste for less cost. Existing programs may be replaced or modified to be more effective and new programs may be developed. But, as the County exhausts its options to reuse and recycle materials from the waste stream, more effort may be needed to engage citizens and businesses to reduce waste if the goal to reduce or eliminate waste disposed in landfills is to be realized.

The SWMAC is very interested in establishing a better way to measure the progress of these programs consistent with statewide goals. Currently, the recovery rate is measured on an annual basis by ODEQ and will continue to be monitored. Another monitoring tool would be to examine the per capita disposal rate. By doing so, the County can observe how the County is effectively reducing the waste generated as well as the total amount recycled.

S.1.3.3 Recycle More Materials

The County has achieved a recovery rate of almost 57% of the waste generated. New services will be required to increase this rate. The 2009 SWMP has identified the following strategies to accomplish this goal.

- The residential commingled collection program has been in place for about five years. The County should work with franchised haulers to evaluate if there are ways to increase participation in these services. This could include converting all services to once per week, increasing promotion and education, or creating more incentives. Since the major infrastructure is now in place, perhaps with some adjustments the program can realize increased participation.

- Begin planning a program to collect more recyclables from commercial customers. The specified approaches will need to be worked out with the franchised haulers and the cities they serve. As stated in the SWMP, there could be 25,000 tons or more of recyclable materials that can be recycled from this commercial stream.

- As part of developing collection programs for increased recovery of commercial recyclables, begin to plan a system for collecting food waste. There are two large scale compost operations in Marion and Benton Counties and both are pursuing permits and modifications to their facilities to handle food waste. It is expected they will be capable of composting and marketing these materials in the next three years. At that time, collection programs for food waste can begin.

These strategies represent the primary targets for increasing the amount of waste recycled. The analysis in the SWMP indicates that if these initiatives are successful, the recovery rate could increase from 57% to as much as 70% with the new services.

S.1.3.4 Maintain Cost-Effective Processing and Disposal System

The 2009 SWMP examined the alternatives for processing and disposing of waste that is not recycled. The SWMP considered the status of emerging technologies as well as continued use of the WTEF. The WTEF has provided a reliable and stable system to process waste, generate a renewable source of energy, and reduce the amount of waste disposed in municipal waste landfills. The bonds that initially financed the WTEF have been retired and the facility can operate free of debt. The costs to transport and dispose at regional landfills as well as other alternative technologies were also evaluated. The findings indicate the lowest cost alternative is to continue operation of the WTEF. With the service agreement between the County and Covanta Marion, Inc. due to expire in 2014, the County will need to begin negotiations with Covanta. The goal is to complete the negotiations by 2014 to ensure certainty for waste disposal.

S.2 2009 SWMP Recommendations

The following recommendations are excerpted from each chapter of the SWMP, having been developed after considerable discussion on each topic and the existing County system in place.

S.2.1 Waste Reduction, Reuse and Recycling Recommendations

The list of recommendations for the 2009 SWMP considers the fact that the County has instituted a comprehensive waste reduction and recycling strategy that includes many programs and services. Major investments have been made in equipment, facilities, and human resources to implement this program to ensure its success. When considering the range of alternatives presented in Chapter 3, it is important to recognize that considerable investment has been made in existing services and programs. Many of the services and programs have evolved to meet the current needs of the system while others may be marginally effective.

Recommendation 3.1: Evaluate current waste reduction and recycling (WR/R) programs for the purposes of determining services needed to maintain and increase the recycling rate. This should include replacing or adding programs aimed at reducing the per capita generation rate in Marion County.

Recommendation 3.2: Conduct an assessment of the residential curbside recycling program and determine ways to increase participation in services.

Recommendation 3.3: Complete the pilot study for multi-family housing recycling to determine what programs and services can be implemented to provide for an effective method to recover more materials from this source.

Recommendation 3.4: Evaluate the collection and processing alternatives to determine the best approach for expanding commercial recycling programs and opportunities.

Recommendation 3.5: Evaluate the feasibility of diverting drywall waste from BI for recycling.

Recommendation 3.6: Re-evaluate the possibility to divert more dry waste material from Salem-Keizer Recycling and Transfer Station (SKRTS) for processing at the Marion Resource Recovery Facility (MRRF).

Recommendation 3.7: Examine ways to expand food waste composting by establishing processing capabilities and a firm market or outlet for the material. Once a market has been established consider methods to collect and divert more food waste.

S.2.2 Processing and Recycling Recommendations

Until a comprehensive commercial recycling collection program is implemented in Marion County, there is not an immediate need to increase processing capacity. Over the next few years, it will be important for the County to work with local jurisdictions, businesses, government agencies and franchise haulers to develop an expanded commercial recycling program. Once the program has been developed and implementation has begun, more recyclable materials from businesses and government complexes will be generated that will require additional handling and processing.

Recommendation 4.1: In preparing the Facility Master Plan, the County should evaluate the specific requirements to expand processing capacity at existing solid waste facilities and/or private recycling businesses.

Recommendation 4.2: Continue to work with local processors, Compost Oregon and Process Recovery Center (CO), to establish capabilities to enhance composting of food waste and other organic materials.

S.2.3 Collection and Transfer Stations Recommendations

Franchised haulers in Marion County provide relatively uniform and consistent services throughout the cities and unincorporated County. Over the last five years, collection of commingled recyclable materials from residential customers has matured and appears to provide a majority of households with the opportunity to recycle and separate yard waste. One opportunity to expand recycling is to recover more materials from the commercial waste stream. A coordinated commercial collection program will need to be developed on a scale similar to that of the residential collection program.

The current transfer station system has continued to evolve over the past 15 years and has provided convenient and reliable service to the customers. With growth in population and with the WTEF operating at capacity, there will be an increasing need to more efficiently transport waste to alternative disposal sites. A facilities plan to determine what investments are needed in the future should be completed.

Recommendation 5.1: The County should work with franchised haulers to complete a more in-depth evaluation of the methods to recover more recyclables from the commercial waste stream. The evaluation should examine use of rate incentives and other means to separate commingled recyclables from commercial wastes or create high-grade loads for processing. It should also include an evaluation of alternatives of transporting the materials with the residential commingled stream to processors in Portland or consider expansion of additional processing capacity in Marion County.

Recommendation 5.2: Prepare a Facilities Master Plan that will identify investments required to existing facilities to meet the needs of the solid waste system over the next 10 years. The Facility Master Plan should consider ways to increase recovery of materials, improve efficiency of handling and transporting materials and expanding overall capacity.

S.2.4 Alternative Technology and Solid Waste Disposal Recommendations

The County has increased the recycling rate over the past five years. The amount to be processed and disposed is about 250,000 tpy and will continue to grow as population increases. The WTEF can continue to operate and provide for converting 185,000 tons of MSW per year to electric power. The remaining waste must be disposed of at out-of-County landfills. However, the goal is to continue to implement programs and services to reduce this amount. Recommendations for processing and disposal of waste are as follows:

Recommendation 6.1: The County should begin negotiations with Covanta in 2009 with the intent of completing service agreement renewal or a new agreement by 2014. Having a secure agreement by this schedule will provide adequate time to prepare for any changes in the solid waste system that might be necessary prior to 2014 when the current service agreement is due to expire.

Recommendation 6.2: The County should negotiate an agreement with an out-of-County landfill to ensure adequate disposal capacity is available for waste that is not reused, recycled and/or supplied to an alternative disposal technology.

Recommendation 6.3: The renewed or new agreement with Covanta should include provisions that can accommodate the potential for the County to supply waste to a future alternative disposal technology and also address the potential to add a third combustion unit to the existing WTEF.

Recommendation 6.4: Evaluate beneficial uses for ash residue to determine alternatives to landfilling. This may include establishing a demonstration project or other approaches.

Recommendation 6.5: The County should identify areas within the Comprehensive Land Use Plan that may be considered for future solid waste processing or disposal facilities.

S.2.5 Administration and Enforcement Recommendations

As presented in the SWMP, there are no immediate administrative or management deficiencies with the current system. The County has continued oversight of the solid waste management system, and through agreements with franchised haulers, ensures that adequate facilities are available to provide cost-effective and uninterruptible services. The recommendations primarily reinforce that the County, through day-to-day operations by

PWES, continues to provide a stable and financially sound enterprise fund. In addition, it continues under the current institutional framework to carry out its mission through a collaborative and active partnership with cities, franchised haulers, other service providers, citizens, and businesses.

Recommendation 7.1: The County should continue to operate the solid waste management system as an enterprise fund and maintain a policy of internal financing. The system should continue to rely on system users paying directly for services and for the enterprise fund to limit future debt.

Recommendation 7.2: PWES should determine the resources needed to maintain and enhance the effectiveness of the WR/R support program. The assessment of needs would coincide with recommendations stated in Chapter 3 of the SWMP to focus on increasing participation in existing services and to consider educating residents and businesses on opportunities aimed at reducing the overall waste generation rate.

Recommendation 7.3: PWES should complete a five to seven year capital improvement plan that identifies and programs investments which are required to upgrade or improve facilities. The SWMP will continue to ensure adequate funding is available with revenues from the enterprise fund or from private vendors.

S.3 Implementation Schedule

The 2009 SWMP provides a road map for guiding the further development of the solid waste management system in Marion County. It contains 19 different recommendations, several of which are related or linked to other actions. It should be recognized that not all actions can be implemented immediately, due to the need to provide everyday services as well as limitations in resources. The following implementation schedule, therefore serves as a tool to help establish priorities and plan resources to execute the recommendations. It is a general timeline and should not be considered a strict schedule.

Table S-2 – Implementation Schedule
Marion County - 2009 SWMP Update

Recommendations	2009	2010	2011	2012	2013	2014
Waste Reduction / Recycling						
3.1 Assess Waste Reduction & Recycling Initiatives	Assess/Plan	Implement	WR/R - On-going			
3.2 Assess Residential Curbside Program	Assess/Plan	Implement Refinements				
3.3 Complete Multi-family Pilot Program Study	Report Plan	Implement Strategies				
3.4 Commercial Recycling		Planning	Start Up/Pilot Program		Implement	
3.5 Feasibility of Drywall Recycling		Feasibility Study				
3.6 Expansion of Dry Waste from SKRTS	Feasibility/Contract Implementation					
3.7 Examine Ways to Expand Food Waste Program	Planning		Start Up		Implementation	
Processing / Recycling						
4.1 Evaluate Commercial Processing Options	Evaluate Options / Facilities Plan		Phased In			
4.2 Food Waste Composting	Planning/Startup		Implement Collection Programs			
Collection / Transfer						
5.1 Commercial Waste Collection	Planning	Pilot/Demo/Start Up		Implementation		
5.2 Prepare Facilities Plan	Facilities Plan					

Table S-2 – Implementation Schedule (Continued)
Marion County - 2009 SWMP Update

Recommendations	2009	2010	2011	2012	2013	2014
Alternative Technology / Disposal Options						
6.1 Negotiations w/ Covanta-WTEF						
6.2 Out-of-County Waste Disposal Agreement						
6.3 Expansion of Alt. Technology -Feasibility Analysis		Options / Facilities Plan				
6.4 Beneficial Use of Ash		Planning/Permitting	Pilot Project			
6.5 Review/Amend Comprehensive Land Use Plan	Amendment Process					
Administration / Enforcement						
7.1 Maintain Long-term Enterprise Fund Policies & Practices	Ongoing					
7.2 Update Waste Reduction & Recycling Program	Assessment	Programming	Ongoing			
7.3 Review/Update 5-7 Year Capital Improvement Plan	Review	Update CIP	Implementation			

1. INTRODUCTION

1.1 Context of the Plan Update

Marion County (County) prepared an update of their comprehensive Solid Waste Management Plan (SWMP) in 2002. The SWMP focused on reviewing the status of the solid waste system, evaluating alternatives for increasing waste reduction and recycling, and made recommendations to improve and expand services. The SWMP was prepared through the leadership of the Marion County Department of Public Works/Environmental Service Division (PWES) and cooperative efforts of franchised haulers, cities, and other private companies driven by the common goal to create an integrated and coordinated approach for managing solid waste. The Solid Waste Management Advisory Council (SWMAC) provided a forum for dialogue and comment on the SWMP to ensure that public input helped shape the direction and priorities of the County's future.

The SWMP has provided the road map for making changes to the solid waste management system to meet statewide goals and local service needs. In 2001, the Oregon Department of Environmental Quality (ODEQ) reported that Marion County had attained a recycling rate of 44%. With the adoption of the SWMP in 2002 and implementation of the recommended programs for reducing waste and recycling more materials, the ODEQ has reported that Marion County achieved a recycling rate of 56.5% in 2007. The gains in the recycling rate are testament to the coordinated and cooperative efforts of local jurisdictions, franchised haulers, and private businesses to meet the challenges of the statewide goals. Most important is that citizens and businesses of Marion County have responded favorably to these new programs and services by participating in waste reduction and recycling of more materials.

In this 2009 SWMP update, it is important to examine how waste reduction programs and recycling services are performing and consider ways to continue the success. Over the past 20 years, the mainstay in reducing local dependency on landfilling of wastes has been the operation of the Waste-to-Energy Facility (WTEF) in Brooks, Oregon. This facility has performed a reliable service to convert an average of 182,837 tons of waste per year, from 1987 through 2009, and generate approximately 11 megawatts of electrical power for sale to Portland General Electric (PGE). In 2008, the revenue bonds used to finance the construction of the facility were retired. The current agreement between the County and Covanta to operate the WTEF will expire in 2014. The 2009 SWMP update reviews the status of the WTEF and its potential future role in the Country's integrated solid waste management system. Other processing and disposal options are evaluated.

The 2009 SWMP update considers any changes in regulations that affect the management of solid waste. Also, as the County has continued to grow in population, the amount of waste generated in the County now exceeds the capacity of the WTEF, increasing the reliance on landfills outside the County for disposal of wastes.

The update of the 2009 SWMP:

- Reviews the implementation progress to date and verifies if assumptions made in 2002 are still valid.

- Considers impacts from changes in regulations, technology, and market conditions.
- Identifies if and when new or expanded facilities will be required.
- Evaluates administrative and management practices to determine financial stability.

The SWMP provides a forward look at the solid waste management system and identifies the needs and opportunities for the next 10 years. It will provide decision-makers with a general direction as to the facilities and programs required to continue the success of the solid waste management system.

The County, together with stakeholders (local jurisdictions, private sector operators and the public), must continually review the progress made and assure that the overriding needs and values of the community and the overall waste management system are met. By following the direction and priorities adopted in the 2009 SWMP update, Marion County will enhance and improve the quality of services and maintain a cost-effective solid waste management system.

1.2 Plan Purpose and Goals

This SWMP update is designed to provide guidance on solid waste management issues over a 10-year planning period (2009-2019). However, it should be recognized that solid waste practices, regulations, and technologies are dynamic in nature and there is a need to update and revise the SWMP on a regular basis in the future.

The guiding principle in Marion County's solid waste management planning is that solid waste should be viewed and managed as a resource. The County strives to conserve resources through behavioral changes and recognizes the integral link between solid waste management, the environment, and ultimately the quality of life. This 2009 SWMP update presents a comprehensive long-term approach to solid waste management in the County, designed around this resource conservation and management principle. The SWMP update will provide citizens and decision-makers in the County with a guide to implement, monitor, and evaluate solid waste facilities and programs in the future. Recommendations developed for the SWMP update not only guide local decision-makers, but substantiate the need for local funds and state grants for local solid waste management projects and new programs.

Marion County, working cooperatively with local jurisdictions, private sector operators, and the public, has been able to achieve an effective and efficient integrated solid waste management system. The system includes the WTEF, landfills, transfer facilities, curbside recycling, waste reduction and recycling facilities, a yard debris/wood waste recycling program, public education, and outreach programs. The County's primary objective, as stated in the 2002 SWMP, is to continue to provide:

> *"Guidance for continued development and implementation of an integrated solid waste management system that has been developed through a cooperative effort of local governments, citizens and industry. The SWMP should achieve development of a system which is environmentally sound, technologically feasible, cost-effective, locally controlled and publicly acceptable; and provides for an overall reduction in long-term per capita waste generation and toxicity."*

Achieving this objective requires that the Plan attain a balance between cost-effectiveness and environmental responsibility, as well as being technologically feasible and accepted by the public. To ensure that this will be obtainable, the SWMAC and public participants developed specific objectives that the solid waste system should strive to achieve. These objectives are:

- To provide an integrated solid waste management system that achieves an effective combination of strategies and programs guided by the principles adopted in the state hierarchy to reduce waste at the source, reuse and recycle materials, compost, recover energy, and land disposal.

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

- To promote an approach for managing solid waste that supports continuation of building a more sustainable future.

- To develop programs and support implementation of facilities that ensure materials recovered from the waste stream attain the highest and best use and are recycled.

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

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

- To provide services that meet the diverse needs of businesses and residences in urban and rural communities and are both effective and fair to all users.

- To maintain a cooperative approach among the cities, County and other local governments by continuing ongoing networking to ensure successful implementation of the SWMP.

- To ensure ongoing public input opportunities through the development and implementation of the SWMP.

One of the components of Marion County's primary objective is to protect the environment by emphasizing waste reduction. To achieve this, the County must establish a target waste recovery rate and reach or exceed that level by the year 2009. The statewide goal, established by ODEQ, sets Marion County's recovery rate at 54% for 2009 (Oregon Revised Statute (ORS) 459A.010). Thus far, the County has exceeded this goal by achieving a recovery rate of 57.6% in 2006 and 56.5% in 2007. However, this target will be measured on an annual basis, and programs and facility assessments will be made on the County's progress towards maintaining this state-mandated goal.

In addition to the state recovery rate goal, additional goals identified by the SWMAC that apply to the current solid waste management system in Marion County include the following:

- Achieve cost-effective diversion by maintaining long-term disposal capacity and avoiding significant, additional capital investments for new disposal facilities.
- Generate and evaluate alternatives to further enhance the County's current 56.5% recovery rate (including, but not limited to, an evaluation of enhanced curbside collection).
- Maintain the role of the WTEF in the County, "region" and state. (The WTEF currently provides processing and energy recovery for waste from Marion County and special waste streams of certain other counties and regions of the state.)
- Develop a long-term management strategy to facilitate cost-effective utilization of the WTEF. (The WTEF has reached capacity; therefore, other disposal options must be explored.)

1.3 Issues Addressed by the Plan

Since the 2002 SWMP was adopted, many programs and services have been implemented and there has been a measurable increase in the County's recycling rate. As such, Marion County is a leader in the State of Oregon, as well as nationally, in achieving their recovery goals. The 2009 SWMP update reviews the progress made and recommends where resources and actions should be placed to improve the system. Some of the key questions addressed in the SWMP are as follows:

- *What other programs/services can be implemented to curb waste generation, reduce disposal and increase recycling?*
- *Population and industry growth in the County results in increased need for recovery and disposal resources. How should the system address this growing demand?*
- *WTEF has been an important part of the Marion County solid waste management system since 1986. What is the future of the facility given that agreements to service the County and sale of energy are due to expire in 2014?*
- *What new facilities or services are needed to meet the future solid waste management system's needs? This would include consideration of new or emerging technologies.*

- *Are the current financial condition and rate structure adequate to maintain fair and equitable rates and fiscal stability?*

These represent some of the more significant issues and concerns addressed in this SWMP update. Each chapter of the SWMP discusses the needs and opportunities pertaining to a specific component of the solid waste management system. As each component of the solid waste management system is reviewed and updated, issues related to meeting the goals of the SWMP are addressed.

1.4 The County's Role in Solid Waste Management Planning and Operations

The County's PWES has the primary responsibility for planning and operating the County's solid waste management (SWM) system, and the County Board of Commissioners oversees the activities of the Department. The County has authority to direct all solid waste to designated transfer, resource recovery or other disposal facilities. This authority, granted by the ORS 459.125, allows the County to:

> *"Regulate, license, franchise and certify disposal, transfer and material or energy recovery sites or facilities; establish, maintain and amend rates charged by disposal, transfer and material or energy 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 material or energy recovery sites or facilities located within the county. Licenses or franchises granted by the board may be exclusive."*

The control of waste transfer granted under ORS 459.125 is specific to Marion County. In general, local administrations in Oregon that manage solid waste (i.e. cities, counties, and/or metropolitan service districts), including Marion County, are permitted to enter into agreements with state, local governments, or private parties under ORS 459.065:

> *"(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."*

To provide services for managing waste, the County contracts with private businesses to operate most facilities. By using contracts to manage the system, the County maintains flexibility to respond to changing regulations and emerging technologies, and also employs

the resources and experience of franchised haulers. This approach takes advantage of private sector expertise and efficiencies, while enabling the County to be part of managing and overseeing the solid waste management system.

1.5 Plan Organization

This introductory chapter has provided information on the purpose of the updated SWMP and guiding principles for managing solid waste in Marion 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 management system, including:

Chapter 3	Waste Prevention/Reduction/Recycling Analysis
Chapter 4	Recycling and Materials Processing
Chapter 5	Collection and Transfer
Chapter 6	Alternative Technologies and Waste Disposal (Ash and Municipal Solid Waste (MSW))
Chapter 7	Administration and Enforcement

As each component is reviewed, the chapter covers the following subjects that relate to that component:

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

2. BACKGROUND AND WASTE STREAM ANALYSIS

2.1 Introduction

This chapter provides the following information:

- The physical and economic characteristics of the planning area (Marion County, Oregon).
- 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 since the 1995 SWMP.
- A presentation of waste generation projections.

2.2 Characteristics of the Planning Area

Marion County is located in northwest Oregon and comprises 1,184 square miles bounded to the east by the Cascade Mountains, the west by the Willamette River, and adjacent to Clackamas County in the north, Yamhill and Polk Counties to the west, Linn County to the south and Jefferson and Wasco Counties to the east. The western half of Marion County lies within the Willamette River Valley, and the eastern half includes the Cascade Mountain foothills. Topography ranges from approximately 150 feet above mean sea level (msl) in the valley to over 10,000 feet above msl at Mount Jefferson, located in the extreme southeast corner of the County.

The Willamette River Valley is sheltered from extreme weather by the Coastal Range, producing warm, dry summers and mild, wet winters. Average annual precipitation in the County's Valley area is 40 inches per year. In the eastern part of the County, precipitation increases rapidly with elevation and ranges from 100 to 130 inches per year in the Cascades.

The population of Marion County has increased at an average rate of 1.2% per year and by a total of 10.5% since the 2000 Census.[1] As of 2008, the County now has an estimated population of 314,866.[2] In 2007, this population resided in an estimated total of 118,767 housing units,[3] with an average Census 2000 household size of 2.70 persons.[4] State and County wide population and housing figures are shown in Table 2-1.

[1] 2008 Oregon Population Report, Population Research Center, Portland State University, March 2009.
[2] Ibid.
[3] US Census Bureau, "2007 Population Estimates, Housing Unit Estimates, Oregon by County," n.d., <http://factfinder.census.gov/home/en/official_estimates_2007.html> (10 April 2009)
[4] US Census Bureau, "2007 Average Household Size, Marion County, Oregon," n.d., <http://factfinder.census.gov/home/en/official_estimates_2007.html> (10 April 2009)

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

Category	Year	Marion County	Oregonwide
Population estimate[5]	2008	314,865	3,791,060
Population net change	2000 to 2008	30,032	369,661
Population% change		10.5%	10.8%
Number of Housing Units[6]	2007	118,767	1,609,595
Housing Units net change	2000 to 2007	10,278	152,243
Housing Units% change		9.5%	10.5%

Marion County's population is generally concentrated in 20 incorporated cities ranging in population from 230 in Idanha to 154,510 in Salem.[7] Most of the urbanized areas are located in the western half of the County along or near the major road corridors such as Interstate 5 and State Highways 22 and 214. The city of Salem, which is incorporated in both Marion and Polk Counties, is the largest city in the County, and serves as the County seat and the capital of the State of Oregon.

Table 2-2 - 2007 Certified Estimated Population of Incorporated Cities in Marion County, OR[8]

Jurisdiction	Population
Aumsville	3,535
Aurora	970
Detroit	265
Donald	1,025
Gates*	455
Gervais	2,260
Hubbard	3,125
Idanha*	145
Jefferson	2,655
Keizer	36,150
Mill City*	329
Mt. Angel	3,785
St. Paul	415
Salem*	132,033
Scotts Mills	300
Silverton	9,540
Stayton	7,815
Sublimity	2,285
Turner	1,730
Woodburn	23,355
Unincorporated	82,693

*The city is located and has population in more than one county; population listed is the Marion County portion only.

The Willamette River Valley is the most diverse agricultural region in Oregon, specializing in crops such as berries, vegetables, hazelnuts, hops, grass seed and nursery products. Marion County is ranked number one in Oregon with respect to agricultural production. Coincident with the growth of agriculture was the development of the food processing industry, which

5 Source: 2008 Oregon Population Report, Population Research Center, Portland State University, March 2009.
6 Source: US Census Bureau, "2007 Population Estimates, Housing Unit Estimates, Oregon by County," n.d., <http://factfinder.census.gov/home/en/official_estimates_2007.html> (10 April 2009)
7 Source: 2008 Oregon Population Report, Population Research Center, Portland State University, March 2009.
8 Source: 2008 Oregon Population Report, Population Research Center, Portland State University, March 2009.

is now one of the largest in the nation. Valley land is also used for grazing and rearing activities to produce livestock and poultry for market.

The economic base of the County includes government, agriculture, food processing, forest products, manufacturing, education and tourism. In 1998 the unemployment rate was 6.3% dropping to 5.7% in 2005. Table 2-3 provides an economic snapshot of the County.

Table 2-3 - Marion County Economic Activity[9]

Category	Year	Marion County	Oregonwide
Per Capita Income	2005	$28,826	$32,289
Civilian Labor Force	2006	151,392	1,898,847
Unemployment Rate	2006	5.7%	5.4%
Full & Part Time employment	2005	173,843	2,232,693
Net Change Full & Part Time employment	2000 – 2005	12,146	121,778
Average earning per job	2005	$39,787	$41,152
Private non-farm establishments	2005	8,055	108,571
Private non-farm employment	2005	96,815	1,409,576
Building Permits	2006	1,970	26,623

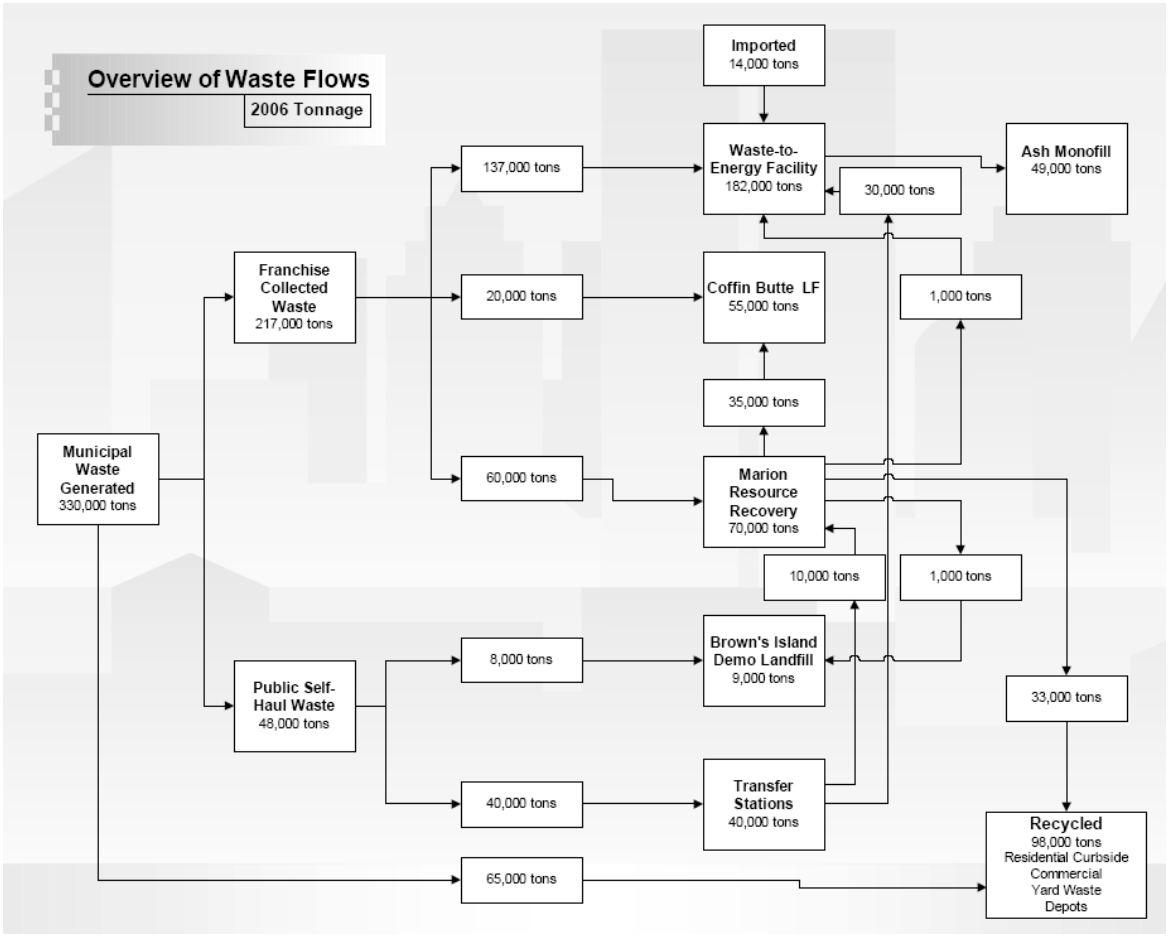
The top three employment sectors, as reported in 1999 by the Oregon Economic and Community Development Department, are retail trade, manufacturing, and accommodation and food services. Salem has a substantial manufacturing sector consisting of food processing and paper goods production. These industries typically are associated with high volumes of food and paper waste by-products.

2.3 Description of the Solid Waste Management System

The solid waste system in Marion County consists of collection, transfer, waste recovery, recycling, household hazardous waste, composting and disposal facilities and services. Collectively, the facilities and programs in Marion County effectively manage the County's waste and recyclables. Private sector tonnages not flowing through the County's facilities are reported to the State either by the generator or the disposal entity. The State computes this private sector tonnage into the County's overall generation tons and recycling rate. This chapter provides an updated description of the major components of the 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 here but discussed in later chapters. Marion County's solid waste disposal sites, transfer stations, WTEF and the flow of waste and recovered materials quantities handled in 2006 are shown in Figure 2-1.

[9] Source: Federal Statistics (Bureau of Economic Analysis, Bureau of Labor Statistics, National Agricultural Statistics Service, National Center for Health Statistics, U.S. Census Bureau), "Marion County, Oregon, MapStats." 07-Aug-2008. www.fedstats.gov/qf/states/41/41047.html (April 14, 2008).

Figure 2-1 - Overview of Waste Flows in Marion County, 2006 Tonnage



Source: Marion County PWES

2.3.1 Refuse Collection

There are eight private companies that provide collection of MSW from residences and commercial establishments in Marion County (Table 2-4). Each of these companies is either franchised by the County or by local jurisdictions, under authority granted by ORS 459.125. This same legislation also gives Marion 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."*

This authority was granted to enable the County to effectively manage the entire waste stream including that sent to the WTEF.

Franchise agreements grant each company the sole right to collect solid waste and residential curbside recyclables from a specified area, as depicted by Figure 5-1 in Chapter 5. Franchised haulers are contractually obligated to provide a regular schedule for collection

of garbage in all areas of the County and recyclables in urbanized areas. Service charges by the franchised haulers are regulated by cities and by Marion County.

Table 2-4 - 2008 Private Solid Waste Haulers and Service Areas

Collection Service	Service Area	Term of Agreement
Allied Waste of Salem	Salem	Rolling seven[10]
D & O Garbage Service	South Salem/North Salem, Marion County	Rolling seven
Loren's Sanitation Service	Keizer, Marion County	Rolling seven
North Marion Disposal	Donald, St. Paul, Marion County	Rolling seven
Pacific Sanitation Service	Keizer, Northeast Salem, Detroit, Idanha, Jefferson, Turner, Mill City, Gates, Marion County	Rolling seven
Suburban Sanitary Service	Salem, Marion County	Rolling seven
Allied Waste of Marion County	Aumsville, Aurora, Gervais, Hubbard, Mount Angel, Salem, Scotts Mills, Stayton, Silverton, Sublimity, Woodburn, Marion County	Rolling seven
Valley Recycling and Disposal Service	Northeast Keizer, Marion County	Rolling seven

2.3.2 Transfer Stations

There are two transfer stations that operate in Marion County. The Salem/Keizer Recycling and Transfer Station (SKRTS) is located southeast of Salem off Highway 22. The site is owned and operated by Capitol Recycling and Disposal under an agreement with the County. In 2000, over 20,000 tons of solid waste were delivered to SKRTS.[11] In 2007, the quantity of waste going though the facility jumped to 33,546 tons, an increase of almost 68%.[12] Solid waste received at SKRTS is transferred to the WTEF for processing. In addition to the solid waste, recyclables are accepted at SKRTS. Some recyclable materials are transported to the Marion Resource Recovery Facility (MRRF) for sorting and recovery.

Over the years, improvements have been made to SKRTS, allowing for increased area dedicated to receiving source separated recyclable materials. The facility handles many types of recyclable materials brought in by the public in higher quantities such as: lead acid batteries, mixed paper, cardboard, "grey board", food/beverage container glass, electronics (including: stereos, computers, phones / cell phones, printers, TVs, and microwaves),

[10] Denotes a continuously renewing 7-year term for contracts, per hauler agreements.
[11] 2002 Annual Report, Marion County Department of Public Works, Environmental Services Division.
[12] 2007 Annual Report, Marion County Department of Public Works, Environmental Services Division.

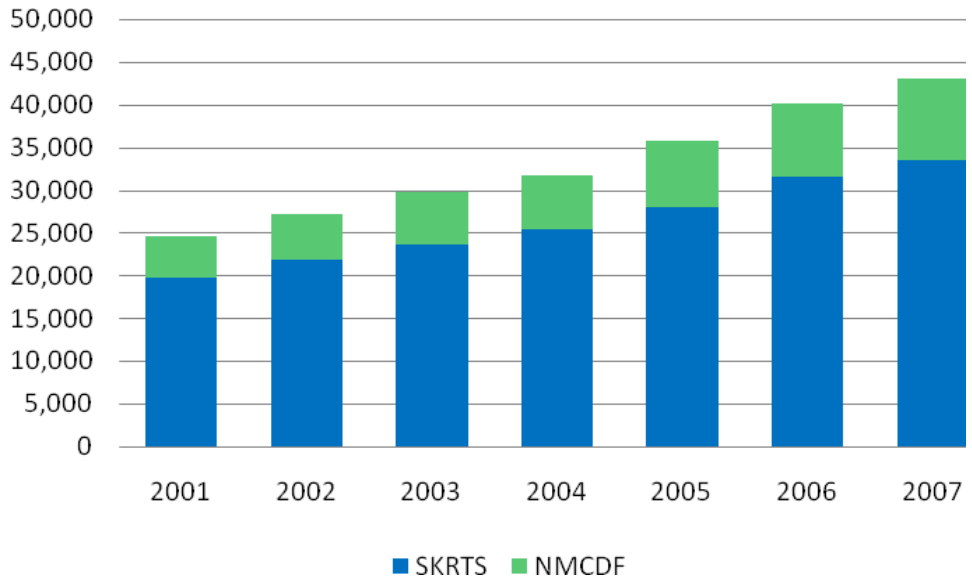
plastic rigid containers #1-7, and latex paint. In addition, yard debris and wood waste are segregated and transported to a commercial composting facility for recycling. In 2005, a Household Hazardous Waste (HHW) drop-off program was added to the facility as part of a cooperative effort between Marion and Polk Counties.

The County also owns a smaller transfer station located at the North Marion County Disposal Facility (NMCDF) that serves the northern-most portion of the County. The facility is operated by Marion County. NMCDF consists of a series of bays to allow cars and pickup trucks to dump waste that will be transported to the WTEF. The facility includes a drop-off area for source separated recyclable materials. In 2000, the facility received 4,525 tons[13] and in 2007 more than doubled that amount, up to 9,467 tons as Table 2-5 and Figure 2-2 show.

Table 2-5 - Transfer Station Tonnages[14]

Transfer Station	2001 Tons	2002 Tons	2003 Tons	2004 Tons	2005 Tons	2006 Tons	2007 Tons
SKRTS	19,782	21,808	23,615	25,340	28,050	31,542	33,546
NMCDF	4,873	5,390	6,151	6,421	7,696	8,559	9,467
Total	**24,655**	**27,198**	**29,766**	**31,761**	**35,746**	**40,101**	**43,013**

Figure 2-2 - Transfer Station Tonnages[15]



2.3.3 Waste-to-Energy Facility (WTEF)

The WTEF began operation in 1986. Covanta Energy, formerly Ogden Martin, operates the facility under an agreement with Marion County. The facility is designed to burn approximately 550 tons of MSW per day or about 185,000 tpy. The facility converts the energy released during combustion to electricity which is sold to PGE. The WTEF reduces the

[13] 2002 Annual Report, Marion County Department of Public Works, Environmental Services Division.
[14] 2007 Annual Report, Marion County Department of Public Works, Environmental Services Division.
[15] Ibid.

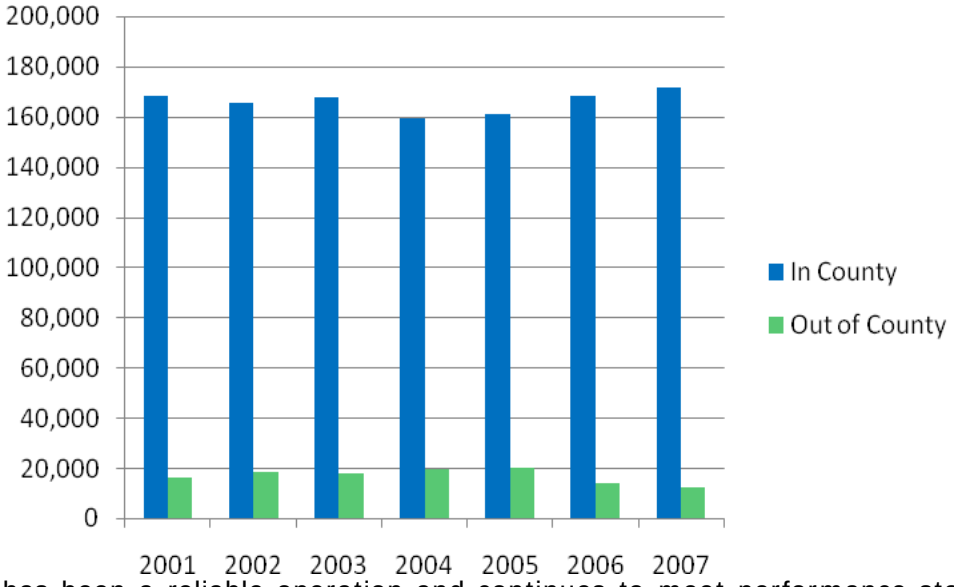
total volume of waste by 90%. Ash residue is taken to the NMCDF where it is buried in a dedicated lined monofill cell.

In general, there are sufficient quantities of solid waste from Marion County to supply the facility at peak capacity on an annual basis. In the past, during certain times of the year when waste volumes were lower, small amounts of waste were brought in from outside the County. Tonnage originating outside the County and brought to the WTEF has generally increased until 2006 and 2007 when it dropped back below the 2001 amount (See Table 2-6 and Figure 2-3 - WTEF Waste Tonnage).

Table 2-6 - WTEF Waste Tonnage[16]

WTEF Waste Tonnage	2001 Tons	2002 Tons	2003 Tons	2004 Tons	2005 Tons	2006 Tons	2007 Tons
In County	168,247	165,439	167,605	159,597	160,785	168,516	171,591
Out of County	15,899	18,545	17,985	19,745	19,831	13,899	12,176
Total	**184,146**	**183,984**	**185,590**	**179,342**	**180,616**	**182,415**	**183,767**

Figure 2-3 - WTEF Waste Tonnage[17]



The WTEF has been a reliable operation and continues to meet performance standards. In 1998, air quality controls were added to meet new federal standards for mercury and nitrogen-oxides (NO_x) emissions.[18] The current operating agreement with Covanta Energy expires in 2014.

[16] 2007 Annual Report, Marion County Department of Public Works, Environmental Services Division.
[17] Ibid.
[18] Per Kelly Champion, Environmental Division, Covanta Marion, March 2008.

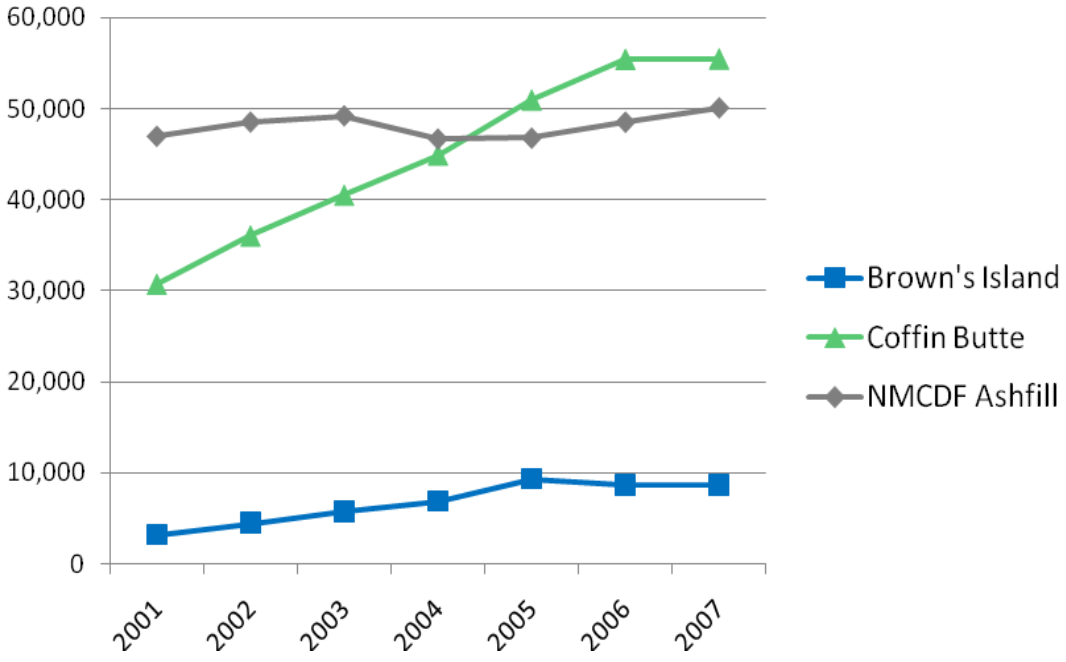
2.3.4 Disposal Facilities

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 Marion County, the only landfill permitted to accept MSW is the backup cell at the NMCDF. The backup cell hasn't been used to date but continues to be retained for future use. All MSW generated in Marion County must either be delivered to the WTEF or taken to landfills outside of the County. Waste in excess of the WTEF's capacity is hauled to Coffin Butte Regional Landfill (Coffin Butte) (sometimes referred to as Valley Landfill) in Benton County. Small quantities of MSW generated in Marion County are also disposed of at Riverbend Landfill in Yamhill County, amounting to less than 5,000 tons in 2007.[19]

There are two landfills in the County that are permitted to accept limited types of waste. NMCDF accepts ash from the WTEF, and the Brown's Island Demolition Landfill (BI) receives certain types of construction and demolition debris.

Table 2-7 and Figure 2-4 show the tonnage of waste materials that flow into these disposal operations.

Figure 2-4 - Marion County Tonnage to Landfills[20]



[19] Disposal for Marion Wasteshed (Marion County) 2007, per Peter Spendelow, ODEQ.
[20] Ibid.

Table 2-7 - Marion County Tonnage to Landfills[21]

Landfills	2001 Tons	2002 Tons	2003 Tons	2004 Tons	2005 Tons	2006 Tons	2007 Tons
Brown's Island	3,227	4,469	5,765	6,935	9,336	8,676	8,659
Coffin Butte	30,672	35,997	40,467	44,909	50,939	55,420	55,460
NMCDF Ashfill	47,010	48,558	49,238	46,713	46,805	48,546	50,104
Total	**80,909**	**89,024**	**95,470**	**98,557**	**107,080**	**112,642**	**114,223**

2.3.4.1 North Marion County Disposal Facility (NMCDF)

The NMCDF is located two miles north of the City of Woodburn. The facility is owned and operated by the County. Until 1998, the landfill accepted small quantities of MSW. Presently, this site is only accepting ash residue from the WTEF. The County also maintains a lined landfill cell for MSW at NMCDF. This cell acts as a backup disposal option for the WTEF, if it were not available for some length of time outside of scheduled down time.

The disposal site encompasses a total of 94 acres and receives an average of 140 tons of ash residue five days a week (5days/week). Each ash landfill cell is designed with a bottom liner to prevent precipitation that enters the cell from migrating into the groundwater. Water that accumulates in the ash cell is called leachate, and is collected and transported to a storage lagoon. The County contracts for ash leachate hauling and disposal to a landfill in eastern Oregon.

This site is projected to have sufficient capacity to dispose of ash residue from the WTEF through the existing agreement term with Covanta Energy, which expires in 2014. There is also available space on-site for additional ash disposal capacity if needed.

2.3.4.2 Brown's Island (BI) Demolition Landfill

The BI landfill is permitted to accept only inert demolition waste. The landfill primarily receives gypsum wallboard from private haulers in Marion County. The facility also receives roofing tiles, ceramics, bricks, concrete or other inert materials. Since there are no liner systems installed at BI, the landfill is restricted from accepting all other types of waste.

In 2001, the County reports that BI accepted about 3,227 tons of demolition waste and 8,659 tons in 2007.[22] Since the County does not weigh the waste stream entering the landfill, it is necessary to estimate the amount of waste by converting from volume to weight. The ODEQ and the County use different conversion factors, creating a discrepancy in the reported annual waste stream at times.

In 2000, the ODEQ granted the County an extension to the (landfill/operating) permit. This extension allowed the County to expand vertically by adding lifts on top of the current landfill, thus providing more capacity. At current waste flows, BI has sufficient permitted capacity until 2020.

[21] 2007 Annual Report, Marion County Department of Public Works, Environmental Services Division.
[22] 2002 and 2007 Annual Reports, Marion County Department of Public Works, Environmental Services Division.

2.3.4.3 Coffin Butte Regional Landfill (Coffin Butte)

Coffin Butte is a 700-acre site north of Corvallis in Benton County, privately owned and operated by Allied Waste Industries, Inc. Coffin Butte accepts waste from four counties, including Marion County. At the current rate of disposal, this facility is expected to be in operation in excess of 30 years.

Manufactured products comprise nearly half of the refuse that is received by Coffin Butte. Construction debris and other recyclable materials such as yard debris or concrete account for approximately one quarter of waste received. Coffin Butte does not accept hazardous wastes, motor oil, tires, batteries, or fluorescent light tubes, etc. By recycling yard debris and wood waste, Coffin Butte reduced landfill tonnage by more than 20% (Oregon State University, College of Forestry 1999).

2.3.5 Recycling Facilities

There are many private businesses and volunteer organizations that participate in the programs to recycle materials from the County's waste stream. This section describes the primary facilities that receive, process, and market materials produced from collection services.

2.3.5.1 Garten Services, Inc.

Garten Services, Inc. (Garten), a non-profit organization, is the largest recycling organization in the County. A variety of source-separated materials are handled at their warehouse and processing facility. A drop off depot is available for mixed paper, newspaper, cardboard, glass containers, tin cans, household aluminum, and rigid plastic containers. At the beginning of 2008, Garten began accepting electronics for recycling from Marion County. Garten is a state certified collection site for electronics covered by the Oregon's new Electronics Recycling Law (ORS 459A.300-.365). It also receives many electronic devices and small appliances that do not contain refrigerants, fluids or radioactive materials. Garten also offers records destruction services for information media including paper, plastics and electronic devices.

Garten is a partner with the franchised haulers and Far West Fibers in Portland to process and market the mixed paper stream. Commingled recycled materials collected in Marion County are transported to Far West Fibers for processing. The trucks hauling the commingled stream then back haul mixed paper products that are processed for recycling through Garten.

Garten operates a collection service for office and print shop papers and coordinates commercial collection of recyclables through the franchised haulers. Garten also runs a buy back operation for all the above materials.

2.3.5.2 Marion Resource Recovery Facility (MRRF)

MRRF is operated as a cooperative organization of the franchised haulers in the County. Initially, the facility was used to segregate construction and demolition waste and recover wood and other materials. In recent years, the facility expanded in order to process

commercial waste loads. Presently, franchised haulers bring commercial loads that contain higher quantities of cardboard, waste paper, and other recyclables to be recovered.

2.3.5.3 Compost Oregon (CO)

Compost Oregon (CO), formerly known as Woodwaste Reclamation, is a privately owned 10 acre composting and wood mulching facility located in Aumsville, Oregon. CO receives wood and yard waste from the two transfer stations in the County, curbside collection, and from self hauls. All materials received by the facility are composted on site, and finished product is sold to local retailers, wholesalers, and nurseries. CO is planning to expand the facility to process and compost food waste.

2.4 Current and Projected Waste Stream Composition and Quantities

The Waste Stream Analysis presented here provides a summary of current waste stream generation and composition in Marion County and forecasts future disposal and recycling levels. Marion County waste disposal trends and corresponding historical population data were used to produce a 20-year solid waste forecast (2008-2027). This forecast is used to project the amount and composition of waste generated, processed and disposed in the future. Projected waste flows are critical to the planning for facilities and services in the updated SWMP.

Since 1995, record keeping and reporting methods have continued to develop and improve. The updated SWMP includes the best information available and compares it with data from other areas to portray an accurate characterization of the waste stream that will be generated and disposed of in Marion County. The information can be used to examine areas where programs may be targeted to reduce waste and to recycle more materials. Results can also be used in planning the expansion of existing facilities or construction of new facilities. However, prior to making major investments in facilities or programs, further evaluation of the waste stream may be warranted.

2.4.1 Definition

For the purposes of this projection, the total waste stream is defined as tons of solid waste generated in Marion County, which includes both disposed and reused/recycled/composted. Most types of solid waste are processed at the WTEF or landfilled, while other wastes are reused, recycled, composted, or disposed of in sites designated for a specific type of special waste. The largest component of the total waste stream is MSW. MSW consists of waste generated by residences, offices, institutions, commercial businesses and other waste generators not producing special wastes. The majority of Marion County's MSW is incinerated at the WTEF and is reduced to ash. Ash is the second largest component of the total waste stream. The management and disposal of this ash is regulated differently than MSW. The WTEF ash is considered a special waste. Special wastes also include industrial waste, hazardous waste, infectious wastes, sludges and septic tank pumpings, tires, and recycled waste. Each special waste category has its own characteristics and handling requirements.

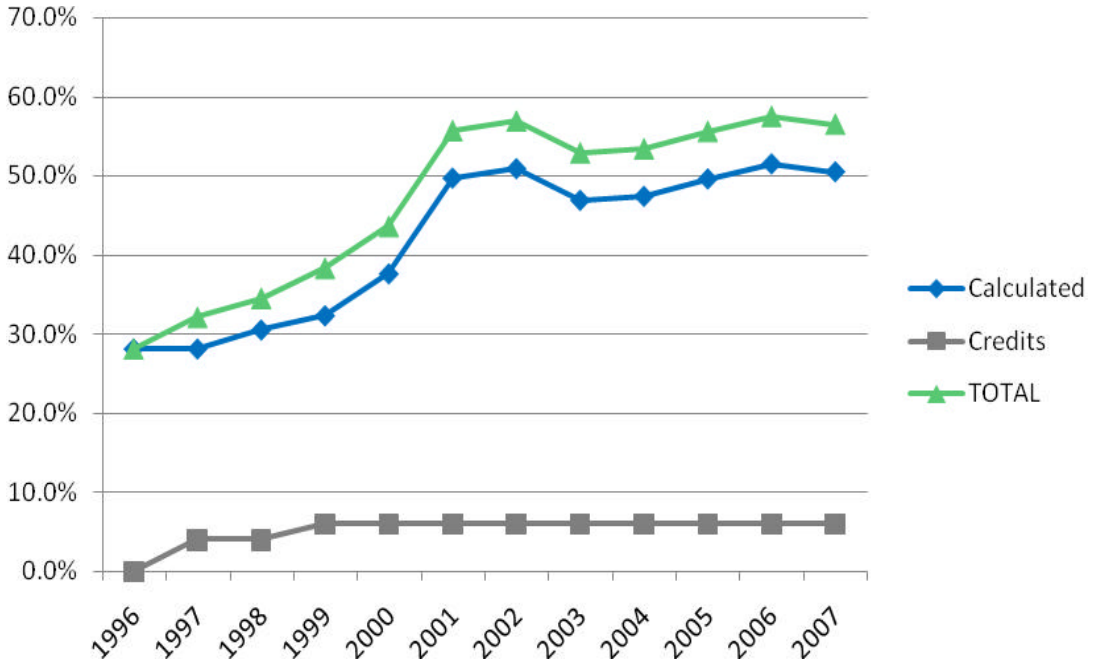
All operators that collect and/or process wastes report the amount of recycled materials to ODEQ each year. This includes specific generators that recycle their own waste, as well as

all solid waste handling facilities. The result is an annual report, prepared by ODEQ, which summarizes the recovery rate for each county. Recovery rates for each county in Oregon from 1992 to 2007 are listed in ODEQ's 2007 Material Recovery and Waste Generation Rates Report (see Table 2-8 and Figure 2-5). The recovery rate is defined as the total material recovered divided by the total material generated. As home to the state's only WTEF, Marion County's recovery and disposal tonnages are revised each year to include certain wastes processed for energy and recovered; as directed by the 2001 Legislature.[23] Recovery credits are earned by counties for waste prevention, reuse and residential composting programs at 2% each and added to the calculated recovery rates. The recovery rate pertains to the amount of material that is recycled, composted, or recovered for energy and not disposed of via landfill. The recovery rate (without the credits) is the value shown in the tables in this chapter unless otherwise stated.

Table 2-8 - Marion County Recovery Rate, 1996-2007[24]

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Calculated	28.1%	28.1%	30.5%	32.2%	37.6%	49.7%	50.9%	46.9%	47.4%	49.6%	51.5%	50.5%
Credits	0.0%	4.0%	4.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
TOTAL	**28.1%**	**32.1%**	**34.5%**	**38.3%**	**43.6%**	**55.7%**	**56.9%**	**52.9%**	**53.4%**	**55.6%**	**57.5%**	**56.5%**

Figure 2-5 - Marion County Recovery Rate, 1996-2007[25]



[23] 2007 Oregon Material Recovery and Waste Generation Rates Report, ODEQ, Land Quality Division, September 2008.
[24] 2007 Oregon Material Recovery and Waste Generation Rates Report, ODEQ, Land Quality Division, September 2008.
[25] Ibid.

Estimates used in this updated SWMP demonstrate a distinction between "disposed" quantities and "generated" quantities. As used in this SWMP, disposed solid waste is considered to be all County solid waste delivered to the WTEF or disposed of at a landfill, in or out of the County, and as reported to ODEQ by regulated waste handling businesses and disposal sites. Waste generation is calculated by adding the total waste disposed and the materials that are recovered, as reported by the County to ODEQ. Some quantity of tons will escape the reporting system such as waste that is illegally disposed, improperly dumped, littered, or burned on-site.

2.4.2 Historical Solid Waste Data

Table 2-9 provides a summary of generated and disposed wastes over a seven-year period between 2001 and 2007 for Marion County, based on the most comprehensive data available.

Table 2-9 - Summary of Historic Waste Stream Data for Marion County Between 2001 and 2007 (in tons)[26]

YEAR	2001	2002	2003	2004	2005	2006	2007
Waste Processed for Energy, Recovery or Disposal	386,007	402,741	398,785	428,776	481,723	507,593	499,886
Waste Disposed/ Incinerated	194,190	197,699	211,510	225,430	242,809	246,333	247,331
Waste Recovered	191,817	205,041	187,275	203,346	238,914	261,260	252,555
Recovery Rate[27]	50%	51%	47%	53.8%	55.6%	57.5%	56.5%

Generated waste requiring disposal in Marion County is delivered to the WTEF, BI, Coffin Butte, or Riverbend Sanitary Landfill. The NMCDF stopped accepting MSW in June of 1998. The amount of waste disposed at these sites in 2001 through 2007 as reported by the County is shown in Table 2-10 and Figure 2-6 - Marion County Municipal Solid Waste Received at Disposal Sites (in tons).[28]

[26] Source: 2007 Oregon Material Recovery and Waste Generation Rates Report, ODEQ, Land Quality Division, September 2008.

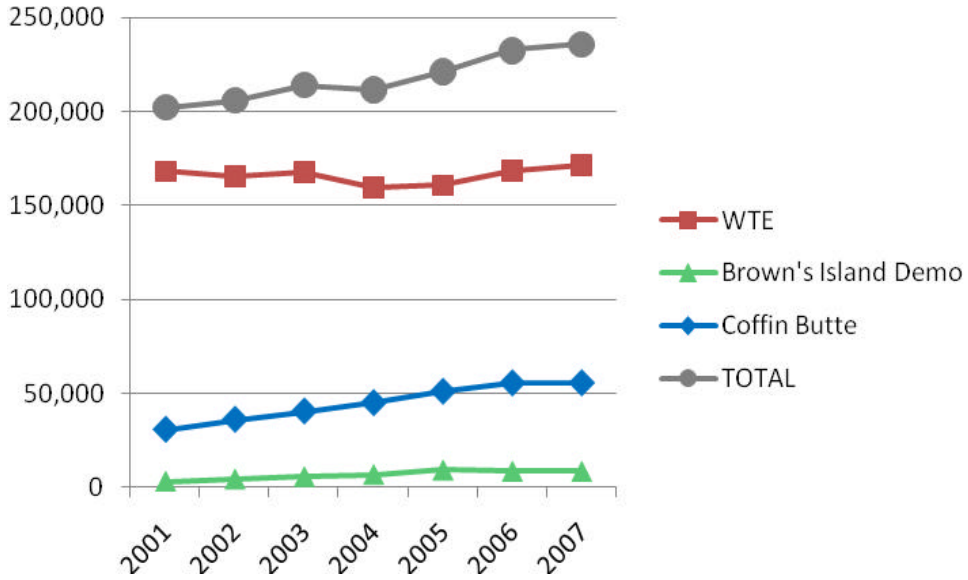
[27] Calculated Recovery Rate as assigned by ODEQ, including 2% credits as earned in 2004-2007, sourced from Marion County Public Works Environmental Services 2006 Annual Report, 2005 Oregon Material Recovery and Waste Generation Rates Report, ODEQ, November 2006, and 2007 Oregon Material Recovery and Waste Generation Rates Report, ODEQ, September 2008.

[28] Tonnages received from Marion County sources by Riverbend Landfill in Yamhill County are not reported to Marion County Public Works Department Environmental Services Division.

Table 2-10 - Marion County Municipal Solid Waste Received at Disposal Sites (in tons)[29]

Disposal Location	2001 Tons	2002 Tons	2003 Tons	2004 Tons	2005 Tons	2006 Tons	2007 Tons
WTE	168,247	165,439	167,605	159,597	160,785	168,516	171,591
Landfills							
Brown's Island Demo	3,227	4,469	5,765	6,935	9,336	8,676	8,659
Coffin Butte	30,672	35,997	40,467	44,909	50,939	55,420	55,460
Total	202,146	205,905	213,837	211,441	221,060	232,612	235,710

Figure 2-6 - Marion County Municipal Solid Waste Received at Disposal Sites (in tons)[30]



The majority of material received at the WTEF and the Coffin Butte Landfill is mixed residential and commercial waste, while most of what is received at BI is construction/demolition debris (C/D) (including drywall, asphalt, fiberglass, brick and concrete). Individual self-haulers deliver small quantities of MSW to Coffin Butte and Riverbend Landfills.

2.4.3 Waste Stream Composition

The composition of the waste stream is important to understand because it provides the distribution of types and quantities of materials in the waste stream, including recyclable and compostable materials. Information was compiled from several sources to produce the waste stream composition that is summarized in Table 2-11 (see Source Notes following Table 2-11 for specifics). The percentage of total waste generated for each waste material type was determined by a waste composition study performed specifically on Marion County's waste by a contractor working for ODEQ. A visual representation of the waste stream composition is shown in Figure 2-7.

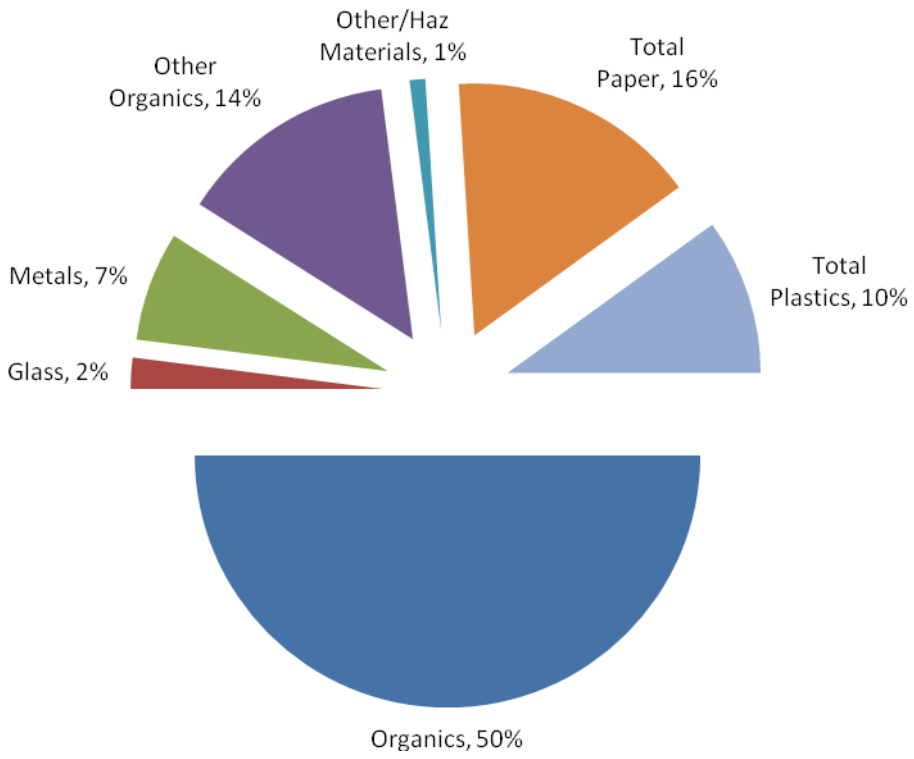
[29] 2002 and 2007 Marion County Public Works – Environmental Services Annual Reports.
[30] Ibid.

Based on material tonnage reporting practice differences between ODEQ and the County, some quantities in Table 2-11 differ from the same records shown in ODEQ reports. Some materials are delivered directly to recycling processors from generators and are not tracked by County recycling program reports, leading to the appearance of differing waste and recycling tonnages and rates between the County and ODEQ. In addition, differences exist in the conversion factors used by both agencies for materials not weighed at facilities.

Trends observed since the 2002 Marion County SWMP include the following (for details see Chapter 6, Alternative Technologies and Solid Waste Disposal, of this document):

- Waste generated in Marion County increased by approximately 30% from 2001 to 2007 (from 386,007 tons in 2001 to 499,886 tons in 2007).
- Waste recovered in Marion County increased by approximately 32% from 2001 to 2007 (from 191,817 tons in 2001 to 252,555 tons in 2007).
- The recovery rate, excluding credits, increased to 50.5% in 2007, up from 50% in 2001. Considering the credits assigned to waste reduction efforts, the calculated 2007 recovery rate (waste reduction and recycling) for Marion County is 56.5%.

Figure 2-7 - Composition of Solid Waste Generated in Marion County[31]



[31] Source: Based on information presented in Table 2-11.

Table 2-11 - Marion County Waste Stream for 2007

Material	% of Waste for Disposal[1]	Waste Disposed (tons)[2]	Waste Recovered (tons)[3]	Total Waste Generated (tons)[4]	% Recovered[5]
TOTAL PAPER	**14.8%**	**36,556**	**58,039**	**94,595**	**61.4%**
Cardboard	3.1%	7,544	32,766	40,309	81.3%
Misc. Paper[6]	12%	29,037	25,274	54,310	46.5%
TOTAL PLASTICS	**9.6%**	**23,843**	**5,469**	**29,312**	**18.7%**
ORGANICS	**47.3%**	**117,037**	**116,327**	**233,364**	**49.8%**
Yard Debris	3.6%	8,953	70,318	79,271	88.7%
Wood	7.2%	17,783	39,306	57,089	68.9%
Food	21.4%	53,003	3,541	56,544	6.3%
Tires	0.2%	445	1,550	1,995	77.7%
Other Organics[7]	14.9%	36,852	1,612	38,464	4.2%
GLASS	**1.6%**	**4,056**	**7,549**	**11,605**	**65.0%**
METALS	**6.8%**	**16,868**	**58,887**	**75,755**	**77.7%**
Aluminum (all)	0.4%	1,039	3,976	5,015	79.3%
Tin Cans	0.9%	2,127	378	2,505	15.1%
Electronics	1.4%	3,562	796	4,357	18.3%
Other (Scrap Metal)	4.1%	10,141	53,737	63,878	84.1%
OTHER INORGANICS	**13.1%**	**32,277**	**429**	**32,706**	**1.3%**
Rock/Brick/Concrete[8]	2.7%	6,727	384	7,112	5.4%
Gypsum Wallboard	4.6%	11,254	45	11,298	0.4%
Misc Inorganics[9]	6.3%	15,458	-	15,458	0.0%
OTHER/HAZ MATERIALS	**0.6%**	**1,533**	**5,009**	**6,542**	**76.6%**
Motor Oil	0.0%	25	2,817	2,842	99.1%
Batteries	0.1%	148	1,537	1,685	91.2%
Other Haz[10]	0.5%	1,336	655	1,990	32.9%
TOTAL WASTE	**100%**	**246,331**	**252,555**	**499,886**	**50.5%**

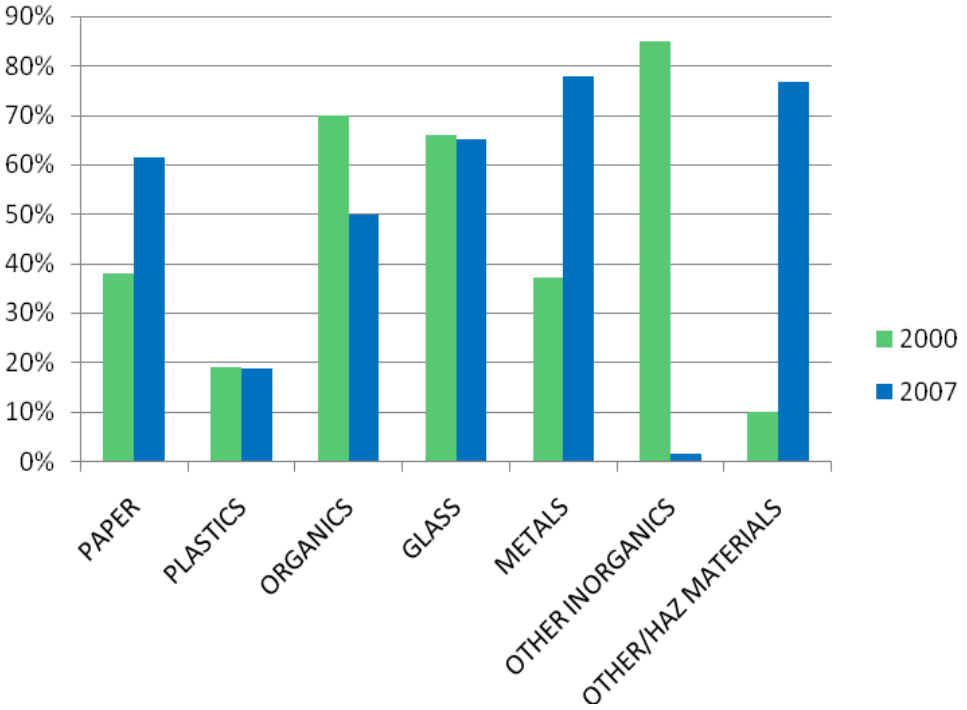
Table 2-11 - Marion County Waste Stream for 2007 (Continued)

Source Notes

[1] "**% of Waste for Disposal**" is based on Oregon Solid Waste Composition 2005/06, Marion County Supplement, Table Marion9 corrected for water/contamination, ODEQ, Draft July 2007.
[2] "**Total Waste Disposed**" value as reported by 2007 Oregon Material Recovery and Waste Generation Rates Report, ODEQ, September 2008. Material values calculated from % of Waste for Disposal x Total Waste Disposed.
[3] "**Waste Recovered**" **(tons)** by material as recorded for Marion County by ODEQ in 2007, per Peter Spendelow, Waste Composition & Recycling staff, Land Quality Division, Solid Waste Section.
[4] "**Total Waste Generated**" is calculated from (Waste Disposed+Waste Recovered).
[5] "**% Recovered**" is calculated from (Waste Recovered/Waste Disposed + Waste Recovered)).
[6] "**Misc. Paper**" - Disposed includes: waxed cardboard, low grade unbleached paper, pollycoats + bleached drink boxes, non-compostable non-recyclable paper, low grade bleached paper, Hardcover books, and other compostable non recyclable paper, per Table Marion9, ODEQ Draft July 2007, plus newspaper/magazines and Hi Grade paper. Recovered includes: Paper- all but OCC (cardboard) per Peter Spendelow, ODEQ.
[7] "**Other Organics**" - Disposed includes: other rubber products, disposable diapers, carpet/rugs, textiles, asphalt roofing & tarpaper, furniture (mixed material), and other misc. organics material, per Table Marion9, ODEQ, Draft July 2007. Recovered includes: Asphalt roofing, textiles, and animal waste/grease, per Peter Spendelow, ODEQ.
[8] "**Rock/Brick/Concrete**" - Disposed includes: Rock/Brick/Concrete per Table Marion9, ODEQ Draft July 2007. Recovered includes: Construction/demo per Peter Spendelow, ODEQ.
[9] "**Misc. Inorganics**" - Disposed includes: soil/sand/dirt, pet litter/animal feces, fiberglass insulation, other miscellaneous inorganics, and "medical wastes" per Table Marion9, ODEQ, Draft July 2007. No "misc. inorganic" materials categorized as Recovered.
[10] "**Other Haz Materials**" - Disposed includes: Latex paint, oil paints, other flammables, pesticides/herbicides, corrosive cleaners, and other hazardous chemicals, per Table Marion9, ODEQ Draft July 2007. Recovered includes: Antifreeze, fluorescent lamps, paint, solvents, and diesel per Peter Spendelow, ODEQ.

A comparison of the recycling rates by material type for the County in 2000 and 2007, based on Table 2-11, is provided in Figure 2-8. Since some materials are handled directly by recycling markets and/or not reported through the County recycling program system, recycling rates presented do not represent all materials recycled from all generators in the County.

Figure 2-8 - Comparison of Material Recycling Rates in 2000 and 2007[32]



On average, the recycling rates by material type should increase over time, given the activities of a healthy community recycling program. However, as new technologies change the ways in which we collect and process recyclables, reporting or estimating tonnage of individual materials becomes more challenging. Recyclable materials can be prepared for collection in different ways. In source-separated recycling programs, generators place materials into different containers based on the type of recyclable; in commingled collection, all materials are mixed into one container and separated at a central sorting/processing facility before marketing. Prior to 2001, recyclables collected in Marion County were source-separated; Marion County began collecting and tracking commingled recyclables in 2001[33]. Today a significant portion of recycling is collected in a commingled stream, necessitating the recycling facilities estimating the proportion that can be attributed to specific materials. In addition, some materials, such as magazines and newspapers are actually combined in the reprocessing stage, rather than kept separate, leading to additional measurement challenges over the years. The graph Figure 2-8 demonstrates the currently reported recycling rates for various materials, based on information available from the County and ODEQ. In subsequent years, changes in the categories of recyclable materials tracked may be needed.

2.4.4 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 Oregon Office of Economic Analysis (OEA) assume variable annual growth rates for each five-year period, ranging from 1.06% to 1.29%. U.S.

[32] *Source: Table 2-11 and 2000 Marion County SWMP.*

[33] "Commingled" materials include various papers, plastic bottles, and metal cans. Glass bottles and jars are excluded from typical "commingled" collection in the Marion County region, whereas many area programs do collect them for recycling in a separate stream from other materials.

Census figures indicate that population in Marion County actually increased by 2.47% annually between 1990 and 2000. Table 2-12 displays historical and projected population; projected population is shown as a range with the OEA forecast figures at the low end and Census-calculated figures (2.47% annual increase over 2000 population figures) at the high (conservative) end of the range. Because larger populations will result in higher calculations for total waste generated, using a higher population growth estimate is more conservative from a planning perspective. For this reason, waste stream projections in Table 2-13 were calculated based on an estimated annual population growth rate of 2.47% throughout the period of consideration, rather than using the OEA forecast figures. Waste stream generation forecasts are covered in greater detail in Chapter 6, Alternative Technologies and Solid Waste Disposal.

Table 2-12 - Historical and Projected Marion County Population Data

Year	OEA Population Projections[34]	Annual Growth Rate of Period[35]	Projection based on U.S. Census Population	Average Annual Rate of Increase[36]
2000	286,300		284,838	
2005	302,913	1.13%	301,216	1.15%
2010	323,128	1.29%	318,536	1.15%
2015	344,443	1.28%	336,852	1.15%
2020	367,018	1.27%	356,221	1.15%
2025	388,898	1.16%	376,704	1.15%
2030	410,022	1.06%	398,364	1.15%

According to ODEQ, Marion County's per capita waste generation rate was 3,311 pounds per person in 2006, up from 2,489 pounds per person in 2000, an increase of 33%[37]. Table 2-14 shows the actual waste generation and per capita quantities for 2000 and 2005 as well as the predicted waste generation quantities for 2010 through 2030, which were calculated by multiplying the 2006 per capita generation rate[38] by the more conservative (higher) population estimates from Table 2-12.

[34] Source: Forecasts of Oregon's County Populations and Components of Change, 2000-2040, Office of Economic Analysis, Department of Administrative Services, State of Oregon, April 2004.
[35] Source: Forecasts of Oregon's County Populations and Components of Change, 2000-2040, Office of Economic Analysis, Department of Administrative Services, State of Oregon, April 2004.
[36] Annual rate of increase used = 1.15% per year; representing the average annual increase since the 2000 Census, per 2006 Oregon Population Report, Population Research Center, Portland State University, March 2007.
[37] 2006 Materials Recovery Report, Marion County, ODEQ.
[38] In the 2007 DEQ Materials Recovery Report, ODEQ revised the 2006 Marion County per capita waste generation rate to 3,304 pounds per person per day. However, the original 2006 figure was used in calculations, as noted, to represent a "worst case" scenario for planning purposes.

Table 2-13 - Marion County Waste Stream Projections

Year	Population[39]	Waste Generation (tons)[40]	Per Capita (pounds)[41]
2000	286,300	356,130	2,489
2005	302,913	481,723	3,191
2010	323,128	534,938	3,311
2015	344,443	570,225	3,311
2020	367,018	607,598	3,311
2025	388,898	643,821	3,311
2030	410,022	678,791	3,311

The per capita waste generation estimation figure was not increased in forecasting, although it has escalated each year since data has been reported by ODEQ. (There was a very small reduction in 2003; however, the 2004 figure again surpassed the 2002 number.) Strikingly, the 2004 amount of 2,875 pounds per person per year jumped 11% to 3,191 pounds per person per year in 2005. The most recent increase to 3,311 pounds per person per year for 2006 is a climb of 3.75% over 2005. In 2007, Marion County's per capita waste generation rate fell slightly to 3,216 pounds per person per year, however, the higher 2006 figure of 3,311 pounds per person per year is used in forecasting to predict a "worse case" scenario in planning.

To address waste reduction and prevention, in 2001 the Oregon State Legislature passed ORS 459A.010 that established the following statewide waste generation goals:

- For calendar 2005 and subsequent years, there will be no annual increase in per capita MSW generation.

- For calendar 2009 and subsequent years, there will be no annual increase in total MSW generation.

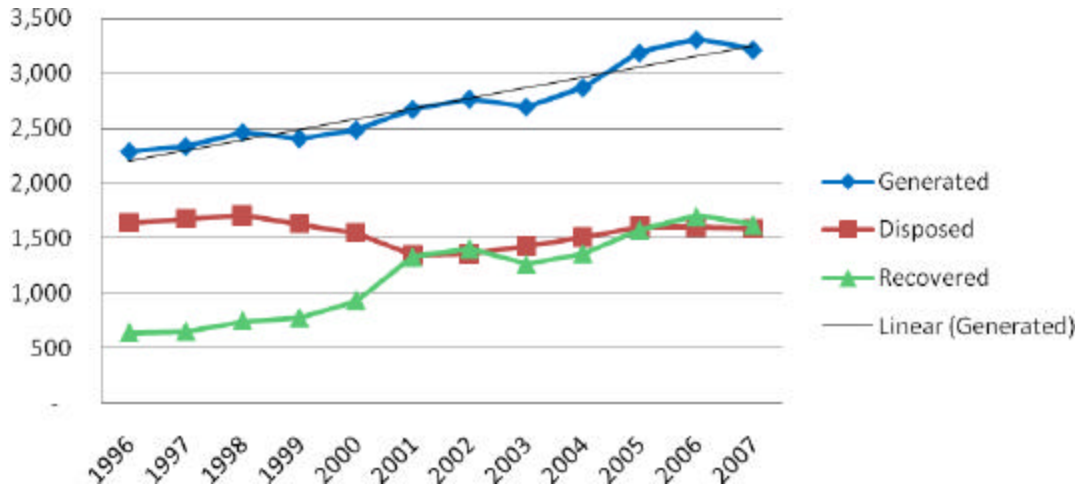
Marion County has yet to meet these statewide waste generation goals. Despite the County's commercial and residential waste reduction education and programs, the total amount of waste generated per person has generally risen each year. Participation in recycling and composting programs diverts an increasing amount each year from disposal however, generation of the total of all wastes (solid waste, recyclables, compostables) per person continues to rise. In summary, County businesses and residents are recovering more and disposing less, but still generating more total material each year, as shown in Table 2-14 and Figure 2-9.

[39] See population data presented in Table 2-13. Conservative (higher) population projections were used.
[40] 2000 and 2005 tonnages are actual tonnages per 2006 Oregon Material Recovery and Waste Generation Rates Report, ODEQ, November 2007; 2010-2030 tonnages based on a per capita waste generation rate of 3,311 pounds/year as reported by 2006 Materials Recovery Report for Marion County, ODEQ.
[41] Ibid.

Table 2-14 - Waste Per Capita, Marion County (Tons)[42]

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Generated	2,293	2,338	2,466	2,413	2,489	2,678	2,770	2,697	2,875	3,191	3,311	3,216
Disposed	1,648	1,680	1,714	1,635	1,552	1,347	1,360	1,430	1,512	1,608	1,607	1,591
Recovered	645	658	752	778	937	1,331	1,410	1,267	1,364	1,582	1,704	1,625

Figure 2-9 - Waste Per Capita, Marion County (Tons)[43]



Using this historic waste generation, disposal, and recovery information along with these forecasting predictions, Marion County can adequately plan their solid waste management system to handle future quantities of materials.

[42] 2006 and 2007 ODEQ Materials Recovery Report, Marion County
[43] Ibid.

3. WASTE PREVENTION/REDUCTION/ REUSE AND RECYCLING ANALYSIS

3.1 Introduction

Since the 2002 SWMP, Marion County's Waste Reduction, Reuse, and Recycling programs have continued to expand. Components of the Countywide waste prevention and recycling program are discussed in the following sections. After a description of existing programs, further program needs and opportunities in Marion County are evaluated. Techniques to address needs in three categories are then investigated: increased participation in existing programs, expanded services to underserved sectors, and increased recycling of specific materials. Within each category, specific areas are identified that can be targeted for greater waste reduction, reuse and recycling.

3.2 Background

In keeping with the Solid Waste Program's mission to provide the customers of Marion County with an environmentally responsible and cost effective system for reduction and disposal of solid waste, through quality services, education, and public involvement, PWES has implemented a multi-faceted, comprehensive recycling and waste reduction program in cooperation with franchised haulers, incorporated cities, and private recyclers. The program satisfies the requirements of the 1991 Oregon Recycling Act (Senate Bill 66) and the 1997 changes and additions, codified in Oregon Administrative Rules (OAR 340-090-0040). Since the inception of PWES's program, the amount of waste recycled has grown steadily. Marion County's recovery rate has grown to 56.5% in 2007. This is computed by adding the reported rate of recycled materials (50.5%) with the applied credits for implementing various waste prevention/reuse/residential composting programs (6%). Marion County's 2006 recovery rate, calculated at 57.5%, surpassed the ODEQ goal of 37% by 2005 and the 2007 rate is already ahead of the 54% required by 2009 (including the 2%-each waste reduction, reuse, and residential composting credits given by the state).

Table 3-1 shows the County's historical quantities of waste reported as recycled over the past five years. The totals found in Table 3-1 combine the annual materials reported to PWES from the curbside programs, commercial recycling, recycling depots, and transfer stations. Some materials directly recycled by waste generators (i.e. not collected by franchised haulers and/or not taken to County transfer stations) are not reported to PWES but are reported directly to the ODEQ. These quantities are not included in Table 3-1.

These differences in reporting account for the discrepancy between the total materials recycled in Table 3-1 and waste recovered in Table 2-11 in Chapter 2. The amount of materials for 2007 listed in Table 3-1 (110,282 tons) includes only those that are received by Marion County facilities or handled by franchised haulers; the quantity listed in Table 2-11 in Chapter 2 (252,555 tons) also includes materials recycled directly by organizations as reported to ODEQ.

Table 3-1 - Recycled Material Tonnage Reported to Marion County[1]

Collected for Recycling by Franchised Haulers[2]	2002 Tons	2003 Tons	2004 Tons	2005 Tons	2006 Tons	2007 Tons
Commingled Recyclables[3]	8,503	16,005	17,692	17,880	19,273	20,196
Newspaper/ Magazines	4,540	1,533	1,652	1,305	1,040	984
Cardboard	10,651	9,934	9,826	9,671	9,432	10,075
Glass[4]	1,295	1,004	1,597	1,592	1,607	1,759
Tin/Aluminum[5]	520	195	142	83	45	91
Used Oil[6]	309	395	342	347	305	283
Hi-Grade Paper	720	285	269	571	374	344
Scrap Metal	13,322	11,448	12,107	10,793	9,346	9,772
Lead-Acid Batteries	42	69	76	77	79	66
Consumer Batteries	26	43	42	50	28	77
Electronics[7]	280	241	349	462	492	469
Mixed Waste Paper	619	567	544	201	16	0
Tires	294	290	314	345	387	481
Wood	10,773	10,500	13,140	18,607	18,737	19,228
Yard Debris	35,482	36,938	47,700	44,986	44,207	44,308
Plastics	337	114	95	86	123	197
Paint	111	106	47	139	184	198
Other	1,292	1,313	605	2,406	2,688	1,754
Total	**89,116**	**90,980**	**106,539**	**109,601**	**108,363**	**110,282**

1 Source: Marion County PWES 2006 and 2007 Annual Reports.

2 Combined tonnages from Residential Curbside Recycling collection programs, Commercial collections, Recycling Depots, and Transfer Stations.

3 Commingled Recyclables consist of the typical single-family curbside recyclable materials collected by the franchised hauler system of: containers such as tin/ cans; aluminum cans and foil; rigid plastics #1-#7 including bottles, tubs, and tub lids; and paper fiber materials of newspaper; magazines; corrugated cardboard; greyboard/paperboard/boxboard; books; and other mixed paper.

4 Glass includes bottles and jars collected curbside, from commercial customers, and from drop-off sites at transfer stations.

5 Tin/Aluminum includes cans, foil, and trays collected from commercial customers and drop-off sites at transfer stations.

6 Used Oil includes material collected curbside and from drop-off sites at transfer stations.

7 Electronics material did not include televisions, microwaves, and printer/fax/copiers until January 2008.

It is noted that several material categories reported less tonnage in 2006 than in the prior 2005 or 2004 quantities; the reasons for this are likely variable. Material categories originally collected separately, such as newspaper/magazines, cardboard, tin/aluminum, plastics, hi-grade paper, and mixed waste paper are now collected from single-family households in the Commingled Recyclables category. The tonnages for these categories reported on the County's Annual Report only reflect quantities of material collected from transfer station drop off sites or segregated commercial collections at businesses. It is also possible that generators have transitioned their collection services to private, non-franchised haulers for these materials and thus, the County does not receive data on these tonnages recycled. (However, the ODEQ report does capture these quantities.) Some commodities like newspapers are decreasing as news is shifting to electronic media. Other material categories, such as consumer batteries and used oil, are only shipped periodically and data are only reported when a shipment is made; therefore, material could be stockpiled and shipped after an annual report is created, showing a lower amount of material from that time period. Lastly, materials, such as scrap metal, have sometimes

enjoyed high market prices and may not be deposited in the County's recycling system as in the past, but rather would be sold directly to market by individual generators or scavengers.

3.3 Existing Waste Reduction and Reuse Programs

Oregon has established waste generation 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, in 2001 the Oregon State Legislature passed ORS 459A.010 that established the following statewide waste generation goals:

- For calendar 2005 and subsequent years, there will be no annual increase in per capita MSW generation.
- For calendar 2009 and subsequent years, there will be no annual increase in total MSW generation.

These goals attempt to stop both the growth in per capita (per person) 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 programs and education to affect the Waste Generation Rate within its borders

3.3.1 Waste Reduction Programs

Reduction of solid waste generated by residents and commercial establishments is a priority of the County's solid waste management program. This is reflected in the objectives adopted in this 2009 SWMP, which should be used to establish priorities.

The objectives pertaining to waste reduction, reuse and recycling are as follows:

- To provide an integrated solid waste management system that achieves an effective combination of strategies and programs guided by the principles adopted in the state hierarchy: reduce waste at the source, reuse and recycle materials, compost, recover energy, and land disposal.
- To continue educating consumers in order to promote practices and methods to reduce the long-term per capita waste generation and seek, through community outreach, a cooperative spirit to assume individual responsibility to prevent waste.
- To promote an approach for managing solid waste that supports continuation of building a more sustainable future.
- To develop programs and support implementation of facilities that seek to ensure materials recovered from the waste stream attain the highest and best use and are recycled.

In keeping with these objectives, the County, cities and franchised haulers have implemented several waste reduction initiatives described below.

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

Enlisting the public in waste recovery efforts is key to program participation and success, providing businesses and citizens with the information necessary to fully understand and properly use the recycling services available to them. Through partnerships with local businesses, franchised haulers, and citizen volunteers, PWES has developed a solid waste education outreach, promotion, and advertising program for recycling, composting and other waste reduction methods. The existing program provides information to citizens, teachers and students, businesses and institutions, and community groups. The following is a list of the various programs and services that have been instituted:

Key Educational Programs

- School presentations by a full-time Recycling Educator and qualified volunteers.
- Master Recycler/Composter program classes with graduate certification and enlistment into a cadre of trained volunteers.
- Green Building classes, including publication of a Sustainable Construction Guide.
- Salem/Keizer Green School Program.
- EarthWISE program providing resource efficiency audits and certifications for businesses desiring to identify waste reduction and recycling opportunities and achievements, as well as environmentally preferable purchasing, energy and water conservation and other sustainable practices.
- College scholarships and internships to facilitate the education of more individuals in the field of solid waste management and waste reduction.
- Resource library of books, videos, and lesson plans on various waste reduction, recycling, and composting topics.
- Working with Mid-Valley Garbage & Recycling Association on development and distribution of recycling education and promotional materials.

Key Promotional Programs

- Distributions of “Waste Matters,” a multi-page tabloid newsletter filled with recycling, waste reduction, composting, and general solid waste information, to all County residences twice a year.
- Support of Allied Waste’s self-guided nature walk “Earthwalk” at the SKRTS with educational exhibits on reused and recycled content materials, waste reduction, recycling, and composting.
- Regular public service announcements and news stories broadcasts via television and radio.
- A regularly updated website which outlines the County’s comprehensive Recycling Program (http://www.co.marion.or.us/PW/ES/).
- A website dedicated to providing locations for disposal and/or recycling options for a wide variety of materials (http://apps.co.marion.or.us/Recycle/).
- Sponsorship of a Recycler of the Year Contest, recognizing outstanding individuals and programs.
- Recycle Art Calendar Contest at area schools.
- Promotion of business paper recycling through the Saturated Collection of Office Paper (SCOOP) program run by Garten.

- Support of perpetual recycling collection station for polystyrene (styrofoam) at local Fresh Start Market to augment County's periodic collection events.
- Promotion of non-County run reuse and recycling programs including:
  - Goodwill Industries' drop-off sites throughout Marion County.
  - St. Vincent de Paul collections of reusable items at SKRTS.
  - Habitat for Humanity ReStore construction materials reuse store.
  - Christmas tree recycling collections by church and scout groups.
  - Promotion of Recycling Drop-off Depots operated by private recycling businesses.

Key Customer Services Programs

- A recycling hotline, sponsored by Mid-Valley Garbage & Recycling Association to provide residents with the latest waste prevention and recycling information. In Salem: (503) 390-4000. Toll free outside of Salem: (877) 390-4001.
- An informational website, sponsored by Mid-Valley Garbage & Recycling Association to provide residents with the latest waste prevention and recycling information (www.mrtrashrecycle.com).
- Compost demonstration sites at selected locations throughout the County.
- Sponsorship of compost bin sales at truckload events.
- Publication of a Waste Reduction & Disposal User Guide with information on various aspects of the solid waste management system in the County.
- Lending of recycling collection bins for private events or community functions.

PWES's education, promotion and services program is a comprehensive approach that has demonstrated effective results in advancing the overall strategy to reduce waste. By working with franchised haulers, it targets all generators of waste while continuing to educate future generations about the methods and means for reducing wastes. For instance, Garten is planning to add expanded services in 2009.

3.3.1.2 Purchasing and Production Practices

The County has implemented its own Environmentally Preferable Purchasing Policy for use by County departments. In addition, to demonstrate their own commitment to closing the recycling loop, the County ensured that the Courthouse Square Government office building, completed in 2000, incorporated products with recycled content into the design, as well as recovered as much material as possible during the construction. The building achieved a Bronze rating, based on the U.S. Building Council's LEED Green Building Rating System. To further promote green building practices and the use of recycled content materials in construction projects, PWES offers "Green Building" classes to builders, engineers, architects, building managers and the general public.

3.3.1.3 Commercial Programs

Commercial waste audits can be a valuable tool for businesses to recognize areas where they can improve and increase their recycling efforts, streamline processes, eliminate waste generation, and save money on waste disposal. PWES offers free technical assistance to businesses in the County including efforts such as conducting business waste audits. Franchised haulers in the County also provide waste audit services similar to those offered by PWES.

In addition to commercial waste audits, for 2007, PWES developed and implemented a comprehensive business environmental assistance and certification program called Earth Workplace Initiative for Sustainable Enterprise (EarthWISE) targeting the focus areas of recycling, waste reduction and prevention, environmentally preferable purchasing, energy efficiency and conservation, water conservation and pollution prevention, and outreach and education. PWES staff report working on assessments with over 60 businesses in the last year. Businesses passing the assessment become EarthWISE-certified and are publicly recognized for their green practices, including a listing on the program's website and a window sticker. At present, there are over a dozen EarthWISE-certified businesses, and the County demonstrated leadership by assessing and certifying its own PWES.

Garten, in conjunction with Marion County and franchised waste collection companies, has developed the SCOOP program. This program was created to increase office paper recycling by educating businesses about recycling, providing alternatives for recycling pick-ups, and designing a recycling program that best fits the individual business. The franchised haulers provides outside containers and collects the paper. The paper is then taken to Garten where it is graded, sorted, packed, and shipped to various mills for recycling. Confidential document destruction services for paper, plastic and electronic media are also available.

3.3.1.4 Electronics Recycling

Oregon E-Cycles, established by Oregon's Electronics Recycling Law (ORS 459A.300.365), is a new statewide program that provides responsible recycling for computers, monitors and TVs. The program is financed by electronics manufacturers and jointly implemented with the ODEQ. Oregon E-Cycles is an example of product stewardship. Product stewardship directs everyone involved in the life cycle of a product to take shared responsibility for the impacts to our health and environment that result from the production, use and end-of-life management of the product.

Beginning January 1, 2009, electronics manufacturers are required to provide responsible recycling for computers, monitors and TVs at no cost to anyone bringing seven or fewer items to a participating Oregon collector at one time. However, households, small businesses and small non-profits may recycle more than seven at a time. These entities are requested to call ahead if they plan on bringing more than the seven item limit. Effective January 1, 2010, computers, monitors and TVs are banned from disposal in Oregon. Garten is state certified to receive these materials under this program.

Garten and other participating organizations also collect additional types of electronics not covered by Oregon's Electronic Recycling Law and higher volumes of the covered electronic devices than required by the law.

3.3.1.5 Home Composting

PWES operates a home composting promotion program. The objective of this program is to encourage residents to compost yard waste on their property rather than place that material at curbside for collection. Each year PWES sells compost bins to its residents in a "truckload" sale; in 2007, PWES sold over 1,000 compost bins at its May sale. Classes and literature on composting are available through PWES, as well as free technical assistance from the recycling staff.

PWES promotes "grasscycling," or leaving grass clippings on the lawn, as a waste reduction method. The practice is promoted through the distribution of literature and electronic media published by the PWES and at composting education classes.

3.3.2 Reuse Programs

PWES promotes and facilitates the donation of materials to non-profit groups for reuse and recycling. County recycling literature suggests the donation option and provides referral information for non-profit groups seeking reusable materials. PWES promotes buying, donating or selling used items at thrift stores as a way of giving items a new life. Some of these stores include: Goodwill Industries, Humane Society Shop, St. Vincent De Paul Store, Salvation Army Thrift Store, the Union Gospel Mission Store, Value Village, and the Habitat for Humanity ReStore for construction materials. These organizations accept or sell such items as: clothing, appliances, furniture and other household products. Most of these organizations support on-the-job training programs or provide funds to charitable organizations or causes. Additionally, a trailer for reusable items is sited by St. Vincent de Paul in the recycling area at SKRTS.

3.3.3 Recycling Programs

PWES and its partners are committed to providing residents with convenient, cost-effective, quality recycling services, which exceed the State recycling goals. This task is best accomplished through partnerships with the waste generators, the recycling community, the franchised haulers and the cities; these groups continue to educate and motivate residents and businesses to voluntarily reduce, reuse and recycle their wastes. PWES and the franchised haulers have implemented several recycling initiatives consisting of residential curbside collections, multi-family recycling, commercial recycling, drop-off facilities, special waste collections, and tire and agricultural waste recycling.

3.3.3.1 Residential Curbside Recycling Collections

Curbside collection of designated recyclable materials is provided for all single-family homes in all but one of the cities and suburban areas of Marion County; this city maintains recycling drop-off depot services only. In some communities, materials are collected separated, while other jurisdictions subscribe to commingled or mixed (also called single-stream) recycling systems. Although collection frequency, container size and type, and setout instructions vary, materials handled are uniform.

Residents may recycle standard curbside recycling items such as:

- Aluminum (foil, trays and cans)
- Corrugated Cardboard
- Greyboard (paperboard/boxboard)
- Magazines
- Mixed Waste Paper
- Newspaper
- Rigid Plastic Containers (any #1-7 container such as tubs, trays and bottles)
- Plastic Milk Jugs
- Glass Bottles & Jars
- Tin/Steel Cans
- Small Scrap Metal

All programs require glass bottles & jars to be separated from standard recyclables for segregated collection. In addition, the Marion County program supports curbside collection of specialty recyclables:

- Household Batteries.
- Motor Oil
- Cooking Oil
- Latex Paint

Many franchised haulers offer the option for residents to contract only for curbside recycling services and elect to self-haul their own wastes. Curbside Yard Waste collection is also available to residents of many communities in a specialized container. Variable rates for waste collection provide residents some incentive to reduce or recover certain materials.

Commingled collections of recyclables, where materials are mixed together in one container, occur in or are planned for several cities throughout Marion County. Various commingled curbside recycling programs will typically offer a manually-collected bin/basket or a larger automated cart. Separated curbside recycling programs will use the manual bin/basket and ask residents to separate materials in paper bags within or next to the bin/basket. Specialty recycling is provided in the manual bin/basket. Some jurisdictions offer the automated cart for standard commingled recycling and the manual bin/basket for specialty recyclables. The automated cart units can be lifted and dumped using vehicle equipment, rather than requiring manual labor handling, preventing worker injuries and handling more materials for less cost. Most communities have implemented automated curbside collection of wastes as well.

More communities have implemented commingled collection programs, moving away from the source separated method. This makes it much easier for these households to recycle, thus increasing the participation rate. By doing so, the amount of recycled material is increased. PWES supports expansion of commingled recycling to other cities of the County.

3.3.3.2 Multi-family Housing Recycling

PWES also promotes multi-family housing recycling programs. Most multi-family housing units are in city jurisdictions and therefore not governed by County programs. Franchised haulers are available to provide recycling collection at the multi-family housing locations however; participation in multi-family recycling programs is not as high as desired. This is likely due to limited environmental commitment on the part of property management, frequent management turnover, and the transient nature, cultural diversity, and lifestyle of tenants, as well as possible space constraints for collection containers and perceived program costs. Both franchised hauler representatives and PWES staff consider this sector an opportunity for additional diversion as well as a continuing challenge. Starting in 2008, PWES is piloting additional multi-family recycling program efforts with an AmeriCorps Volunteer as the Program Specialist. This full-time employee will spend approximately 70% of time on expanding the multi-family recycling program, by working with apartment managers, residents, and the franchised haulers to develop an education and outreach plan.

3.3.3.3 Commercial Recycling

In Marion County, commercial trash collection is franchised by the cities, but commercial recycling is outside of the cities' franchise system and is arranged between the generator and franchised hauler. Each of the eight franchise companies that make up the Mid-Valley

Garbage & Recycling Association offer commercial recycling collection to their refuse customers as well as providing stand-alone recycling services. Wastes from some industrial customers may also be accepted, as long as they meet the criteria of MSW.

Many businesses in Marion County have a recycling program, even though it is not mandatory. The number of businesses recycling and the materials being collected varies from business to business and area of the County. Haulers work with businesses to specifically design a program that accommodates their needs. Haulers offer variable collection container services, ranging from 90-gallon roll carts to 40-50 yard drop boxes (also known as roll-off containers). Typically, drop box service is offered to construction businesses to collect recyclable materials such as: scrap lumber, scrap metal, corrugated cardboard, 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.

PWES is not able to easily quantify how much recyclable material is being collected directly from businesses as most franchised haulers have routes combining collection from both residential and business customers. PWES does, however, use print, television, and radio advertising to continually promote business recycling.

There appears to be more opportunity to expand commercial recycling efforts and many of the necessary elements are in place. There is a desire by PWES and the franchised haulers to recycle more commercial waste. Also, Mid-Valley Garbage & Recycling Association has constructed a material recovery facility for construction materials and dry waste that is capable of increasing recycling processing levels and expanding to meet future demand.

However, as mentioned previously, the County only has the authority to develop and implement programs in the unincorporated areas. The support of each local jurisdiction is needed in order to implement upgraded commercial recycling in the area.

3.3.3.4 Drop-off Facilities

To augment curbside collection, there are recycling depots throughout the County where citizens may drop off designated recyclable materials. These facilities, for the most part, are operated and serviced by the local franchised haulers, and the County has marked them with green and white “Recycling” signs to aid the public in locating them. The recycling depot operators, locations, and materials accepted are as follows[1]:

Allied Waste of Marion County (Silverton)
830 McClaine St., Silverton
Open for Recycling: Saturdays Only, 9 - 5
Accepted Materials: Appliances, Cardboard, Glass Bottles & Jars, Latex Paint, Magazines, Motor Oil, Newspaper, Rigid Plastic Bottles/Containers/Trays/ Tubs #1-7, Plastic Milk Jugs, Scrap Metal, Tin & Aluminum.

[1] Source: Marion County Public Works Environmental Services promotional publications, website, and personal communications with staff, 2008.

Allied Waste of Marion County (Woodburn)
2215 N. Front St., Woodburn
Open for Recycling: Monday through Friday, 8 - 5
Accepted Materials: Appliances, Cardboard, Glass Bottles & Jars, Greyboard, Latex Paint, Magazines, Motor Oil, Newspaper, Rigid Plastic Bottles/Containers/ Trays/Tubs #1-7, Plastic Milk Jugs, Scrap Metal, and Tin & Aluminum.

Clayton-Ward Recycling Center
3500 Mainline Dr NE, Salem
Open for Recycling: Monday through Friday, 7 - 5,
Saturday - 7 - 3
Accepted Materials: Cardboard, Glass Bottles & Jars, Greyboard, Magazines, Motor Oil, Newspaper, Office Paper, Mixed Scrap Paper, Plastic Milk Jugs, Scrap Metal, Tires, Tin & Aluminum, Wood Waste, and Yard Waste.

D&O Garbage Service, Inc.
1140 Boone Road SE, Salem
Open for Recycling: 7 days per week, 24 hours per day.
Accepted Materials: Aluminum Cans/Foil/Trays, Cardboard, Glass Bottle & Jars, Magazines, Newspaper, Plastic Bottles/Containers/Trays/Tubs #1–7, Plastic Milk Jugs, Scrap Metal, and Tin Cans.

Garten Services, Inc.
3334 Industrial Way NE, Salem
Open for Recycling: 7 days per week, 24 hours per day.
Accepted Materials: Household Aluminum including Cans, Trays, and Foil, Cardboard, Glass Bottles & Jars, Greyboard, Newspapers, Magazines, Mixed Paper/Junk Mail, Phone Books, Office Paper, Plastic Milk Jugs, Computers/Electronics, Rigid Plastic Bottles/Containers/Trays/Tubs #1-7, and Tin Cans

Loren's Sanitary Service, Inc.
1141 Chemewa Road N, North Keizer
Open for Recycling: 7 days per week, 24 hours per day.
Accepted Materials: Appliances, Cardboard, Glass Bottles & Jars, Greyboard, Latex Paint, Magazines, Motor Oil, Newspaper, Rigid Plastic Bottles/Containers/Trays/Tubs #1-7, Plastic Milk Jugs, Scrap Metal, Tin & Aluminum.

Marion Recycling Center, Inc.
3680 Brooklake Road NE, Brooks
Open for Recycling: Monday through Friday, 7 - 3
Accepted Materials: Cardboard, Glass Bottles & Jars, Greyboard, Magazines, Mixed Scrap Paper, Newspaper, Office Paper, Rigid Plastic Bottles/Containers/Trays/Tubs #1-7, Plastic Milk Jugs, Tin & Aluminum.

North Marion County Disposal Facility (NMCDF)
17827 Whitney Lane NE, Woodburn
Open for Recycling: Monday through Saturday, 8 – 5, closed major holidays.
Accepted Materials: Appliances, Car Batteries, Cardboard, Cell Phones, Dry Cell Batteries, Electronics including Computers, Eyeglasses, Glass Bottles & Jars, Hearing Aids, Latex Paint, Magazines, Mixed Scrap Paper, Motor Oil, Newspaper, Plastic Bags, Rigid Plastic Bottles/Containers/Trays/Tubs #1-7, Plastic Milk Jugs, Printer Cartridges, Scrap Metal, Tin & Aluminum, Tires, Yard Waste.

Pacific Sanitation, Inc.
3475 Blossom Drive NE, Salem
Open for Recycling: 7 days per week, 24 hours per day.
Accepted Materials: Cardboard, Glass Bottles & Jars, Greyboard, Latex Paint, Magazines, Mixed Scrap Paper, Motor Oil, Newspaper, Office Paper, Rigid Plastic Bottles/Containers/Trays/Tubs #1-7, Plastic Milk Jugs, Scrap Metal, Tin & Aluminum.

Regis High School
550 W. Regis, Stayton
Open for Recycling: 7 days per week, 24 hours per day.
Accepted Materials: Newspaper Only.

Salem/Keizer Recycling & Transfer Station (SKRTS)
3250 Deer Park Road SE, Salem
Open for Recycling: 7 days per week, 8 – 5, closed major holidays.
Accepted Materials: Appliances, Car Batteries, Cardboard, Cell Phones, Computer Components/Electronics, Dry Cell Batteries, Eyeglasses, Firewood (Cordwood), Fluorescent Tubes/Mercury Lamps, Glass Bottles & Jars, Greyboard, Hearing Aids, Latex Paint, Magazines, Mercury Thermometers, Milk/Juice Cartons/Drink Boxes, Mixed Scrap Paper, Motor Oil, Newspaper, Office Paper, Rigid Plastic Bottles/Containers/Trays/Tubs #1-7, Plastic Bags, Plastic Milk Jugs, Printer Cartridges, Telephone Books, Scrap Metal, Tin & Aluminum, Tires, St. Vincent DePaul Donations of Clothing and Furniture, Wood Waste, and Yard Waste.

Suburban Garbage Service, Inc.
6075 State St., Salem
Open for Recycling: 7 days per week, 24 hours per day.
Accepted Materials: Cardboard, Glass Bottles & Jars, Greyboard, Magazines, Mixed Scrap Paper, Motor Oil, Newspaper, Rigid Plastic Bottles/Containers/Trays/Tubs #1-7, Plastic Milk Jugs, Scrap Metal, Tin & Aluminum.

Valley Recycling & Disposal, Inc.
2515 Salem-Dallas Highway NW, Salem
Open for Recycling: 7 days per week, 24 hours per day.
Accepted Materials: Cardboard, Glass Bottles & Jars, Magazines, Motor Oil, Newspaper, Rigid Plastic Bottles/Containers/Trays/Tubs #1-7, Plastic Milk Jugs, Tin & Aluminum.

In addition to the drop-off centers, the franchised hauler companies sponsor other efforts and events aimed at collecting source-separated materials. At present, there are nearly 20 container locations throughout Marion County, including businesses and schools, for a newspaper and magazine collection program. A direct donation from the sale of recyclables in this high-profile "DARE to RECYCLE" program helps to fund the Drug Abuse Resistance Education (DARE) program, a public-safety program designed to help keep children off of drugs. There are also some recycling drop-off centers in the County that are not affiliated with the franchisees, including Clayton-Ward Recycling Center and Garten in Salem. The franchised haulers heavily support Garten, which serves people with disabilities through curbside recycling and other areas of the local recycling industry.

3.3.3.5 Special Waste Collections

There are several programs for collection/drop-off of "special wastes" in Marion County, targeting specific materials for diversion/recycling.

- Latex Paint – Marion County is reportedly the only program in the country collecting latex paint through the city curbside recycling collections by local franchised haulers. Household quantity for collection is limited to two cans per week. In addition, latex paint is accepted at several of the recycling drop-off facilities operated by area haulers. Collected latex paint is blended and processed into reusable paint and provided in five-gallon buckets. It is marketed free-of-charge on a first-come basis at SKRTS and NMCDF as an undercoat to cover graffiti, and the effort has been named the "Paint Back" program. Any leftover quantity at the end of the year is discarded (via burning at WTEF), as material is not stored in a temperature controlled environment over the winter.

- PVC Plastics – Each year in April, in conjunction with Earth Day celebrations, PWES hosts a PVC plastics collection event. Material is accepted free-of-charge at either the recycling center at SKRTS, NMCDF, or BI, staff arranges for recycling of recyclable PVC items and safely disposes of the remainder. The 2007 PVC disposal day yielded about 19.5 tons, a 33% increase from the previous year.[2]

- Green Waste – Green waste (yard, garden, wood waste, and leaves), is collected curbside in many communities as well as accepted at SKRTS, NMCDF, and BI. Materials collected curbside and at the County transfer stations are transported to CO in Aumsville, where they are made into compost, mulch, or hog fuel products. Material delivered to BI is composted and utilized back on public projects such as various city and County parks.

- Food Waste – A small portion of pre-consumer food waste from manufacturing is currently diverted to small-scale composting at CO in Aumsville. Food waste materials may include:

    - Fruit and vegetable scraps
    - Waxed cardboard
    - Coffee grounds
    - Coffee filters

    With the implementation of new ODEQ composting site regulations, CO anticipates increasing the amounts and types of food wastes accepted for composting in the near future.

- Electronics Recycling – As of January 2008, Marion County has expanded their partnership with Garten to include recycling of a wider variety of consumer electronics including: televisions, microwaves, photocopy machines, computers/laptops, electronics peripherals (mouse, keyboard, speakers, etc.), printers, printer cartridges, cell phones/PDAs, stereos/portable music players, VCR/DVD players, telephones, cameras, video camera. Items are accepted at the SKRTS, NMCDF, or directly at Garten for recycling.

[2] 2007 Marion County PWES Annual Report.

Oregon's Electronics Recycling Law enacted in 2007 (House Bill 2626) creates and finances a statewide collection, transportation, and recycling system for desktop computers, portable computers, monitors, and televisions (deemed 'covered electronic devices' or CEDs). Manufacturers of CEDs sold or offered for sale in Oregon must either manage their own collection and recycling programs under a plan approved by ODEQ or participate in the State contractor program established under this new law. These programs must use environmentally sound management practices for the collection, transportation, and recycling of CEDs. "Environmentally sound management practices" are defined as: Practices that comply with all applicable laws, including but not limited to adequate record keeping, tracking the fate of recycled materials, performance audits and inspections, provisions for reuse and refurbishment, compliance with worker health and safety requirements, maintaining liability insurance and financial assurances. As this law experiences implementation, a system of more coordinated electronics recycling opportunities should become available to Marion County residents.

- Fluorescent/Mercury-Containing Light Bulb Recycling – Residents can take up to 10 residential fluorescent or mercury/containing lamps to the SKRTS and drop them off for recycling at no charge. In addition, lamps are accepted at the permanent Household Hazardous Waste (HHW) facility at SKRTS during operating hours and periodic events.

- Household Hazardous Waste (HHW) – In early 2005, Marion County opened a permanent HHW Collection Facility co-located with SKRTS and operated by a private hazardous waste services contractor. On each Thursday and the 1st and 3rd Saturdays of every month, residents of Marion County can drop off HHW materials free of charge. As a cooperative effort between Marion and Polk Counties, residents of Polk County may also use the location free of charge. In addition, ODEQ has entered into an agreement whereby PWES can be reimbursed for residents of any Oregon county utilizing the facility for HHW material. Business materials are also accepted at the facility by the HHW contractor. A cost is assessed for commercial materials except for mercury-containing devices, such as thermostats, switches and thermometers, the reimbursement of which is covered by an ODEQ program. In addition to general promotional information on toxics reduction, PWES also sponsors and funds HHW collection events in outlying communities of the County through an intergovernmental agreement with Polk and Yamhill counties. Rotating through various cities and towns, PWES plans to phase Marion County event schedules from yearly to every other year, based on a reduction in participation as residents clean out stockpiled materials and utilize the permanent HHW facility.

- Mercury Thermometers – In 1999, Marion County initiated a mercury thermometer exchange program, allowing residents to exchange their mercury-containing thermometers for a new digital thermometer at SKRTS and at periodic HHW collection events. Use of the program has diminished in recent years as many households have already exchanged old thermometers and now own digital thermometers. PWES sends the mercury thermometers collected through this program for recycling.

- Polystyrene #6 Plastics ("Styrofoam") – PWES advertises and promotes periodic polystyrene collection event days, targeting packing block and meat/egg tray foam products. They partner with a private recycler of the material for the truckload quantity received at the event(s). Recently, CO obtained a densifier for the material

and transports the foam product to their Portland, Oregon location for processing. Due to overwhelming success and demand for an increasing number of these periodic collection events, PWES staff and CO have devised a year-round collection program at the Salem location of Fresh Start Market.

- Eyeglasses/Hearing Aids – PWES partners with Lions Clubs' *Gift of Sight* program, collecting reusable eyeglasses and hearing aids at both of the County transfer stations for distribution worldwide to needy recipients.

- Appliances – Unwanted appliances are accepted for scrap metal recycling at the SKRTS and NMCDF. There is a charge to citizens for this service.

- Plastic Bags – Since 2007, plastic bags such as those used in grocery stores, dry cleaners, and/or newspaper delivery are collected in receptacles at the NMCDF and SKRTS transfer stations through a PWES partnership with Agri-Plas, Inc. a local plastics recycler handling multiple types of plastics.

- Cooking Oil – In support of local biodiesel refineries and as an effort to reduce the amount of liquid in wastes, Marion County accepts used cooking oil for recycling. Residents can bring used cooking oil, in clear, closed containers, to the recycling drop-off centers at SKRTS and NMCDF. In addition, as of February 2009, the Mid-Valley Garbage & Recycling Association franchised haulers of Marion County announced expansion of their specialty curbside recycling collection services to also include used cooking oil, making it likely the first program in the country to collect this material directly from households.

In addition to these specialty materials programs and opportunities, Marion County's website hosts a Recycle Page which allows users to select from an extensive list of materials to recycle/dispose and then returns names of locations which accept the materials for recycling and/or disposal. Public opportunities as well as private business recycling locations are cited as resources.

3.3.3.6 Other Waste Recycling

Agricultural Plastic Wastes

Agri-Plas, Inc. is a privately owned agricultural plastics product recycling venture located in Brooks, Oregon. Agri-Plas recycles agricultural plastics from farming and nursery operations, such as nursery pots and trays, ground cover, seed and fertilizer sacks, plastic binder twine, triple-rinsed pesticide containers and greenhouse film, as well as quantities of other industrial, commercial, or household plastics. Many of the materials which Agri-Plas handles are not accepted by conventional recycling facilities and have traditionally been burned or buried. Materials are sorted and processed (including hand cleaning, grinding, and aspirating) on site, then shipped to manufacturers. Agri-Plas is committed to utilizing domestic markets for product whenever possible. In 2000, Agri-Plas received a startup grant from Marion County in the amount of $50,000. In 2002, they received an additional $33,000 grant from the County, funding an education position traveling to nurseries and teaching staff how to properly sort materials and prepare them for shipment to the recycling facility. ODEQ has also provided funding assistance, showing the needs and benefits of financial assistance to recycling businesses.

The recycled plastic materials are used in manufacturing a number of products, including nursery pots, seed bags, and filler for bitumen roofing. In 2006, Agri-Plas accepted and recycled approximately 15,600,000 pounds of plastic.[3] This amounts to 7,800 tons of material per year. It is possible that more plastic materials could be received and processed at Agri-Plas if the facilities were expanded and more people in the industry were educated about the service.

Lately, Agri-Plas has partnered with Plas2Fuel, a Kelso, Washington company, to turn dirty, low-value and typically non-recycled plastics back into crude oil. Through use of proprietary plastic-to-oil converting units, Agri-Plas has created synthetic crude oil from these plastics and shipped it to an area refinery for further processing. Their future plans include additional conversion units and facility expansion, possibly increasing the local and regional market for otherwise non-recyclable plastics.

Scrap Metal

WTEF extracts ferrous metals from incoming waste and resulting ash via an electronic magnet. Revenues received from the sale of metal recovered at the Covanta Marion facility is shared among Covanta and PWES. In addition, plans are being considered to recover non-ferrous metals at the WTEF.

Tires

PWES accepts tires for recycling at the SKRTS and NMCDF. There is a fee for this service which varies depending on the size and use of the tire and whether or not it has been removed from the metal rim. Allied Waste of Marion County hauls tires collected at County transfer stations for recycling.

As of 1999, there had been a decline in tire recycling in Oregon, while over half the tires disposed and nearly half those recovered in Oregon were from neighboring states. In 2001, a Task Force on Tire Recycling was established by the Governor to investigate markets for tire recycling. In October 2002, their recommendations included establishing a scrap tire recovery goal for Oregon-generated tires of 60% by 2006 and 80% by 2009.[4] Although bills were introduced in the 2003 Legislative session attempting to establish similar goals, no state-wide tire recovery initiative has been implemented in Oregon to date. Recovery of tires is calculated as a portion of the County's overall recycling target rate.

3.3.4 Composting

As a result of the 1995 SWMP, the County established a yard debris and wood waste compost program. From 1995 to 2000, the amount of material recovered grew from less than 10,000 tons to more than 40,000 tons. This increase was accomplished through the efforts of the County, working in conjunction with franchised haulers and the cities, to implement curbside collection of yard waste. In 2007, the County reportedly diverted over 63,000 tons of wood waste and yard debris combined.

CO, in cooperation with PWES, expanded their compost operation to assist in processing the additional material generated by collecting curbside yard waste. They operate under an

[3] www.agriplasinc.com, Agri-Plas, Inc. website "About Us" page, viewed April 2008.
[4] *Oregon Tire Recycling Report,* Oregon State Legislature, Task Force on Tire Recycling, October 2002.

ODEQ commercial composting permit on a 10-acre site within the city limits of Aumsville. The facility processed around 67,000 tons of yard debris and wood waste in 2007.

In addition, a four-acre composting area was developed adjacent to BI Demolition Landfill in southwest Salem and opened in December 2000. BI primarily accepts yard debris collected during city cleanups held throughout the year, but also receives some yard waste from local park clean-ups. All material received is from public sources; no private citizen or business yard waste is accepted. The BI site manager composts the material in windrows, and a majority of the compost material produced at the facility is utilized by municipal operations on parks and other public facilities. Material is not available publicly. Any surplus material not utilized by public operations is sold in bulk each year to make way for the new batch of compost.

Summary

Marion County staff, along with franchised haulers, private recyclers, and city governments, manages a vast array of Waste Reduction, Reuse, and Recycling programs. With the depth and breadth of Marion County's existing efforts, staff encounters challenges in creating new diversion programs. However, as population increases in the County, continued vigilance in current and new areas of recovery will be needed for the County to achieve the local and state-wide goals for recovery as well as per capita waste generation.

3.4 Needs and Opportunities

The State of Oregon has set a state wide target to not increase levels of per capita waste generation in 2005 and through subsequent years. (ORS 459A.010). Marion County's per capita waste generation rate for 2004 was calculated at 2,875 pounds per capita. The ODEQ reports that average waste per capita generated in 2007 increased 11.9% to 3,216[5]. The increase in the per capita waste generation rate is a result of many factors outside the control of the County. These include such things as consumer buying habits, packaging and marketing of products, and the overall economy. Even so the County needs to continue to explore alternatives to produce effective strategies in promotion and education to reduce per capita waste generation and meet the State-wide target. Over the last decade new approaches, like Community-Based Social Marketing, have emerged as an effective alternative for delivering programs to foster sustainable behavior including waste reduction. The five steps of Community-Based Social Marketing are: selecting behaviors, identifying barriers, developing strategies, conducting a pilot, and broad scale implementation. This strategy has shown to be effective in both waste reduction as well as waste diversion efforts.

The State of Oregon has also set Marion County's targeted recovery rate at 54% by 2009. To maintain at least the 2007 calculated recovery rate of 56.5% and assure achievement of the 2009 goal, the County must sustain current recycling levels while striving to seek growth in the amount of targeted materials recovered. The PWES program must include the following:

- Continue to receive the available 2% credits by maintaining comprehensive Waste Prevention, Reuse and Residential Composting promotion and education programs, for a 6% total credit to the County's Recovery Rate.

[5] ODEQ, 2007 DEQ Materials Recovery Report – Marion County

- Continue to budget sufficient funds and dedicate resources at current levels or better in order to execute the programs.
- Increase participation levels in current programs and services.
- Continue to research and develop innovative services to customers that present the greatest potential to reduce the amount of waste generated per capita and to increase the amount of recovered materials.

Based on discussions with County staff, franchised haulers, and other private recycling system participants and from research of other programs in selected communities, there are several specific areas that could contribute to meeting the recovery rate goal. These areas are:

- Increase participation in residential curbside recycling collection programs.
- Further evaluate recycling opportunities with multi-family housing.
- Increase opportunities to recycle more material from commercial generators.
- Examine markets or market development for recyclable materials currently in the waste stream.
- Explore the application of Community Based Social Marketing to waste reduction, reuse and recycling efforts in the County.

Expanding commingled residential curbside recycling collection into areas currently serviced by separated collection or drop-off only services could encourage increased recycling participation. Commingled collections are easier on residents, as they are not required to separate the materials they set out for recycling, and higher participation is expected in areas with existing programs of separated recycling. In addition, utilizing the larger, automated cart containers rather than smaller bin/basket containers will allow residents to include more volume of collected materials and enable efficient automated collections. Labels on cart lids will provide constant reminder and consistent education of program parameters and assist with participation and compliance, further boosting recovery.

Other tools are available that may be used to increase waste recovery rates including pay-as-you-throw (PAYT) or other rate incentive programs and government mandates. PAYT and rate incentive waste programs raise awareness among individuals on the cost of waste collection and disposal and the available recycling alternatives. Government mandates could increase recycling participation by penalizing customers for non-compliance with recycling requirements. The County generally prefers to use incentive-based programs, rather than regulatory programs, however.

Multi-family housing recycling is limited in Marion County. In some places, multi-family housing units have centralized areas where recycled materials can be deposited, but many multi-family units have no on-site facilities. Currently, the County is working with property management companies that want to provide an opportunity to recycle for their residents through coordination with franchised haulers. In most cases, multi-family residents must use recycling drop-off centers to dispose of their recyclables. Participation in recycling by multi-family residents can be increased by implementing a program that is on-site and convenient for multi-family residents. Assistance from franchised haulers is needed to create an affordable and consistent program, coupled with education, to ensure participation and compliance.

Other recycling programs that can be expanded include business recycling, food waste composting, and construction, demolition and land-clearing debris material recycling. Garten and the franchised haulers are soliciting and facilitating the set up of business recycling

programs in multi-tenant facilities requiring the coordination of many different entities. It is operated under the name of "SCOOP". This program, and others like it, could be expanded to increase recycling in the commercial sector. The CO facility receives and processes all of the curbside yard waste collected by franchised haulers in Marion County as well as any yard waste delivered to SKRTS. However, they receive very little Marion County food waste for composting. Food waste represents over 21%, or more than 52,000 tons of County waste destined for disposal. CO may eventually have capacity to accept more of this material for composting. Alternately, other business ventures may be interested in providing this service as they do for other jurisdictions in the northwest. Since disposal costs at out-of-County landfills are less than facilities in the County-wide system, some C/D waste material is leaving the County. Recycling could be increased by processing these materials at County owned or in-County located facilities.

Participation and recycling rate increases may result from program improvements that simplify the process, reduce the cost to recycle the material, and/or otherwise provide incentives for participants to recycle. Certain cities and their franchised haulers have already started initiatives, such as commingled collection of recyclables, which are expected to increase waste quantities diverted to recycling. The County must also continue to promote waste reduction programs where residents are educated on the use of improved packaging, nontoxic household products, and reusable products.

3.5 Alternatives for Increased Waste Reduction, Reuse, and Recycling

The County and waste/recycling franchised haulers continue to provide comprehensive waste reduction and recycling programs and services that exceed the goals provided by the State. It also must consider ways to increase effectiveness of reducing waste generations. The system faces even more challenges to maintain current waste generation levels while implementing programs and services which continue to reduce waste going to disposal sites.

There are several opportunities whereby the County can achieve gains in waste reduction, reuse, and recycling. The following alternatives are discussed as methods to increase participation and recover more materials. The alternatives are aimed at increasing the effectiveness of preventing waste generation and growing the recycling rate from the 2007 level of 50.5%. Buy-in, cooperation, and assistance from each of the incorporated jurisdictions in the County are needed to ensure successful and seamless implementation of any County-wide programmatic changes or additions.

3.5.1 Enhance Current Promotion/Education/Support Services

As indicated, the County has many active, successful, well-run programs operating currently, in cooperation with local franchised haulers and processors. Utilizing existing efforts and infrastructure to the fullest extent possible will continue to increase tonnage diversion. However, improved results are needed to meet the State's per capita waste reduction goals. One new method suggested is "Community-Based Social Marketing." It is recommended that the County explore these strategies in further advancing waste reduction, reuse and recycling efforts. The five steps of community-based social marketing are: selecting behaviors, identifying barriers, developing strategies, conducting a pilot, and broad scale implementation. Further research and development of these techniques hold the best promise of helping the County meet the State's per capita waste reduction goals.

3.5.1.1 Increase Coordinated Education Efforts

Education that complements community values is the single most important element in an effort to increase waste recovery. Without implementing or changing programs, citizens can be fully informed on aspects of all new, current, ongoing, periodic, and changing recycling programs and opportunities, providing them the knowledge to participate properly. When this education is crafted to complement or address the community values, progress is imminent. A recycling program as mature as Marion County's is could not have thrived this long and performed so well without education and advertisement efforts that have hit a responsive chord. However, as the community and its needs have grown and changed, educational elements and strategies may be required to come together to react to needs and complement other services. There has not been a thorough review or performance evaluation done lately to determine if existing efforts are the most effective means of informing and educating generators. In addition, new ways of reaching consumers have been developed which may not be fully utilized within the current program.

An evaluation and overhaul of all existing educational efforts and how they address social behavior is important. Complementing this research with targeted visual advertising as well as any media sources and other appearances, would assist in creating a single program "image" which helps foster resident and business' "brand recognition" of the County's award-winning recycling program. The County could undertake this effort in-house, using the additional staff member recently added to the program, or engage a third party to review the overall program. An appraisal is needed to determine whether Community-Based Social Marketing or alternative means of outreach could be more productive or efficient in reaching targeted audiences, freeing staff to run programs while generators have the information and stimulus they need to affect desired results.

3.5.1.2 Enhance Commercial Recycling

Working through the EarthWISE program, coordinating with the franchised haulers and incorporated jurisdictions, and through the principles used in Community-Based Social Marketing, the County could attempt to determine what barriers may exist in diverting additional tonnages for businesses not currently recycling or not able to utilize services for full recovery. Depending on materials and quantities generated, businesses could be connected with current markets or new services may need to be explored.

This program may include EarthWISE certification and/or additional waste audits to inform generators on how their waste stream may be source separated to provide recycling opportunities. Waste audits can be useful in building or modifying collection routes for certain commercial business discard materials in order to provide recycle-rich loads. These loads can then be delivered to a facility like the MRRF for processing and reclamation of materials.

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 program(s). Once a service has been shown 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 the County resources and the franchised haulers as well as cooperation from businesses. It is anticipated that the new

County staff position will be available to assist in business outreach for possible new waste collection program efforts.

3.5.1.3 Upgrade Special Events Recycling Program

Providing waste reduction and recycling opportunities and programs at public or private special events can be a boost to reduce waste and the 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 total public awareness campaign. The current practice of lending County-owned recycling containers, signage, and training to local festivals and events provides 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. Garten was awarded an ODEQ/Marion County grant (effective in March 2009) to complement these County event recycling services and loaned equipment. 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 or Garten could assist in planning standard recycling and/or composting collection systems for these events. Planning for event recycling requires understanding of vendor flexibility in the use of recyclable or compostable packaging and wares. It is anticipated that a portion of County's staff currently dedicated to special events recycling coordination could be reduced by Garten's entry into this field.

3.5.1.4 Continue Waste Reduction/Recycling Grants

The grant program has been a part of the Marion County recycling promotion and education program for many years. It has generally been successful in helping enthusiastic generators implement new recycling programs including providing capital to purchase bins or other tools and equipment.

Past funding for County-sponsored Waste Reduction/Recycling Grants provided to worthy community projects or businesses was available from the revenue generated from a surcharge on medical waste disposed at the WTEF from sources outside Marion County. In addition to grants, these monies fund part of a recycling education staff position in the Salem/Keizer School District. The County has set a cap on the amount of medical waste that can be received from outside sources; thus, funds to support continuation of these grant programs are limited. Securing grant funds allows continuation of this grass-roots program, spurring the community to devise workable solutions to waste recovery. Funding based on a reduced stream of optional waste will not provide consistent monies with which to grant new ideas. The Waste Reduction/Recycling Grant program could be effective in helping to start up programs for select generators even if the level of funding were less than in previous years. In fact, although the County budgeted over $100,000 per year for the program, the budget was never fully expended, based on applications received and projects proposed. A smaller budget, possibly with per-grant graduated limits, could still provide opportunity to several waste reduction and/or recycling projects.

A consumer-driven program, such as these grants, is a proactive element for increasing waste reduction and recycling awareness and programs which does not require a major commitment of County staff resources to operate. Evaluation of projects, initial seed

monies to spur the effort, and periodic reporting and verification (which can also be used in publicity) can provide years of waste diversion for enthusiastic, guaranteed participants in a commercial recycling program, which the County may never have known was desired or possible without the grant application.

3.5.1.5 Consider Upgrade of Polyvinylchloride (PVC) and/or Polystyrene Collection Events to be Permanent

By assessing the amount of material collected and staff time spent to organize and run periodic events, the County could determine if permanent recycling for these materials would be more cost-effective and result in higher diversion. With the recent success of the polystyrene collections and market developments for local polystyrene recycling, coordination may be possible to provide year-round service for this material. Early discussions between the County and vendors lead to the initial establishment of a (currently) permanent collection location for polystyrene at the Salem Fresh Start Market. Use of this service by the public, maintenance by the location, and contractor availability to accept and market this recyclable material will need to be monitored to assess the sustainability of this recent implementation. Establishing a permanent collection program has two benefits: it provides a direct, ongoing diversion of these materials for recycling and collection helps to expand awareness of the entire County waste reduction/recycling program.

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

Another strategy for increasing the recycling recovery rate is to target certain types of generators to take advantage of existing diversion and collection services. The effort places a demand on education and awareness but does not require significant investment in new equipment or facilities. Also, the programs are targeting materials that already have stable collection routes and markets.

3.5.2.1 Expand Residential Curbside Services

Since completion of the 2002 SWMP, curbside collection of commingled recycled materials has been implemented throughout most of the County. Every city but one offers curbside collection of recycled materials, whether mixed or separated. In addition, many urbanized areas (County areas within the urban growth boundary) also have residential curbside recycling services. Some of the franchised haulers have reported set out rates of 70% or more in their service areas. However, there are reportedly some pockets of residential developments which may not be provided with this service or may not be aware of the option to engage the service, given the proper procedures. Franchised haulers reportedly promote the services, but there is no verification of how well the overall curbside recycling program is performing. The recycling rates as well as the data assembled from ODEQ suggest the curbside collection program is fairly successful for those currently serviced.

Now that curbside collection of residential recyclables has been operating for several years, it seems reasonable to review the overall performance to determine if there are ways to enhance it via opportunities such as: getting more customers to participate on existing routes, identifying areas where services might be expanded, and increasing tonnage of set-outs from existing participant households. Over the next few years, the County, working with the franchised haulers, could look to providing as much collection coverage to the service area as possible. In addition, targeted promotion and education programs can be

provided to increase participation. Since the infrastructure already exists, and if a slight increase in participation can be achieved, perhaps a 2% to 4% increase in the recycling rate could be realized through these efforts.

3.5.2.2 Increase Multi-family Housing Recycling Program

The County and franchised haulers have attempted to capture recyclable materials at multi-family housing such as apartments, condominiums, and townhomes. Currently, the County has embarked on a pilot study with a select number of multi-family housing to determine how a program can best be implemented and sustained. As discussed earlier in this chapter, there are many factors that create challenges to recycling at multi-family housing and it will take a commitment of all parties to make the program successful. Some ideas include:

- Form committees with local government, franchised haulers, and owners and/or property managers to develop a recycling program which includes some type of incentive to encourage participation and discourage non-participation.
- Develop promotion/education programs for residents of multi-family housing.
- Consider ordinances to require development review/space planning or mandatory recycling opportunities for certain materials.

The pilot program currently underway can help to develop information and data to determine how existing obstacles to increased recycling in multi-family housing can be overcome. By obtaining data on how waste can be recovered as well as determining the infrastructure requirements to make recycling at multi-family units more efficient, a coordinated program can be established that provides a direct benefit or incentive for multi-family housing residents to participate. Once developed, a full-scale multi-family recycling program will require additional staff management, marketing, and education time by County or franchised hauler personnel.

3.5.2.3 Promote Increased Diversion of Electronic Devices from the Waste Stream

Continue to promote and expand opportunities for the public and businesses to effectively reduce, reuse or recycle their electronic devices. With the recent State-wide regulations on electronics recycling, continue to focus on the ease of collection at authorized collection locations throughout the County and specialized collection services when possible. Promoting these services can assist in the necessary diversion of electronic devices which often contain hazardous or toxic materials

3.5.2.4 Provide More Reuse Diversion Opportunities

Expanding on the current reuse opportunity sites and local programs available could increase the amount of material diverted from disposal. Enhancing the current St. Vincent De Paul reuse trailer program at SKRTS to include NMCDF is a step in providing more “one-stop-shopping” at each of the County transfer facilities. In addition, continued coordination and promotion of other reuse community groups and opportunities, such as Habitat for Humanity ReStore, Goodwill Industries, other local charity and profit thrift stores, Freecycle.org, and NW Materials Mart may provide a method to mobilize the public to divert more materials for reuse. If reusable construction materials were targeted, this effort may also feed an increasing demand to provide Green/Sustainable design features into new construction or renovation, in conjunction with the County’s Green Building educational program. Even requesting voluntary reporting by these reuse businesses would assist the

County in quantifying the extent of these efforts and allow data to be included in annual reporting to the State of tonnages diverted from disposal, possibly noting additional recovery not previously calculated.

3.5.3 Target Recovery of New Materials

The diverse County-wide recycling program includes a comprehensive approach to collect and recover much of the materials from residential and commercial businesses. The current collection programs target those materials that have stable markets. These primarily include various types of waste paper, old corrugated cardboard, rigid plastics (bottles/containers/trays/tubs #1-7), glass bottles & jars, and metals. Organic materials such as yard debris and woody waste are also recycled. Considering that these materials will continue to be collected and recycled, another strategy to increase the recycling rate is to target other materials for collection and diversion. The following represent some alternatives that are aimed at recovering other materials with specific programs.

3.5.3.1 Divert More Dry Waste Materials for Processing at MRRF

The MRRF has the capacity to process more material. The facility accepts about 250 tons per day and can adequately process this material within regular operating hours. Diversion of more C/D, and commercial waste to this facility should be pursued. The materials could be collected at transfer stations such SKRTS or NMCDF and transported to the MRRF. Likewise rate incentives could be used to encourage delivery of clean loads that can be processed at MRRF. If sufficient materials can be generated, the MRRF could add a shift or ultimately be expanded with additional equipment to process the increase of materials.

3.5.3.2 Direct More Plastics to Agri-Plas

Plastics were identified in Chapter 2 as a material that could increase diversion to recycling if markets are found. One potential market for otherwise difficult-to-recycle material is Agri-Plas. Dialogue and planning would be needed among the County, franchised haulers, and Agri-Plas to determine if they can be allowed to accept more materials of the same or different types currently delivered to their Brooks facility. Although they are a unique market for atypical recyclable plastics, the facility is also currently limited, via public entity policy, in the amount of standard recyclable plastics containers (mostly beverage containers) it can process. Repeal of this restriction could provide economies enabling Agri-Plas to handle an increased amount of the various plastics they handle now or expansion to new types. In addition, anticipated advances in their processing capabilities as well as the recently implemented Plas2Fuel process, generating crude oil out of low-grade plastics, may lead to additional material capacity which would benefit from increased allowance of material to be processed for diversion.

3.5.3.3 Implement Food Waste Recycling Program(s)

The implementation of food waste recycling program(s) could have the most dramatic impact on the County's recycling rate. It appears that very little food waste composting is currently being conducted. While current efforts could be incrementally expanded and pilot programs could be initialized, a full-scale food waste program cannot be fully implemented until a stable processor and market(s) have been established. Therefore, any new program(s) will need to be implemented with various steps over a number of years to achieve maximum results and program stability. Programs could include food rescue, composting, and/or providing the material as feed on hog farms, depending on Oregon

regulations and local agriculture practices. Large quantity commercial generators of food waste would be targeted first, with potential residential curbside collection of food wastes incorporated at a future time, depending on stability of processors and markets and staff time available for education and implementation.

3.5.3.4 Consider a Textile Recycling Program

One material not currently targeted by Marion County's program is textiles, consisting mainly of used clothing or fabric scraps from manufacturers, industry, and residents. Whereas some clothing is destined for reuse through thrift organizations such as St. Vincent De Paul's, other material is only suitable for recycling. Franchised haulers may be available in the area for textile recycling collections, depending on the structure of a possible program. Alternately, the County could encourage larger generators or processors of the material to work directly with textile recycling service providers. Further research is needed to determine potential quantities and sources of used textiles, whether textile recycling companies currently operating in the region have interest in servicing Marion County, and what type of arrangements are needed to create collection opportunities among businesses, franchised haulers, residents, and other service providers.

3.5.3.5 Investigate Asphalt Shingle Recycling or Increased Recovery

Asphalt shingles are currently disposed by the cubic yard at BI or by the ton at the WTEF. While the County does receive recovery credit for some of the quantity of asphalt roofing shingles disposed at the WTEF as recovered energy, the recycling of this material could increase the County's overall diversion tonnage. At this time, asphalt shingle recycling markets and processes are developing in the region, and the County may be able to take advantage of pilot or fledgling programs by segregating some materials from disposal.

3.6 Recommendations

The list of recommendations for the 2009 SWMP considers the fact that the County has instituted a comprehensive waste reduction and recycling strategy that includes many programs and services. Major investments have been made in equipment, facilities, and human resources to implement this program and ensure its success. However, it is also recognized that there is much that needs to be done to reverse trends in the up-to-recently increasing waste generation rates per capita. When considering the range of alternatives presented in this chapter, it is important to recognize that considerable investment has been made in existing services and programs. Many of the services and programs have evolved to meet the current needs of the system while others may be marginally effective. It will be necessary to target new generators to take advantage of existing and new programs and select those materials that offer the greatest potential for recovery. But the overall waste reduction/reuse/recycling program in the County needs to include innovative ways to decrease waste generation rates and increase diversion through reuse and recycling. The application of social science/behavioral change strategies may be needed to take the County to the next level of excellence.

With the ever-changing means of communicating and with extended uses of the internet there are many new methods available for informing, communicating and promoting key programs and services. Many companies throughout the country are now revamping marketing strategies and more efficient means to communicate with existing customers and more importantly expanding on market share. These same methods or means can be considered as part of the County's solid waste program. In re-assessing the current

programs new and more effective means to enlighten generators of waste the value of reducing or preventing waste and increase their participation to reuse and recycle those materials to reduce waste that must be disposed.

Recommendation 3.1: Evaluate current waste reduction and recycling programs (WR/R) for the purposes of determining services needed to maintain and increase the recycling rate. This should include replacing or adding programs aimed at reducing the per capita waste generation rate in Marion County.

Rationale for Recommendation: Marion County has a mature and well funded waste reduction and recycling promotion and education program. Through the combined efforts of the County staff, franchised haulers, and businesses, this program has developed to be quite successful in creating awareness and promoting the overall message of waste prevention and recycling services. With growing access to internet services and increased use of technology it would be desirable to assess the current WR/R programs and determine what changes to these programs could be implemented. The objectives would be to increase consumer awareness on means to prevent waste, promote waste reduction and recycling and increase participation in WR/R services.

Recommendation 3.2: Conduct an assessment of the Residential Curbside Recycling Program and determine ways to increase participation in services.

Rationale for Recommendation: The curbside recycling program has been nearly fully implemented throughout the County and has been operating for several years. It is appropriate to review the performance of each of these collection areas in order to determine if there are ways to increase participation of current residents, entice new participants in existing areas, or expand service to other areas. In addition, a comprehensive assessment could help determine whether a uniform program, throughout all jurisdictions in the County, could enable more diversion through standardization of collection information, containers, and services. By completing this assessment, the County and the service providers can then determine if targeted programs for education and promotion should be implemented, whether there are additional areas that could be served by these collections, or if programmatic changes could be implemented. Such an effort can only help to verify the success of the program and identify if certain adjustments are needed to increase the amount recovered through the residential curbside recycling collection program.

Recommendation 3.3: Complete the Pilot Study for Multi-family Housing Recycling to determine what programs and services can be implemented to provide for an effective method to recover more materials from this source.

Rationale for Recommendation: Implementing a comprehensive multi-family collection recycling program has many obstacles. However, it can provide nearly as much residential recyclable material per capita, or more, than typical curbside programs. The pilot program currently underway by the County is one means to gain information and determine the best parameters for effectiveness of such a program. By completing this pilot program, the County, franchised haulers, owners/property managers, management companies, and residents of multi-family housing can be better informed on how to cost-effectively provide these services and determine essential elements for successful programs. If successful methods can be demonstrated through this pilot program, it is possible that the ability to expand the program to other multi-family housing could be accomplished. This program will utilize the resources of the County staff to lead the effort, monitor the results, and ensure

the completion of the pilot program so data can be utilized for further multi-family recycling program analysis and creation.

Recommendation 3.4: Evaluate the collection and processing alternatives to determine the best approach for expanding Commercial recycling programs and opportunities.

Rationale for Recommendation: Working with interested businesses, franchised haulers, and disposal locations, County staff, under the EarthWISE business sustainability program, can identify opportunities for waste diversion from commercial generators of recyclable materials. Method of sector selection can vary, such as: targeting specific materials with existing markets and franchised haulers, marketing services and information to kindred businesses of those already recycling successfully, or focusing on a large-generator area based on geographic location (such as service area and retail/industrial cluster). Identification of sector businesses to approach with enhanced information on recycling program services available will lead to additional tonnages diverted. Promotion of success stories or best practices can recruit additional businesses with similar wastes, situations, or locations. Requiring reporting on discards from businesses would assist the County in providing information and outreach to interested businesses and large generators on services and programs available for waste diversion and recycling, potentially leading to financial savings. Coordination with all jurisdictions would be needed for successful report compilation.

Recommendation 3.5: Evaluate the feasibility of diverting drywall waste from BI.

Rationale for Recommendation: The County should investigate the potential to divert a portion or all of the drywall disposed at BI to existing markets. Currently, over 11,000 tons of drywall waste is disposed at BI each year. By practice, much drywall material is source separated in the construction process as drywall installation contractors typically handle their own wastes. In addition, some drywall material is sorted out from other construction discards at the MRRF, prior to delivery of desirable material to the WTEF. Much of this heavy drywall material is then delivered, by contractor or processor, to BI where it is disposed by the cubic yard. The WTEF is not interested in burning the material and collectors shy away from disposing of the heavy material by the ton. Thus, recyclable drywall material is already segregated from other materials and ready for redirection to recycling markets.

In recent years, new markets for this material have developed in the Portland/Vancouver area. The County should evaluate the feasibility to transport this material to these markets. As part of the evaluation it can consider the advantages of preserving capacity of BI for handling waste disposal during catastrophic events such as floods or high winds or for other, non-recyclable materials, since this is an intended purpose for the facility.

Recommendation 3.6: Re-evaluate the possibility to divert more dry waste material from SKRTS for processing at the MRRF.

Rationale for Recommendation: The MRRF has the ability to process additional materials from construction sources and the SKRTS operation. With this available capacity, it is important to address means to increase the material processed and increase the recovery rate.

Recommendation 3.7: Examine ways to expand food waste composting by establishing processing capabilities and a firm market or outlet for the material. Once a market has been established, consider methods to collect and divert more food waste for recycling.

Rationale for Recommendation: Based on Marion County's current recycling rate capture of food wastes offers perhaps the greatest opportunity to expand into new materials for recycling and accomplish a much higher recovery rate. As mature programs search for new materials to divert, food waste provides a visible amount of tonnage among discards. Currently, there are an estimated 52,000 tons of food and organic waste generated in the County that are disposed. Some of the material is likely kitchen fry oil/grease waste destined for new biodiesel markets. As the material has gained market value, a once nuisance waste product has become profitable. While curbside yard debris collections in some jurisdictions do allow "fruit and vegetable scraps from garden, waxed cardboard, coffee filters and grounds," to be included in the cart destined for composting, those participating are likely providing a very small fraction of the food waste stream. However, there may be greater opportunities to expand food waste recycling on a larger scale. Other municipalities in the region, with guaranteed processors and markets, have successfully added commercial and consumer food wastes to their curbside composting or specialty collection systems. To assure measurable and continued success, we recommend that the County embark on a multi-step process to expand this effort with such targeted increments as:

- Educating serving entities on food rescue operations.
- Fostering food recycling activities with existing compost franchised haulers, as allowed by newly implemented Oregon regulations.
- Quantifying food-based businesses with high volumes of readily compostable discards (generally not including dairy or meat materials), such as farmers markets, growers, breweries/wineries, and food processors.
- Approaching institutional generators and other large kitchen facilities to capture consolidated material from single source with low education/training needs.
- Assisting interested institutions with on-site composting projects via education, research, funding, and training.
- Recruit secondary wave of food-based businesses with smaller volumes of materials which must be more carefully managed (unpacking grocery wastes, segregation by customers, dairy/meat wastes included, etc.).
- Considering residential curbside collection of food wastes only after stable and successful full-scale composting can be accomplished for large generators and funding for intensive education as well as service can be sustained.

4. RECYCLING AND MATERIALS PROCESSING

4.1 Background and Existing Conditions

Since 2002, a key change in the solid waste system has been the implementation of new collection services. These collection services now require or encourage residents to separate recyclable materials and yard waste from normal garbage. Each household and even some businesses have multiple carts in which to place different materials. Then, each cart is collected separately and the waste or recyclables delivered to different facilities to be processed and/or sent to markets. As these collection programs have matured, so have the facilities that are in place to process and transport the materials to markets. The focus over this period has been on the residential collection services and less on commercial waste streams.

This Chapter reviews the current facilities in Marion County that receive and process materials for the purposes of recovering and marketing materials. Deficiencies for meeting future needs are identified and the existing infrastructure and capacity and capabilities for processing additional materials to increase materials recovery are evaluated. Recommendations relative to additional processing and materials recovery needs are presented.

4.1.1 Existing Collection and Processing

Under 1999 ORS, Marion County has the authority to franchise the collection, processing and marketing of recyclable materials. The control of waste transfer granted under ORS 459.125 is specific to Marion County. In general, local administrations in Oregon that manage solid waste (i.e., cities, counties, metropolitan service districts), including Marion County, are permitted to enter into agreements with state and local governments, or private parties under ORS 459.065.

Eight franchised haulers provide curbside collection services in Marion County. These collection companies formed the Mid-Valley Garbage & Recycling Association, a unique cooperative, providing collection services to single-family and multi-family housing, including curbside recycling and yard waste collection. The franchised haulers collect recyclables received at recycling depots (see Chapter 3) and provide pick-up of special items by request. Recyclables are processed at several facilities throughout the County and in cooperation with facilities outside of the County.

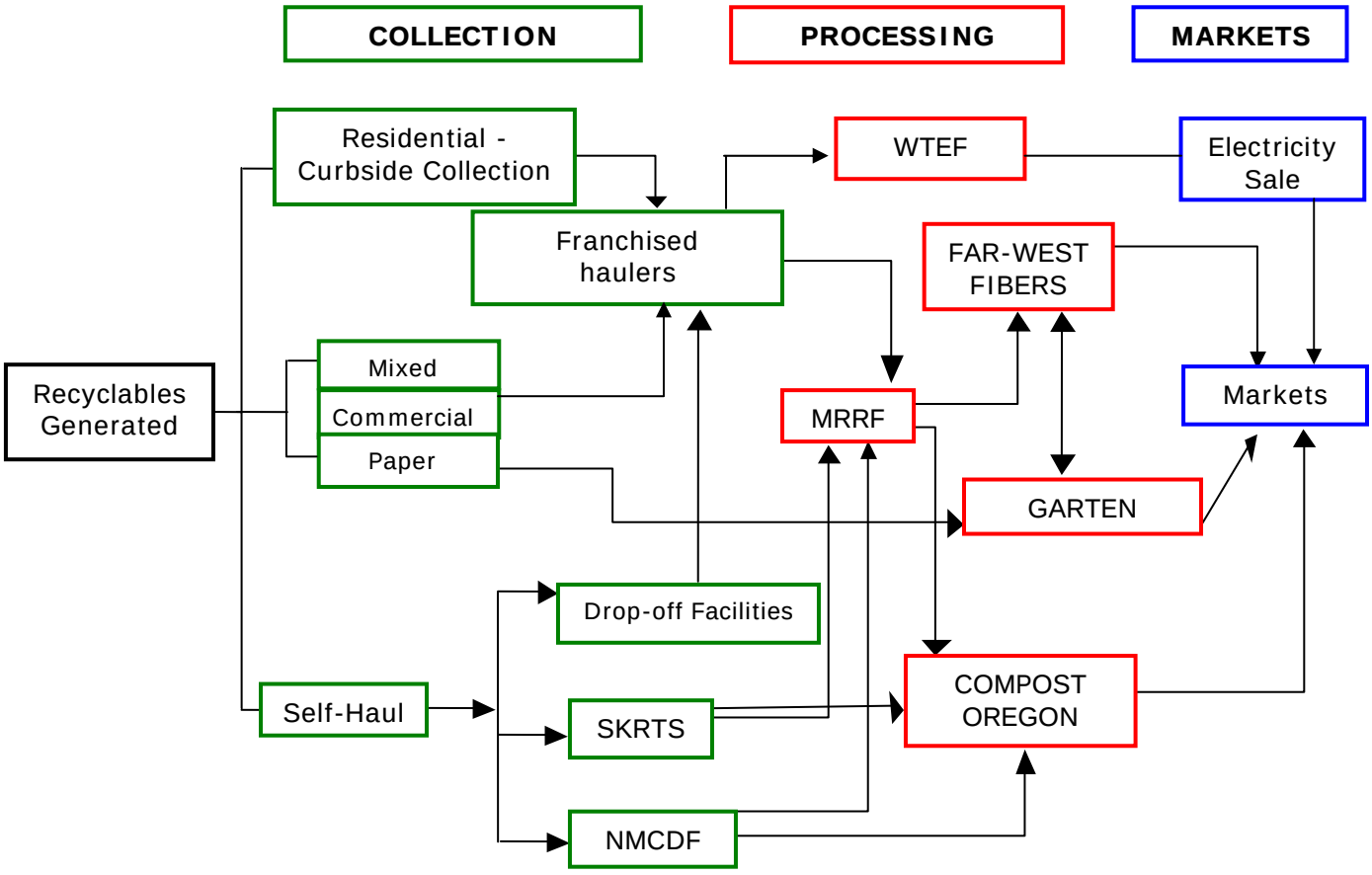
4.1.2 Collection and Processing Services

One of the stated goals of the SWMP is to provide services that meet the diverse needs of businesses and residences in urban and rural communities and 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 the households and businesses to participate in recycling, including:

- Curbside Collection – provided to most of the County
- Drop-off Centers – 13 different locations throughout the County
- Special Material Collection Events

These services are discussed in detail in Chapter 3. This section details the existing services for collecting recyclables and yard debris from businesses and residents and delivering them to facilities for processing. Figure 4-1 shows an Overview of the Processing/Recovery System and the flow of recyclables.

Figure 4-1 - Overview of Processing/Recovery System



In addition to these operations, there are other businesses that receive source-separated materials. These businesses process and transport materials to markets.

4.1.2.1 Commercial Waste Recycling

The recyclable material that is currently taken to processors is largely from curbside collection of residential materials in the County. Processing capacity for these residential materials is adequate within the system used by the County. However, there is limited collection and processing of commercial recyclables in Marion County. There are recyclables generated by businesses that are delivered to Garten, and some commercial loads high in recyclable content may be delivered to MRRF. However, there are no formal collection programs for these materials, and as such, there are limited processing capabilities in the County.

Recovery of recyclable materials from commercial waste represents an opportunity to increase recycling with minimal changes to the system. Commercial waste contains larger amounts of paper or fiber products. Certain businesses generate more than others. Some waste collection companies in other jurisdictions have formed special collection routes to pick up loads that are rich in paper products. These loads are delivered to materials recovery facilities for processing. Far West Fibers (FWF), for example, accepts commingled recyclable loads from certain haulers in Washington County, Oregon.

From data collected by ODEQ, representing waste disposed from Marion County, it is reported that over 36,000 tons of old newspaper, mixed paper and old corrugated cardboard (OCC) were discarded in 2005. The same study indicated most of this fiber was from commercial sources. The following table presents the breakdown of the commercial waste stream as sampled at disposal sites. It assumes that between 50% and 55% of the waste disposed is from commercial sources. Since the County disposed of about 250,000 tons in 2007, the amount of commercial waste is estimated to be 130,000 tons.

Table 4-1 - Marion County Estimated Commercial Waste Disposed 2005

Material	Subcategory	% in Waste	Tons	Tons
All Paper		23%		29,900
Plastics		13%		16,900
Organics		50%		65,000
	Yard Waste		5,200	
	Wood Waste		2,600	
	Food Waste		46,800	
Metal		5%		6,500
Glass		1%		1,300
Other Inorganic		8%		10,400
Total		**100%**		**130,000**

Source: ODEQ, Oregon Solid Waste Composition Study - Marion County Supplement (2006)

The quantity of material that may be recovered from the commercial waste stream cannot be determined without further evaluation. Specifically, it would be desirable to obtain more data on the areas with concentrated commercial businesses. It would then be necessary to determine ways to create high grade loads and provide efficient collection of these select customers. Once the collection system is in place, the material will need to be taken to a MRF for processing. This could be at the MRRF, or if loads are relatively clean, possibly at the Garten facility.

4.1.2.2 Recycling Drop-off Centers

The two main drop-off facilities for public source-separated recyclables (residential and commercial), are SKRTS in the southern part of Marion County and the NMCDF in northern Marion County are presented. There are several additional drop-off centers throughout the County to encourage public recycling participation (see Chapter 3 for information on these centers.)

4.1.2.3 Salem-Keizer Recycling & Transfer Station (SKRTS) is owned and operated by Allied/BFI, with the gatehouse functions operated by (and revenues collected by) the County. Source-separated materials are accepted from the public and segregated

for delivery to or pick-up by various, specialized, organizations for reuse or recycling. Segregated yard waste and wood waste is transported directly to CO for composting. Select recyclable material is transported to MRRF for further processing (see Processing Facilities, below). Table 4-2 shows the Summary of Material Flow from SKRTS over the period 2004-2007.

Table 4-2 - Summary of Material Flow from SKRTS

	Tons per Year			
	2004	**2005**	**2006**	**2007**
Total Waste Received	25,340	28,050	31,542	33,546
Transferred to WTEF	15,302	18,185	21,568	23,550
Transported for Processing	10,038	9,865	9,974	9,996
% Processed	39.60%	35.20%	31.60%	29.80%

Source: 2007 Annual Report, Marion County Department of Public Works, Environmental Services Division; supplemental data from Jeff Bickford, PWES Division Manager.

At this time, about 30% of the waste received at SKRTS is sent to MRRF for processing. Source-separated materials such as yard debris and wood waste are transported to CO. As displayed in Table 4-2 the amount of waste received at SKRTS has increased by 32% over the past four years. Assuming this trend continues, it may be necessary to make improvements at SKRTS to better handle increased traffic and the amount of waste delivered. Such improvements could result in transporting more materials to be processed. There is a limit of 10,000 tpy that SKRTS may take to MRRF. This limit was set to ensure sufficient material for the WTEF. However, the waste stream grows, (which it has) it would be desirable to revisit the limit, particularly if it is feasible to sort and recover more of this material.

4.1.2.4 North Marion County Disposal Facility (NMCDF) is owned and operated by Marion County. In 2007 there were about 10,000 tons of waste and recyclables received at this transfer station. Source-separated and commingled recyclable materials received from the public are transported to MRRF for further processing. Waste and non-recyclable materials are transported to the WTEF for incineration.

A significant expansion of the NMCDF, essentially doubling the facility capacity, has been completed. The expansion will provide for the separation of tipping areas and increased recovery of materials by better pre-sorting of garbage, yard debris, and demolition materials. This allows a greater amount of material to be diverted to MRRF for recycling.

4.1.3 Processing Facilities

Recyclables collected throughout the system are transported to various facilities for processing or consolidation and transferred to other processors. The primary facilities that receive and process materials are:

- Marion Resource Recovery Facility (MRRF) - located north of Salem west of I-5 at the Brooks exit
- Garten- located in Salem

- FW - Materials Recovery Facility located in Hillsboro, Oregon
- CO - located off Highway 22 in Aumsville
- BI Landfill - located in Salem (accepts yard debris from the City of Salem and County departments for composting)

For this SWMP update, "processing" of materials means sorting materials and removal of unwanted or dissimilar materials to recover a clean product for sale to a best-use market.

Marion Resource Recovery Facility (MRRF) is owned and operated by the Mid-Valley Garbage & Recycling Association, a cooperative of the eight franchised haulers in Marion County. The franchised haulers that own the MRRF are proactive in the community to promote waste reduction, reuse and recycling. They work closely with Marion County's staff to coordinate certain aspects of Marion County's recycling education program.

The facility is located west of I-5 off the Brooks exit on a 5.5 acre parcel with a 36,000 sq ft building that houses process equipment and a sorting line. The facility currently serves two primary functions. First, all commingled recyclable materials collected throughout the County are delivered to the facility. These materials are loaded into larger trailers and transported about 40 miles to FWF, a material recovery facility located in Hillsboro, in Washington County. At the FWF, the commingled stream is processed with equipment and sorters to separate the various materials to be sent to markets.

The second functions of MRRF is to process C/D waste material and select commercial loads for recovery of wood, metal and corrugated cardboard. MRRF reports that it can sort 150 to 200 tpd of C/D waste and select commercial loads at this facility using a single-shift operation. Certain high graded commercial loads may be delivered to MRRF if they contain large amounts of either corrugated cardboard, wood or paper products that can be readily recovered.

The facility layout allows trucks from the Association to dump onto a tipping floor where large bulky materials can be manually sorted. The remaining material is loaded onto a conveyor, and wood, corrugated cardboard, and metal can be sorted and marketed. The facility is set up primarily to process C/D waste and select high graded commercial waste. It may be possible to process different waste streams perhaps with certain equipment modifications. It is not currently capable of processing the commingled recyclable materials.

Table 4-3 presents a summary of the materials received at the MRRF and their destination upon receipt and processing from 2004 through 2007.

Table 4-3 - Summary Material Flow from MRRF

	(Tons per Year)			
	2004	**2005**	**2006**	**2007**
Total Received	60,255	63,670	69,825	71,757
Commingled - FWF	17,692	17,880	19,223	20,196
Processed	42,563	45,790	50,602	51,561
Residual - Coffin Butte Landfill	28,714	30,379	34,824	34,802
Residual - WTEF	2,807	135	632	304
Total Residual	31,521	30,514	35,456	35,106
Recovered/Recycled from Processed	10,229	11,287	12,525	14,715
% Recovered from Processed	23.40%	24.80%	25.00%	28.30%

Source: 2007 Annual Report, Marion County Department of Public Works, Environmental Services Division; supplemental data from Jeff Bickford, PWES Division Manager.

The facility recovers between 25% and 30% of the material that is processed. The primary materials recovered are wood waste (about 85%), metal (7%) and OCC (4%).

Other materials sorted include dry wall, concrete and rubble. MRRF operators report that the facility can process more materials. If necessary, a second shift to sort more material can be added.

In January 2002, Mid-Valley Garbage and Recycling Association entered into a ten-year agreement with FWF and Garten to process materials collected at the curbside. Residential commingled recyclables collected by franchised hauler trucks come to MRRF where they are reloaded for delivery to FWF for processing. In this capacity, the MRRF acts as a transfer station to consolidate materials for more efficient transport. Under the agreement, mixed paper sorted out of the commingled material at FWF is back-hauled to Garten for further processing for best-use marketability. The back-haul offsets the transportation cost of the commingled materials to the market areas of Portland.

This agreement is an excellent example of the sustainable business philosophy and practice of Marion County and the businesses involved with the County's waste management system. The past six years have proven this agreement beneficial for all the parties. Negotiations are currently underway to extend the agreement beyond 2012. This agreement, if extended, would provide the available capacity to process all recyclables generated in Marion County for several years. More importantly, the cooperative business environment reduces redundancy and the need to invest large amounts of capital to handle future volumes of recyclable materials.

Garten Services Inc. (Garten) is a private, not-for-profit organization providing many services to the community and work for adults with disabilities. Garten is the primary processor/marketer of recyclables from non-commingled collections throughout the County. Garten receives, grades, sorts, bales, and ships mill-ready recyclables through its 120,000-square foot processing facility. The facility receives materials in package lots and in bulk from throughout the County and the state, and has shipping access for eight trailers and four rail cars. Garten currently accepts, processes, and markets the following materials:

- Corrugated cardboard
- Newspaper
- Multiple grades of office and printing papers (including books and magazines)
- Mixed papers and paper packaging (including "greyboard," aseptics, and milk cartons)
- Plastic films (polyethylene).
- All clean, rigid plastic containers (bottles, tubs and trays)
- Aluminum and tin cans
- Color-separated glass containers
- Electronics to refurbish and recycle

Garten receives its recyclable materials from various sources. These sources include franchised haulers, private businesses, state and local government offices both inside and outside the County, smaller independent recyclers and franchised haulers throughout the state. Mixed office papers are received from FWF in a unique three-way partnership. Mixed paper is reloaded at the MRRF and efficiently transported to a FWF. A back-haul provides the Garten facility with mixed office papers that were collected in the Metro Region.

One of Garten's current efforts in Marion County is to expand the SCOOP program. This program was designed by the partnership between Garten, Marion County, and the franchised haulers to increase the amount of office paper being recycled by area businesses. The program provides the businesses with educational materials, containers, and collection service. Additionally, Garten has received a grant from Marion County to employ a sourcing representative to visit multi-tenant commercial establishments and encourage cooperation in developing a centralized pick up. This service is designed to coordinate route efficiency with the collection routes of the haulers that pick up the materials for delivery to Garten. The program features a total mixing of all paper grades in order to save space and increase convenience for the participant.

All paper delivered to Garten is processed to ensure the quality meets purchasing mill standards and then is shipped in unit loads directly to mills in Oregon, other areas in North America, and the Pacific Rim. Electronic recyclables delivered to Garten are also processed. Employees will dismantle computers and other E-waste bi-products to recover materials and to safely ship the residual to other markets for further processing and recovery.

Far Waste Fibers (FWF) in Hillsboro is a 67,000-square foot materials recovery facility opened in 1999.The facility has the capacity to process 12,000 tons of mixed recyclable material per month. The facility was built to respond to the changes in collection of recycled materials from source-separated to a commingled stream. As a result, the facility handles a significant amount of the commingled recyclable materials collected in the Portland area.

In 2007, Marion County shipped an average of 1,700 tons per month of residential commingled material to FWF. The facility has the capacity to process more materials if required. There are also several other materials recovery facilities in the Portland metropolitan area that could receive Marion County's materials if needed.

FWF has been in the recycling business since 1980 and has established market outlets for these materials. By sending the recovered materials from Marion County for processing at FWF, the County has secured the marketing of materials collected in Marion County. Garten

also benefits from this arrangement by processing and marketing all of the mixed paper products that are delivered to FWF.

Another important aspect of this arrangement is the overall marketing strategy used by FWF to re-sell recycled fiber to paper mills in Oregon and the northwest. Even though foreign markets may pay a slight premium for these materials, FWF believes supplying recycled fiber to local mills helps retain jobs locally and keeps the markets competitive. These goals are consistent with Marion County.

4.1.4 Yard Debris and Wood Waste Process Facilities

Over the past 10 years processing of yard debris and wood waste was managed by CO, formerly known as Wood Waste Reclamation. The main receiving and processing facility is located in Aumsville, Oregon. In January 2009, Norcal Waste Systems of San Francisco, Ca. (Norcal) purchased CO and will assume responsibility for the entire operations. On April 28, 2009 Norcal changed its corporate name to Recology. Recology is a full service waste management company providing collection, recycling, transfer, and disposal services. Recology is very experienced in compost operations including food waste composting. They currently operate four facilities throughout the State of California where they handle a variety of organic materials and successfully market the materials.

In assuming the ownership and operation of the Aumsville facility Recology plans to expand the composting marketing approach and to aggressively pursue the food waste composting. Over the past few years CO has pursued land use permits to allow for expanding the compost operations. With this process near completion, Recology, as the new owner, intends to prepare specific plans for the design of the process systems and equipment needed to meet the demands of handling a variety of organic materials.

In 2006 and 2007, CO processed an average 46,000 tpy. The breakdown of this tonnage is shown in Table 4-4.

Table 4-4 – Compost Oregon (CO)
Tonnage Statistics for Materials Received and Sources

Sources of Materials	2006	2007
Self Haul	2,625	2,378
Curbside	45,324	38,570
SKRTS	3,527	4,153
NMCDF	-0-	-0-
Special Events	480	576
Polk County	257	149
Total	**52,213**	**45,826**

Source: Beth Myers-Shenai, Marion County PWES Waste Reduction Coordinator, via email to Doug Drennen of JR Miller & Associates, 2/18/09 – data from Glen Zimmerman, Compost Oregon.

CO chips scrap wood from the private sector and ships the material to the Smurfit Mill in Newberg, Oregon to be used as fuel. CO now processes over 50,000 tons per year. To increase this throughput CO began accepting some green feedstock such as vegetative waste or produce waste. A number of franchised haulers have begun picking up such

vegetative food waste from select generators. CO plans to expand and modify its compost operation to accept all food waste, including meat and dairy products.

Most compost from the CO facility is sold to local retailers. In discussions with Norcal they plan to enhance the marketing strategy to ensure all materials are sold. Norcal has had good success with marketing food waste compost in the State of California and believes there are additional opportunities to market additional compost products in Oregon.

Brown's Island (BI) primary service is the County's disposal site for inert C/D materials. BI also composts wood waste and yard debris. Compostable materials received at the facility come from the Salem Parks Division clean-up projects as well as Christmas trees collected by groups in the City. Trucks delivering compostable materials from NMCDF to BI are loaded with finished compost, which is returned to NMCDF to be used as daily cover. The system is more efficient because trucks moving in both directions (to and away from the BI facility) transport material. Although most compostable material in the County is processed at CO, the BI facility is available in the event that additional composting services are needed.

Process and Recovery Center (PRC) is located 10 miles north of the City of Corvallis on Camp Adair Road, in Benton County. It is owned and operated by Valley Landfill, which also owns and operates the Coffin Butte Landfill. PRC was established in the early 1990's to provide communities an opportunity to recycle yard waste. The site is approximately 30 acres and has the capacity to triple its current volumes. PRC currently receives yard waste and wood products from the following Counties: Linn, Benton, Polk, Lincoln, and Marion. The site presently processes 30,000 tons of material; the majority is processed into compost and the remainder is ground into hog fuel. The site is permitted to accept green waste and pre-consumer food waste. Valley Landfill is actively pursuing permits for PRC to accept all food waste.

4.2 Needs and Opportunities

Since the adoption of the commingled collection system over five years ago, all of the key facilities needed to process and transport recyclable materials are in place. MRRF processes C/D waste and receives and transports commingled materials cost-effectively. Garten has continued to adapt to process mixed paper backhauled from the Portland area. It has also expanded its processing capabilities to handle different materials.

CO accepts and processes the majority of yard debris and wood waste generated in the County. It composts various types of organic materials and markets several end products. CO currently vegetative food wastes from select generators. CO is close to receiving land use approval to expand their process operation to add other food waste categories such as meats and dairy products. Once permitted and the facility is expanded acceptance of all food waste for composting can occur. At that time a program to collect and transport food waste can be developed. This could significantly increase diversion of organics generated in the County.

The Marion County system currently relies on the processing capacity of MRFs located in the Portland area. About 20,000 tons of materials from residential commingled collection program are sent to FWF for processing. With several large scale MRFs in the Portland area there is no shortage of capacity to process recyclables. Given the proximity to markets and

the cost to install and operate the necessary processing equipment, it appears to be the most cost effective strategy to utilize existing capacity.

Targeting the commercial waste stream to recover more recyclable materials represents an opportunity to increase the recycling rate. ODEQ reports that possibly as much as 75% of the commercial waste stream could be recycled. This does include a large amount of organics, which includes food waste. While this is a targeted waste stream, until a sufficient market can be developed for food waste, significant food waste diversion can't be achieved. However, considering paper, metal and plastics, possibly 30% of commercial waste could be recovered and recycled. Based on commercial waste data provided by ODEQ, it is estimated that 25,000 tons or more could be recovered from commercial generators not including food waste. To recover this material additional processing would be required.

4.3 Alternatives

Based on current recycling programs and collection practices the Marion County system has sufficient capacity to process and market recycled materials. The 2009 SWMP update has identified to waste streams that may have impacts to this system. First, there is the possibility to expand on the amount of materials recovered from commercial generators. The primary materials targeted include OCC, mixed paper, plastics, metal and yard debris / wood waste.

The second targeted material is food waste and other compostable organics. CO is actively pursuing the permits and plans for expanding the Aumsville facilities to accept of process these materials.

4.3.1 Processing Recyclable Materials

Assuming, Marion County in conjunction with franchise haulers and cities, proceed to implement a commercial collection system, there will be an opportunity to recover additional recycling material. There are several options for providing for the collection of these materials. They include a system of collecting separate bins from select commercial establishments to collect commingled materials similar to the commingled collection program for residential customers. A second option would be to aggressively promote the incentives to segregate recyclable materials from food waste or other waste with no markets to high-grade commercial loads, so those materials could be collected separately and taken to a facility for processing. Similar programs have occurred in the other jurisdictions such as Washington County and Portland where commercial loads are high graded and taken to existing material recovery facilities.

The following represent possible alternatives that could be implemented to provide additional processing capabilities for recovering more materials from the commercial waste stream.

- Build a new material recovery facility in Marion County.
- Build processing capacity for commercial waste recycling in Marion County.
- Expand MRRF to transport commercial recyclable materials to processors out of county.

Given these primary needs, the alternatives for processing and recycling more materials are discussed.

Build a New MRF in Marion County

As discussed in Chapter 5 of the update, it is possible that between 20,000 - 30,000 tons of recyclable material could be recovered from the commercial waste stream. To recover this material, additional processing capacity would be needed. One option could be to construct a new large-scale MRF in Marion County. The new MRF could be designed to process both the commercial waste stream and the commingled materials collected from residential customers in the County. When adding both commercial and residential materials the MRF would be capable of processing over 50,000 tons per year or a flow rate of about 150-200 tons per day.

A MRF of this capacity would be comparable to full-scale material recovery facilities in the Portland marketplace. A new site of between 5 and 10 acres would need to be located and permitted. A typical structure for a MRF to process 200 tpd would be about 75,000 square feet. Using a pre-engineered metal building for the primary structure, the new MRF structure would cost about $25 million to $30 million. The cost of the land and other site improvements such as utilities and grading would be an additional investment.

The equipment required to do the processing would range from $8 million to $12 million or even higher. The operating costs in a MRF facility can range between $25 and $40 per operating ton.

The advantage of building a new MRF would be the ability to have more direct control over the processing and marketing of materials generated in the County. It provides some certainty and reliability in managing the solid waste system. It would also provide a link between the collection practices and the processing capabilities and markets. For instance, if residential and commercial customers fail to properly separate recyclable materials and contamination increases, there is a link to the value of the processing and the value of the materials generated at the processing facility. The system would have more incentive to respond to educate customers on reducing contamination. The County could work with cities and franchised haulers to effectively create more incentives for customers to reduce contamination. Likewise, the solid waste system could share in the upside benefits of the revenues generated by the recycling and marketing system.

The disadvantages of a new MRF would be the large investment required to site and build the facility. The initial investment could be as high as $30,000,000, requiring a debt service of $2,000,000 to $3,000,000 over the next 25 years. This could add anywhere from $10 to $20 per ton to rates. The recovered materials would still have to be transported to markets, some of which could be in the Portland area, or even farther. Operating costs are expected to be between $25 and $40 per ton. Total cost to build and operate a new MRF could range between $60 and $80 per ton, which would have to be incorporated into the rate base of the solid waste system. Revenues would be used to offset cost. Over the last 5 years these revenues ranged from $100 to as high as $180 per ton on average for all commodities. Currently the revenues are averaging less than $30 per ton and will vary significantly depending on markets.

4.3.1.1 Build Processing Capacity for Recycled Commercial Waste

Another alternative would be to install equipment to process the new commercial waste stream in existing facilities in the County. Options may include installing equipment at either MRRF or at Garten. This would eliminate the need to locate a new site and build a new facility. Also, the equipment used to process commercial waste is usually not as extensive as that required to process commingled materials from residential customers. Typically, the primary materials recovered from commercial waste include OCC, office and mixed paper, plastics, metals, and some organics. Because there are fewer containers

compared to the residential waste stream, it is much easier to process. A typical commercial process line will include a combination of screens to separate OCC from the mixed papers and a series of sort stations to negative sort contaminants. At the end of the process line will be a relatively clean mixed paper stream. Depending on markets additional sorting could be used. Metals are often removed, using a magnetic separator.

The materials recovered from a commercial waste stream generally have a higher value and the operating costs are less. Because the equipment required to process commercial waste is simpler, it is much more feasible to add this equipment to existing facilities.

4.3.1.3 Expand the Marion Resource Recovery Facility

Currently, MRRF operates a transfer station for all commingled recyclable material collected from Marion County residential customers. At this facility, materials are reloaded and taken to FWF in Washington County for processing. MRRF also operates a processing line to recover materials from C/D materials delivered to the facility. It may be feasible to expand the facility for the purposes of processing commercial waste. One approach could be to add equipment to the existing sort line and accept high-graded commercial loads.

The level of investment required to add equipment could be in the range of $1,000,000 - $3,000,000. If an entire new line is required it may require a larger investment. There may also need to be some structural modifications to expand the facility to provide space for storage and handling the material. However MRRF has the sufficient property to accomplish this without expansion onto adjacent parcels.

This alternative has similar advantages to building a new MRF, by providing some level of control of the entire program. It would have the added advantage of reinforcing generating responsibilities because the franchised haulers would have direct incentive to create cleaner loads for processing to improve the marketability of the recovered materials, thus increasing revenues. The increased revenues may offset operating and capital costs necessary to implement the program.

Another advantage may be that mixed office paper could be transported to Garten for further processing adding to their material supply. And, a positive aspect is that the fiber material extracted from the commercial waste stream has markets in the Pacific Northwest. Assuming a high quality material can be generated, revenues from this operation may be stable and sustainable. Another advantage of this alternative is its ease of implementation. Most of the infrastructure is in place for adding these features.

A disadvantage of this alternative would be the added cost to install equipment and expand the MRRF. While the equipment itself is not as large an investment as installing a processing line for residential commingled material, there will be additional expenses. There is capacity for processing materials in the Portland area. However, whether it is feasible or not will have to be evaluated on a case-by-case basis.

A more detailed financial analysis should be performed to compare these costs. However, having more control over the process flow and the relationship to the generators could offset these costs.

4.3.1.4 Install additional processing at Garten

Garten operates in a large facility that is centrally located in the Salem market area. They currently receive and process much of the mixed paper from Marion County and other sources in the Portland area resulting from the back-haul from FWF. As such, Garten has established markets for a variety of fiber products that are recovered from the waste stream.

Similar to MRRF, Garten could install equipment to process commercial waste. The process line might also provide other benefits and efficiencies to sort other products currently being at individual stations. Garten may have the additional advantage of being able to hand-sort certain mixed papers streams more efficiently because of lower labor cost. This might improve the revenue stream by doing further separation of this material.

The advantages and disadvantages of constructing a facility at Garten are very similar to those at MRRF. Operating cost may be lower and there may be added efficiencies gained by combing sorting operations. Garten has established markets and it will continue to provide valuable jobs.

It may also be feasible to add commercial processing capabilities at both Garten and MRRF. The commercial waste stream in Marion County is estimated to be about 130,000 tons or more. Therefore, depending on which collection systems or practices are implemented a supply of material both facilities may be feasible. As such, both facilities could provide some level of sorting to increase the capability to process more commercial material.

A decision on the type of equipment to be installed would have to be developed in conjunction with the collection strategies that are employed. However, working together there could be certain advantages to increasing providing adequate capacity for processing materials at either or both facilities.

4.3.1.5 Expand MRRF to transport commingled commercial materials to Out-of-County MRFs

Many of the MRFs in the Portland area are accepting and processing select commercial waste streams or commingled materials from commercial customers at their facilities. The equipment in these MRFs is capable of handling the volume generated by the commercial waste stream. MRRF currently receives over 20,000 tons of residential commingled materials. Their facility is designed to store and reload material into larger trailers for efficient transportation to out of County processors. It is possible that commingled commercial materials could be accepted and transferred to these same processors. Recently, MRRF requested support for expanding their facility. The expansion would allow for additional storage and more efficient handling of the commingled stream.

With this alternative the Marion County system would not need to install additional equipment for this processing. There may be added operating cost to the system and cost to transport the material to out of County processors. If delivered to FWF the cost may be between $5 and $8 per ton. However, given that the commercial waste stream contains a high percentage of fiber material that generally has a higher market value, the cost to implement this alternative may be offset by revenues from the sale of materials. There may be additional cost to provide for collection services.

The advantages of this alternative are several. First, Marion County and its partners would not be required to make any significant investments to start up the program. By using existing processing capacity no new equipment installation is necessary. Another advantage would be the fact that after the initial start up the County could gain valuable information. If the commercial collection system proves successful and generates a larger amount of recyclable material, the decision to add additional processing equipment at either MRRF or at Garten could be made. There is no significant disadvantage to this alternative as it provides the opportunity for Marion County and its partners to phase in the collection and processing with minimal capital and operating investment.

4.3.1.6 Processing Additional Organic Material

Over the past 10 years, Marion County has implemented a comprehensive yard and green waste collection and recycling system. A majority of residential customers are provided with bins to separate yard and green waste material. The material is collected and transported to CO, where it is converted to compost or other soil amendment products. In recent years, food waste from select generators (i.e., fruits and vegetable materials) have been collected and added to the compost operations.

CO has been pursuing programs to expand their operation to handle additional organic materials, particularly food waste from a wide range of generators. Food waste to be accepted would include meats and dairy products that require additional operational controls and procedures to ensure a usable product to meet market conditions. Food waste represents about 52,000 tons or 21% of waste disposed from the County. Having the capability to recover and process this material into a usable product would substantially increase the recycling rate in the County.

The following discusses the options for expanding food waste composting.

4.3.1.7 Expand Operations at Compost Oregon

CO has reported that a new permit to expand the Aumsville facility could be approved in 2009. The primary purpose of this expansion is to install new equipment and processes to handle additional organics including all food waste. After the permits have been obtained it is expected to take 2 to 3 years to modify the facility to process the wider range of organics and to establish additional markets.

In January 2009, Norcal Waste Systems purchased CO. As mentioned previously, the company's name has since been changed to Recology. Recology is very experienced in operating large scale compost facilities, several of which accept food waste. Currently, they operate four large-scale compost operations in Northern California. The facility processes all of the food waste collected in San Francisco. They have a proven track record of successfully operating compost facilities and marketing the materials. Reportedly, they have worked with the wine industry to market their compost products.

The prospect of collecting food waste and potentially other organic waste for composting is promising. Having existing facilities that can be expanded and experienced operators greatly enhances the potential for success. It will be important to provide adequate time for Recology to implement its plans and develop additional markets for the materials before starting up specific collection programs. But with these key ingredients in place this option is promising.

4.3.1.8 Transport Food Waste to Process and Recovery Center (PRC)

PRC has been composting yard debris and wood waste for several years and is now pursuing permits for processing food waste. Located about 30 miles south of Salem, it provides an alternative site to process organics generated in Marion County. Material could be transferred from existing transfer stations or some material could be hauled directly.

4.3.1.9 Transport Food Waste Materials to Cedar Grove

Although there are many yard and green waste processors and composting operations in the northwest few if any are currently accepting and processing broader range of food waste (i.e., meats and dairy products). There may be several reasons for this but until a private operator makes the investments needed to permit, process and market the material it is unlikely to occur in a reasonable timeframe.

The Cedar Grove Compost Facility is located just east of Seattle, Washington about 180 miles from Salem. They have implemented a program to accept all food waste materials. Some organic waste is being transported from Portland area as well as other regions to this facility. The facility initially had issues with the quality of material being delivered because these waste streams contained sufficient amounts of plastics or other contaminants that impacted operations. We understand Cedar Grove has or is in process modifying its operations to accommodate a certain level of this contamination. Once fully implemented it is expected that a contamination will be less of an issue.

It does not appear to be a practical option for Marion County to transport materials to Cedar Grove. But it may be a consideration to evaluate this option as a back up to other options.

4.3.2 Build New MSW Materials Recovery Facility (Dirty MRF)

Another approach for recovering more recyclables from the waste stream is to build a mixed municipal solid waste material recovery facility referred to as a "Dirty MRF". In this operation refuse collected from residential and commercial customers is brought to a facility similar to that used to process commingled recyclables. The process differs in that recovering recyclables from mixed waste requires additional equipment to screen waste as well as more extensive sort lines to recover paper cardboard, wood, metals, plastics and glass. Inert materials that are screened off are often used as alternative daily cover (ADC) at landfills. In several states ADC is recorded as a recycled material as it replaces soil that is typically used for landfill cover.

In some communities Dirty MRF's are used in place having a separate single or dual stream collection programs. In these cases the Dirty MRF is targeting the same materials that are collected by the commingled collection system. For that reason Dirty MRF's are not common in Oregon. Several plants do operate in California and in other states. Because of the feedstock varies depending on the collection programs used for that community the recovery rates vary from as low as 10% to as high as maybe 30%. However, on average a Dirty MRF recovers between 15% and 20% of the material. And, because the waste is mixed, targeted materials are often contaminated reducing quality and market value.

Marion County is currently processing and disposing of about 250,000 tpy (800 tpd). If a Dirty MRF were constructed perhaps 18% or about 45,000 tons maybe recovered. To process this amount of material would require one, 40 ton per hour process line running with 3 shifts or 2 lines at 1.5 shifts. Equipment cost for a typical Dirty MRF could range between $10,000,000 and $15,000,000 per line. Based on a recent study for the City of Los Angeles, CA total cost for a Dirty MRF would range from $30,000 to $50,000 per installed capacity. An 800 tpd facility would cost between $26,000,000 and $40,000,000. The same study indicates operating cost range from $30 to $50 per ton.

A Dirty MRF can be used to not only recover materials but also to prepare the mixed waste stream for further processing and energy recovery. If recyclable and inerts can be adequately striped from the waste stream the residual can be as feedstock for various alternative technologies. Specifically, a Dirty MRF is complementary to producing refused derived fuel (RDF) and for gasification and bio conversion technologies. From that standpoint Dirty MRFs are a necessary preprocessing step for recovering energy. Because Marion County's system uses a mass burn technology preprocessing is not required. Therefore, programs targeted at collecting source separated materials appear more feasible than to add to the system cost of building and operating a Dirty MRF.

4.4 Recommendations

Until a comprehensive commercial recycling collection program is implemented in Marion County, there is not an immediate need to increase processing capacity. Over the next few years, it will be important for the County to work with local jurisdictions, businesses, government agencies and franchise haulers to develop commercial recycling program. Once the program has been developed and implementation has begun, more recyclable materials from businesses and government agencies will be generated that will require additional handling and processing. As presented in this chapter, in the early stages of this program the opportunity to receive these materials at either the MRRF or at Garten is possible. Depending on the level of processing required, the materials could be transported to MRFs in the Portland Area in the initial stages of the developing the commercial recycling program.

As results from the collection program begin to evolve and the demand for additional processing is apparent, the County can further evaluate the processing alternatives. Given this background, the following is the recommended strategy for future processing capabilities in Marion County.

Recommendation 4.1: In preparing the Facility Master Plan, the County should evaluate the specific requirements to expand processing capacity at existing solid waste facilities and/or private recycling businesses.

Rationale for Recommendation: The County is fortunate to have several options available for expanding processing capabilities. As part of completing a facilities master plan, the County, working with its partners, can perform an appropriate evaluation of the investments necessary to provide additional infrastructure to meet the needs of the solid waste system over the next 10 years. Performing this work in conjunction with the facility's master plan will enable a total and comprehensive review of all of the needs of the solid waste system to be established. It will enable the County to work with its jurisdictions and solid waste purveyors to set priorities for the investments to be made by both the County and private sector to insure that the appropriate facilities are in place.

Recommendation 4.2: Continue to work with local processors (CO and PRC) to establish capabilities to enhance composting of food waste and other organic materials.

Rationale for Recommendation: Currently, there are considerable investments being made to permit and develop the capabilities to accept all food waste in the County and region. With the recent acquisition of CO by Recology, a company experienced in composting food waste, there is a good opportunity to develop a food waste collection and recycling program. In addition PRC is also proceeding to obtain permits to accept food waste. Once that has been accomplished, the County can consider alternatives methods to collect and supply material for this operation. The advantage of this approach is that no new major investments need to be made in the immediate future.

5. WASTE COLLECTION AND TRANSFER

5.1 Background and Existing Conditions

This chapter focuses on the current refuse collection programs and transfer station facilities to serve the residents and businesses in Marion County. Deficiencies, needs or areas where changes could be made to meet the goals presented in this SWMP update are identified. Alternatives for addressing changes or deficiencies are discussed in relation to the objectives stated below. Based on the analysis and input from the SWMAC, franchised haulers, and the general public, recommendations are presented.

For purposes of this SWMP, "waste transfer" refers to waste transport (by individuals or collection vehicles) to the WTEF, a disposal site, or to a transfer facility with subsequent transport of the waste to a disposal site.

The existing collection and transfer system is evaluated in terms of its ability to meet existing and projected needs and the following objectives as they relate to collection and transfer services:

- To provide an integrated solid waste management system that achieves an effective combination of strategies and programs guided by the principles adopted in the state hierarchy, which is to reduce waste at the source, reuse and recycle materials, compost, recover energy, and lastly, utilize land disposal.
- To provide services that meet the diverse needs of businesses and residences in urban and rural communities which are both effective and fair to all users.
- 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 cost equitably to all users.
- To develop programs and support implementation of facilities that seek to ensure that materials recovered from the waste stream attain the highest and best use and are recycled.
- To maintain system flexibility to respond to changes in waste stream composition, waste management technologies, public preferences, new laws and changing circumstances.

5.1.1 Regulatory Framework

The County regulates collection services in unincorporated areas of Marion County. Each city regulates these services within their jurisdictional limits. In addition, Marion County has been granted additional authority under Oregon statutes related to collection and transfer of solid waste. This regulatory authority and jurisdiction is described below. This section also describes existing collection services and transfer facilities.

5.1.2 Local Authority

Under 1999 ORS, local administrations (cities or counties) have the authority to enter into agreements "for joint local franchising of service or the franchising or licensing of disposal sites." (ORS 459.065) Marion County is specifically authorized to "Regulate, license, franchise and certify disposal, transfer and material or energy recovery sites or facilities; establish, maintain, and amend rates charged by disposal, transfer and material or energy 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 material or energy recovery sites or facilities located within the County." (ORS 459.125) This law grants flow control to Marion County, which is a primary factor in determining the efficiency of solid waste management transfer and disposal. The right of governments to maintain flow control has been debated in a number of recent legal cases. The future of flow control has implications for how efficiently Marion County can manage solid waste. This issue is discussed further in Chapter 6 - Alternative Technologies and Solid Waste Disposal.

5.1.3 Existing Collection Services

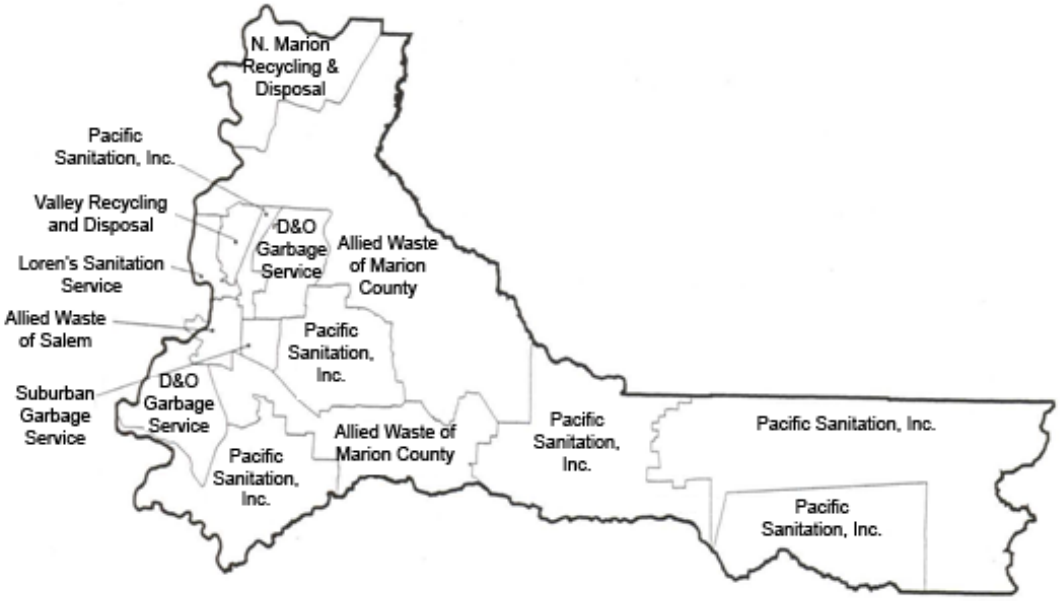
In unincorporated areas, the County issues franchises to private solid waste collection companies. The County reviews financial performance and sets collection rates. Franchised haulers operate independently of the County, provided they adhere to guidelines. The County may also manage waste operations in areas where the local municipality chooses not to regulate refuse collection.

In the incorporated areas, each city regulates the collection services through franchise agreements (unless the municipalities choose to defer this authority to the County). The franchise agreements are similar to those used by the County in the unincorporated areas. Each City will administer the franchise, including determining the types of services and schedule of rates for these services.

Although municipalities can create franchise agreements in their incorporated areas, Marion County currently retains flow control over all wastes generated in the County. As a result, all non-recyclable wastes collected in the County are typically sent directly to the WTEF. The WTEF may be unavailable at times either due to scheduled maintenance, or if the waste generated in the County exceeds the facility's capacity. When this occurs, at the direction of the PWES, franchised haulers will haul waste directly to the Coffin Butte Landfill located in Benton County, or occasionally to the Riverbend Landfill in Yamhill County.

There are eight franchised businesses providing collection services within Marion County. Six are independently owned, while Allied Waste, a national waste management company (recently merged with Republic Services), owns the remainder. Figure 5-1 shows the franchised haulers and their respective service areas.

Figure 5-1 - Marion County Franchised Haulers



Over the past five years and since the last SWMP update, franchised haulers working with the County and the cities transitioned to an automated collection system. Converting to the automated equipment made collection services more cost-effective and more flexible, offering more convenient pick up of various materials at the curbside. Now, a number of the cities in the County are provided with three separate containers in which to place refuse, commingled recyclable materials and yard waste. Services vary in the different cities and throughout the County. For instance, many areas are provided with weekly garbage and yard waste pickup, with commingled recyclable materials being collected bi-weekly. Some communities offer weekly pick up of commingled recyclables, while some areas do not have yard debris collection, but do have mixed recycling.

The automated system allows for different levels of service, and the rate schedule provides incentive to reduce waste by using a smaller container. Most cities provide several options of container size for weekly refuse, with more standardized container sizes for yard waste and commingled recyclable materials. The rate for this service is around $25 to $26 per month for the larger 90-gallon garbage container. If a customer wishes to use a 60-gallon container for refuse, this rate averages about $20 per month, and if a customer desires a smaller container, a 35-gallon container and a 20-gallon “mini-can” are also available at a slightly lesser rate.

Rates typically include either weekly or bi-weekly pick up of recycled materials in 90-gallon or comparable container and weekly pick up of yard debris. Collection service rates are shown in Table 5-1.

Table 5-1 - Collection Services - Residential and Commercial Rates in Unincorporated County Areas

	Salem Urban Growth Boundary	Rural Areas*	Sparse Areas*
Residential			
90-95-gallon can at curb	N/A	$32.65	$34.40
65-gallon can at curb	$25.55	$28.60	$31.65
32-35-gallon can at curb	$19.10	$18.30	$20.05
20-gallon can at curb	$17.35	$17.60	$19.40
Multi-family			
Each 32-35-gallon can at curb	$13.10	$14.65	$15.60
Each 65-gallon can at curb	$19.80	$32.65	$34.40
Commercial			
One-yard (1st stop)	$67.05	$77.20	$89.55
Two-yard (1st stop)	$120.95	$132.75	$150.00
Four-yard (1st stop)	$220.35	$265.80	$337.55
Six-yard (1st stop)	$316.65	$356.80	$445.00

* Does not include recycling or yard debris service

All areas within the County are provided with the opportunity to subscribe to waste collection services. In spite of this, the County continues to experience illegal dumping, which could be an indicator of service deficiencies. However, some residents who have access to waste collection services could also be illegally disposing of waste. This could be due to an unwillingness to pay collection fees and/or a perceived inconvenience of transporting materials to drop-off locations at transfer stations. Because waste collection services are currently available in all areas of the county, illegal dumping is not attributed to lack of service in Marion County. Convenience or cost of service may be more important factors contributing to the continued practice of illegal dumping.

It is uncertain which measures could be most effective in minimizing the practice of illegal dumping. Residents in sparsely populated areas of the County, who must drive long distances to reach transfer stations or landfills, may be less likely to dump illegally if transfer stations are closer and more convenient. Some residents may respond to “amnesty days,” during which waste is accepted free-of-charge. Providing special collection events for bulky waste items can also reduce illegal dumping. Other counties that provide free waste disposal service to residents still report problems with illegal dumping, however. This indicates that cost may not be the only factor.

Rather than expanding services, education and enforcement may be more effective strategies to investigate for minimizing illegal dumping. Education would include informing the public about the costs associated with illegal dumping and health hazards that can arise from rodent attraction and impacts to water quality. Residents can be educated through the distribution of pamphlets and posters, and a more extensive community education program could be established.

Marion County currently employs three enforcement officers to serve the entire County. Road maintenance crews also may address illegal dumping issues. Monitoring and enforcement could be increased by the creation of a task force to address illegal dumping. Other methods of deterrence include increasing lighting at known illegal dumping areas and

publishing names of offenders in local newspapers. The County could also consider mandatory collection for all residences. This would require all residents to pay for service. It is assumed that residents who pay for collection at the curb would be unlikely to haul waste elsewhere for (illegal) disposal. It should be noted, however, that mandatory collection is expected to draw criticism from residents.

5.1.4 Commercial Waste Collection

The focus over the past few years has been to implement new curbside services for residential customers. With the successful implementation of these services, the 2009 SWMP update places more emphasis on programs and services that could increase recovery of materials from businesses. There is no comprehensive data on the amount of waste collected from commercial sources. Each franchised hauler selects the type of collection equipment used and routes according to the demographics of the service area. However, commercial waste typically represents 50% to 55% of the waste generated and disposed. Assuming Marion County is a typical cross section of other communities, of the 247,331 tons disposed in 2007, between 123,000 tons and 138,000 tons are estimated to be from commercial businesses.

ODEQ completed a fairly comprehensive waste sort study for Marion County in 2005. In this study, they evaluated waste from residential, commercial and mixed routes. Mixed routes may be served by either front or rear-load vehicles that can pick up residential containers, most likely from multi-family housing and commercial containers. These data provide some insight into waste composition of commercial waste in Marion County. Table 5-2 presents a summary of the breakdown of waste composition using results from ODEQ's 2005 study, assuming an average of 52.5% of the waste, or about 130,000 tons, is from commercial sources.

Table 5-2 - Marion County
Estimated Composition of Commercial Waste

Component	Percentage	Tons	Est. Recovery (%)	Est. (Tons)
All Paper	23%	29,900	56%	16,744
Plastics	13%	16,900	10%	1,690
Organics	50%	65,000		
Yard Waste	4%	5,200	50%	2,500
Wood Waste	2%	2,600	50%	1,300
Food	36%	46,800		
Other	8%	10,400		
Metal	5%	6,500	40%	2,600
Glass	1%	1,300		
Other Inorganic	8%	10,400	25%	2,600
Total	**100%**	**130,000**	**21%**	**27,434**

Based on this 2005 study, there appears to be over 20% of readily recyclable materials contained in commercial waste stream. Assuming a portion of the food waste can be collected and processed, this amount could increase. If even only 25% of food waste was recovered, that would add 12,000 tons of additional recovered materials to the commercial waste stream.

The County and franchised haulers provide education materials to promote more recycling at businesses. The SCOOP program also targets businesses that may generate larger amounts of mixed paper to separate this material for collection and delivery to Garten. However, to provide more recycling services to businesses, franchised haulers will need to consider working with customers to provide enhanced recycling services. This may include providing containers for commingled materials or offering to pick up specific loads containing higher quantities of fiber. By high grading loads, businesses can be offered monetary incentives, in the form of revenue, material rebates, or reduced cost of transport and/or processing disposal, in addition to the avoided cost to dispose of the material as waste.

Once materials are collected commingled or high graded, these loads can be either processed or transported to existing MRFs in the region. In Washington County, Oregon, commercial loads are taken to FWF for processing. The majority of recyclables recovered are paper and old corrugated cardboard. Another option is to process the materials at MRRF in Marion County.

5.2 Transfer Stations

Currently, there are two transfer stations in Marion County (see Figure 2-1 in Chapter 2). One transfer station is located at the NMCDF that serves the northern portion of the County. This facility is owned and operated by Marion County. The other facility is SKRTS located off Highway 22 in the south portion of the County.

Both facilities have been operating over 15 years and were initially developed to provide a convenient location to serve outlying cities and rural areas that may or may not elect to subscribe to collection services and are also used to haul bulky waste items. As the population in the County continues to grow and the areas around these facilities become more populated, each transfer station is receiving much more waste. In short, these facilities will become increasingly more important as part of providing comprehensive services. Table 5-3 shows the amount of waste received at both transfer stations over the past six years.

Table 5-3 - Transfer Station Tonnages[1]

Transfer Station	2002 Tons	2003 Tons	2004 Tons	2005 Tons	2006 Tons	2007 Tons
SKRTS	21,808	23,615	25,340	28,050	31,542	33,546
NMCDF	5,390	6,151	6,421	7,696	8,559	9,467
Total	**27,198**	**29,766**	**31,761**	**35,746**	**40,101**	**43,013**

[1] Source: Chapter 2, Table 2-5.

Both transfer stations have been developed to meet the goals of the Marion County solid waste system by increasing opportunities to reuse and recycle materials. In addition, both transfer stations accept source-separated materials that may be harmful to the environment if landfilled or incinerated. Each transfer station is described in more detail below.

5.2.1 North Marion County Disposal Facility (NMCDF)

For many years, NMCDF, located just north of Woodburn, was the primary landfill serving the northern portion of Marion County. When the WTEF started operations in 1986, the landfill was converted to an ash disposal site and a recycling center/transfer station was constructed. The purpose of this facility is to provide a location where residents in the rural portions of the County can bring recyclable materials and also deposit waste into containers, which are transported to the WTEF. The site is owned and operated by Marion County, but the County contracts with a franchised hauler to transport waste and recyclables.

Materials accepted at NMCDF include mixed garbage, yard waste, lumber, appliances, tires, and recyclable materials. This facility has seen an increase in waste delivered to the site. Since 2002, the waste delivered jumped from 5,400 tpy to 9,400 tons in 2007, representing an annual increase of 15% per year. The County has recently expanded the facility, providing additional dump spaces to allow for segregating waste streams and to accommodate increased traffic.

The facility is designed to address Marion County's recycling goals and promote reuse and recycling. A full range of recyclable materials is accepted here, including: appliances, car batteries, cardboard, cell phones, dry cell batteries, electronics (including computers), eyeglasses, glass bottles & jars, hearing aids, latex paint, magazines, mixed scrap paper, motor oil, newspaper, plastic bags, rigid plastic bottles/containers/trays/tubs #1-7, plastic milk jugs, printer cartridges, scrap metal, tin & aluminum, tires, and yard waste.

Many of these materials are not collected by franchised haulers; therefore, this facility provides a convenient location to handle certain items which are not routinely recycled.

With the expanded facility, customers can drop off refuse, but may also dispose of segregated loads of yard debris and/or C/D materials. C/D waste can be transported to BI for disposal and yard waste is taken to BI to be composted.

5.2.2 Salem/Keizer Recycling Transfer Station (SKRTS)

The County's largest transfer station is SKRTS, located on a 21-acre site east of Salem off Highway 22. This transfer station is owned and operated by Allied Waste, who operates this facility under an agreement with Marion County. The County operates the scalehouse and collects tip fees. When the WTEF became operational in 1986, franchised haulers hauled directly to the WTEF with SKRTS being used mostly as a recycle center and transfer site for self-haulers.

Similar to the NMCDF, the amount of waste received at SKRTS has increased substantially in recent years. As shown in Table 5-3, in 2007, SKRTS received almost 34,000 tons, representing a 54% increase since 2002. Since this facility receives waste delivered by the general public, the largest key issue is the amount of traffic the facility must handle. Like the NMCDF, this facility has been expanded to add services in step with the County's goals to recycle more materials. A full service drop-off recycling facility provides a convenient

location to leave source separated reuse items and recyclable materials. The expanded Recycle Center at SKRTS also provides drop off for items that may be harmful to the environment if landfilled or incinerated.

Items accepted for recycling at SKRTS include: appliances, car batteries, cardboard, cell phones, computer components/electronics, dry cell batteries, eyeglasses, firewood (cordwood), fluorescent tubes/mercury lamps, glass bottles & jars, greyboard, hearing aids, latex paint, magazines, mercury thermometers, milk/juice cartons/drink boxes, mixed scrap paper, motor oil, newspaper, office paper, rigid plastic bottles/containers/trays/tubs #1-7, plastic bags, plastic milk jugs, printer cartridges, telephone books, scrap metal, tin & aluminum, tires, St. Vincent De Paul donations of clothing and furniture, wood waste, and yard waste.

In 2004, working with Allied Waste, the County opened the HHW Receiving and Handling Facility located at the SKRTS site. This facility is only open certain times of the week. However, in cooperation with neighboring counties, it also serves as a bulk handling facility for HHW materials received at mobile collections events in Marion, Polk and Yamhill Counties.

Due to its convenient location off Highway 22 and just southeast of Salem, SKRTS has become an increasingly important facility in providing services. Continued growth in the County will place additional demands on both transfer stations.

5.3 Needs and Opportunities

Based on the review of the current services, the needs and opportunities of the collection and transfer system are discussed in this section.

5.3.1 Collection Services

Since the 2002 SWMP was adopted, the franchised haulers have successfully transitioned to fully or semi-automated collection vehicles. The new equipment provides for more efficient collection of garbage, commingled recyclables, and yard debris. Collection services are provided in all areas including the most rural areas of the County. One item that may impact collection services in the future could be the price of fuel for collection vehicles. In certain areas of the Country, franchised haulers are considering use of alternative fuels such liquefied natural gas (LNG) or compressed natural gas (CNG) for their fleets. These fuels burn cleaner than traditional collection fleet fuels and therefore reduce the adverse impact to air quality.

Collection rates are generally in line with the level of services provided as compared to other cities in Oregon. As long as the system continues to dispose of waste in the County, there are no immediate needs identified for changes in collection services. In keeping with recommendations stated in Chapter 3, the franchised haulers should consider ways to expand collection of commingled materials at commercial businesses. Expanding these services might have a slight impact on collection rates to these customers. However, with the price of recycled materials being historically higher in recent years, notwithstanding the difficult conditions of recycling markets in the current economic recession, and the fact the infrastructure is in place to accommodate added materials, the impact should be minimal.

5.3.2 Need to Expand Transfer Station Capacity

There are several emerging needs in regards to the current transfer station system; the needs revolve around two issues. First is the need to consider modifications to SKRTS to accommodate the growing demand from self-haul customers at this facility. Second is the growing demand to haul waste in excess of the WTEF capacity to an out-of-County disposal site. In 2002, the amount of waste in excess of WTEF capacity and disposed of at Coffin Butte was 35,000 tons. In 2007 the amount has increased to 55,000 tons, rising at 13% per year (see Table 5-4).

Table 5-4 - Waste from Marion County Sent Out of County for Disposal at Coffin Butte Landfill (Tons)[2]

Year	2002	2003	2004	2005	2006	2007
Tons	35,997	40,467	44,909	50,939	55,420	55,460

It is important to realize that the amount of waste in excess of the WTEF capacity is not produced year-round, but is intermittent throughout the year. Nonetheless, with growth in population, the demand to efficiently transport waste outside the County will increase unless there is a change in the disposal system.

Likewise, if for some reason the County elected to discontinue disposal at the WTEF in 2014 when the current contracts expire, there would not be any means to efficiently transport waste to a landfill outside the County. The nearest landfill with capacity is Coffin Butte, and it is approximately 30 miles from the center of the City of Salem. Even at this distance, it is not cost-effective for collection trucks to directly haul all of Marion County's waste to the landfill. In short, the County is outgrowing the current transfer station system, and this will eventually impact the ability to collect and direct the waste to the appropriate facilities, even with continued success of the waste reduction, reuse and recycling programs.

The lack of transfer capacity cannot be handled with the current facilities. Either a new transfer station will be needed or existing facilities will require expansion. Transfer capacity can be added at any of the existing facilities, including the WTEF. The time to properly plan, permit, design and construct even an addition to an existing facility could take three years or longer.

This issue was discussed in the 2002 SWMP, and there has been consideration of certain strategies. Covanta Marion has looked into an expansion of their receiving and tipping area at the WTEF to allow for more storage and surge space. The new facilities would include provisions for top loading transfer trailers for delivery to a landfill of any waste in excess of the WTEF capacity.

Similarly, the Mid-Valley Garbage and Recycling Association is exploring ways to expand the MRRF. These new facilities may include capability to sort more materials as well as to efficiently load transfer trailers for hauling waste in excess of the system to a landfill.

[2] Source: 2007 Annual Report, Marion County Department of Public Works, Environmental Services Division.

These two options have merit and are discussed further in the alternatives section below. Even if either or both of these concepts are developed, there is still a need to consider modifications to the SKRTS facility since the extensive self-haul traffic volume frequently overwhelms the system.

5.4 Alternatives and Evaluation

5.4.1 Increase Commercial Waste Collection of Recyclable Materials

The SCOOP program is one way franchised haulers are targeting commercial businesses to recycle mixed paper. There is a comprehensive strategy to implement more universal collection services for this waste stream. Data regarding waste disposed in Marion County suggest there may be a considerable amount of recyclable materials available for capture within the commercial waste stream. Studies indicate that businesses will respond to rate incentives and cost avoidance. The current rates provide reasonable incentives for businesses to consider smaller waste containers in conjunction with reduced frequency of pickups. In order for these incentives to materialize into increased recycling rates, education and promotion must include financial benefits.

The County, working with the Mid-Valley Garbage and Recycling Association and Garten, could consider expanding the current commercial recycling programs. This could be through a combination of collection in select targeted areas and/or establishing a pilot program for collecting commingled recyclable materials from certain businesses. The program should include a direct financial incentive for these customers to participate.

Some communities have considered instituting Disposal Bans (DB) or Mandatory Recycling Ordinances (MRO) to restrict generators from disposing of paper or other recyclables. These regulatory approaches require ongoing monitoring and enforcement to realize increases in recycling rates. However, studies indicate that volume based rates and high tipping fees are also effective incentives to recycle.

5.4.2 Develop Transfer Stations Capacity

For the past 20 years, the County and franchised haulers have continued to develop the facilities needed to provide collection and transfer services.

The success of the waste reduction and recycling programs implemented over this period has aided in delaying the need for any new system capacity. While the need for this new capacity is not immediate, it is appropriate that in order to have the capacity available when it is needed, alternatives which are in the best interest of maintaining cost-effective services to users need to be evaluated and a course of action determined.

Several options for transfer station expansion or construction of new facilities are addressed below. Construction of transfer station facilities at MRRF or the WTEF are two possible solutions. Other alternatives include expanding existing transfer stations: NMCDF and SKRTS. At this time, these facilities accept only residential/commercial materials delivered directly by residents and businesses, but they could be expanded to allow access for franchised haulers. The possibility of constructing a transfer station at a new site is also explored.

5.4.2.1 Expand MRRF to Function as a Transfer Station

The MRRF, which currently accepts primarily C/D waste to be sorted for recyclables, is located near the WTEF. The MRRF and the WTEF are each about one-half mile from I-5. Based on site visits in June 2008, there appears to be space for expanding the existing MRRF facility or adding an additional building for transfer capacity.

The MRRF is situated between Salem and Woodburn, and is centrally located relative to waste generation. The proximity of the MRRF to I-5 also makes it easily accessible and increases convenience for franchised haulers that are accustomed to transporting waste to the WTEF. If the WTEF remains in operation, all waste would be transferred to the same location, minimizing the transport distance to the WTEF. This should contribute to maximizing efficiency for the haulers, which should translate into lower costs.

One option discussed in Chapter 3 is to direct more waste from SKRTS to the MRRF for processing. Likewise, additional processing for commercial loads could be incorporated in a new or expanded facility. This has two advantages, it will increase the recovery rate and it will allow the facility to meter waste delivery to the WTEF and, at certain times, to the landfill.

5.4.2.2 Add Transfer Capacity at the WTEF

In response to the growing need to regulate or meter the delivery of waste to the WTEF, Covanta has prepared a site plan and proposed layout for expanding the tip floor and waste receiving area. In this plan, the WTEF could continue to receive waste at all times, including times of scheduled facility maintenance, planned downtime, or when waste exceeds capacity. During such times as the waste cannot be processed through the WTEF, the waste could be reloaded into transfer trailers for delivery to an appropriate disposal site.

This site would provide similar advantages to the alternative of expanding the MRRF. Its location in proximity to and access off I-5 are the same, and all waste could be metered and efficiently transported to out-of-County disposal sites.

In addition, expanding an existing facility is preferable to siting a new transfer station, if it is located properly. This option differs from the alternative to expand MRRF in that this proposed option does not currently include processing waste to recover materials.

5.4.2.3 Expand NMDCF to Function as a Larger Transfer Station

Another possible location for transfer station expansion is NMCDF. NMDCF has some advantages because it is located with relatively easy access and has space for expansion. NMDCF is located in the northern portion of the County (north of Woodburn) and is not centrally located relative to waste generation and disposal facilities. Because of this, transport to NMDCF will be less cost effective than other alternatives. However, the NMCDF site might be a desirable location if the County were to consider disposal at other landfills located outside of the County. If disposal options north of Marion County are utilized, the NMDCF may become more cost-effective.

5.4.2.4 Expand SKRTS

SKRTS is located close to areas of waste generation just off a State highway, providing easy access. It is located in the south part of the County and provides a means to cost-effectively transport waste to the Coffin Butte Landfill. To handle additional traffic, as well as to handle more waste, the facility would need to be modified. There is sufficient space to retrofit the existing transfer station, but the site does have certain limitations.

More study is required to determine how SKRTS could be expanded. However, its proximity to where most waste is generated, as well as its location relative to Coffin Butte, make this alternative desirable from a standpoint of service level and cost-effective transportation.

5.4.2.5 Consider Other Possible Transfer Station Locations

Transfer stations could be located at a number of other areas in the County that meet the criteria of convenience, centralized location, available land, and transportation access. BI, for example, is centrally located and may be another potential location for siting of a transfer station.

Many factors should be considered in transfer station planning. Determination of the most suitable site for a transfer station would need to take into consideration the location of current and future disposal options. Transfer station needs would vary depending on which disposal options are selected in the future.

An important factor is whether the County continues to deliver waste to the WTEF after 2014 when the current contract expires or begins to rely on other alternatives for managing waste. Relying on other management methods could include an alternative technology or disposal at regional landfills located in the Columbia Gorge. Another factor to consider will be the need to process and recover more material.

With the waste stream growing and with limited transfer station capacity in existing facilities, the need to invest in new transfer capacity will increase in the near future.

5.5 Recommendations

Franchised haulers in Marion County provide relatively uniform and consistent services throughout the cities and unincorporated County. Over the last five years, residential collection services have matured and appear to provide a majority of customers the opportunity to recycle and separate yard waste. One opportunity to expand recycling is to recover more materials from the commercial waste stream. This can be accomplished through several methods. One is to offer rate incentives to high-grade waste and possibly expand pickup of commingled materials from these sources. The materials can then be either processed in Marion County or transported to other processors in the region.

The current transfer station system has continued to evolve over the past 15 years and has provided convenient and reliable service to the customers. With growth in population and with current capacity of the WTEF, there will be an increasing need to more efficiently transport waste to alternative disposal sites. There is the possibility that increased disposal capacity could be developed in Marion County either with expansion of the WTEF or possibly alternative technology. However, this is unlikely in the near future, thus improvements in transfer station capacity are needed.

Recommendation 5.1: The County should work with franchised haulers to complete a more in depth evaluation of the methods to recover more recyclables from the commercial waste stream. The evaluation should examine use of rate incentives and other means to separate commingled recyclables from commercial wastes or create high-grade loads for processing. It should also include an evaluation of alternatives of transporting the materials with the residential commingled stream to processors in Portland or consider expansion of additional processing capacity in Marion County.

Rationale for Recommendation: Although there is some recycling of commercial waste, there is no uniform strategy for recovery of material from this source. Commercial waste represents approximately 50% or more of the waste generated in the County. General rate incentives likely already exist in collection franchise agreements for more lucrative materials or quantities; however, more commercial recyclables are readily available for recycling but are not being directed as such. Many businesses may not generate sufficient quantities of material to justify segregating the material or haulers may not have motivation to provide recycling collection services to additional customers. Free-market and voluntary recycling is occurring, but further commercial recycling gains may require infusion of additional means to affect diversion, including regulations or requirements for recycling services provided at businesses of a certain size. Without further evaluation of the generators and waste stream, a definitive program that will be cost-effective and efficient cannot be pursued.

Recommendation 5.2: To manage growing waste streams in an efficient and cost-effective manner, the County should develop a facilities implementation strategy or prepare a Facilities Master Plan over the next two years. The purpose of the strategy or master plan is to develop a comprehensive capital improvement plan to increase transfer capacity and where possible, introduce potential for additional processing and recovery. The plan would include a financial strategy and identify new investments to be made by the private sector and those required by the County.

Rationale for Recommendation: More efficient transport capacity within the solid waste system is needed. Each of the main receiving facilities (SKRTS, MRRF and the WTEF) could be expanded to accommodate this need. In addition, each facility may have specific improvements that will benefit the entire system. For instance, modification at SKRTS should be considered to deal more efficiently with increased waste flow and traffic. As discussed in the previous chapters of the SWMP update, the MRRF could be expanded to accept more high graded commercial waste that could be processed at the facility or possibly shipped to processors in Portland. A facilities master plan that addresses the financial and logistical merits of each transfer station option can properly weigh these factors. Another factor to consider in developing a plan includes how the transfer stations should be owned and operated. The County may choose to retain full control of facilities, or elect to work through a public/private partnership.

6. ALTERNATIVE TECHNOLOGIES AND SOLID WASTE DISPOSAL

6.1 Background and Existing Conditions

Marion County's solid waste disposal practices are reviewed below. The discussion includes background on the topic of flow control. This is an important factor in the SWMP. In addition to the County's overall responsibility to provide for safe management and proper disposal of MSW, it provides the County with adequate resources to implement alternative technologies for waste disposal. A description of the WTEF, which is a significant component of the County's waste management strategy, as well as a review of alternative technologies and other disposal options, follows.

6.1.1 Flow Control

Flow control is a state or local government waste management tool that directs solid waste to designated facilities. Flow control can be direct (ordinances), indirect (franchises), or economic (lower tip fees or user fees). Flow control is important because costs and efficiencies for a waste disposal or processing facility vary based on its waste quantities.

ORS 459.125 historically granted legislated flow control to Marion County. In a 1994 U.S. Supreme Court ruling (C.A. Carbone, Inc. v. Town of Clarkstown), a local flow control law that designated a "private" disposal facility was struck down, and this effectively invalidated legislated flow control throughout the nation. The Carbone case established that flow control laws such as the Town of Clarkstown's were in violation of the Commerce Clause of the U.S. Constitution, which prohibits local governments from interfering with interstate commerce.

After the 1994 U.S. Supreme Court ruling in Carbone, several federal courts followed this ruling and struck down flow control laws in various localities. However, flow control continued in many locations through certain exceptions to Carbone, such as a local government being a market participant, intrastate flow control in locations where interstate commerce was not affected by the legislated direction of waste, non-discriminatory flow control, and economic flow control.

Flow control has been significantly affected by a subsequent and more recent U.S. Supreme Court decision. The New York Counties of Oneida and Herkimer had formed a public benefit corporation, the Oneida-Herkimer Solid Waste Authority, and each County adopted and implemented local flow control laws directing solid waste collected in their Counties to their Authority-owned transfer stations and a new Authority-owned regional landfill. Those laws were subsequently challenged by local waste haulers as restricting interstate commerce, preventing the haulers from taking waste collected in those Counties to lower cost landfills in Pennsylvania, and being in contravention of the 1994 U.S. Supreme Court's Carbone decision.

Several years of litigation related to this challenge ensued, and on April 30, 2007, the U.S. Supreme Court, in a landmark 6-3 decision in United Haulers Association, Inc., et. al. v. Oneida-Herkimer Solid Waste Management Authority, et. al., validated Oneida and Herkimer Counties' abilities to enact their flow control ordinances dictating the fate of solid waste

generated in those counties. This decision was most significant because the U.S. Supreme Court recognized that the Oneida-Herkimer Solid Waste Management Authority was operating a public facility; their tipping fees were higher than average and allowed that authority to offer other integrated services of recycling, composting, and household hazardous waste disposal in addition to solid waste disposal; and the local laws offered health and environmental benefits to citizens. In the Court's 16-page majority opinion, Chief Justice Roberts noted "…any arguable burden the ordinances impose on interstate commerce does not exceed their public benefits." In this decision, the U.S. Supreme Court established a distinction between a state-created waste authority and private sector disposal facilities under the Commerce Clause of the U.S. Constitution, ruling that the Commerce Clause should not control the decision of the voters on whether government or the private sector should provide waste management services and that government is vested with the responsibility of protecting the health, safety, and welfare of its citizens.

In the wake of the U.S. Supreme Court's 2007 decision, several jurisdictions have moved forward to enact new local flow control ordinances or re-establish local laws that had been deemed to be invalidated and/or unenforceable after the Carbone decision.

6.1.2 WTEF Description and Current Status[1,2]

The WTEF, located on a 16-acre site in Brooks, Oregon, was designed and constructed by Ogden Martin Systems, later renamed Covanta Marion, Inc., (Covanta) and began commercial operation in March 1987. The County contracts with Covanta for processing services of MSW at the WTEF. The agreement requires the County to deliver a minimum of 145,000 tons of solid waste each year to the WTEF. The WTEF received around 183,000 tons of waste in 2007, which operates it at or near the available capacity of 185,000 tpy.

The facility reduces the volume of waste by 90%, which results in reduced quantities of remaining material that is transported to the NMCDF. The tip fee charged to franchised haulers delivering waste to the WTEF in fiscal years (FY) 2008 and 2009 is $67.45 per ton. Covanta receives a portion of that tip fee which, in FY2008, averaged approximately $46.00 for every ton of waste processed, according to a formula specified in the agreement that includes a fee for operation and maintenance, and an additional service fee of approximately $16.00 per ton for waste processed during the year in excess of 145,000 tpy, and certain pass-through costs. These tip fee figures do not include debt services costs on the bonds for the WTEF that were retired in October 2008. With the bonds paid off, the financial obligation from the tip fee revenue requirements is eliminated.

Electrical energy sold by the facility, net of internal consumption, averages approximately 465 kilowatt hours (kWh) per ton of solid waste processed 86,000 megawatt hours (mWh) per year, and has been sold for approximately $0.065 per kWh to PGE, or about $30 per ton of solid waste. The annual revenue to the County is about $4.2 million per year. In addition to the service fee mentioned above, Covanta receives a small percentage of electricity revenue; Covanta's share in FY2008 averaged approximately $2.40 per ton.

Ferrous metal recovery from ash residue has averaged approximately 4,000 tpy, or 2.2% of waste deliveries. Revenue from marketing recovered ferrous metal is approximately $300

[1] *Personal Communication with Russ Johnston, Covanta Facility Manager, Marion County WTEF, August 1, 2008.*
[2] *Personal Communication with Karen Breckenridge, Covanta Business Manager, Marion County WTEF, August 26, 2008.*

per ton in FY2009, but will vary depending on market conditions. Completion of Covanta's implementation of a magnet system to replace the original unit was scheduled for September 2008. The new unit is projected to increase ferrous metal recovery by approximately 1,000 tpy. Covanta receives a fee for operating the ferrous metal recovery unit and 50% of revenues, net of marketing and administrative costs incurred by the County.

The WTEF includes two combustion units rated at 275 tpd each when firing fuel having a heating value of 4,500 British thermal units/lb. (Btu/lb.) The furnace/boiler systems generate superheated steam that is directed to a turbine-generator unit rated at 13.1 MWh. Approximately 11 MWh is sold on a continuous basis when running at capacity (550 tpd), after in-facility needs are met. Sales of electrical energy are by an agreement with PGE that runs through June 30, 2014. As of the middle of calendar year (CY) 2008, Covanta has yet to commence discussions regarding an agreement for the sale of electrical energy after the 2014 end date.

The initial air pollution control system consisted of reverse semi-dry scrubbers, carbon injection, and an air fabric filter baghouse that remove sulfur dioxides (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), hydrochloric acid (HCl), dioxin, volatile organic compounds, lead, cadmium, mercury, and particulates. These are regulated emissions, as is opacity, a function of particulates in the stack gases. This facility was the first WTEF in the U.S. to employ the combined dry scrubber/fabric filter air pollution control system in combination.

The County entered into the "Second Amended and Restated Agreement for the Supply and Acceptance of Solid Waste" (Agreement) in 1984 with Covanta. The Agreement has since been amended ten times, most recently on March 26, 2008.

Under the Agreement, Covanta is responsible for operation and maintenance of the WTEF, generation of electricity for sale, and processing ash to recover ferrous metal. The County is responsible for running the scalehouse, providing transport and sale of recovered ferrous metals, and transport and disposal of all ash residues. Under the Agreement, the County has guaranteed a minimum waste supply, previously mentioned, to the WTEF and Covanta has provided certain operating and performance guarantees to Marion County.

The Agreement with Covanta extends through September 19, 2014, at which time the Agreement may be extended, revised, or terminated. If the County elected not to contract with Covanta after 2014, Covanta could receive waste from other jurisdictions with which to operate the WTEF.

6.1.2.1 Operational History and System Performance

The operation and environmental impacts of the WTEF have been monitored since its construction. The WTEF has achieved several objectives for the County.

One objective is reduction in waste volume. Available process capacity is 185,000 tpy, or a daily average of approximately 507 tpd. Available capacity allows for scheduled and unscheduled outages for maintenance and repair. Covanta conducts two major scheduled outages each year, one week per each boiler unit, or two weeks total for the two boilers, thus maintaining some processing capacity during these outages. However, during these

outages, some waste is routed to out-of-County landfills. Scheduled outages reduce capacity less than 4% of the maximum available amount of hours in the year.

In addition, unscheduled outages occur for repair, typically single item problems, such as one boiler tube leaking, that require shutting down one boiler for a period of time of a few hours to a couple of days. Unscheduled outages are annually reported to ODEQ, in compliance with the WTEF's solid waste facility permit requirements. During calendar year 2007, unscheduled outages were approximately 2% of the total amount of hours available in the year.

Another objective is generating electricity for use in running the WTEF and selling the balance to PGE. Sales to PGE, discussed previously in this subsection, indicate that this objective is being met.

6.1.2.2 Compatibility of WTEF with Existing System

The County disposed of more than 247,000 tpy of MSW in CY2007 (see Table 2-11) and sent approximately 171,000 tpy of this amount to the WTEF for combustion. The WTEF will continue to serve as a primary component in Marion County's waste management system.

The WTEF receives solid waste delivered from franchised hauler trucks and transfer trailers, stores it in a totally enclosed area of the facility, including a below-grade concrete-lined pit, and combusts in two furnace/boiler units. Thermal energy produced from combustion is converted to steam in boilers, and steam is used to produce electricity. The WTEF combusts waste in an unprocessed form; that is, materials are not removed from delivered loads and neither is the waste processed mechanically prior to combusting it. The types and quantities of materials directly entering the WTEF affect its performance and facility planning needs. Certain waste components have a higher heating value (HHV) because of their elemental composition. It is possible that removal of certain components for recycling could affect the energy output of the WTEF.

Information from other jurisdictions that have a WTEF and recycling programs indicates that removal of combustible components, such as paper, is somewhat balanced by the removal of noncombustible or inert material such as metal and glass. Over the past years, quantities of materials removed from the waste stream have reached more than 50% (see Table 2-11). Much of this material includes yard waste, wood waste, paper, and plastics, each of which is combustible; therefore, each contributes to the HHV of mixed waste. However, Covanta reports that the HHV of solid waste processed varied only nominally around an average of 4,600 Btu per pound during this period. It should be noted that for the five-year period prior to development of the 2002 update of the County's SWMP, Covanta reported an average HHV of waste of 4,500 Btu per pound. Therefore, increasing recycling rates in the service area has had only a minor impact on the WTEF operation.

6.1.2.3 Future Availability of WTEF

The WTEF will have operated for 27 years when the Agreement expires in 2014. However, with regular maintenance and appropriate major component replacement, the WTEF can serve the County to 2014 and longer. Covanta has conducted a variety of life-extending repair or replacement projects over the last several years, including, within the last two to three years:

- Adding an overlay of Inconel to waterwall (boiler) tubes, a metal alloy to minimize corrosion and erosion on tube surfaces impinged by combustion gases, an ongoing project.
- Replacing bottom one third of the baghouse, the system that removes particulate from combustion gases prior to exhausting them to the atmosphere.
- Replacing part of the superheater section of the boiler, the section of boiler tubes that combustion gases impinge upon.
- Replacing the bottom of lime quench reactor, a component of the acid gas scrubber system.

Additional replacement/repairs may be needed in or before 2014 to ensure high performance is maintained after 2014.

6.1.2.4 Air Quality[3]

Another objective of the WTEF is meeting requirements of its Clean Air Act Title V air emission permit, issued by ODEQ. The facility has met its performance operating requirements each year since 1987. The WTEF has a continuous monitoring system for carbon monoxide (CO), oxygen gas (O2), nitrogen oxide (NOx), sulfur dioxide (SO2), hydrochloric acid (HCl) opacity, as well as other controls, meters, and monitors, including radiation detection equipment.

In May 1998, the air pollution control system was retrofitted with a NOx control system and a mercury control system. This was installed to comply with the 1990 Clean Air Act amendments, including the 1996 U.S. Environmental Protection Agency (EPA) "maximum achievable control technology (MACT)" standards for large municipal waste combustion units that burn more than 250 tpd of MSW. The WTEF can be retrofitted with additional systems if emission standards are revised beyond existing technology capabilities or if controls on additional emissions are required due to new regulations.

Within the last ten years, ODEQ issued one Notice of Non-Compliance citation to the WTEF, for a delayed reporting of an emission excursion, an event when emission levels higher than normal operating levels occur. Emissions excursions are allowed for up to 3 hours per event and a total of 15 hours per year for only carbon monoxide during boiler shutdown, startup, or a malfunction such as a boiler steam tube leak. Such events occur during unscheduled and scheduled outages previously discussed. Covanta reports such events to ODEQ in compliance with its permit requirements. Table 6-1 shows 2008 emissions data in comparison with the DEQ and EPA permit levels.

During the WTEF's operating life, Covanta has never received a Notice of Violation from ODEQ.

[3] *Personal Communication with Kelly Champion, Covanta Environmental Manager, Marion County WTEF, August 27, 2008.*

Table 6-1 – Waste-to-Energy Facility Emissions (2008) vs. Permit Levels

	EPA Permit Limit	New Oregon DEQ limits	Marion 2008 Emissions
Lead (µg/dscm*)	400	200	0.052
Cadmium (µg/dscm)	35	20	0.0045
Dioxin/Furan (ng/dscm#)	30	15	3.8
Particulate (mg/dscm+)	25	25	0.007
Mercury (µg/dscm)	50	50	0.0063

*µg/dscm – microgram per dry standard cubic meter
#ng/dscm – nanograms per dry standard cubic meter
+mg/dscm – milligram per dry standard cubic meter

6.1.2.5 Greenhouse Gas Reduction and Carbon Footprint[4]

The Solid Waste Industry is well aware of the role it plays in reducing Greenhouse Gas (GHG) emissions and the carbon footprint it produces. General purpose landfills have been identified in several states including Oregon as a significant contributor of GHG. Likewise, WTEF contribute to carbon emissions even with extensive air handling controls. In many cases, the industry is working to reduce the carbon footprint or to purchase offsets.

Covanta is a member of the California Climate Action Registry (CCAR), a private non-profit organization formed by the State of California. The California Registry serves as a voluntary GHG registry to protect and promote early actions to reduce GHG emissions by organizations. The California Registry provides leadership on climate change by developing and promoting credible, accurate, and consistent GHG reporting standards and tools for organizations to measure, monitor, third-party verify and reduce their GHG emissions consistently across industry sectors and geographical borders. In 2008, more than 300 private corporations, institutions, environmental organizations, and local governments were members.

Covanta has reported to CCAR and had verified GHG emissions from process (waste burning) and other facility activities for 2005 through 2007 for the company's WTEF located within California. The company has not had a reason to report GHG values for air emissions from its Oregon facilities to ODEQ, but with its experience in California the company is capable of developing reports for its Oregon facilities when that requirement occurs.

Covanta also is a participant in the Western Climate Initiative (WCI), a collaboration launched in February 2007 by the Governors of Arizona, California, New Mexico, Oregon and Washington to develop regional strategies to address climate change.

[4] *Personal Communication with Jeff Hahn, Covanta Environmental Manager, Marion County WTEF, September 3, 2008.*

Covanta's participation in these two groups is for the purpose of identifying and implementing emissions reporting capability according to accepted protocols as each of the member states and provinces in which the company operates facilities commences a reporting requirement.

The company also has experience in developing life cycle carbon footprint analyses for its facilities, including life cycle analyses for generation of electricity using alternatives beyond WTEF. In these analyses, the carbon footprint of electricity generated by the electric utility company that has foregone generation due to Covanta's WTEF is developed using the local utility company's current fuel mix. This method presents a more realistic estimate of emission trade-offs occurring within the region of each WTEF.

6.1.2.6 Potential WTEF Availability after 2014

Covanta Energy, a unit of Covanta Holding Corporation (Covanta Holding), a New York Stock Exchange company, owns, through a local subsidiary company Covanta Marion Inc., the Marion County WTEF. This is one of 44 facilities the company operates in the U.S. as well as another 52 internationally. Covanta Energy also operates other types of energy-generating facilities. Covanta Holdings Corporation reported revenue for the 12 months ending December 31, 2008 of $1.66 billion and net income of $139 million, both unaudited.[5]

The WTEF has had several major projects to extend system life; however, additional projects will likely be required in 2014. Covanta intends to present those needs as part of a capital structure proposal for service to the County beyond 2014, the current agreement period.

Covanta expects to commence discussions with the County prior to 2014 regarding availability of the WTEF after 2014. Although Covanta has expressed an interest in continuing its service to the County, Covanta also has stated an objective of continuing operation of the WTEF, by obtaining waste deliveries from other sources, if it cannot reach agreement for continued deliveries from County-controlled sources.

One advantage of the County's continued use of the WTEF is that the bonds have been retired. Only capital to replace components and make facility modifications will be needed. This advantage might be reduced by system replacement costs that will be needed in 2014, including costs to remove existing elements and acquisition and installation costs of equipment that are higher than original due to general cost escalation factors over years since the facility was originally constructed.

Another consideration is electricity sales after June 30, 2014, and projected revenues under a new or renewed agreement with PGE. In its Power Purchase Information (Schedule 201), PGE offers rates that escalate in time. A fixed price option for 2014 ranges from $54 to $82 per MW, according to the time of year and time of day. Market-based (non-fixed) rates are tied to the price of natural gas. Rates in Schedule 201 are the starting point for negotiated rates for facilities providing more than 10 MW to PGE. PGE has expressed a willingness to continue purchasing electrical energy generated by the WTEF beyond 2014. In 2007, PGE updated its Schedule 202, guidelines and procedures for developing a negotiated power purchase agreement with the Company. The term of such an agreement may have up to 20

[5] Covanta Holdings. *"Fourth Quarter and Full Year Results."* www.investors.covantaholding.com (April 14, 2009)

years. Covanta would be expected to meet the requirements of the Schedule 202 process, primarily based on its history of selling power for the life of the WTEF and that the updated Schedule 202 complies with the federal law known as the Public Utility Regulatory Policy Act of 1978 (PURPA), a law that was in effect at the time of development of the original electrical energy sales agreement.[6,7] It may be feasible to sell power to a buyer other than PGE. In this case, there would likely be a "wheeling" charge to distribute the power to such buyer.

In 2008, PGE did not pay Covanta for any renewable energy credits or other similar credits. Oregon law has excluded WTEF from eligibility for this type of credit. However, the County and Covanta have been working with their representatives at the state and federal level in an attempt to get waste-to-energy recognized as a renewable power producer in both state and federal law. This would bring equity to the renewable energy equation, as currently when garbage is placed into a landfill and it generates methane which is combusted, this is considered renewable, while burning that same waste directly for energy is currently not considered renewable. The result of this effort, should it prove to be successful, would put a premium on the price received for this energy, thus increasing the level of revenue received from power sold to utilities wishing to use this energy to meet their renewable portfolio standard requirements.

PGE has some flexibility in purchasing electrical energy from other generators such as the WTEF, as generally prescribed by the Oregon Utilities Commission. Also, Covanta could consider responding to Request for Proposals (RFPs) that PGE expects to issue over each of the next several years for purchase of power from facilities qualifying under the PURPA law. PGE also would entertain purchasing power from the WTEF under a "non-qualified" sales agreement, whereby the procedures and requirements would not be totally limited by the PURPA law.

6.1.3 WTEF Ash Residue Disposal[8]

Marion County, under its Agreement for Supply and Acceptance of Solid Waste with Covanta, is responsible for transport and disposal of ash produced at the WTEF. Ash is disposed at the NMCDF. This landfill facility is located approximately three miles northwest of Woodburn and is adjacent to the former Marion County Department of Public Works shop off Crosby Road. It is the only solid waste landfill located in the County that is permitted to accept ash.

The NMCDF receives approximately 50,000 tons of ash from the WTEF each year, representing approximately 75% reduction by weight of solid waste deliveries, but 90% volume reduction, due to the higher density of ash compared to unprocessed solid waste. NMCDF is an ash monofill; that is, no other type of waste is landfilled at the facility. Solid waste is received at the NMCDF; however, it is transferred to tractor trailer rigs in a transfer station located on the site, for transportation to the WTEF.

Prior to construction of the WTEF in 1986, the NMCDF received solid waste from the northern portion of the County, disposing of waste in open trenches. After that date and

[6] *Personal communication with Bruce True, Power Purchase Department, Portland General Electric Company, August 15, 2008.*
[7] Portland General Electric website. "*Schedule 201, 202.*" www.portlandgeneral.com *(April 14, 2009).*
[8] *North Marion County Disposal Area, Update, June 2008, County website.*

until 1996, the landfill disposed of small quantities of solid waste that could not be burned at the WTEF. Beginning in 1996, the landfill disposed of no unprocessed solid waste.

The County has constructed one cell at the landfill that is permitted to accept unprocessed solid waste. This would be used if operation of the WTEF were to cease and, thus, is referred to as the "Back-Up Landfill." It has not been used as of 2009, and the County plans to modify the cell for disposal of ash, as well as obtain a revised permit for it and use it beginning approximately 2014. Based on this plan, the NMCDF would be used for ash disposal until 2020, at which time it may be closed if additional capacity cannot be permitted. Since the County is responsible for ash disposal under its existing Agreement with Covanta, disposal of ash beyond 2020 would be one of the issues to be addressed in an extension of the Agreement beyond 2020.

Marion County owns the site and is responsible for operating the landfill, including placing, compacting, and covering waste, in compliance with all regulatory requirements. Marion County is responsible for leachate disposal and compliance monitoring for the old landfill and the ash monofill. Tests indicate that the ash is non-hazardous. Three ash monofill cells have reached capacity and have been closed and capped. In 2008, the County was using the fourth ash monofill cell (referred to as Cell IV). Cell IV is scheduled to receive ash through 2014. Current technology includes a double composite liner, including two flexible membrane liners and a two-foot-thick clay layer.

Ash residue delivered to the NMCDF is saturated or nearly saturated with water. This water leaches out of the ash residue and migrates to the bottom of the landfill cell. Likewise, rainfall on the cell migrates to the bottom of the landfill cell. Leachate is removed from the ash monofill with a collection piping and pumping system. Removed leachate was stored in an open lagoon and then land applied from 1989 until 1997. A polypropylene (film plastic) cover was installed on the lagoon to reduce the volume of leachate that must be treated by eliminating precipitation from entering the lagoon. Also, at that time, the County began to tarp exposed ash fill area to divert rainfall from the cell area.

Leachate was stored in the lagoon until 1998, when the County began to transport it to the Georgia Pacific pulp mill in Toledo, Oregon. This practice was discontinued in 2005. In 2004, the County began sending leachate to a treatment system constructed at the landfill. This practice was discontinued in 2007 when the treatment facility was closed due to operational and maintenance issues.

In 2007, the County entered into a long-term agreement for off-site disposal of leachate with Waste Connections, Inc. and began transporting and disposing leachate at the Finley Buttes Landfill in eastern Oregon. Under this agreement, Waste Connections will load, transport, treat and dispose of approximately 3.5 million gallons of leachate per year. The cost of ash disposal is $5.25 per ton if allocated over all tons.

During CY2008, the County replaced the polypropylene floating cover at the landfill with a new Hypalon floating cover. The County added other constructed appurtenant features to the lagoon during that same time period.

6.1.4 Existing Landfill Disposal

The majority of MSW generated in Marion County and slated for disposal is received at the WTEF, on the order of 74% in 2007. However, with any system that uses an alternative

technology to traditional landfilling, there are certain limitations that must be planned to make sure all waste is properly disposed. This includes three types of waste or events:

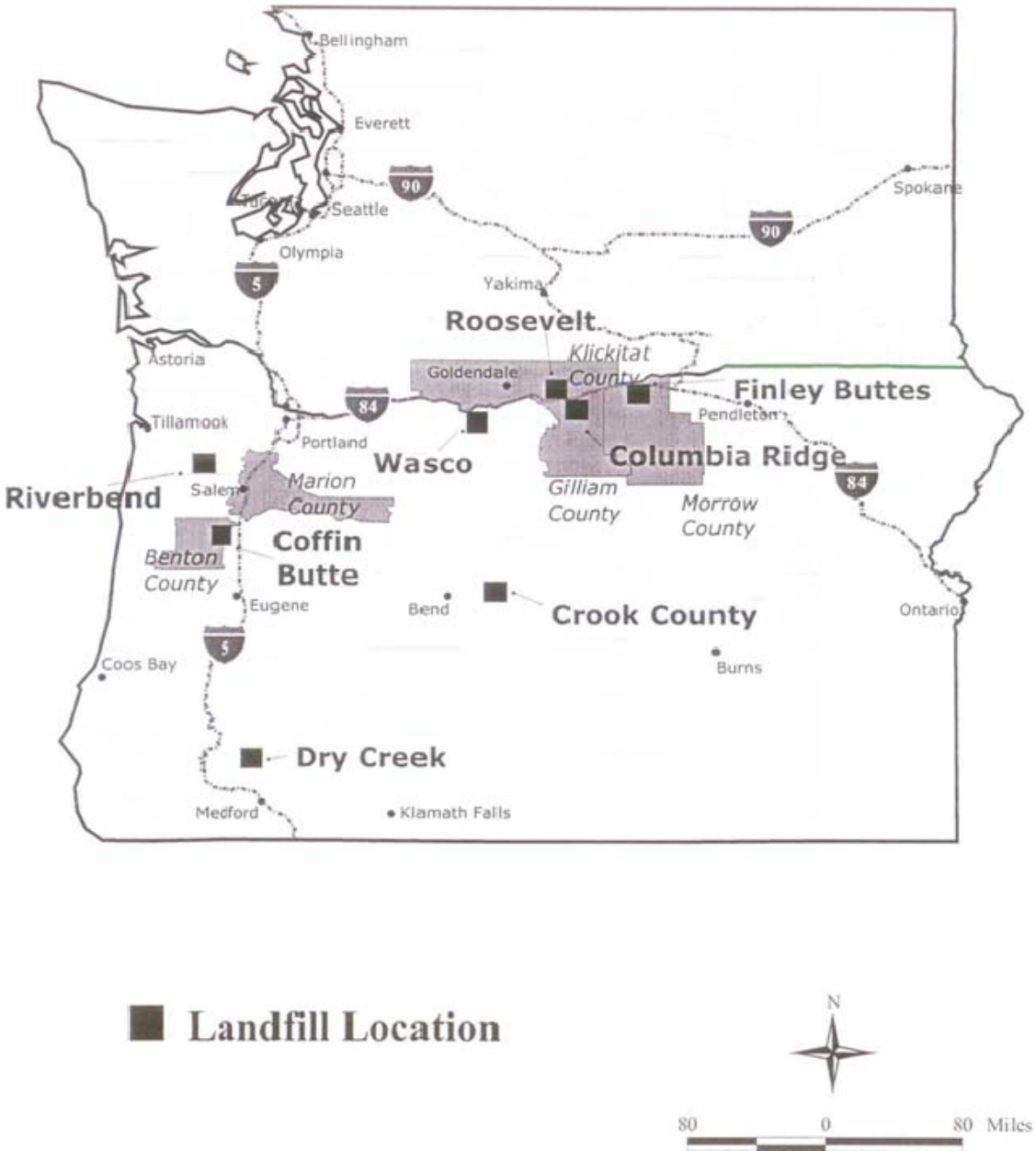
- Waste that cannot be combusted (non-combustible).
- Diverted waste during times that the WTEF is shut down for maintenance.
- Waste generated in excess of the WTEF capacity.

Marion County generated over 64,000 tons of waste in these categories for landfill disposal in 2007. Figure 6-1 shows locations of out-of-County regional landfills potentially available to receive these excess tonnages.

Marion County is fortunate to have two regional MSW landfills located in reasonable proximity to its jurisdictions. Coffin Butte is located in adjacent Benton County, about 30 miles from the city center of Salem. It receives waste directly from franchised haulers that is generated in excess of the WTEF capacity. It also handles waste when the facility is down. The County has an informal agreement with these companies to deliver MSW to Coffin Butte when the WTEF is operating at capacity or is offline. Coffin Butte also receives residual waste from the MRRF. Coffin Butte has sufficient capacity to support the disposal needs of Marion County. The other disposal site is the Riverbend Landfill, located in Yamhill County, 30 miles from the center of the City of Salem.

Historically, each of these landfills has received MSW from Marion County, although Riverbend in much lower amounts. These landfills receive waste in excess of the WTEF capacity and waste when the WTEF is shutdown.

Figure 6-1 - Regional Out-of-County Landfills



During these events, the County has worked in a cooperative arrangement with franchised haulers to deliver waste to the landfill directly from collection routes. However, with population growth, the number of trips directly to the landfills has increased, and with higher fuel prices, it is becoming more costly for collection trucks to transport waste to the landfills, and this is beginning to put pressure on rates. To accommodate more efficient transportation, it will be necessary to use larger transfer trailers to transport waste to landfills. This will require new investments in the County transfer station system. The cost to transport waste by larger transfer trailers is about $0.05 to $0.08 per ton – mile, while

the cost to transport waste by collection trucks is approximately $0.13 to $0.15 per ton-mile.

As discussed in Chapter 5, Waste Collection and Transfer, in order to transport waste to landfills more economically, additional transfer capacity is required. This capacity may be achieved by expansion of or modifications to existing facilities. Another option is to possibly site and build a new transfer station.

6.1.4.1 Coffin Butte Landfill

Coffin Butte, located south of Marion County, near Corvallis in Benton County, has served as backup to the WTEF since 1987. Located about 30 miles from the center of Salem, this landfill receives waste in excess of the WTEF capacity. It also serves as backup to the WTEF when there is scheduled maintenance or downtime.

Coffin Butte is owned by Allied Waste, which was recently acquired by Republic Services and is the second largest waste management company in the United States. The County has no formal agreement with Coffin Butte to accept waste originating from Marion County. Coffin Butte charges a "public gate rate" of $44 per ton for disposal. The landfill, formerly regulated by Benton County for disposal rates, now has the ability to negotiate an agreement rate based on volume.

The landfill owners have reported there is sufficient capacity within the approved landfill footprint for many years of service at current disposal quantities. If the County's use of the WTEF is discontinued, the amount of County waste that may have to be disposed in a landfill increases by 185,000 tpy. This amount of waste will have an impact on the site life of the current Coffin Butte Landfill. Based on preliminary findings from information provided by the landfill owner, the landfill would accommodate disposal of Marion County's waste for at least 25 years. This assumes no new alternative disposal technology is implemented and the County's recycling rate stays the same.

6.1.4.2 Riverbend Landfill

Located in Yamhill County, this MSW landfill is operated by Waste Management Northwest. In addition to providing disposal options for Yamhill County wastes, the facility serves as a regional disposal site for several communities in northwest Oregon, including counties on the coast and Columbia County. The landfill is approximately 30 miles west of Marion County. The landfill has a limited capacity under its current approved footprint. Waste Management Northwest has proposed an expansion of the landfill and is now working with local officials and ODEQ to consider this expansion. However, the approval of this expansion is uncertain and Yamhill County has recently issued an RFP for consulting services to evaluate waste disposal options should the expansion not be approved. If this expansion is not implemented, it is likely that tonnages currently directed to Riverbend Landfill by area jurisdictions will be rerouted to Coffin Butte, which may have an impact on the service life of this landfill. Transportation costs to the Riverbend Landfill from Marion County are similar to those for Coffin Butte.

6.1.4.3 Use of Area Landfills for Residue / Overage / Bypass Tonnages

There are important advantages to using one or both of these MSW landfills as a disposal site for waste in excess of, and as backup to, the WTEF. First, each facility has sufficient

capacity to dispose of the County's excess waste in the near term (5-10 years), although Riverbend Landfill's expansion is uncertain. Second, they are near the County, which minimizes the cost to transport waste versus more distant landfills located in eastern Oregon. Third, each landfill is willing to discuss a service agreement with Marion County to guarantee available capacity. To date, almost all waste in excess of the WTEF has been disposed of at Coffin Butte because it is closer to where waste is generated in the County.

The disadvantage may be that the landfills are too convenient to self-haulers. Many self-haulers, including contractors with C/D, transport their own waste to the Coffin Butte. By hauling directly to the landfill, these customers avoid paying for general services provided by the County, such as waste reduction and recycling services, or debt service for existing infrastructure that is available to them. Users of the Marion County system are then forced to pay more on a unit cost basis to fund these programs.

These customers also avoid using the collection system that provides a fairly high level of service and is more cost-effective to collect and deliver waste to the appropriate facility. Also, if their direct-haul material contains high amounts of recyclables, as C/D waste often does, there is no potential to recover and recycle certain materials, and the County loses out on capturing additional recycling tonnages.

In order to address these issues and ensure there will be sufficient capacity available, the County should consider contracting with one or both of these landfills. The County could use its flow control authority to require that all the waste is processed for recovery and that sufficient waste is delivered to the WTEF. In return, the out-of-County landfill could provide a set fee and also collect appropriate fees to pay for the County services.

6.1.4.4 Construction and Demolition (C/D) Debris

Typical C/D waste materials may include: ashes, asphalt shingles, concrete, fiberglass, bricks, dirt, plaster, rock, tile, vinyl flooring, plastic sheeting, window glass, asbestos, and polystyrene (styrofoam) insulation. Select drop-box loads of C/D waste are taken to the MRRF for separation and processing. Once the material is processed, the residual waste is taken to Coffin Butte or BI for disposal. Other C/D materials, which may include items such as wood waste, metal scraps and some plastics, are recycled through the processing at MRRF.

6.1.4.5 Brown's Island Landfill (BI)

The BI is permitted to accept only inert demolition waste that cannot be handled at the WTEF. The landfill primarily receives sheetrock from franchised haulers in Marion County. The facility also receives roofing tiles, ceramics, bricks, concrete or other inert materials. Since there are no liner systems installed at BI, the landfill is restricted from accepting all other types of waste.

In 2007, BI accepted an estimated 8,659 tons. The number of tons is converted from volume because there are no scales at the landfill. In 2000, the ODEQ granted the County an extension to the (landfill/operating) permit. This extension allowed the County to expand vertically by adding lifts on top of the current landfill, thus providing more capacity.

BI also serves as a backup for disposal of disaster debris materials in case of catastrophic events. Incidents of floods, severe wind storms or ice in winter can result in larger than

normal amounts of waste that must be disposed. BI provides a backup for such events. Based on current waste flows, the landfill has an estimated site capacity for 15 years of service. Once this landfill is full, the County would not have benefit of a local disposal site for these waste streams. Either a new landfill must be sited and permitted or this waste will need to be transported to Coffin Butte or other local regional sites if available.

6.2 Waste Stream Projections

6.2.1 Waste Disposal Projections

Waste stream projections were calculated through 2030 to determine the County's disposal needs (Table 6-2 through Table 6-5). Marion County's 2000 population was estimated at 286,300 by the Population Research Center of Portland State University in their 2008 Oregon Population Report, based on Census data. Projections of waste generated from 2006 to 2030 were calculated using population projections and a constant estimated per capita waste generation rate of 3,311 pounds per year, the 2006 Marion County rate reported by ODEQ[9]. Although Marion County's per capita waste generation rate fell slightly in 2007 to 3,216 pounds per person per year, the higher 2006 rate of 3,311 was used in these calculations to plan for a "worst case" scenario, in case waste generation rates were not able to be reduced in future years.

National research indicates that per capita rates of waste generation increase over time. Marion County's per capita waste generation figures have also increased steadily almost every year since 1996. For example, waste generated per capita was 2,770 pounds/year in 2002, 2,875 pounds/year in 2004, and 3,311 pounds/year in 2006. However, the estimate employed in this SWMP update uses a constant per capita waste generation rate for the 20-year period.

As discussed in Chapter 2, although the recycling rate grew at a slightly higher rate than that of waste generated, the amount of waste disposed continued to increase as well, due to population growth. The amount of materials recycled in Marion County has increased from 191,817 tons in 2001 to 252,555 tons in 2007 (see Table 2-9 in Chapter 2). This represents a 31% increase in six years or an average growth rate of 4.7% per year in recycling. Over the same period, waste disposed grew more than 27%, with an average of growth of about 4.1% per year, and the amount of waste generated increased by almost 30%, averaging 4.4% growth per year, potentially due to factors such as population increases, product/services changes, and consumer purchasing patterns. In general, recycling and reduction in per capita waste generation have not and are not expected to keep pace with population growth.

Waste generation projections were developed using four waste stream alternatives, each with different assumptions for recycling rates and disposal. They include:

[9] In the 2007 DEQ Materials Recovery Report, ODEQ revised the 2006 Marion County per capita waste generation rate to 3,304 pounds per person per day. However, the original 2006 figure was used in calculations, as noted, to represent a "worst case" scenario for planning purposes.

- Table 6-2 assumes that the 2006 recycling rate (51.5%)[10] remains constant throughout the 20-year period and the WTEF continues its existing operation.

- Table 6-3 assumes that the recycling rate will increase gradually from the 2006 rate of 51.5% to 60% in 2014 and remain constant until 2030, and the WTEF continues its existing operation. This alternative is expected to achieve additional recycling of currently targeted materials and recycling of new recyclable materials which are currently disposed, based on waste characteristics presented in Chapter 2.

- Table 6-4, similar to Table 6-2, assumes that the 2006 recycling rate (51.5%) remains constant throughout the 20-year period; however, Table 6-4 shows the WTEF ceases to receive contracted waste deliveries from Marion County operations after 2014.

- Table 6-5, like Table 6-3, assumes that the recycling rate will increase gradually from the 2006 rate of 51.5% to 60% in 2014 and remain constant until 2030, but also shows the WTEF ceasing to receive contracted waste deliveries from Marion County operations after 2014.

The tables show significant differences in the total MSW that may be delivered for alternative disposal by 2030. Each scenario indicates that a substantial volume of MSW will require disposal by 2030. The volume is greater under the last two alternatives in which the WTEF is closed to County-provided wastes.

Assuming the WTEF remains operational throughout the 20 year period, under the constant 51.5% recycling rate alternative (Table 6-2), over 2.3 million cumulative tons of MSW will require disposal in excess of the capacity at the WTEF and BI, compared to 1.3 million cumulative tons under the 60% recycling alternative (Table 6-3). This waste is currently disposed of privately at Coffin Butte, Riverbend, and other out-of-County landfill facilities.

A 60% recycling rate means that approximately one million fewer tons will be delivered for landfill disposal in the 20 years than if the recycling rate remains at the 2006 rate of 51.5%. The amount of MSW requiring disposal increases under the last two alternatives. Assuming a constant 51.5% recycling rate and discontinued Marion County contracted use of the WTEF (Table 6-4), a cumulative total of 5.3 million tons will require alternative disposal by 2030. The alternative in which the recycling rate is escalated to 60% by 2014 and the WTEF is no longer contracted to receive Marion County waste (Table 6-5) reduces that cumulative total to only 4.2 million tons.

These waste stream alternative scenarios demonstrate the importance of disposal options for Marion County. The County's growth rate over 20 years will exceed its disposal capacity unless it considers expanding the WTEF, building an in-County landfill, purchasing capacity at local or regional landfills, or implementing an alternative waste disposal technology. These options may not provide exclusive solutions for the County's growth. A best management approach for disposal may be to combine more WTEF capacity with multiple landfill agreements and a realistic recycling rate.

[10] The 2006 recycling rate of 51.5% was used in calculations as the highest recent achieved rate under current conditions, thus repeatable by the existing County residents and businesses without any programmatic changes.

Table 6-2 - Waste Stream Projections with a 51.5% Recycling Rate (Constant) and Continued Use of WTEF

Year	Population [1]	Waste Generated (tons)[2]	Waste Recycled (tons)	Recycling Rate[3]	Waste Disposed (tons)[4]	Waste to WTEF (tons)[5]	Waste to Browns Island (tons)[6]	MSW to be Landfilled (tons)[7]	Cumulative MSW to be Landfilled (tons)[8]
2000	286,300	356,130	135,329	38%	220,801	170,950	7,812	42,039	
2001	289,623	360,435	180,218	50%	180,218	168,247	3,227	8,744	
2002	292,945	364,570	185,931	51%	178,639	165,439	4,469	8,731	
2003	296,268	368,705	173,291	47%	195,414	167,605	5,765	22,044	
2004	299,590	372,840	175,235	47%	197,605	159,597	6,935	31,073	
2005	302,913	481,723	240,862	50%	240,862	160,785	9,336	70,741	
2006	306,956	508,166	261,705	51.5%	246,460	168,516	8,676	69,268	
2007	310,999	514,859	265,152	51.5%	249,707	171,591	8,659	69,457	69,457
2008	315,042	521,552	268,599	51.5%	252,953	185,000	9,092	58,861	128,317
2009	319,085	528,245	272,046	51.5%	256,199	185,000	9,547	61,652	189,970
2010	323,128	534,938	275,493	51.5%	259,445	185,000	10,024	64,421	254,391
2011	327,391	541,996	279,128	51.5%	262,868	185,000	10,525	67,343	321,734
2012	331,654	549,053	282,762	51.5%	266,291	185,000	11,051	70,239	391,973
2013	335,917	556,111	286,397	51.5%	269,714	185,000	11,604	73,110	465,083
2014	340,180	563,168	290,032	51.5%	273,136	185,000	12,184	75,952	541,035
2015	344,443	570,225	293,666	51.5%	276,559	185,000	12,793	78,766	619,801
2016	348,958	577,700	297,515	51.5%	280,184	185,000	13,433	81,752	701,553
2017	353,473	585,175	301,365	51.5%	283,810	185,000	14,105	84,705	786,258
2018	357,988	592,649	305,214	51.5%	287,435	185,000	14,810	87,625	873,883
2019	362,503	600,124	309,064	51.5%	291,060	185,000	15,550	90,510	964,393
2020	367,018	607,598	312,913	51.5%	294,685	185,000	16,328	93,357	1,057,750
2021	371,394	614,843	316,644	51.5%	298,199	185,000	0	113,199	1,170,949
2022	375,770	622,087	320,375	51.5%	301,712	185,000	0	116,712	1,287,661
2023	380,146	629,332	324,106	51.5%	305,226	185,000	0	120,226	1,407,887
2024	384,522	636,576	327,837	51.5%	308,739	185,000	0	123,739	1,531,626
2025	388,898	643,821	331,568	51.5%	312,253	185,000	0	127,253	1,658,879
2026	393,123	650,815	335,170	51.5%	315,645	185,000	0	130,645	1,789,525
2027	397,348	657,809	338,772	51.5%	319,037	185,000	0	134,037	1,923,562
2028	401,572	664,803	342,374	51.5%	322,430	185,000	0	137,430	2,060,992
2029	405,797	671,797	345,976	51.5%	325,822	185,000	0	140,822	2,201,813
2030	410,022	678,791	349,578	51.5%	329,214	185,000	0	144,214	2,346,027

[1]Marion County's 2000 population was estimated at 286,300 by the Population Research Center of Portland State University in their 2006 Oregon Population Report, based on Census data. Population in this table is calculated using Office of Economic Analysis, Department of Administrative Services, State of Oregon Forecasts of Oregon's County Populations and Components population figures released April 2004.

[2]Projected waste generated between 2006 and 2030 was based on an estimate of 3,311 lb per capita (the 2006 waste generation rate) remaining constant, although it has raised continuously in past years.

[3]Recycling Rate shown is the Calculated Recycling Rate only, without the addition of Recovery Credits for Waste Prevention, Reuse, or Residential Composting activities, per ODEQ Material Recovery and Waste Generation Rates, actual reported rates from 2000-2006.

[4]Waste Disposed shown is mathematical product of Waste Generated minus Waste Recycled.

[5]WTEF Tonnage shown is in-County material only, per Marion County Public Works 2006 & 2007 Annual Reports, and WTEF also receives out-of-County material, making up any shortfall to the 185,000 TPY capacity.

[6]Waste disposed at BI shown 2000-2007 is in-County material only, per Marion County Public Works Annual Reports, tonnages shown for 2008 and beyond were calculated based on a 0.5 percent annual increase from 2007 levels, until the facility's expected closure in 2020.

[7]This is MSW requiring disposal in excess of WTEF and BI; these wastes are currently disposed privately at Coffin Butte, Riverbend, and other landfills.

[8]Cumulative MSW is the total waste requiring disposal over the 20-year projection, in excess of that disposed at WTEF and BI.

Table 6-3 - Waste Stream Projections with Recycling Rate Escalating from 2006 rate of 51.5% to Increased 60% Recycling Rate by 2014 and Continued Use of WTEF

Year	Population [1]	Waste Generated (tons)[2]	Waste Recycled (tons)	Recycling Rate[3]	Waste Disposed (tons)[4]	Waste to WTEF (tons)[5]	Waste to Browns Island (tons)[6]	MSW to be Landfilled (tons)[7]	Cumulative MSW to be Landfilled (tons)[8]
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2002	292,945	364,570	185,931	51%	178,639	165,439	4,469	8,731	
2003	296,268	368,705	173,291	47%	195,414	167,605	5,765	22,044	
2004	299,590	372,840	175,235	47%	197,605	159,597	6,935	31,073	
2005	302,913	481,723	240,862	50%	240,862	160,785	9,336	70,741	
2006	306,956	508,166	261,705	51.5%	246,460	168,516	8,676	69,268	
2007	310,999	514,859	265,152	51.5%	249,707	171,591	8,659	69,457	69,457
2008	315,042	521,552	274,932	52.7%	246,620	185,000	9,092	52,528	121,984
2009	319,085	528,245	284,875	53.9%	243,370	185,000	9,547	48,824	170,808
2010	323,128	534,938	294,980	55.1%	239,958	185,000	10,024	44,934	215,742
2011	327,391	541,996	305,453	56.4%	236,542	185,000	10,525	41,017	256,759
2012	331,654	549,053	316,098	57.6%	232,955	185,000	11,051	36,904	293,663
2013	335,917	556,111	326,914	58.8%	229,197	185,000	11,604	32,593	326,257
2014	340,180	563,168	337,901	60.0%	225,267	185,000	12,184	28,083	354,340
2015	344,443	570,225	342,135	60.0%	228,090	185,000	12,793	30,297	384,637
2016	348,958	577,700	346,620	60.0%	231,080	185,000	13,433	32,647	417,284
2017	353,473	585,175	351,105	60.0%	234,070	185,000	14,105	34,965	452,249
2018	357,988	592,649	355,589	60.0%	237,060	185,000	14,810	37,250	489,499
2019	362,503	600,124	360,074	60.0%	240,049	185,000	15,550	39,499	528,998
2020	367,018	607,598	364,559	60.0%	243,039	185,000	16,328	41,711	570,709
2021	371,394	614,843	368,906	60.0%	245,937	185,000	0	60,937	631,646
2022	375,770	622,087	373,252	60.0%	248,835	185,000	0	63,835	695,481
2023	380,146	629,332	377,599	60.0%	251,733	185,000	0	66,733	762,214
2024	384,522	636,576	381,946	60.0%	254,630	185,000	0	69,630	831,844
2025	388,898	643,821	386,292	60.0%	257,528	185,000	0	72,528	904,373
2026	393,123	650,815	390,489	60.0%	260,326	185,000	0	75,326	979,699
2027	397,348	657,809	394,685	60.0%	263,124	185,000	0	78,124	1,057,822
2028	401,572	664,803	398,882	60.0%	265,921	185,000	0	80,921	1,138,743
2029	405,797	671,797	403,078	60.0%	268,719	185,000	0	83,719	1,222,462
2030	410,022	678,791	407,275	60.0%	271,517	185,000	0	86,517	1,308,979

[1]Marion County's 2000 population was estimated at 286,300 by the Population Research Center of Portland State University in their 2006 Oregon Population Report, based on Census data. Population in this table is calculated using Office of Economic Analysis, Department of Administrative Services, State of Oregon Forecasts of Oregon's County Populations and Components population figures released April 2004.

[2]Projected waste generated between 2006 and 2030 was based on an estimate of 3,311 lb per capita (the 2006 waste generation rate) remaining constant, although it has raised continuously in past years.

[3]Recyclcing Rate shown is the Calculated Recycling Rate only, without the addition of Recovery Credits for Waste Prevention, Reuse, or Residential Composting activities, per ODEQ Material Recovery and Waste Generation Rates, actual reported rates from 2000-2006.

[4]Waste Disposed shown is mathematical product of Waste Generated minus Waste Recycled.

[5]WTEF Tonnage shown is in-County material only, per Marion County Public Works 2006 & 2007 Annual Reports, and WTEF also receives out-of-County material, making up any shortfall to the 185,000 TPY capacity.

[6]Waste disposed at BI shown 2000-2007 is in-County material only, per Marion County Public Works Annual Reports, tonnages shown for 2008 and beyond were calculated based on a 0.5 percent annual increase from 2007 levels, until the facility's expected closure in 2020.

[7]This is MSW requiring disposal in excess of WTEF and BI; these wastes are currently disposed privately at Coffin Butte, Riverbend, and other landfills.

[8]Cumulative MSW is the total waste requiring disposal over the 20-year projection, in excess of that disposed at WTEF and BI.

Table 6-4 - Waste Stream Projections with a 51.5% Recycling Rate (Constant) and Discontinued Use of WTEF after 2014

Year	Population [1]	Waste Generated (tons)[2]	Waste Recycled (tons)	Recycling Rate[3]	Waste Disposed (tons)[4]	Waste to WTEF (tons)[5]	Waste to Browns Island (tons)[6]	MSW to be Landfilled (tons)[7]	Cumulative MSW to be Landfilled (tons)[8]
2000	286,300	356,130	135,329	38%	220,801	170,950	7,812	42,039	
2001	289,623	360,435	180,218	50%	180,218	168,247	3,227	8,744	
2002	292,945	364,570	185,931	51%	178,639	165,439	4,469	8,731	
2003	296,268	368,705	173,291	47%	195,414	167,605	5,765	22,044	
2004	299,590	372,840	175,235	47%	197,605	159,597	6,935	31,073	
2005	302,913	481,723	240,862	50%	240,862	160,785	9,336	70,741	
2006	306,956	508,166	261,705	51.5%	246,460	168,516	8,676	69,268	
2007	310,999	514,859	265,152	51.5%	249,707	171,591	8,659	69,457	69,457
2008	315,042	521,552	268,599	51.5%	252,953	185,000	9,092	58,861	128,317
2009	319,085	528,245	272,046	51.5%	256,199	185,000	9,547	61,652	189,970
2010	323,128	534,938	275,493	51.5%	259,445	185,000	10,024	64,421	254,391
2011	327,391	541,996	279,128	51.5%	262,868	185,000	10,525	67,343	321,734
2012	331,654	549,053	282,762	51.5%	266,291	185,000	11,051	70,239	391,973
2013	335,917	556,111	286,397	51.5%	269,714	185,000	11,604	73,110	465,083
2014	340,180	563,168	290,032	51.5%	273,136	185,000	12,184	75,952	541,035
2015	344,443	570,225	293,666	51.5%	276,559	0	12,793	263,766	804,801
2016	348,958	577,700	297,515	51.5%	280,184	0	13,433	266,752	1,071,553
2017	353,473	585,175	301,365	51.5%	283,810	0	14,105	269,705	1,341,258
2018	357,988	592,649	305,214	51.5%	287,435	0	14,810	272,625	1,613,883
2019	362,503	600,124	309,064	51.5%	291,060	0	15,550	275,510	1,889,393
2020	367,018	607,598	312,913	51.5%	294,685	0	16,328	278,357	2,167,750
2021	371,394	614,843	316,644	51.5%	298,199	0	0	298,199	2,465,949
2022	375,770	622,087	320,375	51.5%	301,712	0	0	301,712	2,767,661
2023	380,146	629,332	324,106	51.5%	305,226	0	0	305,226	3,072,887
2024	384,522	636,576	327,837	51.5%	308,739	0	0	308,739	3,381,626
2025	388,898	643,821	331,568	51.5%	312,253	0	0	312,253	3,693,879
2026	393,123	650,815	335,170	51.5%	315,645	0	0	315,645	4,009,525
2027	397,348	657,809	338,772	51.5%	319,037	0	0	319,037	4,328,562
2028	401,572	664,803	342,374	51.5%	322,430	0	0	322,430	4,650,992
2029	405,797	671,797	345,976	51.5%	325,822	0	0	325,822	4,976,813
2030	410,022	678,791	349,578	51.5%	329,214	0	0	329,214	5,306,027

[1]Marion County's 2000 population was estimated at 286,300 by the Population Research Center of Portland State University in their 2006 Oregon Population Report, based on Census data. Population in this table is calculated using Office of Economic Analysis, Department of Administrative Services, State of Oregon Forecasts of Oregon's County Populations and Components population figures released April 2004.

[2]Projected waste generated between 2006 and 2030 was based on an estimate of 3,311 lb per capita (the 2006 waste generation rate) remaining constant, although it has raised continuously in past years.

[3]Recycling Rate shown is the Calculated Recycling Rate only, without the addition of Recovery Credits for Waste Prevention, Reuse, or Residential Composting activities, per ODEQ Material Recovery and Waste Generation Rates, actual reported rates from 2000-2006.

[4]Waste Disposed shown is mathematical product of Waste Generated minus Waste Recycled.

[5]WTEF Tonnage shown is in-County material only, per Marion County Public Works 2006 & 2007 Annual Reports, and WTEF also receives out-of-County material, making up any shortfall to the 185,000 TPY capacity.

[6]Waste disposed at BI shown 2000-2007 is in-County material only, per Marion County Public Works Annual Reports, tonnages shown for 2008 and beyond were calculated based on a 0.5 percent annual increase from 2007 levels, until the facility's expected closure in 2020.

[7]This is MSW requiring disposal in excess of WTEF and BI; these wastes are currently disposed privately at Coffin Butte, Riverbend, and other landfills.

[8]Cumulative MSW is the total waste requiring disposal over the 20-year projection, in excess of that disposed at WTEF and BI.

Table 6-5 - Waste Stream Projections with Recycling Rate Escalating from 2006 rate of 51.5% to Increased 60% Recycling Rate by 2014 and Discontinued Use of WTEF after 2014

Year	Population [1]	Waste Generated (tons)[2]	Waste Recycled (tons)	Recycling Rate[3]	Waste Disposed (tons)[4]	Waste to WTEF (tons)[5]	Waste to Browns Island (tons)[6]	MSW to be Landfilled (tons)[7]	Cumulative MSW to be Landfilled (tons)[8]
2000	286,300	356,130	135,329	38%	220,801	170,950	7,812	42,039	
2001	289,623	360,435	180,218	50%	180,218	168,247	3,227	8,744	
2002	292,945	364,570	185,931	51%	178,639	165,439	4,469	8,731	
2003	296,268	368,705	173,291	47%	195,414	167,605	5,765	22,044	
2004	299,590	372,840	175,235	47%	197,605	159,597	6,935	31,073	
2005	302,913	481,723	240,862	50%	240,862	160,785	9,336	70,741	
2006	306,956	508,166	261,705	51.5%	246,460	168,516	8,676	69,268	
2007	310,999	514,859	265,152	51.5%	249,707	171,591	8,659	69,457	69,457
2008	315,042	521,552	274,932	52.7%	246,620	185,000	9,092	52,528	121,984
2009	319,085	528,245	284,875	53.9%	243,370	185,000	9,547	48,824	170,808
2010	323,128	534,938	294,980	55.1%	239,958	185,000	10,024	44,934	215,742
2011	327,391	541,996	305,453	56.4%	236,542	185,000	10,525	41,017	256,759
2012	331,654	549,053	316,098	57.6%	232,955	185,000	11,051	36,904	293,663
2013	335,917	556,111	326,914	58.8%	229,197	185,000	11,604	32,593	326,257
2014	340,180	563,168	337,901	60.0%	225,267	185,000	12,184	28,083	354,340
2015	344,443	570,225	342,135	60.0%	228,090	0	12,793	215,297	569,637
2016	348,958	577,700	346,620	60.0%	231,080	0	13,433	217,647	787,284
2017	353,473	585,175	351,105	60.0%	234,070	0	14,105	219,965	1,007,249
2018	357,988	592,649	355,589	60.0%	237,060	0	14,810	222,250	1,229,499
2019	362,503	600,124	360,074	60.0%	240,049	0	15,550	224,499	1,453,998
2020	367,018	607,598	364,559	60.0%	243,039	0	16,328	226,711	1,680,709
2021	371,394	614,843	368,906	60.0%	245,937	0	0	245,937	1,926,646
2022	375,770	622,087	373,252	60.0%	248,835	0	0	248,835	2,175,481
2023	380,146	629,332	377,599	60.0%	251,733	0	0	251,733	2,427,214
2024	384,522	636,576	381,946	60.0%	254,630	0	0	254,630	2,681,844
2025	388,898	643,821	386,292	60.0%	257,528	0	0	257,528	2,939,373
2026	393,123	650,815	390,489	60.0%	260,326	0	0	260,326	3,199,699
2027	397,348	657,809	394,685	60.0%	263,124	0	0	263,124	3,462,822
2028	401,572	664,803	398,882	60.0%	265,921	0	0	265,921	3,728,743
2029	405,797	671,797	403,078	60.0%	268,719	0	0	268,719	3,997,462
2030	410,022	678,791	407,275	60.0%	271,517	0	0	271,517	4,268,979

[1]Marion County's 2000 population was estimated at 286,300 by the Population Research Center of Portland State University in their 2006 Oregon Population Report, based on Census data. Population in this table is calculated using Office of Economic Analysis, Department of Administrative Services, State of Oregon Forecasts of Oregon's County Populations and Components population figures released April 2004.

[2]Projected waste generated between 2006 and 2030 was based on an estimate of 3,311 lb per capita (the 2006 waste generation rate) remaining constant, although it has raised continuously in past years.

[3]Recycling Rate shown is the Calculated Recycling Rate only, without the addition of Recovery Credits for Waste Prevention, Reuse, or Residential Composting activities, per ODEQ Material Recovery and Waste Generation Rates, actual reported rates from 2000-2006.

[4]Waste Disposed shown is mathematical product of Waste Generated minus Waste Recycled.

[5]WTEF Tonnage shown is in-County material only, per Marion County Public Works 2006 & 2007 Annual Reports, and WTEF also receives out-of-County material, making up any shortfall to the 185,000 TPY capacity.

[6]Waste disposed at BI shown 2000-2007 is in-County material only, per Marion County Public Works Annual Reports, tonnages shown for 2008 and beyond were calculated based on a 0.5 percent annual increase from 2007 levels, until the facility's expected closure in 2020.

[7]This is MSW requiring disposal in excess of WTEF and BI; these wastes are currently disposed privately at Coffin Butte, Riverbend, and other landfills.

[8]Cumulative MSW is the total waste requiring disposal over the 20-year projection, in excess of that disposed at WTEF and BI.

6.3 Needs and Opportunities

The primary goal of the Marion County solid waste system is to reduce and eventually eliminate waste that must be disposed. This is not only the goal of Marion County, it is defined in statewide policies and regulations to reduce the dependency on landfilling as it is the lowest level within the hierarchy of waste management practices. Although the County-wide efforts have resulted in minimizing waste disposed in landfills, there continues to be waste generated in excess of what is currently recycled and combusted at the WTEF. As shown in Chapter 2, the amount of waste being disposed at the WTEF and at landfills has increased by 1.5% annually over the last seven years. Since the WTEF has a finite capacity, the amount going to landfill has increased to almost 65,000 tpy. At the same time, the amount recycled in Marion County has increased by an average of 9.5% per year.

The County-wide solid waste management program has made considerable gains to increase the recycling rate. The 2009 SWMP contains recommendations to continue the growth in the recycling rate. Even so, the County must develop a long-term strategy to manage waste in excess of the quantity for disposal at the WTEF. If it is decided to discontinue the delivery of County waste to the WTEF, then a new processing and disposal method needs to be implemented. Any system without the current WTEF should address the goals of the SWMP and state waste hierarchy. In considering all options available to the County, it is relevant to evaluate the status of "alternative technologies," besides traditional landfilling and WTEF, which have been under development over the past several years.

Two basic scenarios exist for the future of the Marion County solid waste management system. One continues the reliance on WTEF and pursues methods to reduce waste, recycle more materials and/or implement other alternative technologies for managing waste. The second is to not renew the County's disposal agreement with Covanta, discontinue delivery of waste to the WTEF in 2014, and either implement new alternative waste disposal technologies that are reliable and cost-effective and reduce waste disposed at landfills or arrange for disposal at an existing alternate disposal facility or construct and utilize a new, in-County facility. In any scenario, a MSW landfill is a necessary component of the system.

Today, MSW in excess of the WTEF capacity is delivered to Coffin Butte. An informal arrangement with local franchised haulers permits waste to be delivered directly to Coffin Butte as needed. The haulers may send MSW to Coffin Butte as long as a sufficient waste flow is delivered to the WTEF. This informal system has worked effectively in past years. However, with population growth in the County, the amount for disposal has increased, and it is becoming less desirable and more costly for franchised haulers to drive the over 30 mile distance to Coffin Butte in Benton County. As discussed in Chapter 5, more transfer capacity will be needed in the future. Likewise, a long-term agreement with a disposal site is needed to provide certainty there will be sufficient capacity to handle the waste that cannot be processed in the WTEF and/or in some alternative technology system.

6.4 Alternatives and Evaluation

This alternatives and evaluation discussion considers the needs and issues raised in the previous sections. Alternatives include those for handling the major waste streams of MSW, ash residue and C/D. These alternatives are discussed and evaluated in terms of their ability to meet the goals and objectives developed by the SWMAC (see Chapter 1).

Even as the County has been a leader in reducing waste and recovering or recycling various materials from the waste stream, it is projected that substantial additional waste will be generated by 2030 that may need to be disposed at landfills. It is possible that alternative disposal technologies may emerge to be cost-effective and could reduce the amount of MSW delivered to landfills. In order to provide the current status of these alternative disposal technologies, the SWMP contains an Appendix A that describes the different types of technologies used to manage waste throughout the world. Appendix A discusses the performance status of these technologies as well as some recent attempts of other jurisdictions to vet further information from entities offering systems and/or services through alternative technologies. However, the County must have sufficient landfill capacity, if not as the primary disposal method then as a backup, if alternatives cannot be developed and/or for certain non-reusable/non-recyclable residuals and certain potential emergency needs. If the County were to keep recycling at the current rate but discontinue the use of the WTEF, then the amount of waste that must be disposed is estimated to be a cumulative total of 5.3 million tons by 2030.

Given these conditions, the disposal alternatives currently available to the County are discussed in Section 6.4.1.

6.4.1 Alternatives for Municipal Solid Waste (MSW) Disposal

Based on projections, there is a minimum of over 1.3 million tons of MSW for disposal in excess of the capacity of the WTEF and BI from 2008 to 2030 (assuming recycling rates increase as depicted in Tables 6-3 and 6-5). The amount could grow to as much as 5.3 million tons if the WTEF disposal agreement is not renewed after 2014 and recycling does not increase (worst case scenario depicted in Table 6-4). Through 2014, however, the amount in excess of the WTEF disposal capacity is projected to be over 500,000 tons or around 70,000 tpy. The alternatives to address the County's future disposal needs are summarized as follows:

Option 1 - Continue Use of WTEF

Continue use of WTEF for Marion County waste disposal needs beyond 2014 up to current capacity. Direct residual, bypass, and overflow wastes to local landfills. This alternative allows the County to consider future options for dealing with the waste that is not recycled and is being disposed of at landfills. Options include possible implementation of an alternative technology or construction of a third boiler at the WTEF.

Option 2 - Discontinue Use of WTEF

After the WTEF agreement expires in 2014, direct all non-recycled Marion County generated wastes to local landfills. In advance of 2014, negotiate disposal agreements with these facilities. Develop appropriate in-County waste transfer infrastructure to handle total County waste transfer operations. Negotiate long-term transfer agreements with service provider(s).

Under this alternative the County can continue to monitor the progress of alternative technology for future consideration for development in the County. Another option is to pursue siting and permitting a landfill in the County.

Following is a discussion of the key elements to be included in the solid waste system. In this discussion the unit costs presented are assumed to be allocated over all waste disposed in the Marion County system (248,000 tons in 2007) so that a comparison of the options can be made.

6.4.1.1 Continue Use of the WTEF

The County's agreement with Covanta is due to expire in 2014. However, the County and Covanta can develop a new agreement to continue the operation beyond the expiration date. Since the bonds used to finance the project have been retired, the cost to continue disposal should be less than the current costs. The facility appears to be in good condition and has been properly maintained. Covanta reports that there has been no significant interruption of over its operating life service. Covanta has indicated that they do not anticipate the need for major capital improvements to maintain operations in the near future.

If the County elects to continue delivery of waste to the WTEF, a new agreement with a new set of terms will need to be negotiated. The structure of the new agreement must consider changes in the energy marketplace and an appropriate revenue sharing arrangement. The WTEF provides a reliable source of power, so it is considered a primary market source of renewable energy. The County currently pays Covanta $46 per input ton to operate the facility. However, if this expense was allocated over the entire solid waste system the cost would be $35 per ton.

The County, for its part, is responsible to ensure delivery of the minimum amount of MSW and to manage transportation and disposal of the ash residue. It costs just $5.25 per ton if allocated over all waste. Thus, the cost of operating the WTEF and disposing of the ash is about $40 per ton without debt service.

The unit operating cost does not take into account the revenue from the sale of electricity or recovered metal that is shared by the County and Covanta. The facility will continue to generate 86,000 mWh per year with revenue about $4,200,000 per year. The electric power offsets power that would need to be generated by other uninterruptable sources from hydro-electric or fossil fuels such as coal or natural gas. Revenue from the sale of electricity is expected to increase about 5% per year.

There are certain advantages to continuing to deliver waste to the WTEF. First, no new major facilities or other capital investments will be needed in the near future. This will allow the County, cities and solid waste purveyors to invest in programs to reduce waste and recycle more materials. Second, the County will continue to manage the majority of its waste inside Marion County and avoid transportation expense from hauling out-of-County. With rising diesel fuel prices, the cost to transport longer distances will increase. By minimizing overall transportation costs, the system will use less fuel, reduce carbon emissions and reduce wear on the local and state road systems.

Continued use of the WTEF means the County will need to eventually develop additional disposal capacity for ash residue. Currently, there is sufficient capacity at the NMCDF until 2020, or about 12 years. If treatment options to recycle the leachate can be developed, new cells could be developed in the location of the current leachate ponds. This would provide area for new landfill cells without transporting to a regional disposal site. And, there is

continued research and development to advance uses of the ash residue from WTEF that might be feasible in the future.

The WTEF will need to continue to monitor and upgrade air handling systems if there are any changes to regulations. Air quality is monitored on a continuous basis, and the facility is reported to meet all current air quality standards. To date, the facility has never received a notice of violation based on the continuous emissions monitoring. These standards are very stringent.

Because of the issues related to the continued operation of the WTEF and lead time needed to ensure facilities and agreements are in place to meet the County's needs throughout 2014 and beyond, it is important to make a decision on the WTEF's future role in Marion County's integrated SWM. If an agreement cannot be reached for any reason, the County will need to make plans to implement an alternative disposal system.

If the County does not renew its agreement with Covanta, Covanta would likely pursue replacement waste supply from other sources. With the debt retired and available capacity to sell, Covanta could operate the WTEF as a "merchant" facility. If the County does not renew its agreement, or if, for some reason, the WTEF is closed, the County must secure disposal options for the 185,000 tons of waste per year currently delivered to the facility. And, there is an additional 55,000 tpy generated in excess of the WTEF capacity. As shown in Table 6-5, the amount of waste to be disposed will be over 300,000 tpy in 2015. This amount of waste may require the County to site a new landfill and/or develop an alternative facility to be in operation by 2014, or negotiate for a long-term agreement with a regional site, assuming that neither of the nearby out-of-County landfills could handle this amount of waste annually for any length of time. If the County does select to long haul waste a new transfer station may be required.

Even with the debt on the WTEF being retired, there may be certain investments made to ensure the facility continues to operate efficiently. So, there likely will be a certain debt component or capital reserve which must be continued to keep up with needs as the WTEF ages.

Legislated flow control, as discussed, is potentially a more viable approach as a result of the Oneida-Herkimer decision. The WTEF must maintain a minimum volume of waste input to operate efficiently, and if flow control issues conflict with this requirement, the WTEF may become less cost-effective.

The waste generated for disposal in the County after recycling now exceeds the capacity of the WTEF and is projected to increase substantially by 2014. One option for managing increased waste loads is to expand the current WTEF capacity by constructing a third boiler.

6.4.1.2 Construct a Third WTE Boiler

The WTEF was designed and constructed for the installation of a third combustion unit. As the waste stream grows, some of the additional waste generated could be managed by adding such capacity at the WTEF. This would increase the WTEF capacity by about 92,000 tpy from 185,000 to 277,000 tpy.

The total waste generated currently well exceeds 277,000 tpy; however, a significant portion of it is recycled. In 2007, the County disposed of over 64,000 tons in landfills. As

discussed in Chapter 3, there is certainly opportunity to recover more material from the amount disposed. The County could not fully supply a third boiler with in-County waste until after 2014, depending on the amount of recycling realized (see Tables 6-2 through 6-3). Construction of a third boiler before it is necessary may create some disincentive to increasing recycling levels.

The cost of adding a third boiler, based on recent expansion of other WTEF, including Covanta facilities, could be expected to be on the order of $200,000 per installed ton/day of capacity. Therefore, adding a third boiler sized at 275 tpd, the same size as the existing two units, would cost an estimated $55 million. If the third boiler is financed with revenue bonds (assuming 5% over 20 yrs), it would result in an annual debt service of approximately $4.4 million per year or about $15 per ton. Currently, the electricity produced at the WTEF is sold at approximately $.065 per kWh. Annual revenue from sale of electricity would be about $2,800,000 based on current rates. Therefore, the cost per ton of adding a third boiler is about $18 not including incremental cost to operate the third boiler. Any consideration to expand the WTEF should include an evaluation of the expected future market conditions.

Covanta's agreement with PGE expires at the end of June 2014, and a new agreement with PGE would need to be negotiated in advance of this time. PGE has expressed a willingness to negotiate a new agreement with Covanta, and the terms, conditions, and pricing under a new or extended agreement would need to be assessed.

If the WTEF is expanded, there would be another 22,000 tpy of ash residue to be disposed or possibly recycled if acceptable uses are found to be feasible and safe. Other impacts on the solid waste system would mean that this waste processed by the WTEF would not be disposed in landfills and avoid over 4,000 trips to out-of-County landfill by transfer trucks. Assuming transportation of waste to Coffin Butte, that is 280,000 truck miles per year.

6.4.1.3 Site a New In-County landfill

To handle the waste disposal needs within Marion County, a new MSW landfill would need to be sited. The new landfill would be designed to meet Subtitle D regulations and receive more than 100,000 tpy if the County continues use of the WTEF. If the County elects to not deliver waste to the WTEF after 2014, the landfill must be capable of disposing of 300,000 tpy.

Pursuit of this option may require the County to sign a short-term agreement with Coffin Butte or other facility to accept wastes in the interim. The County would begin to collect a uniform rate on all waste disposed from Marion County. The County would need to conduct a siting study beginning in FY09. The effort to site, permit, and construct the first cell may require five years or longer. As part of the uniform rates, the County would collect revenue to help pay the capital cost of the new landfill.

Although this alternative may be feasible, there is not assurance the siting would be successful, and the County must consider the difficulties of locating a new MSW landfill. In the mid 1980's the County did consider a new landfill site referred to as the I-5 Landfill. The facility was never permitted. The cost to complete a siting process and pursue permits is estimated to be between $3,000,000 and $5,000,000. This would include an assumption of potential legal challenges to the land use permitting process. Since 1990, in Oregon, there have been no new landfills sited west of the Cascade Mountains. If the site is permitted, the

cost to develop the landfill is estimated between $15 million to $20 million. The actual tip fee will depend on how much waste is delivered to the landfill. Tip fees at existing landfills that have been operational for some years range from $20 per ton to $44 per ton. A new landfill may range from $35 per ton to over $50 per ton. Landfills located on the west side of the Cascades tend to have higher disposal rates since they are small in comparison to the large regional sites located east of the Cascades.

Constructing a new in-County landfill has the advantage of minimizing transportation costs. It also provides the local control that is an important consideration. Since landfills are a limited resource, it is not unrealistic to conceive the facility would serve other jurisdictions. Currently, Coffin Butte serves many areas in the central portion of the state as well as coastal communities. The same is true of the Riverbend Landfill near McMinnville.

With existing capacity available both locally and in eastern Oregon and Washington, few communities have engaged in efforts to site new landfills. As more waste in excess of the WTEF capacity is generated, a new in-County landfill may be more cost-effective, but it may not be politically acceptable to site a landfill.

If the County locates a new in–County Landfill, there still would be some new investments in transfer station capacity. Perhaps existing facilities such as SKRTS, NMCDF and MRRF could be retrofitted to provide both convenient drop-off services and efficient transportation. If not, a new transfer station may be needed to handle approximately 300,000 tpy.

6.4.1.4 Construction of a Bioreactor Landfill

Once a landfill has been sited, it could be developed using a “bioreactor” technology. This could increase cost-effectiveness by minimizing space required for disposal (wastes would be continually biodegraded) and offering a byproduct of electricity generated from recovered methane emissions.

Conventional landfills, particularly east of the Cascade Mountains, are designed and operated under relatively dry conditions that slow the decomposition process. Wastes will decompose eventually, but at a slower rate after landfills are closed. Bioreactor landfills differ in that decomposition is encouraged at the beginning of the life of the landfill. It is accelerated by adding water during the operating period. In bioreactors, leachate generated from the landfill may be recirculated in order to increase the rate of decomposition of wastes. Decomposition can occur aerobically (in the presence of oxygen) and/or anaerobically (without oxygen present). Gases, primarily methane and carbon dioxide, are generated as byproducts of the decomposition process. After dewatering, the gases can be used directly in reciprocating engines. Gases can also be further processed by removing sulfur dioxide and carbon dioxide. This results in higher-Btu gas that can be used in gas turbines to generate electricity, or if it meets pipeline quality gas standards, it may be used in commercial gas distribution systems.

A bioreactor landfill may be feasible in Marion County if there is sufficient waste disposed. The bioreactor cell must be large enough to justify the investment and to generate sufficient quantities of gas. If done properly, leachate and gas products generated during the decomposition process are managed in a more controlled manner. Gases are constantly produced such that a very controlled fill sequence plan must be followed to harvest gas, rather than being released to the environment. Collection of methane gas is of particular interest, because methane is a potent GHG. Landfills have been recognized by the State of

Oregon and other states as a major contributor of GHG emissions. Because the byproducts are released when the facility is newer, there also may be fewer problems with unwanted leakage or emissions than could occur in aging facilities. In bioreactors, landfill space would also become available sooner. Because a bioreactor landfill would be expected to be more stable upon closure, efforts and costs of monitoring the landfill may be reduced. Alternative end uses of the landfill, such as park space, may also occur sooner than for a typical MSW landfill. However, even with a bioreactor design, the landfill space may not be usable for 30 years or more.

There are several advantages in building a bioreactor landfill. However, even with enhanced controls the alternative is viewed similar to a conventional landfill and will be subject to the same challenges as siting a conventional landfill.

6.4.1.5 Export Waste to Regional Sites

Since 1990 there have been several regional landfills permitted and developed in other parts of Oregon and the Pacific Northwest. These are very large landfills primarily located in dry climates east of the Cascade Mountains. Because these landfills accept large amounts of waste (in excess of 500,000 tpy), disposal rates are reasonably low compared to other means of disposal or alternative technologies. Transportation cost, on the other hand, makes it less economical to use these sites.

For instance, Portland Metro contracts with a transportation company to truck waste daily to the Columbia Ridge Landfill located over 120 miles from the metropolitan area. Currently, the transportation cost is about $19 per ton. When added to the estimated $22 per ton tip fee to landfill the waste, the total cost is about $41 per ton. This does not include the cost to operate a local transfer station and to load trailers for delivery. Assuming annual amortization to pay the capital cost is about $8 per ton and assuming the cost to operate a transfer station adds about $10 to $15 per ton the total to build and operate the transfer station could range from $18 to $23 per ton. The total cost to export to regional landfills east of the Cascades is estimated to be between $58 per ton to $65 per ton. The actual cost may be determined through a competitive procurement process which might yield some difference in this cost depending on the term and conditions in the agreement.

Marion County is located within 30 miles of two regional disposal sites that are situated in adjacent counties. While these landfills may not have the capacity as those located in the eastern portion of the state, Coffin Butte does report sufficient capacity to dispose of Marion County's waste for at least 20 years. This assumes 300,000 tpy without the WTEF, or longer if only the waste tonnage in excess of the WTEF capacity were delivered to the landfill. Costs would be similar to the other options to operate the transfer station dispose at the landfill. However transportation cost would be about $8 per ton. The estimated cost of this option may be about $48 to $53 per ton. The Riverbend Landfill has applied for a new permit to expand the landfill in Yamhill, County.

The other regional landfills (within 200 to 300 miles) that could meet Marion County's disposal needs are as follows (See Figure 6-1):

- Columbia Ridge Landfill in Arlington, Oregon
- Roosevelt Landfill in Roosevelt, Washington
- Finley Buttes Landfill in Boardman, Oregon

- Northern Wasco Landfill in Wasco County, Oregon
- Dry Creek Landfill in Medford, Oregon

Many smaller communities throughout Oregon and Washington rely on these large regional landfills because the municipalities do not generate sufficient quantities of MSW to build a local facility. Most of these landfills offer access using alternative transportation modes. Rail haul is available to Columbia Ridge, Roosevelt, and Finley Buttes, and both Finley Buttes and Roosevelt provide for off-loading barges.

With each of these landfills, there is reported to be sufficient capacity to meet the needs of Marion County for many years under any alternative. However, if long-haul to these disposal sites is to be implemented, the transfer station and waste transportation infrastructure would need to be built.

The decision to transport waste out-of-County involves two key issues. The first issue relates to whether the County supports shipping its waste to another county (or state) and relying on other jurisdictions, or whether it prefers to handle its own waste. The jurisdictions where these regional facilities are located often collect a host community fee. In recent years, there has been pressure to increase these fees. These host fees could add as much as $5 per ton to the cost of disposal. Thus, delivery of waste to regional landfill is subject to local control. In a competitive market, landfill operators may be willing to insulate the County from paying for increases in fees.

The second issue relates to the cost to transport waste, usually by rail or truck. Communities that have justified the additional costs have taken different approaches to transporting waste based on their location and access to services. For instance, Vancouver, Washington's waste is barged to Finley Buttes Landfill in eastern Oregon, while waste from the Puget Sound area is rail-hauled to eastern Oregon and Washington landfills.

The cost of transportation is certainly subject to the changes in the price of fuel. Trucking costs have increased about 25% to 30% over the past two years. For Marion County to transport 300,000 tons of waste to regional landfills, it would result in almost 3.5 million total miles. At $25 per ton to transport from Marion County it would cost approximately $7.5 million annually and consume more than 600,000 gallons of diesel fuel.

Rail transportation can be more efficient than trucking over long distances. Several communities in the State of Washington such as Seattle, Everett and Olympia are connected to a rail transportation network. Waste is delivered to either the Roosevelt Landfill or the Columbia Ridge Landfill in Arlington, Oregon. The cost of rail varies based on the distance, the proximity to main lines and ability to connect with other rail shipments. The longer the haul, the more cost-effective it is to use rail. On a cost-per-ton-mile basis, rail may be 30% to 50% less than the cost to truck.

If a community elects to transport waste long distances, rail can be more cost-effective. However, the solid waste system must be able to adapt and handle interruptions related to rail transportation. The railroad has schedules and procedures, and communities must tolerate interruptions in supply and delivery of containers, rail line maintenance or other factors. Some communities reduce risk by purchasing their own containers, but this adds to the capital investment.

6.4.1.6 Alternative Disposal Technologies

Included as part of this 2009 SWMP update is a review of alternative technologies to traditional MSW landfilling, including "proven" technologies that have been operating at commercial scale on a sustained basis for many years and those that are "emerging and/or unproven" in that they are:

- Still in development.
- Operating as a pilot or demonstration facility.
- While they may be operating in certain commercial applications, they may not have been scaled up to large sizes, they may not be processing MSW, their term of operation has been limited, or they may have encountered certain technical problems that have not been fully resolved.

Driven by rising fossil fuel costs, interest in renewable energy, the cost of transport to remote disposal sites, concern over GHG, improvements in technology, and the desire to minimize wastes landfilled and utilize the MSW stream to the greatest extent, a growing number of communities are investigating or re-investigating waste processing technologies and their potential as a future component of their integrated SWM system. They are exploring certain of the conversion technologies that have advanced in recent years and are being applied in various other countries where the lack of availability of land for waste burial and stringent environmental regulations and policies have created the need and/or desire for alternative technologies to manage the waste stream still remaining after reuse/recycling.

Appendix A includes a review of alternative waste disposal technologies and their status as well as an overview of recent research and/or procurements involving alternative technologies that have been conducted or are in process by certain communities in the U.S. It is believed the information and data in Appendix A will provide Marion County with insights that will help in further planning and decision-making regarding the role that alternative technology may have in the County's future SWM system.

6.4.1.7 Conclusions Regarding Alternative Disposal Technologies

There are numerous vendors offering alternative technologies for MSW processing; their experience, resources, and claims vary.

The readiness, reliability, economics, and technical/environmental performance of alternative technologies for MSW are quite varied.
Several U.S. communities are currently evaluating alternative technologies for MSW, and some procurements are in process or reported to be completed by certain communities.

WTEF technologies employing mass burn, waterwall, modular mass burn, and refuse-derived fuel are proven technologies for MSW, with many operating facilities in the U.S. and throughout the world.

Some commercial-scale alternative technologies for MSW or selected components of the MSW stream are expected to be constructed over the next two or three years in the U.S.

Alternative technology for MSW or select waste streams, such as organics, could serve a future role in Marion County. The results of these projects being planned, procured, and/or

constructed in other U.S. communities should be monitored by Marion County, as they will help determine the applicability for Marion County, particularly with regard to cost, ability to finance, performance, and risk.

6.4.1.8 WTEF Ash Residue Disposal

The WTEF will be a component in Marion County's SWM system to at least 2014. The NMCDF has sufficient capacity to dispose of ash residue until 2020, which exceeds the timeframe of the County's service agreement with Covanta. As discussed in Section 6.1.3, the County has an effective ash management and leachate treatment system with the appropriate capacity. As an alternative to disposing of ash at NMCDF, the utilization of ash under proper controls and sound applications could also be investigated.

6.4.1.9 Utilization of Ash Residue / Reuse

In the United States, WTEF handle about 8% of the total amount of MSW disposed. In Europe as much as 16% of the waste is processed through WTEF. In the past there have been many studies related to re-using ash residue from WTEF. The research in ash reuse relates to what happens when the ash comes in contact with water and whether certain materials such as heavy metals or other constituents, which could be harmful to humans or the environment, if these leach out. Recent studies indicate that this is not the case, and, as a result, many states are considering new practices for managing ash residue. California and Maryland are two states that allow beneficial uses of ash to be considered in estimating recycling rates. Over the last several years there is increasing interest in developing beneficial uses for the ash residue.

A beneficial use survey conducted by the Integrated Waste Service Association indicates that over 2.5 million tons of ash residue is being used in landfills as daily cover. Another 330,000 tons are being used in road base or back fill for parking lot areas. In Europe ash from WTEF is used in a variety of ways such as construction materials and even used to remediate acid mine drainage sites. However, despite this progress there is not widespread public acceptance to seek beneficial uses of ash residue. To assist in the research and development of ash reuse the University Ash Consortium (UAC) was established by the Waste To Energy Research and Technology Council (WTERT). This group combines the research efforts of Temple University, University of New York Stony Brook and Columbia University to consider the technical, economic and environmental feasibility of converting ash to a reusable resource. Over the past several years this independent research group is continuing to evaluate the potential to find beneficial uses for this material.

There are several technologies for ash treatment including vitrification, fixation, and chemical stabilization (Valenti 1999). Vitrification occurs when ash is heated above 2400°F and transformed into an inert, glass-like substance. In fixation, heavy metals in fly ash are absorbed into activated carbon. Stabilization is more cost-effective and is the most widely used technique of ash utilization. In stabilization, the ash is chemically treated to produce an inert material that can be used for cover or fill.

Marion County has been a leader in waste reduction and recycling and if a beneficial use of the ash could be developed that is both cost effective and environmentally sound it would reduce dependency on landfills even more.

6.5 Evaluation of Options

The main emphasis of the SWMP is to continue to reduce or prevent waste, and reuse and recycle more materials. But the system must have the infrastructure in place to continue to manage the material that cannot be recycled and minimize or eliminate waste disposed in landfills. The two primary options for disposal of post-recycling waste to be addressed in this Plan update are:

- Continue to deliver waste to the WTEF.
- Begin to develop an alternate approach.

This evaluation focuses on these options and provides information for selecting a course of action. Since the County's agreement with Covanta is due to expire in 2014 it is imperative that the 2009 SWMP provide a clear direction in order to ensure proper time to fully implement the recommendations.

In the above sections of this Chapter, a description of alternatives is presented. To evaluate these alternatives a comparison of primary options has been made. The evaluation uses the guiding principles or values that are stated in Chapter 1 of the SWMP.

The factors used to evaluate the system options are as follows:

- Cost effective and provide rate stability.
- Promote the hierarchy of waste management – highest and best use.
- Provide local control.
- Reduce waste generation.
- Reduce toxicity.
- Flexibility to adhere to changes in regulation and waste stream.
- Environmentally sound.
- Economically proven – certainty and reliability.

These represent the key evaluation criteria that have been guiding principles for managing solid waste in Marion County for many years.

The distinct Options and associated assumptions are described as follows:

Option 1 - Continue Use of WTEF beyond 2014

Under this Option the County will begin to negotiate with Covanta immediately in order to arrive at a decision in the next couple of years. The length of the agreement should be set based on terms and conditions and associated financial arrangements that best serve the County and the SWM. Outcomes of this approach allow the County to minimize new investment in infrastructure and to continue to commit increased resources to waste reduction and recycling.

The County will need to work with owners of SKRTS, MRRF and Covanta to determine other improvements needed to increase processing and recovery of materials and ensure transportation efficiencies. It also means in the immediate future that waste in excess of the WTEF capacity will be landfilled. This option allows the County to consider future alternatives for dealing with the waste that is not recycled and is being disposed of at landfills. These include possible implementation of an alternative technology or construction of a third boiler at the WTEF.

Option 2 - Discontinue Use of WTEF

Under this Option the County will discontinue commitment of waste to the WTEF. The County would begin to set up infrastructure needed to process and transport waste to a regional landfill. This will include new capital investments either by the County or the franchised haulers. As with the Option 1 it would be desirable to consider implementing additional processing to maximize recovery of materials.

A long term agreement with a regional landfill would be negotiated. Starting in 2014 the County would begin transporting waste that cannot be recycled to a regional landfill. The County can continue to monitor and consider other alternative technologies and determine if such systems are cost effective in the future.

Covanta could continue operation of the WTEF by pursuing delivery of waste from other sources assuming it continues to maintain permits.

Comparison of Costs

In completing a comparison of the cost of the Options, it is important to recognize that the actual rates charged at facilities will be different. Rates are established based on allocating expenditures and allocating those expenditures based on a set of policies established by the County. In order to simplify the comparison of Options, costs are normalized over the waste handled by the entire system. In 2007 the total waste handled by the system was 248,000 tons. This includes all waste disposed at the WTEF, BI, and Coffin Butte.

The other factor to consider when comparing options is that certain costs are included in all options. This includes the County's cost to carry out waste reduction and recycling programs and services, administration and engineering, and operations of the gatehouse at all facilities. These costs are about $18 per ton and can be attributed to any of the disposal options. Costs to operate the transfer stations are $9 per ton and expenses are allocated over the entire system.

The cost to operate the WTEF is established and is known until 2014. After 2014 the terms of continued operation are expected to be similar but will not be firm until an actual agreement is executed. With the bonds retired, the cost to operate the WTEF is $35 per ton. Adding the cost to transport and dispose of ash residue of $5.25 per ton, the total cost of disposing at the WTEF is $40.25 per ton. This represents the system cost to operate the WTEF but does not account for the revenue generated from sale of electricity. This revenue is about $4.2 million annually or approximately $17 per ton that is shared between the County and Covanta.

Assuming the County were to discontinue delivery of waste to the WTEF after 2014 and instead transport waste to Coffin Butte, the cost would be between $45 and $50 per ton in today's dollars. This does assume a new transfer station capable of receiving all or most of the County's 300,000 tons annually would be sited and built. It may be possible to retrofit existing transfer stations and the MRRF and transport this waste stream from the different waste sheds, but more study would be necessary to verify this cost. If these facilities can be modified to provide adequate transfer capacity it may result in lower up front capital costs but may increase operations and transportation costs.

The Option to continue use of the WTEF is estimated to be $5 to $10 per ton less than use of out-of-County landfills. This does not consider the benefit of revenue from the sale of electricity. In addition, about 20% of the cost to dispose at landfills is related to the cost of

diesel fuel or alternative fuels if used. This is energy not expended if waste continues to be disposed in the County.

The WTEF is subject to changes in regulations. In the past certain modifications to the facility were required to respond to such changes. Anticipating such risk the County has established a Capital Reserve Fund.

A summary of the costs and the impacts to the Marion County solid waste system for these processing and disposal options is presented in the following Table 6-6.

Table 6-6 -
Summary of Estimated Costs and
Facilities and Transportation Impacts

	SELECTED IMPACTS TO MARION COUNTY SOLID WASTE MANAGEMENT SYSTEM		
OPTIONS	**COST PER TON (2009$)**	**FACILITIES**	**TRANSPORTATION**
Continue use of WTEF	$40.25/Ton (Includes cost of ash disposal)	Minimal Impact - Transfer station expansion to efficiently transport waste in excess of WTEF to Coffin Butte	Minimal Impact – Waste not reused or recycled in excess of WTEF capacity must be transported 30+ miles to Coffin Butte.
Transport waste to Coffin Butte	$48 to $53/Ton	Expand existing transfer station(s) or build a new transfer station to increase capacity for transporting waste to landfill (246,000 tpy)	Transportation of waste to Coffin Butte adds approximately 740,000 truck miles per year.
Transport waste to regional landfills in Eastern Oregon or Eastern Washington	$58 to $65/Ton	Expand existing transfer station(s) or build a new transfer station to increase capacity for transporting waste to landfill (246,000 tpy)	Transportation of waste to regional landfills in Eastern Oregon or Washington adds over 3,500,000 truck miles per year. Rail haul could be considered.

Other Evaluation Factors

In addition to the comparison of costs, there are several other guiding principles or values contained in the SWMP as stated above. These principles result in criteria that can be used to compare options and make recommendations. These criteria are presented in the following matrix in order to show a further comparison of the options.

In addition to the information summarized in the options matrix, an Environmental Review of the Waste Processing and Disposal Alternatives is presented in Appendix D. This overview is intended to provide a brief discussion of environmental impacts that are generally attributed to landfilling, WTEF and compost facilities. It is recognized in this discussion that

solid waste systems can include a combination of some or all of these facilities to manage waste. It also acknowledges that solid waste management is a highly regulated industry and all facilities are subject to design and performance standards.

Table 6-7 - Summary of Matrix – Evaluation of Options

Marion County Option	Cost Effectiveness and Long-Term Rate Stability	Promotes Hierarchy of Waste Management – Highest and Best of Resources	Local Control	Reduce Waste Generation	Reduce Toxicity of Waste	Flexibility to Adhere to Changes in Regulation / Waste Stream	Environmentally Sound	Economically Proven to be Reliable
<u>Option 1</u> Marion County continues Energy Recovery with the use of WTEF after 2014	• Rates have remained stable through operating life – currently $40 per ton on system cost basis • No major capital investments are needed to continue operation • Electric sales provides added source of revenue to offset tip fees • Bonds have been repaid allowing flexibility to provide other services or programs.	• Does not compete with waste reduction and recycling (WR/R) goals • Energy recovery is recognized as higher value than landfilling • There is no disincentive to reduce waste if there is adequate waste to meet minimum performance • Requires some dependency on landfilling as backup	• Maintains local control • Limited or no risk to external fees or restrictions • Requires backup disposal site / landfill	• Neutral – No disincentive if minimum performance is met • Revenues from sale of electricity can be used to offset portion of tip fees • Cost to dispose of excess can provide avoided cost incentive	• County has programs to reduce certain toxic waste, i.e. mercury; batteries • Certain materials containing toxic elements are destroyed by incineration at high temperatures	• County must deliver minimum quantity of waste or pay penalties • Facility can adapt to changes in regulation • Presents some risk to change in regulations • Unscheduled downtime requires backup • It is possible that changes to waste stream could impact the higher heating value (HHV). To date there has been no measurable impact.	• WTEF is subject to continuous air monitoring – facility has never received a Notice of Violation. • Air pollution equipment minimizes health risk • Ash residue must be handled properly to minimize fugitive dust • Ash residue leachate required special handling due to conductivity, but does not fail Toxicity Characteristic Leaching Procedure (TCLP) • Provides base load energy from renewable source, i.e. replaces fossil fuels	• WTEF – operated in Marion County for 20 years – has been reliable • Cost to operate has been stable
<u>Option 2</u> Marion County Discontinues Disposal at WTEF and Landfills	• Rates can be stable assuming a long term agreement is in place. Estimated cost to transport and dispose to local regional landfills - $48 to $53 per ton on a system cost basis. • New investment in transfer station capacity will be required • Local fees and restrictions could impact cost of service.	• Does not compete with WR/R Goals • Does not promote highest/best use of resources • Landfills have built-in disincentive – more waste- less cost to operate • Landfill gas can be recovered for energy	• Landfill disposal is reliable and long term agreements can be used to minimize risk. • Disposes of waste in other jurisdiction presents some risk – Host fees; local restrictions /conditions	• Cost to transport/dispose can provide avoided cost incentive • Neutral – No disincentive if minimum performance is met	• County has programs to reduce certain toxic waste, i.e. mercury; batteries • Some material containing toxic elements are buried	• Agreements can be flexible; however, most require minimums to get lower tip fee. • Some risk to change in regulations • Typically minimum waste quantities must be delivered to get reduced tip fee • Some impacts from changes in waste stream	• MSW landfills are designed to protect groundwater • Landfills provide regular monitoring • Option will require added transportation that contributes to “GHG” emissions..	• Modern new landfills are reliable • Not subject to extreme unforeseen conditions • Is subject to increase in transportation cost.

Based on the information assembled as part of this SWMP update and the evaluation summary, there are several conclusions regarding the future management of waste in Marion County.

- The WTEF has been a reliable disposal method for over 20 years. It has been proven to be both economically and environmentally sound. With the bonds paid off, it offers a viable option for the future.

- Continuing use of the WTEF by extending the agreement with Covanta is the most cost-effective option for continuing to manage solid waste in Marion County. It does not require significant investments in new infrastructure. In addition, revenue from the sale of electricity enhances long-term stability and helps offset tip fees. Continued use of the WTEF also provides much more flexibility to invest additional resources into waste reduction and recycling programs. It also reduces the amount of waste required to be transported out of the County.

- As population increases in the County, the amount of waste will continue to grow. As alternative technologies continue to develop and become commercially viable, there may be opportunity to develop a facility that would generate by-products to either complement the WTEF and/or provide additional source of energy. One promising technology is Bio-Reactors/Digesters for organics especially food waste and biomass. Also, a third boiler may be feasible depending on the amount of waste generated.

- By extending the agreement with Covanta, the County could be expected to have more financial resources to apply to waste reduction and recycling programs. This could include seed money to support development of alternatives for organics/ food waste recycling or composting.

- There will be a continuing need for landfills for certain waste streams and for waste that is in excess of the capacity of the WTEF. The County has not identified any suitable areas within its jurisdictional limits that might be designated as potential sites for landfill. As such, the County continues to rely on landfills in other jurisdictions for disposal of waste that cannot be recycled or converted to other products and/or energy.

- Reuse of the ash residue from WTEF is common internationally. There is continued interest and research in the U.S to develop beneficial uses for ash residue from WTEF.

6.6 Recommendations

The County has increased the recycling rate over the past five years such that over 52% of the waste generated is either reused or recycled. The amount to be processed and disposed is about 250,000 tpy and will continue to grow as population increases. The WTEF can continue to operate and provide for converting 185,000 tpy to an energy source. The remaining waste must be disposed of at out of County landfills. However, the goal is to continue to implement programs and services to reduce this amount. Given the options discussed in this Chapter, recommendations for processing and disposal of waste are as follows:

Recommendation 6.1: The County should begin negotiations with Covanta in 2009 with the intent of completing agreement renewal or a new agreement by 2014.

Rationale for Recommendation: Extending the agreement with Covanta is the most cost-effective option for continuing to manage a substantial portion of the post-recycling waste in Marion County. It does not require significant investments in new infrastructure, and revenue from the sale of electricity enhances long-term stability in tip fees. This action also provides more flexibility to invest additional resources into waste reduction and recycling programs. It also reduces the amount of waste required to be transported out of county.

Recommendation 6.2: The County should negotiate an agreement with an out of County landfill to ensure adequate disposal capacity is available for waste that is not reused, recycled and/or supplied to a conversion technology.

Rationale for Recommendation: In past years, the County and franchised haulers have had an informal arrangement with the Coffin Butte Landfill for disposal of waste in excess of the WTEF capacity. As the County considers other changes to process and transport waste more efficiently, it would be desirable to have an agreement in place. The agreement acknowledges that landfill resources in nearby jurisdictions are limited, and securing an agreement will benefit the County and the landfill owner.

Recommendation 6.3: The new agreement with Covanta should include provisions that can accommodate the potential for the County to supply waste to a future alternative technology and also address the potential to add a third boiler.

Rationale for Recommendation: As population increases in the County, the amount of waste will continue to grow. More recently, alternative technologies to convert waste to usable products have emerged and may soon be commercially viable. This is particularly true on a smaller scale (less than 100,000 tpy) of technologies processing select waste types. It may be possible to co-locate such a facility that can produce gas byproducts or heat that might complement the WTEF or provide an additional source of energy. As discussed previously in this Chapter, adding a third boiler may be feasible depending on the availability of adequate amount of waste and the success of the County's future waste reduction, recycling and composting efforts, particularly new initiatives.

Recommendation 6.4: Evaluate beneficial uses for ash residue to determine alternatives to landfilling. This may include establishing a demonstration project or other approaches.

Rationale for Recommendation: The use of ash residue from WTE is common practice internationally. More and more facilities in the US are finding ways to reuse this material. The County should monitor the results of ash reuse/utilization programs at other WTEF and establish a research or pilot project and monitor results to demonstrate if beneficial uses can be pursued that are both safe and cost-effective.

Recommendation 6.5: The County should identify areas within the Comprehensive Land Use Plan that may be considered for future solid waste facilities.

Rationale for Recommendation: There is no immediate need to site new solid waste facilities in Marion County. However, a primary obstacle for locating any facility is obtaining

a land use permit. Often, the comprehensive land use plans adopted by local jurisdictions do not identify areas that may be acceptable for certain facilities that may be necessary. The County's Comprehensive Land Use Plan could be reviewed and updated to identify areas that may be considered for solid waste facilities.

7. ADMINISTRATION AND ENFORCEMENT

7.1 Introduction

In the State of Oregon, counties have the responsibility and authority to provide comprehensive services for managing solid waste. Marion County carries out this mandate by placing the primary responsibility to oversee these services with PWES. This chapter of the 2009 SWMP reviews the County's policies, procedures, enforcement and funding to determine their effectiveness for meeting the goals presented in this SWMP. It also examines the PWES organization to determine the adequacy for managing the needs of the SWM system, and to determine if resources are sufficient to implement the recommended strategies as presented in the 2009 SWMP.

Management Goals

PWES manages the programs and services according to a number of systemwide goals. These systemwide goals provide the guidance for playing a leadership role by directing the overall SWM services for the County. To meet the growing and ever-changing needs for SWM service, PWES is driven by the following goals:

- Continue to implement programs to further enhance services to reduce waste generation, improve the recovery of waste, and minimize disposal in landfills.
- Manage the financial resources in a manner that maintains stability of rates to constituients and provide cost-effective services.
- Facilitate the highest and best use of solid waste resources by maintaining the WTEF.
- Maintain long-term disposal capacity to avoid significant investments for new disposal facilities.
- Work effectively with local jurisdications, private industry and citizens to provide coordinated SWM services throughout the County.

The County uses these goals to guide the use of resources for effectively carrying out SWM programs and services. They are used to help set priorities, as well as identify changes that may be necessary to improve the overall SWM system in Marion County.

7.2 Background and Existing Conditions

7.2.1 Solid Waste Administrative Agencies

Counties are provided the authority and responsibility for managing solid waste under ORS 459.125. This legislation 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. In general, the County has selected to provide services through a combination of owning and operating certain facilities and to contract with private-sector vendors for others. In addition to operations, the County provides a leadership role - 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 meet goals.

7.2.1.1 Marion County Solid Waste

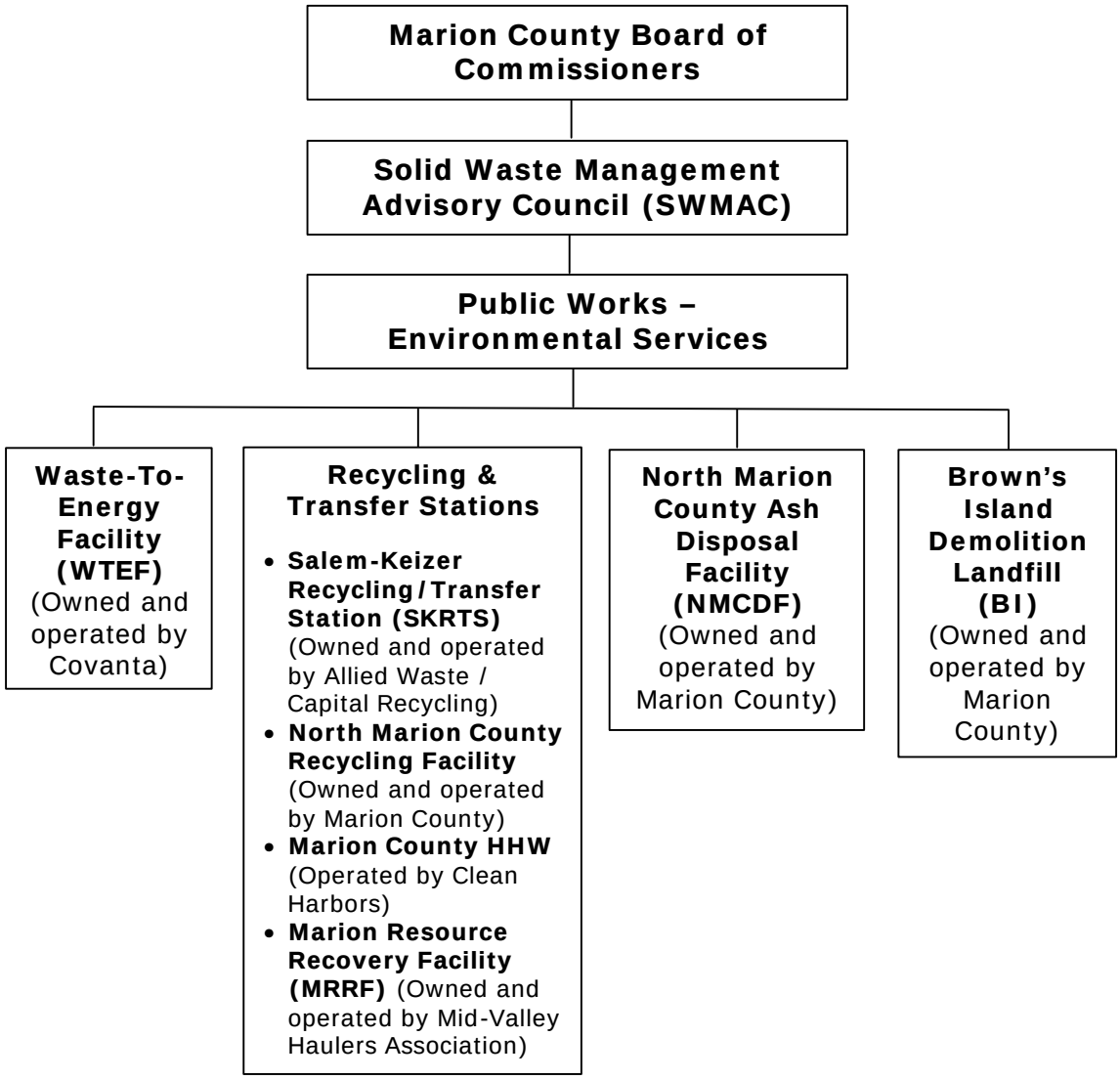
The County owns and operates the North Marion County Disposal Facility (NMCDF) and the Brown's Island Demolition Landfill (BI). Other facilities such as the Salem-Keizer Recycling/Transfer Station (SKRTS), the Waste-to-Energy Facility (WTEF) and Marion Resource Recovery Facility (MRRF) are privately operated under agreements with the County managed by PWES. In each of these facilities, except MRRF, PWES operates the gatehouse and scale systems; therefore, they are responsible for collecting all fees for the operation of facilities and providing services.

The County also works cooperatively with other franchised haulers to ensure that solid waste is managed in an integrated, comprehensive and coordinated approach. This includes cities, agencies and private businesses. Over the past 20 years, the County has continued to foster a private-public partnership that has led to a SWM system that provides cost-effective services throughout the entire County. This approach has resulted in the County providing leadership in setting policy and sharing appropriate facilities while maximizing the use of the private-sector to implement and carry out direct services on a daily basis. Figure 7-1 provides an overview of Marion County Solid Waste operations. As displayed in the figure, the system is comprised of seven different facilities located throughout the County. In each of these facilities, the County either plays a direct role through operation of the gatehouse facilities or through direct operating agreements with private vendors. This relationship is an extension of the overall partnership while taking advantage of the private sector's initiative and creativity to operate the facilities cost-effectively.

Environmental Services is the division of Marion County Public Works Department that is responsible for operating and managing the SWM system, under the direction of the Board of Commissioners. Their responsibilities also include program and facilities management, policy development, engineering, and operations. PWES operates the system as an enterprise fund which is completely funded by user or tip fees, franchise fees, and the sale of energy and recycled materials. As an enterprise fund, no general tax funds are used for operating or managing the solid waste system.

PWES has the authority to direct all solid waste to designated transfer stations, resource recovery facilities and other disposal facilities. This authority is provided to Marion County under ORS 459.125 and allows the County to enter into franchise agreements with private companies, which require them to deliver waste to certain disposal sites. This is known as flow control. Although there have been many challenges to the Federal Supreme Court regarding the ability of local jurisdictions to enact flow control, Marion County continues to exercise flow control authority under a grandfathered clause enacted by federal legislation.

Figure 7-1 - Marion County Solid Waste Operations



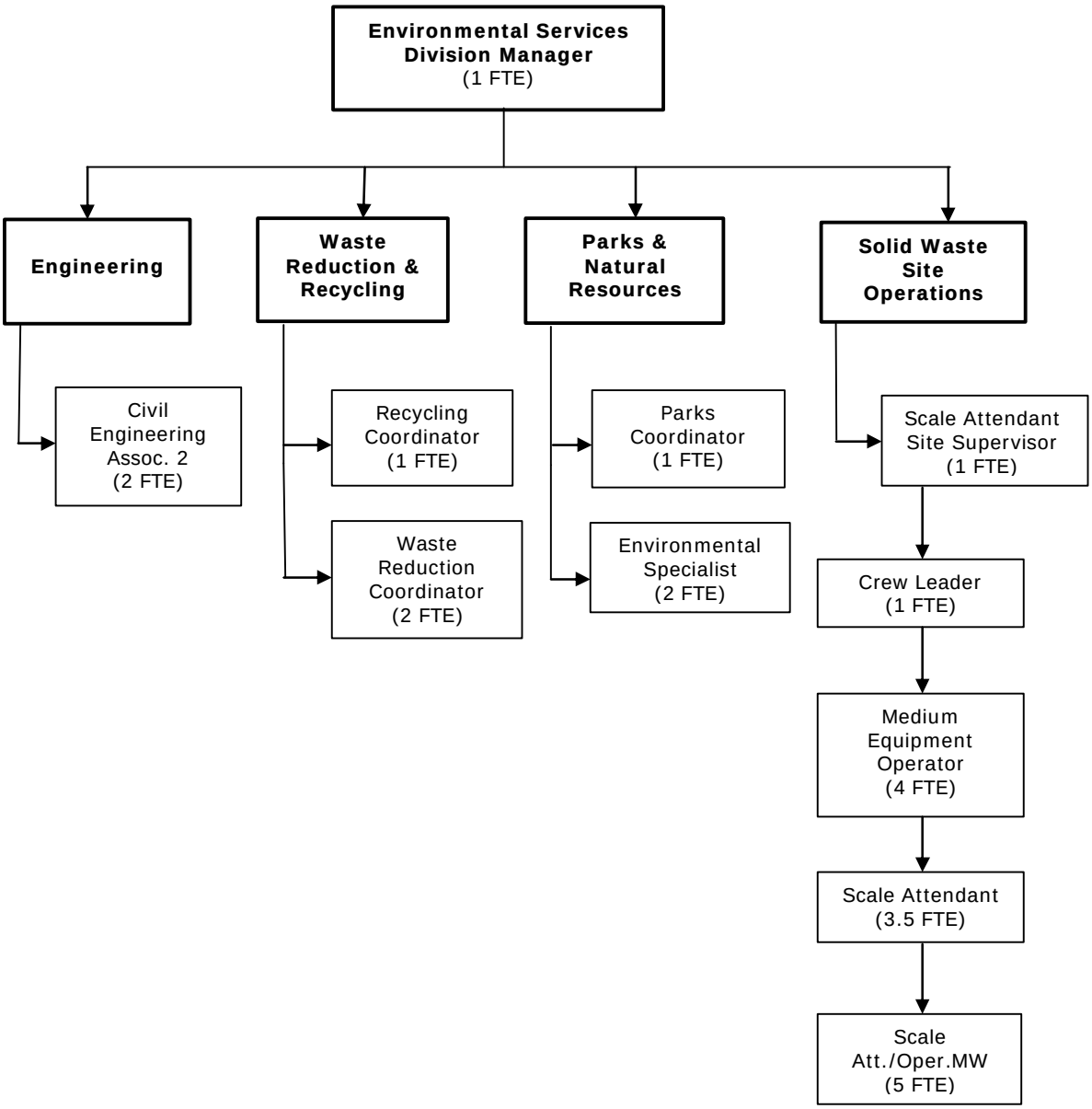
7.2.1.2 Public Works - Environmental Services (PWES) Organization

The Public Works Department of Marion County has many divisions with responsibilities for basic services to the County. One division is Environmental Services, also known as PWES. PWES is comprised of an administrative staff and three specific subdivisions related to SWM services. Division administration is provided by an Environmental Services Division Manager who is supported by additional resources within the Public Works Department. Under the direction of the Environmental Services Division Manager, there is a Waste Reduction and Recycling Group, an Engineering Group and a Solid Waste Site Operations Group. A Parks and Natural Resources Group is also managed by the Environmental Services Division Manager and provides shared resources to the Environmental Services Division. In total, there are 23 full-time employees and one half-time equivalent employee within the PWES organization. Figure 7-2 shows the organizational chart for PWES. In 2009, the Waste

Reduction and Recycling Group was expanded by one FTE position to enhance services and programs. PWES is also aided by part-time and volunteer assistance in waste reduction and recycling programs.

PWES is responsible for managing the preparation and completion of the updated SWMP. As such, they will take responsibility for management and implementation of specific recommendations.

Figure 7-2 - Public Works – Environmental Services (PWES) Organization



7.2.1.3 Incorporated Municipalities

Marion County contains 20 incorporated communities, including: Aumsville, Aurora, Detroit, Donald, Gates, Gervais, Hubbard, Idanha, Jefferson, Keizer, Mill City, Mount Angel, St. Paul, Salem, Scotts Mills, Silverton, Stayton, Sublimity, Turner, and Woodburn.

Incorporated cities have the same authority in Oregon for the management of solid waste as do counties. State law allows cities to license, contract, or franchise with private haulers 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 limits. Cities with populations over 4,000 have responsibilities under SB66 to ensure the implementation of recycling and waste reduction education programs. These programs are partially funded by a fee that is separate from the County franchise fee.

7.2.1.4 Oregon Department of Environmental Quality (ODEQ)

ODEQ is responsible for overseeing State solid waste policy 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 information materials, workshops, seminars, and compilation and management of solid waste data. ODEQ can provide funds to assist local governments in planning and implementing solid waste management programs.

ODEQ 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.

7.2.2 Marion County Solid Waste Management Advisory Council (SWMAC)

Marion County has an established citizens' committee on solid waste that has worked in an advisory capacity since 1979. It has continued to evolve and is now known as SWMAC. It is currently comprised of 16 members representing a diverse group of citizens, special interest groups, businesses, and representatives of the solid waste industry. The Board of Commissioners appoints members to the SWMAC. The Council annually elects a Chair and Vice Chair to be responsible for presiding over each of the monthly meetings.

The SWMAC's primary role is to review the policies and practices of delivering SWM services and to give guidance and advice to the County. The SWMAC plays an important part in updating the SWMP. First, they act as a sounding board to review drafts and to advise on setting priorities and recommendations. Second, while preparing the 2009 SWMP update, they were the primary forum for accepting input and comments from the public and citizen groups. Once the Final Draft SWMP is completed, they will send it to the County Board of Commissioners for adoption.

Marion County's Board of Commissioners relies on the SWMAC to offer advice and counsel in developing strategies and policies for managing solid waste. The SWMAC has played an important role in advising the County on planning and implementing its waste reduction/reuse, recycling, and SWM programs. It is a forum for ideas, information and innovation, and should continue its role in serving the County.

7.2.3 Solid Waste Enforcement

ODEQ has the lead responsibility for enforcing solid waste management and air quality regulations, and permitting all waste-related facilities in Marion County as well as throughout the State of Oregon. PWES is responsible for monitoring and enforcing illegal dumping regulations.

The following sections describe the enforcement responsibilities for SWM:

- **Solid Waste Facilities.** ODEQ issues solid waste permits for each and every 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 the WTEF, 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.

  The NMCDF, owned and operated by Marion County, includes a recycling depot, the ash monofill and the closed landfill. It is routinely inspected for compliance with appropriate state and federal regulations. PWES holds the permits to operate this facility and is responsible for monitoring groundwater on a regular basis. In 1999, a Remedial Investigation and Feasibility Study (RI/FS) was prepared for the NMCDF. As a result, no cleanup action was required. However, the County must perform ongoing monitoring of groundwater associated with the closed landfill. PWES also owns and operates BI and is responsible for monitoring groundwater at this facility as well.

  The specific permit requirements for each solid waste disposal facility are defined in OAR 340.61. ODEQ reviews and, as appropriate, requires renewal of these permits on a 10-year cycle.

- **Air Quality.** ODEQ, through its permitting authority, is responsible for oversight of air monitoring and emissions controls from the WTEF. Covanta, the operator of the facility, provides for continuous monitoring of emissions from the facility as specified in a Title V air contaminant discharge permit. The data is sent to ODEQ, who is responsible for noting violations of air quality standards at the WTEF and assessing fines for noncompliance. U.S. EPA may also assess fines for noncompliance with the Title V permit.

  The WTEF must also comply with federal emission requirements for MSW incinerators, as well as other design, monitoring, reporting, and compliance testing requirements, as set forth in the Title V permit.

- **Water Quality.** ODEQ issues water quality permits for leachate management and permits for stormwater runoff under the National Pollution Discharge Elimination System (NPDES) at both NMCDF and BI.

- **Hazardous and Special Wastes.** ODEQ issues permits for facilities that manage hazardous and special wastes. These include C/D landfills. ODEQ conducts regular inspections of these facilities and develops regulations and guidelines for the proper management and disposal of hazardous and special wastes.

- **Illegal dumping.** PWES investigates and responds to illegal dumping incidences in Marion 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.

7.2.4 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 the County. PWES is responsible for managing and ensuring the delivery of these services through combination of working with different agencies, private business and private-sector vendors. It ensures that revenue resources are adequate to provide these services. Its overall purpose is to provide citizens and businesses of Marion County with an environmentally responsible and cost-effective system for managing solid waste through quality, cost-effective and uninterruptible services.

7.2.4.1 Funding Obligations

PWES operates as a public utility through an enterprise fund. The revenue needed to meet the expenditure requirements of the program is totally provided by tipping and franchise fees, the sale of power, and revenue from the sale of recycled material. As an enterprise fund, there is no reliance on federal, State or local taxes. An enterprise fund mandates that financial obligations for delivery of service, as well as the associated environmental risk, must 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. PWES 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 provide rate stability.

7.2.4.2 The Enterprise Fund

The Marion County Solid Waste Enterprise Fund was established in 1987, when the Governmental Accounting Standards Board codified its financial reporting requirements. As mentioned, it is primarily based on the tip fees for direct services, as well as the sale of energy from the WTEF. Many public works utility operations such as wastewater or water districts typically use enterprise funds. The enterprise fund may manage its revenue resources to provide internal financing for capital projects as well as for daily operations. As an enterprise fund, the County can issue revenue bonds and repay the debt through user fees. The fund's annual revenue requirements are developed through the County's budget process. The breakdown for PWES' FY 2008 - 2009 budget is presented in Figure 7-3 and Table 7-1.

PWES' revenue continues to follow an historic trend to exceed its annual operating expenditure. 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 post-closure maintenance of existing landfills, and contingency funds related to potential environmental liabilities or unforeseen conditions. Dedicated reserve funds are in place to ensure that disposal fees in Marion County remain stable and allow capital project funding without incurring additional debt.

This longtime strategy employed by Marion County has resulted in rate stabilization. The current rate of $67.45 per ton has been in place since 1992. There have been no adjustments to the base rate during this timeframe. During this same period, the County has continued to grow its resources to adequately fund its known and unknown contingent liabilities, as well as to implement programs to reduce waste and recycle materials.

7.2.4.3 Expenditures / Facility Operations and Management

The revenue requirements to fund the programs and provide the services are reviewed on an annual basis. PWES establishes these revenue requirements in four different general categories. These include:

- Administration
- Waste Reduction and Recycling
- Site Operations
- Engineering Support

The administration and administration support services for the SWM operation represents 7% of the entire budget. This includes the direct administrative activities of PWES, as well as support administrative activities from other County Departments. The administrative support activities include legal, financial, accounting, and other support services, including allocation of time for the Board of Commissioners. This budget is typically referred to as overhead and administration for most public utilities. The 7% total allocation for overhead and administration is well within industry standards for public utility operations, which can typically be between 10-15%.

Figure 7-3 - Projected Expenditures – FY 08-09

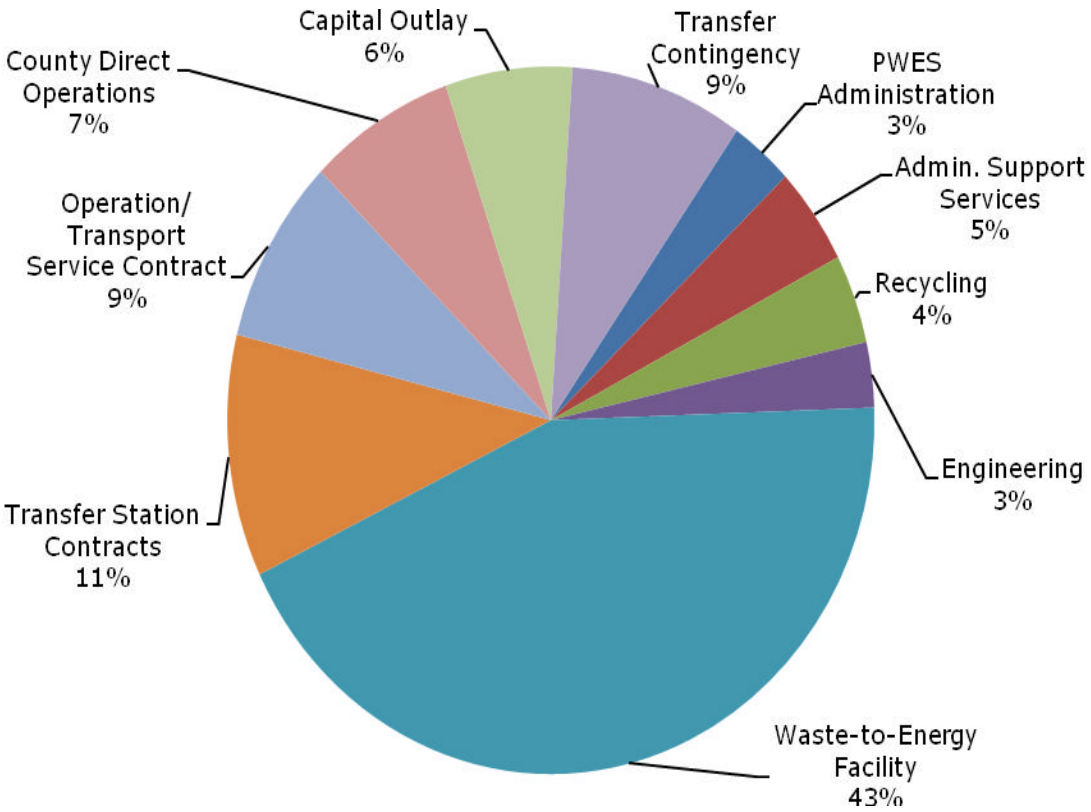


Table 7-1 - Expenditures by Operations

Expenditure	2007
PWES Administration	$ 628,166
Admin. Support Services	$ 889,485
Recycling	$ 809,699
Engineering	$ 592,753
Waste-to-Energy Facility	$ 8,615,900
Transfer Station Agreements	$ 2,202,900
Operation/ Transport Service Contract	$ 1,691,000
County Direct Operations	$ 1,453,747
Capital Outlay	$ 1,255,000
Transfer Contingency	$ 1,720,000
Total	**$19,858,650**

The waste reduction and recycling effort represents 4% of the total budget. This budget is primarily for labor and materials used in carrying out waste reduction programs. This includes education and promotion programs defined in this SWMP. It does not include the direct services provided at each facility for recycling and reducing waste. Because the County owns and operates certain facilities, it employs an engineering and environmental support services group, which represents 3% of the budget. Engineering services are provided at the BI and NMCDF, as well as supporting activities at other operations as required. Site operations and transportation services represent 9% of the budget. This includes the

gatehouse operations as well as agreements with private vendors. PWES does not directly operate vehicles to transport commodities or residuals, as all work is contracted with private-sector vendors.

Roughly 55% of the expenditure budget is for direct operations of the transfer stations and the WTEF. These facilities are privately owned but are operated under agreements with the County. PWES collects all fees and pays these vendors for services as stipulated in their contractual obligations. The current agreement for the operation of the WTEF is slated to expire in 2014. The County may begin the process to renegotiate extension of that agreement.

In October of 2008, the County retired the final debt service for the WTEF. Annual debt service payments were approximately $4 million per year. As a result, the overall financial liability of the County has been reduced, thus providing additional resources for solid waste programs and other purposes. The availability of these resources further enhances the County's ability to maintain rate stability and continue to expand waste reduction services to citizens and businesses of Marion County.

7.2.4.4 Revenue Sources

PWES' revenue sources include user or tip fees, energy sales generated by the WTEF and sales from material recovery, interest, and franchise fees from franchised haulers. (Figure 7-4 and

Table 7-2) The revenue for FY 08-09 is projected to be approximately $20.2 million. About 70% of the revenue is generated from disposal fees and 23% from energy sales. The remaining 7% comes from interest, recycling revenue, franchise fees and transfers from other departments.

PWES manages and operates the gatehouses at each of the facilities receiving waste throughout Marion County, except for the MRRF. Private and commercial vehicles are weighed and charged a unit price when they use the facility. The current charge is $67.45 per ton for commercial businesses at the WTEF and at transfer stations. Individuals that choose to haul their own waste to transfer stations, referred to as self-haulers, may do so and are charged $87.45 per ton. The difference in the tipping fees represents the cost of operating the transfer facilities and the transportation to the WTEF or to other disposal sites. PWES reviews tip fee revenues annually to determine if they are adequate to meet the revenue requirements through its budget and rate review process.

Figure 7-4 - Projected Revenues - FY 08-09

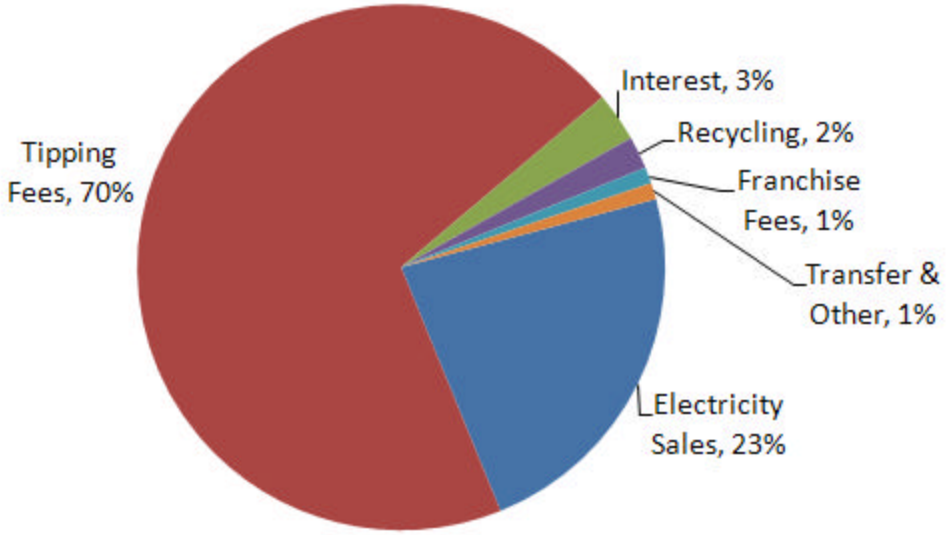


Table 7-2 - Revenues by Sources

Electricity Sales	$ 4,700,000
Tipping Fees	$ 14,106,000
Interest	$ 507,000
Recycled Material Sales	$ 350,000
Franchise Fees	$ 260,000
Transfer & Other	$ 284,000
Total	**$ 20,207,000**

To complete this budgeting process, PWES must review its operations as well as the programs and services to be included in its annual budget. Historically, PWES has considered the recommendations and priorities established in the SWMP as guidance for managing the resources and programs to be implemented each year.

As previously mentioned, the County has done a formidable job of managing revenues and expenditures, such that the disposal rate for tip fees charged at facilities has not increased since 1992.

7.2.4.5 Reserve Funds/Unappropriated Fund Balance

The County maintains an unappropriated fund balance of approximately $25.7 million. Figure 7-5 shows the distribution of these unappropriated funds, and Table 7-3 indicates the amounts. As shown, the County has established $10.5 million in capital reserves. These reserves can be used to make improvements to existing facilities, as well as to provide for expansion of services at existing facilities. In addition, there is roughly $7 million contained

in reserves funds for both BI and NMCDF. These monies are intended to fund the contingent environmental liabilities for post-closure activities at these landfills. These funds are established consistent with State and federal guidelines.

Figure 7-5 – Unappropriated Funds

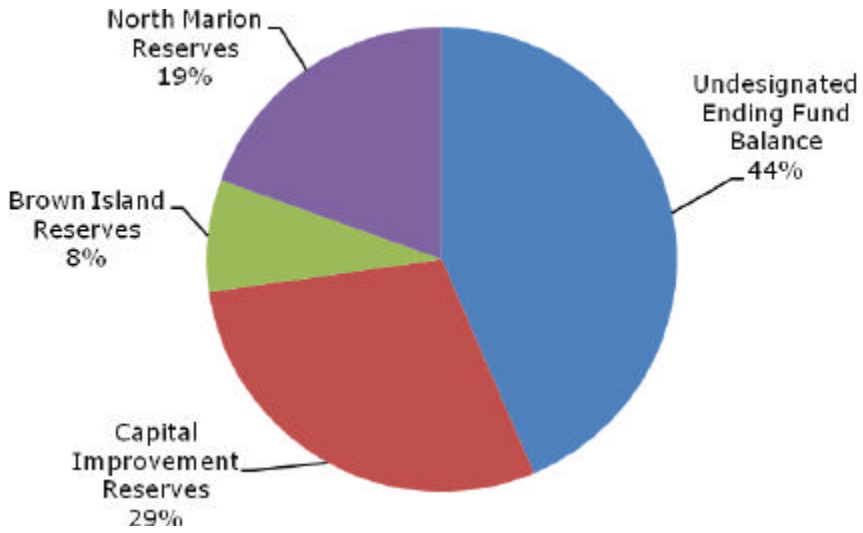


Table 7-3 - Unappropriated Funds

Undesignated Ending Fund Balance	$ 11,199,065
Capital Improvement Reserves	$ 7,500,000
BI Reserves	$ 2,000,000
North Marion Reserves	$ 5,000,000
Total	**$ 25,699,065**

Within the unappropriated fund balance, there are approximately $11.2 million of contingency funds. These contingency funds were established to meet several ongoing responsibilities of Marion County to provide cost-effective services. It includes potential funds for items such as:

- Unknown contractual liabilities associated with operations of the WTEF.
- Unknown environmental contingencies related to the NMCDF.
- Unknown operating contingencies to ensure uninterrupted service.
- Funds to provide rate stability in the event of an emergency or unforeseen conditions.

Because the County has established an unappropriated fund balance for these events, it remains a stable and healthy enterprise fund that can provide continued stability and uninterrupted services to County residents and businesses.

7.3 Needs and Opportunities

Marion County, through the oversight and daily operations of PWES, has continued to manage the solid waste system in accordance with the guiding principles. Through its leadership and by working effectively with franchised haulers, local governments, businesses and citizens, they provide financial stewardship to ensure cost-effective services. This stewardship is apparent by the fact that rates have not been raised since 1992. During this same period, the County has continued to adopt new programs to promote waste reduction and reuse as well as new services to recycle more materials.

By way of policies enacted by the Board of Commissioner and under the management and administrative oversight of PWES, the financial health of the solid waste enterprise fund as a whole is very strong. With this SWMP update, there are new issues to be considered in order to continue enhancing services and to maintain this same leadership and financial performance.

7.3.1 Financing and Funding Considerations

In previous Chapters of the SWMP update, there are several recommendations that have some impact on PWES management responsibilities and allocation of financial resources. These are presented as needs and opportunities to be considered for implementing the recommended actions in this Plan.

In Chapter 3 - Waste Reduction and Recycling, there is a need to not only continue with an aggressive promotion and education program but also recognize that additional resources may be necessary to enhance or expand these programs. PWES is very comprehensive in the number and type of programs it offers, and it has been successful. But, just as there has been much success, it will be important to maintain or increase these programs. The programs must continue to pursue ways to get the message out and to educate citizens and businesses on ways to reduce waste as well as increase participation in existing services. PWES expends almost $900,000 per year on waste reduction, reuse and recycling programs. Just this past year, PWES added an FTE position to increase educational efforts. PWES needs to continue to work with its partners in the SWM system to ensure there are adequate resources applied to these programs.

The current facilities serving the SWM system may need to be improved or expanded. This is acknowledged in both Chapter 4 - Processing and Chapter 5 - Collection and Transfer. One issue raised is the need to more cost-effectively transport waste in excess of the WTEF out of County for disposal. Some expansion to transfer capacity needs to be considered and planned for. Whether the capital to fund these facility expansions comes from the County or from investments by private vendors still needs to be determined. However, there may be some financial impacts, and the potential impacts on tip fee rates will need to be considered.

Another issued raised in Chapter 5 relates to changes in the SWM system for recycling more materials from the commercial waste stream. At this time, it is premature to determine what impacts this may have at the SWM facilities. It is possible that new commercial collection programs could result in generating a commingled material that could be trans-loaded and shipped to processors in Portland along with the residential commingled stream. In this case, the financial impacts would be more on collection rates versus County tip fees. On the other hand, it may be necessary to expand processing capacity at existing facilities. Whatever program is developed, these new programs will need to be assimilated into the tip fee rates.

In Chapter 6 - Alternative Technologies and Disposal, a recommendation to begin discussions with Covanta for the extension of the agreement to operate the WTEF is made. It is not yet known what impacts the new operating agreement with Covanta will have on tip fee rates, if any. In addition to the operating agreement, there is also the need to renegotiate with PGE for sale of electricity from the WTEF. Both these events will impact future financial needs of the solid waste system. The financial obligation to repay the debt service on the original revenue bonds is no longer necessary. This provides a relief to PWES's operating budget.

The other important issue raised in Chapter 6 is the need to address the growth of waste generated in excess of the WTEF. Certainly, the preferred approach is to reduce the overall waste generation rate in Marion County and recycle more materials. Progress towards these goals is represented by adding resources and expanding commercial recycling and food waste composting. Chapter 6 also discusses the possibilities of considering other alternative technologies and/or building a third boiler at the WTEF. The intent is to continue to reduce any dependency on landfilling.

7.3.2 Management Issues

PWES has established an effective management and administrative system. It works through a series of franchise and operating agreements. The haulers, through these franchise agreements, carry out the basic collection and recycling services. However, within city limits, franchise agreements are with the cities, who must buy into the practices and policy direction for managing solid waste.

The SWMAC is tasked with the responsibility to provide advice to the Board of Commissioners on policies, programs and direct services. They continue to play an important role to advise and guide the direction for managing sold waste. The Council continues to be a primary conduit for receiving input from citizen interest groups and the general public. During the process of updating this SWMP, there has been interest in examining ways to engage more citizen input or involvement in the managing of solid waste. This could include community or neighborhood organizations.

As described in earlier Chapters, there are several recommendations which require the participation and buy-in of other constituents. For instance, to expand the recycling collection services, multi-family and commercial customers need to buy in and support new programs. Also, cities, which are responsible for ensuring recycling services are provided and consistent with the countywide programs, are not active in the formulation of new programs. Thus, there may be a need to develop a strategy for expanding their input and participation in making decisions and, more importantly, informing generators of ways to reduce waste.

7.4 Alternatives and Evaluation

Marion County's SWM practices have continued to evolve over the past 10 years. With much of the basic infrastructure in place, PWES, cities, franchised haulers, businesses and citizens have focused on expanding efforts to reduce waste and recycle more materials consistent with the adopted environmental hierarchy. This section discusses considerations for changes that might be considered to address the challenges of implementing the recommendations in the Plan.

7.4.1 Administration / Management

PWES is organized to manage each component of the County's SWM system. It is structured to manage facilities either directly or through agreements with vendors, carry out existing and implement new waste reduction and recycling programs, and manage the financial resources to provide long-term rate stability and to maintain cost-effective services. It has an appropriate rate setting process that pays for solid waste services and provides a cash reserves to fund long-term capital improvements and fund known and unknown contingent environmental liabilities such as post-closure for landfills and potential remedial action.

The current management structure has worked well as evidenced by the substantial gains in achieving waste reduction and recycling goals, as well as maintaining stable tip fee rates. The system is governed by a series of franchise agreements and direct contracts establishing a formal network of private and public ventures. This partnership is unique to Marion County, and it provides the County with the ability to make changes in policies, set new priorities, and work effectively with cities and franchised haulers to institute these changes. PWES works with its partners to provide a comprehensive promotion and education program that enables these entities to effectively communicate the program requirements to the general public. Residences and businesses have responded in support of the various programs and services.

In the near future, there appears to be no immediate deficiencies with the current management structure. PWES works closely with the SWMAC to gain input and direction on programs and services. However, in order to implement some of the recommendations presented in previous Chapters, it may be desirable to engage the participation of the cities and additional special interests. This could include community-based neighborhood groups, special interest groups and businesses.

Alternatives for expanding public involvement might include the following:

- Establish Task Force(s) to take on special issues. Using the SWMAC as the primary sounding board, establish a special Task Force with a specific charge to investigate and evaluate program strategies. This is an extension of the current subcommittee system, but it would be expanded for certain assignments to engage other interest groups. For instance, in an effort to expand multi-family recycling programs, owners or managers of multi-family housing could be asked to participate in the panel to help develop solutions. Because the cities are responsible for managing the collection franchises, they too should be contacted to participate. This would allow the affected franchised haulers to participate directly in the program development and their subsequent implementation.

- Another option would be to expand the SWMAC membership to include representatives from the cities and some of the other entities impacted by new programs. This may be beneficial in that these entities would have the opportunity to participate in policies and programs affecting the entire system. One disadvantage is that the SWMAC currently has 16 members, and the larger the group it becomes, the more difficult it is to manage and develop a consensus.

- PWES could review current outreach programs and determine other methods to engage public participation and involvement, particularly as it relates to waste reduction efforts. This may call for added resources dedicated to this effort within PWES.

- PWES, working with private businesses, cities and franchised haulers, is very active in promotion and education programs. As an alternative to establishing new or special working committees, it may be desirable to reevaluate the comprehensive outreach program and consider new and more effective ways to engage public involvement. This can be part of a community marketing approach.

There is no immediate change in the public involvement required to address a specific problem. However, one goal of the Plan is to reduce waste generation, and this may require developing ways to impart more personal responsibility in this regard. As such, changes to public involvement and outreach may be part of the solution.

7.4.2 Finance and Funding

PWES' fiscal management of the solid waste system has met and exceeded expectations for similar public utility operations. Through its fiscal management practices, it has not only kept rates constant for the past 17 years, but it has established a stable foundation for the near future. The enterprise fund provides a sound operating base and reserve for maintenance, capital improvements and regulatory requirements. It has totally relied on revenues from tip fees and sales from power and related services without any outside sources.

Based on its historic performance and given the funding requirements in the immediate future, it is not expected that PWES would modify the basic enterprise fund. Should the County wish to evaluate alternative funding options, these sources, discussed below, may be considered:

- Internal financing
- Public financing
- General fund financing
- Generator or user fees

7.4.2.1 Internal Financing (Pay-as-you-go)

PWES uses internal financing to operate its solid waste system. It is based on a pay-as-you-go cash flow system commonly referred to as "Paygo." This financial system is preferred by public utilities since it usually has the least cost to the ratepayers over time. The system relies on establishing capital reserves and other defined contingencies to pay for capital improvements, thus avoiding interest expenses associated with debt financing.

Through its fiscal management, PWES has built a reserve fund of about $25 million. These funds have been assigned for specific purposes to address both known and unknown contingent environmental liabilities. Funds have also been reserved for potential capital improvements.

The establishment of these reserves is consistent with an independent financial study completed in 1999. In that study, it was recommended that a capital reserve balance of $10 million be established. The FY08–09 budget included a capital reserve of $7.5 million. Each year, the fund is evaluated as part of the budget process, but it will be important to continue to build this fund as new investments in the facilities may be required in the near future.

The County has exercised sound management and fiscal practices for the enterprise fund. This has eliminated the need to borrow funds and, as such, makes the "Paygo" system a preferred approach.

7.4.2.2 Public Financing

If its growing population requires a change, the County may decide to pay for its system improvements through public financing. This approach, which uses tax-exempt public debt, is a reasonable method to finance large capital projects. This section is an overview of public financing options available to local governments in Oregon. It includes general obligation and revenue bonds, and reviews pertinent ODEQ and Oregon Economic Development Department (EDD) programs.

General obligation bonds pledge to the bondholders the full faith and credit of the issuing city or county for the payment of debt service. The source of this credit is the taxing authority of the city or county. All general obligation debt must be approved by a majority of votes in a specific election. The decision to issue general obligation debt should consider the competing, alternative demands on the debt capacity and property tax levels of a municipality.

Revenue bonds pledge the revenues of a jurisdiction's enterprise activity against the debt service on the issued bonds. They may not require voter approval because they depend upon revenue from the activity rather than the taxing authority of the municipality.

A combination of higher interest rates, coverage requirements, and bond reserves makes revenue bond financing more expensive than general obligation financing. Because these bonds pledge future revenues as collateral for the debt, this form of financing requires a revenue-generating activity whose proceeds can be committed to repayment of the bonds. Through the use of the enterprise fund, the County can issue revenue bonds for capital-intensive projects like the WTEF.

Revenue bonds were a preferred method of financing SWM system improvements in the past. However, the ability to pledge and guarantee revenues dissipated when flow control laws were challenged and upheld.

Oregon law provides for the creation of the State Pollution Control Bond Fund, administered by ODEQ, for the purpose of financing certain pollution control facilities developed by the state and by local governments within ORS 468.195-260. This fund is financed through the issuance of up to $260 million in tax-exempt bonds by the State. ODEQ may use these bonds for projects related to wastewater treatment and SWM facilities. The advantage of selling general obligation or revenue bonds to the State Pollution Control Bond Fund is that it may have a higher bond rating. The result is lower interest costs for the jurisdiction.

To encourage economic development, Oregon issues tax-exempt Oregon Bond Bank Revenue Bonds through the EDD. The EDD uses this money to purchase lower-grade debt from selected communities within the State, which reduces their respective costs. Because the Oregon Bond Bank program is oriented toward the development of new infrastructure, it may be unlikely that bonds issued solely to finance landfill remediation or WTEF improvements would qualify. Bonds issued to develop new landfill capacity, transfer stations, or any other infrastructure of Marion County's solid waste system might qualify for the Bond Bank program. Landfill closure included with other, new infrastructure projects in an issuance to fund overall SWM system improvements might also qualify for Bond Bank support.

One important advantage of public debt over other methods of financing is that the interest on tax-exempt municipal bonds can be significantly lower than on taxable securities. Historically, tax-exempt bonds have had interest rates of 2% to 4 % below those of comparable taxable bonds. There are fixed costs of issuing public debt, including costs of underwriting, rating, printing and registration. General obligation issues may be less expensive.

7.4.2.3 General Fund Financing (New Taxes)

General fund financing of the County's solid waste system is an option with limitations. This approach places PWES'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 tax and fee structure. The solid waste activities would compete with other projects for available funds. All system revenues would be directed to the jurisdiction's general fund.

The most common form of tax would make solid waste part of the property tax. Under this approach, every unit pays its portion of the SWM program. Tipping 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. Tipping fees would be collected at facilities for direct services.

This approach would make sure that all residents and businesses 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 tipping fees and possibly delay or prevent increase 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 tipping fees than to approve new taxes, even if the actual tax is a small percentage of the total property tax.

7.4.2.4 Generator or User Fees

Another financing approach that has gained support in certain jurisdictions is the establishment of user fees. A simple form of user fees is to require all facilities that service the County to charge this fee. In the case of Marion County, the user fee would include debt for new facilities, cost for waste prevention and recycling programs, cost to provide environmental controls at closed landfills, and general administration and overhead.

For user fees to be effective, they must be collected from all waste generated in the County. This can be accomplished by contracting or by franchising haulers. A preliminary analysis performed as part of the previous financial study estimated the user fee to be between $8 and $10 per ton. The analysis performed as part of the study suggested that if this fee were collected for all waste generated in Marion County, it would allow the County tipping fee to remain at its present level for a longer period. The County has flow control, which could be used to leverage the supply of waste to any facility.

Portland Metro enacted a user fee in 1983. Its purpose was to ensure that all users of any solid waste facility serving the region pay for basic services. These services include waste

reduction and recycling programs, HHW operations and other support activities. In 2008, the Metro user fee was $25 per ton, which included an excise tax.

Another form of user fee is a generator fee. Communities such as Montgomery County, Maryland, and Prince William County, Virginia, have enacted generator fees. This is a fixed charge assessed to different classes of generators. Usually, both commercial and residential customers can be assigned an index based on the amount of waste generated. For residences, the amount of waste is historically fairly well defined. For commercial properties, it can vary based on the type of business. It is necessary to conduct a study to better define the quantities and user classes to assess the generator fee as fairly as possible.

The primary advantage of the user fees is that all generators help pay for the basic services. This keeps the system in balance and reduces dependency on tipping fees. It can be implemented at all solid waste facilities by developing service agreements. With the generator fee approach, there is added benefit of achieving a high level of equity among generators because fees are based on actual or imputed levels of generation.

The main disadvantage of the generator fee is that it is often viewed as a tax. Since it is a fixed charge, it does not reward directly those that reduce waste or recycle more. There could also be legal challenges to implementing this form of user charge in Oregon.

It could be much easier to implement a user fee collected at all facilities that handle solid waste generated in Marion County. It may be designed similar to Metro's system, which has been in place for many years. Prior to implementing this system, an evaluation of the system charges to be included in the user fee would be needed.

7.5 Recommendations

Recommendation 7.1: The County should continue to operate the SWM system as an enterprise fund and maintain a policy of internal financing. The system should continue to rely on system users paying directly for services and for the enterprise fund to limit future debt.

Rationale for Recommendation: PWES was established by the County as an enterprise fund and has effectively managed resources, resulting in rate stability and minimized debt. Contingency and reserve funds have been established following sound financial practice as adopted by other public facilities.

Recommendation 7.2: PWES should determine what resources are needed to maintain and enhance the effectiveness of the WR/R support program. The assessment of needs would coincide with recommendations stated in Chapter 3 of the SWMP to focus on increasing participation in existing services and to consider educating residents and businesses on opportunities aimed at reducing the overall waste generation rate.

***Rationale for Recommendation*:** The County has implemented many programs and services, as well as some innovative approaches towards achieving a significant increase in the recycling rate. Recommendations in Chapter 3 of this 2009 SWMP Update call for reevaluating the effectiveness of current programs considering new approaches of using the Internet, other communication tools, and community-based marketing strategies to achieve greater awareness of generator responsibility and to increase participation in existing

services. This includes participation in potential services for multi-family recycling and increased recycling from commercial customers.

Recommendation 7.3: PWES should complete a five to seven year capital improvement plan that considers investments which are required to upgrade or improve facilities. The plan will continue to ensure adequate funding is available with revenues from the enterprise fund or from private vendors.

Rationale for Recommendation: As mentioned in Chapters 4 and 5, there may be a need to make investments in SKRTS or other facilities to expand transfer capabilities and to enhance recovery operations. The County has set aside capital reserves that are largely aimed at improvements to the ash landfill at NMCDF. But improvements to existing facilities may be needed in the near future, and the resource requirements needed to make such improvements should be evaluated. This effort will involve working with owners of SKRTS, MRRF and the WTEF to identify the investments needed and the appropriate funding sources.

Appendix A	Status of Alternative Technologies for Waste Disposal
Appendix B	Waste Prevention White Paper
Appendix C	Cost Tables – New Landfill and Third Boiler Update
Appendix D	Environmental Review of Process/Disposal Options
Appendix E	Public Outreach

Appendix A

Status of Alternative Technologies for Waste Disposal

1. Introduction

This section reviews both proven and unproven waste processing technologies (WPT). Waste-to-energy (WTE) technologies profiled include: mass-burn/waterwall combustion, mass-burn/modular combustion, refuse-derived fuel (RDF)/dedicated boiler, and RDF/fluid bed. Although WTE facilities range in size from 10 to over 3,000 tpd in the U.S., 71% are 500 tpd or larger. Mass-burn/waterwall combustion is the most prevalent WPT in the U.S., employed at 65 of the 89 facilities. However, no new mass-burn WTEF have been built in the U.S. for over 10 years, although there have been some recent expansions of existing facilities. In contrast to its smaller presence in the U.S., WTE is an accepted and commonly used waste processing technology worldwide, with 400 facilities in Europe, 100 in Japan, and 70 in other nations such as Taiwan, Singapore, and China.

In addition to proven technologies, the emerging technologies of high-temperature gasification, fluidized-bed combustion, plasma-arc processing, non-thermal anaerobic digestion, and biological fuel production are also reviewed. Although technically not an emerging technology, biological fuel production has not been commercially proven using MSW-only as a sustained feedstock.

Waste-to-energy and alternative WPT are currently receiving renewed interest due to: the proven WTE track record, increasing fossil fuel costs, growing interest in renewable energy, a higher ranking in the EPA's waste management hierarchy, concern about greenhouse gases (GHG), a change in flow control legislation, advancements in technology, and the increasing cost of long distance transfer and disposal.

Recent activity in the evaluation and procurement of WPT by certain other U.S. cities and counties is discussed. These localities are exploring alternatives for service to their citizens. A total of 80 technology vendors offering 14 different technologies were represented, evaluated, screened, or selected during these research and procurement projects.

The economic characteristics of the various WPT, including capital and operating costs and risk, vary significantly, as reported. Generally, capital cost for the proven technologies are in the range of $150,000 to $250,000 per ton of installed capacity, depending on size and facility configuration. Operating costs are in the range of $35 to $60 per ton processed, not including residue disposal, again dependent on size, equipment and operating profile, and assuming a private operator. These figures are based on industry rules-of-thumb, recent operating results from selected facilities, surveys of industry professionals and related references.

As mentioned earlier, there are 89 WTE facilities generating power from MSW in the U.S. and hundreds worldwide. The other technologies discussed are in various stages of development and, in general, are not mature enough to mitigate the risks potentially inherent with their implementation.

2. Future Marion County Waste Disposal Needs

For the last 20 years, Marion County has relied heavily on the WTEF as the primary processing site for a substantial portion of its waste. Although the County produces waste in excess of the WTEF capacity, the facility handles a majority of the MSW produced inside the County, as well as providing disposal options for specific out-of-County waste materials. While Marion County has the highest per capita recycling rate of any Oregon wasteshed, as the County's population continues to grow, more waste will be produced which requires some form of processing and/or disposal. In fact, the County now exports wastes for out-of-County disposal in landfills in excess of that which can be handled by the WTEF and/or that is currently recycled. Marion County also utilizes local and/or area landfills for disposal of current WTEF ash, certain construction & demolition debris and other waste products unsuitable for combustion, and MSW in excess of the WTEF capacity and bypass wastes during times of facility maintenance. In 2014, the County's current contract to utilize the WTEF for MSW disposal will expire. Whether or not the contract is renewed, Marion County will have wastes needing disposal, through one means or another. Implementation of alternative disposal technologies is a potential option for consideration by County decision-makers as they plan for future waste processing and disposal capacity for County wastes.

3. Overview of Waste Processing Technologies (WPT)

3.1 "Proven" Technologies

Waste has been converted to beneficial use on a large scale for well over 100 years. Incineration with electric power generation was first applied to MSW in 1894 in New York City. Since that time, the burning of MSW with energy recovery (now known as WTE) has matured into an effective and environmentally acceptable technology. The proven thermal waste processing methods include incineration and starved-air combustion, as defined below:

Mass-burn Incineration: This is the controlled combustion of organic or inorganic waste with more than the ideal air (stoichiometric) requirement – excess air - to assure that complete burning occurs.

Starved Air Combustion: Starved air incineration utilizes less air than conventional incineration, and it produces ash similar in appearance to that from a conventional incineration process. The gases that result are burned in a second chamber. The lower air requirement leads to smaller equipment sizes. This process, however, is an incineration process.

Refuse-derived Fuel (RDF): An RDF system processes waste by shredding it and removing ferrous metals in preparation for combustion. The removal of non-combustibles can

increase the specific heat content by over 10% and can allow for revenues from the metals removed. In some configurations, certain other materials are removed in the front-end system prior to combustion.

It has been found that recycling, the most preferred waste management option aside from waste reduction, increases when WTE exists in the United States as well as in other countries. As shown in *BioCycle's* "2006 State of Garbage in America," (http://www.jgpress.com/archives/_free/000848.html), most of the states with large energy recovery rates have recycling rates higher than the national recycling average of 28.5%.[1] These recycling rates range from 43% in Minnesota (where 21% of the waste is burned for energy) to 24% in Connecticut (where 65% of the waste is burned for energy). Oregon illustrates a combination of factors, with 46% recycling and 3.6% combustion for energy. Apparently, where WTE exists, there is greater public awareness of waste disposal and the need to deal with waste reduction overall.

Another method of MSW processing, mixed-waste composting, is being used in some locations but is becoming less and less attractive. Mixed-waste composting may require large land areas, may create significant odor, and produces compost that is limited in its application because of contaminants.

WTE has proven to be a reliable method for waste processing and disposal. Modern facilities are compatible with aggressive recycling programs and have an environmentally acceptable track record.

While new WTE procurements have declined in the U.S., the market for this equipment has increased in Europe and in Eastern Asia. European and Japanese systems suppliers actively market their systems and are consistently improving their performance. The technology is well tested and is used more than any other for WPT facilities in the U.S. and overseas. Table 1 illustrates the use of WTE technology for MSW throughout the world.

Table 1 - WTEF Worldwide[2]

Location	Number of Facilities	Amount of MSW Managed by WTE as a % of Total MSW Generated
USA	89	12.5% based on MSW reported by U.S. EPA and *BioCycle's* data
Europe	400	Varies from country to country
Japan	100	70% to 80%
Other nations (Taiwan, Singapore, China, etc.)	70	Varies from country to country

Table 2 illustrates the size and ownership of WTEF in operation in the United States. 52% of the facilities are owned by public entities, Wheelabrator Technology (Waste Management Inc.) owns 13%, Covanta Energy owns 21%, and other private firms own 13%. Private firms own more of the larger facilities.

[1] *BioCycle* includes recycling, composting, yard waste, WTE and landfill collection in its figures. EPA reports MSW from a slightly different source. They include collection receipts for domestic waste and for industrial waste, but their recycling quantities are derived from firms that recycle the waste, such as paper mills or steel plants, rather than from collection data. This difference in methodology from that used by *Biocycle* is reflected in the difference in recycling rates in the United States in 2006, which is reported as 32.5% by EPA and 28.5% by *Biocycle*.

[2] Source: "The 2008 IWSA Directory of Waste-to-Energy Facilities," Integrated Waste Management Services Association website

Table 2 - WTEF in the United States

Size (Tons Per Day)	Publicly Owned	Privately Owned	Total
= 100	7	0	7
101-499	14	5	19
500-999	8	17	25
1,000-1,999	11	9	20
= 2,000	6	12	18
Total	**46**	**43**	**89**

Table 3 shows the various technologies used in U.S. facilities with the majority of facilities utilizing mass burn technology.

Table 3 - U.S. WTE Facilities by Technology[3]

Technology	Operating Facilities	Daily Design Capacity (tpd)	Annual Capacity [1] (Million Tons)
Mass Burn	65	71,354	22.1
Modular	9	1,342	0.4
RDF-Processing & Combustion	10	15,428	4.8
RDF-Processing Only	5	6,075	1.9
RDF-Combustion Only	5	4,592	1.4
Total U.S. Facilities [2]	94	98,791	30.6
WTEF	89	92,716	28.7

[1] Annual Capacity equals daily tpd of design capacity multiplied by 365 (days/year) multiplied by 85 %. 85 % of the design capacity is a typical system guarantee of annual facility throughput.

[2] Total Facilities includes RDF Processing facilities that do not generate power on site.

The following sections describe the basic types of MSW combustion technologies, all of which have been in use for many years in the U.S.

[3] Source: J.V.L. Kiser and M. Zannes, Integrated Waste Management Services Association, April 2004.

3.3.1 Mass-Burn/Waterwall Combustion

In mass-burn waterwall combustion, MSW is placed directly into the system for incineration with no pre-processing except for removal of identifiable white goods (refrigerators, washing machines, microwave ovens, etc.). Waste is placed onto a grate at the bottom of a combustion chamber in a furnace with walls built of water tubes, as shown in Figure 1. Air for combustion is forced through the grates (under-fire air) and through parts in the sides of the combustion chamber (over-fire air).

Figure 1 - Waterwall Furnace Section[4]

Approximately half the heat generated from the burning waste is absorbed by the waterwalls and the balance heats water in the boiler, as shown in Figure 2.

[4] Source: Babcock and Wilcox.

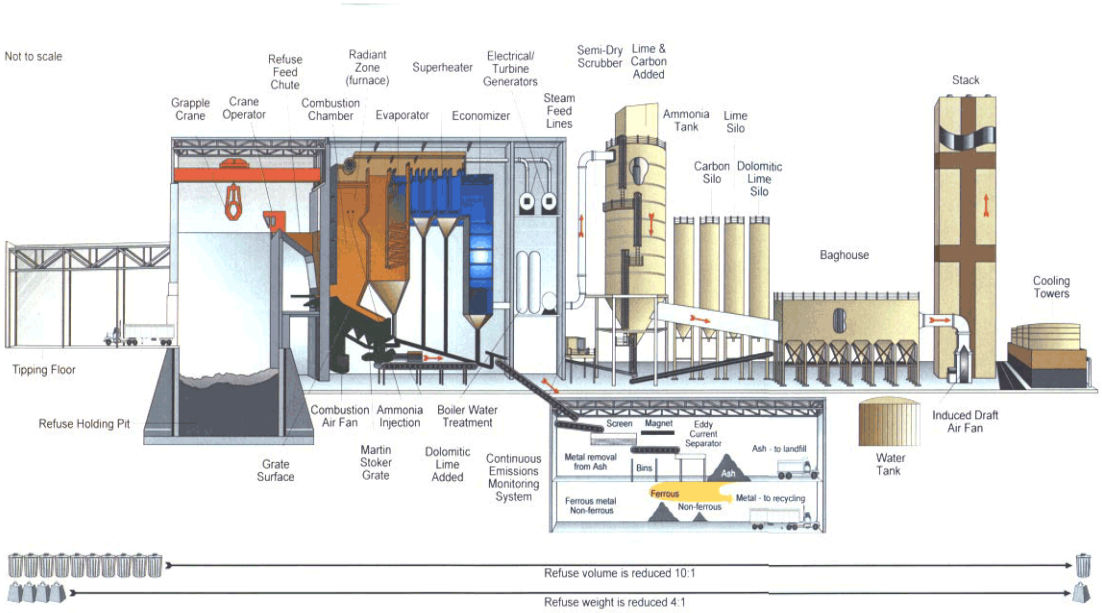


Figure 2 - Typical Mass-Burn Waterwall System[5]

The off-gas exiting the boiler passes through an air pollution control system where the majority of pollutants is removed and is discharged through a stack to the atmosphere. Waste is burned out to an ash in the furnace. Heat extracted from the waterwalls and the boiler section generates steam which, in most facilities, is directed to a turbine generator for electric power production. Waterwall systems are fabricated on-site. They are generally applied to larger systems, 200 tpd up to 750 tpd, with multiple units used when higher capacity is required. They are forgiving in their operation, and are reasonably efficient in the burnout of waste and in the generation of energy.

3.1.2 Mass-Burn/Modular Combustion

Modular combustion is another incineration process. Unprocessed MSW is placed directly into a refractory lined chamber. The primary chamber of the incinerator includes a series of charging rams which push the burning waste from one level to another until it burns out to an ash and is discharged to a wet ash pit, as in Figure 3. No or limited under-fire air is used to limit the entraining of ash into the flue (exhaust) gas stream.

[5] Source: Fairfax County, VA.

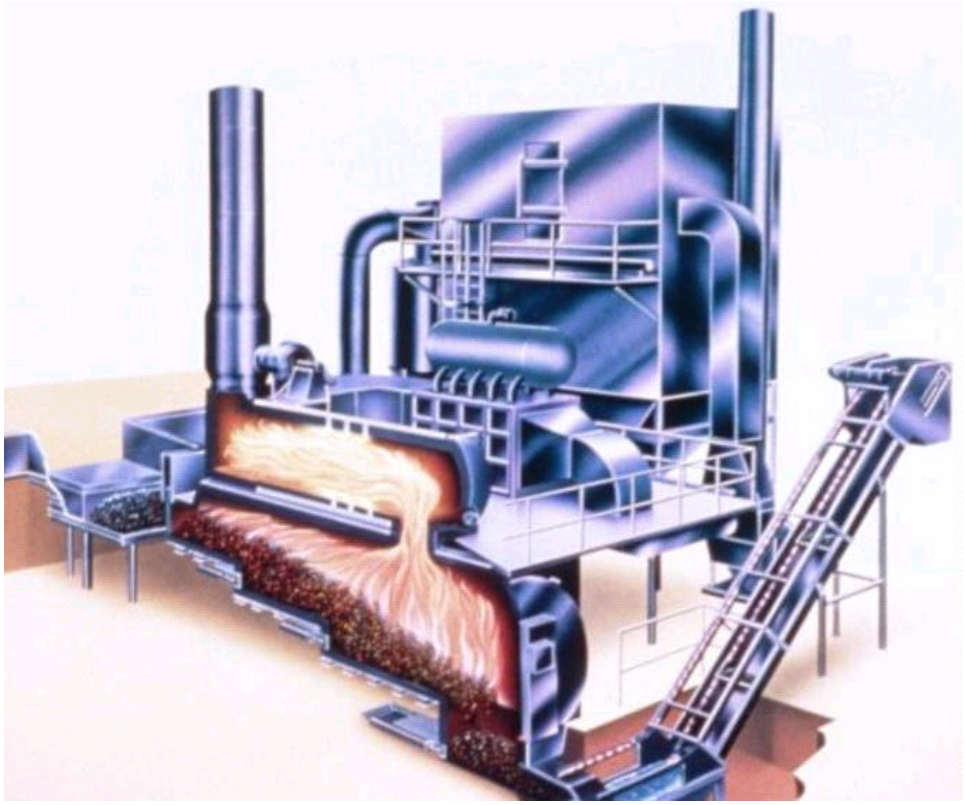


Figure 3 - Typical Modular Combustion System[6]

Less than the ideal (stoichiometric) amount of combustion air is injected into the primary combustion chamber, and a combustible gas is produced from the incomplete waste combustion. The gas from the burning waste is directed to a secondary combustion chamber where additional air is added to complete the burning process. Hot gases pass though a separate waste heat boiler for steam generation and then through an air pollution control system before discharge through the stack to the atmosphere.

A major advantage of this system is injection of less air than ideal in the primary combustion chamber. With less air, the fans can be smaller and the chamber itself can be smaller than with other systems. Also, with less air flow, less particulate matter (soot) enters the gas stream and the air pollution system can be sized for a smaller load.

Modular systems are factory built and can be brought to a site and set up in a relatively short period of time. They are less efficient than waterwall units in waste burn-out and in energy generation. They have been built in unit sizes up to 150 tpd. Multiple units are used to increase facility size to 300 – 400 tpd, such as in facilities in Agawam, MA, Wallingford, CT, and Harford County, MD.

3.1.3 Refuse-derived Fuel/Dedicated Boiler

RDF, in its simplest form, is shredded MSW with ferrous metals removed. Additional processing, such as screening, can be applied to the incoming waste stream to remove and recover glass, aluminum, and other non-combustible materials. Additional processing

[6] Source: Consutech Systems, Richmond, VA.

stages may also be placed in the processing line, such as pelletizing. Pelletizing is the compression of "fluff" RDF into dense pellets generally to be fired along with lump coal. The pellet size depends on the size of the coal used in existing power facilitys.

RDF production is a distinct process; therefore, it is not necessary to be co-located with the combustion facility. In Figure 4, RDF is blown into the furnace from the left, above the grate. What does not burn in suspension (above the grate) will burn on the grate, and the hot gases generated will pass through a waterwall section and then a boiler section. This system is similar to the mass-burn waterwall facility except in the nature of waste charging and burnout.

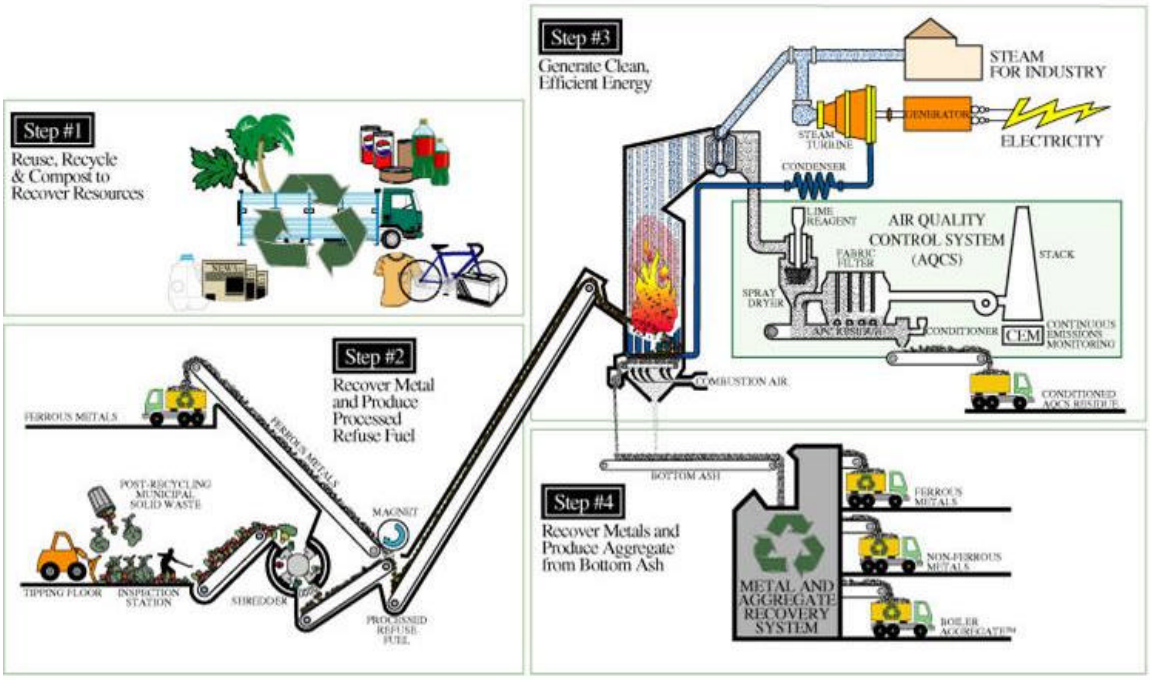


Figure 4 - Typical RDF Combustion Facility[7]

The unique feature of RDF systems is in the pre-processing of waste. As seen in the diagram of a typical RDF processing facility in Figure 5, MSW enters the facility and then passes through a trommel, where bags of waste are broken open and large material is removed. The small material dropping out of the first trommel passes through a second trammel to remove fine noncombustible material. The majority of waste goes through a shredder for size reduction. A magnetic separator removes ferrous metals and the balance of the material is fired in the furnace.

[7] Source: Energy Answers Corporation.

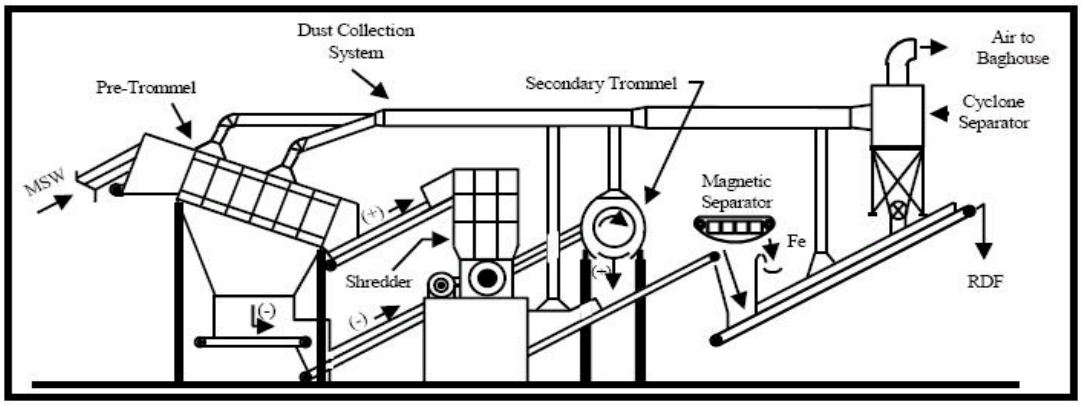


Figure 5 - Typical RDF Processing Schematic[8]

Other configurations may include additional separating equipment or exclude trommels, but the RDF generated is always shredded so that it is capable of being blown into a furnace. Although results vary with the processing configuration, in general, about 80% of the incoming waste stream is converted into RDF for the thermal process.

An advantage of this system is in the removal of metals and other materials from the waste stream. While not all these facilities include this step in the processing line, those that do can realize revenue from the sale of recovered metal. With the removal of non-combustibles, the specific heat content of the RDF can be increased by 10% over the original MSW.

3.1.4 Refuse-derived Fuel/Fluidized Bed

In this incineration process, MSW is shredded to less than four inches mean particle size (the same as with the RDF process described above) to produce the fuel (see Figure 6) before it is blown into a bed of sand in a vertical cylindrical furnace. Hot air is also injected into the bed from below, and the sand has the appearance of a bubbling fluid as the hot air agitates the sand particles. Moisture in the RDF is evaporated almost instantaneously upon entering the bed, and organics burn out both within the bed and in the freeboard, the volume above the bed. Steam tubes are embedded within the bed, and a transverse section of boiler tubes captures heat from the flue gas exiting the furnace, as shown in Figure 6.

[8] Source: generic.

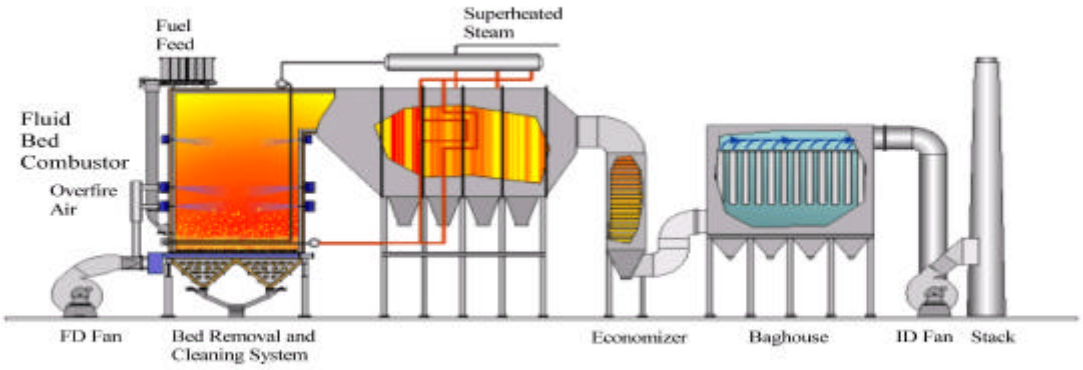


Figure 6 - Typical RDF Fluid Bed System[9]

Fluid bed incineration is more efficient than grate burning-based incineration systems. The bed is very effective in waste destruction and requires less air flow than mass-burn or modular systems. The fluid bed, however, does require relatively uniform-sized material, and RDF preparation is necessary for system operation, not for resource recovery, as discussed above.

3.2 "Emerging" Technologies

There are many technologies currently being proposed for the treatment and disposal of MSW throughout the world. Most of these involve thermal processing, but some others comprise the biological or chemical decomposition of the organic fraction of the waste to produce useful products like compost or energy products, notably synthetic gas (syngas) for downstream combustion.

Thermal processing refers to a number of different types of technologies utilizing heat as the mode of waste treatment. However, most of them, as listed and described below, are variations of conventional incineration.

Gasification: Heating of an organic waste to produce a burnable gas (approximately 85% hydrogen and carbon monoxide mix) for use off-site. As long as the off-gas produced from the system is usable and burned off-site, the system is a gasifier, not an incinerator. Typically, the energy in MSW is both used to fire the system and contained in the gas product.

Pyrolysis: A form of gasification where organic waste is heated without air. A gas is generated that is burned in the gaseous phase, requiring much less oxygen than conventional incineration. This process also generates a char, or frit, depending on the process temperature. (Frit is a glassy, granular material that is uniform in appearance.) The presence of a secondary combustion chamber for the burnout of the pyrolysis gas requires that this system be classified as an incinerator.

Plasma arc: Plasma arc refers to the means of introducing heat into the process. Essentially a plasma arc system is a pyrolysis or starved air process generating heat by firing the waste with a plasma torch using electric current to produce a syngas, which is

[9] Source: Energy Products of Idaho, Coeur D'Alene, ID.

then combusted to produce steam and/or electricity, and is classified as an incinerator. If the system generates an off-gas that contains burnable gases (e.g., hydrogen and carbon monoxide) that can be used off-site, it can be classified as a gasifier.

These technologies are described in more detail in the following subsections.

3.2.1 Gasification

Gasification is the heating of MSW to produce a burnable gas (approximately 85% hydrogen and carbon monoxide mix) for use off-site. While pyrolysis systems are primarily focused on waste destruction, a gasifier is designed primarily to produce a usable gas. Thermoselect, a European firm represented in the U.S. by Interstate Waste Technologies of Malvern, PA, has developed a system composed of 400 tpd modules processing MSW. This technology has been applied in commercial plants in Europe and Japan, and the basic process is shown in Figure 7.

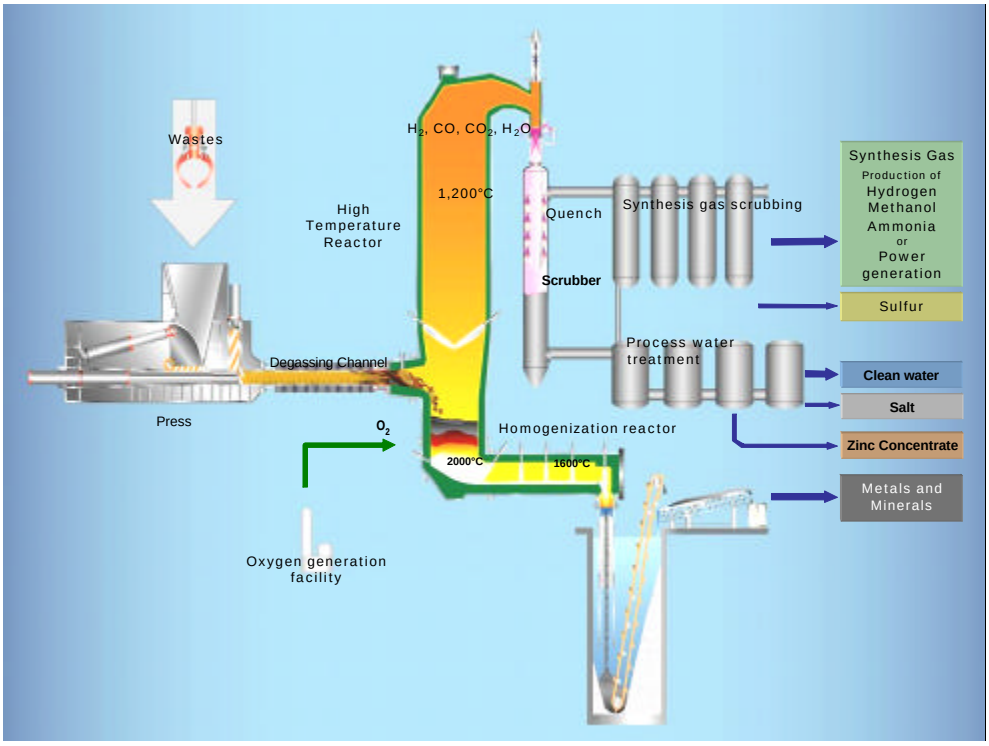


Figure 7- Typical Gasification System[10]

Waste is fed into a gasification chamber to begin the heating process, after being compressed to remove entrapped air. Some oxygen, sufficient only to maintain the heat necessary for the process to proceed, is injected into the reactor where temperatures in excess of 3,000°F are generated. At this high temperature, organic materials in the MSW will dissociate into hydrogen, methane, carbon dioxide, water vapor, etc., and non-organics will melt and form a glass-like slag. After the gas is cleaned, water is removed, and the gas can be used for power generation, heating, or other purposes. The glass-like slag potentially can be used as fill, or as a building material for roads, etc.

[10] Source: Interstate Waste Technologies, Inc., Malvern, PA.

A variation of the fluid bed incineration system previously described is the fluidized-bed gasifier, shown in Figure 8.

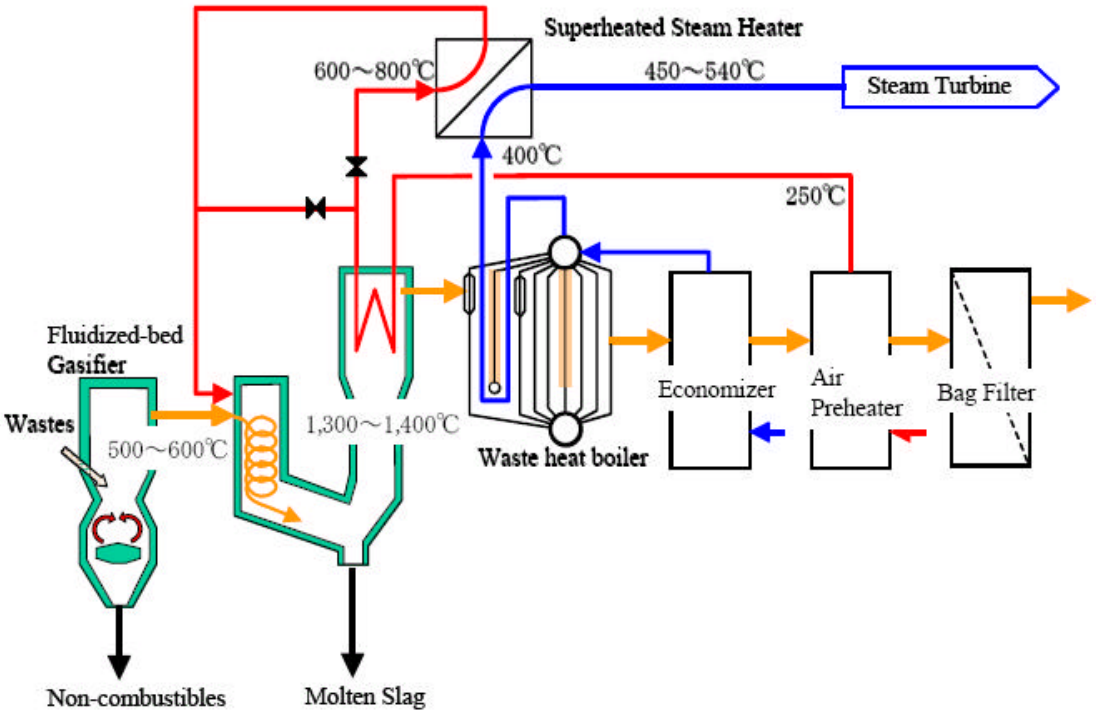


Figure 8 - RDF Fluidized Bed Gasification System[11]

Although this system is described as gasification technology, it does not export a burnable gas. RDF is first prepared using a process similar to the ones illustrated in Figure 4 and Figure 5. The RDF is then charged to the fluid bed and the gas generated is directed to a secondary combustion chamber, shown above, with molten slag dropping out to a water-cooled sump. The molten slag solidifies into a glass-like material which can be used as a construction material or fill. Heat from the gas fired in the combustion chamber is captured in hot water tubes to generate steam which can be used for electric power generation. Without the generation of a usable gas stream and with the necessity of a combustion chamber for gas burn-out, this system is an incinerator.

A gasifier marketed for MSW is built by EnTech of Devon, England, as shown in the schematic in Figure 9. This is a complex system which generates recyclable metals, plastics and other potential revenue streams, in addition to a salable syngas. EnTech reports nine small-scale facilities in operation. A 67 tpd facility operates on a mixture of MSW.

[11] Source: Ebara Corporation, Tokyo, Japan.

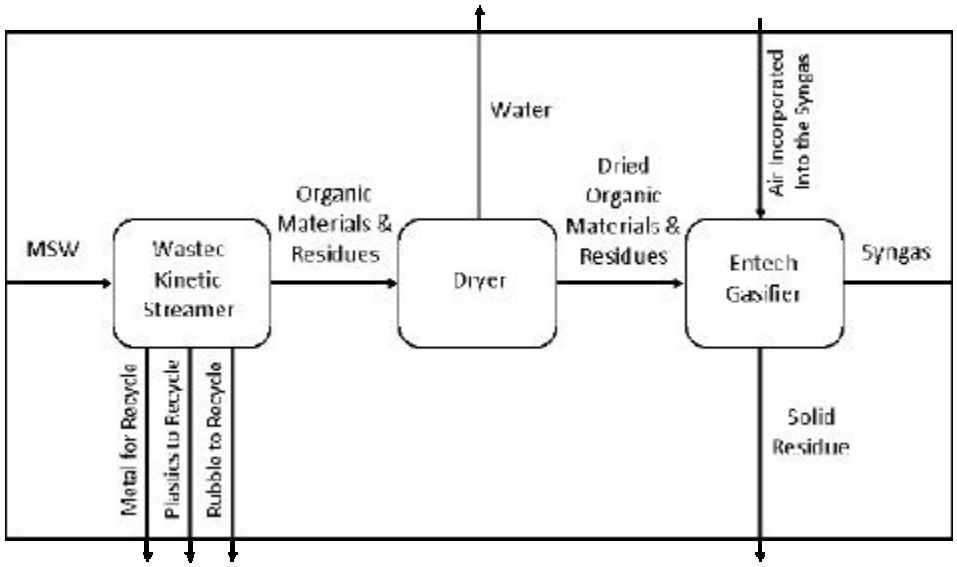


Figure 9 - EnTech Process Schematic[12]

As shown in Figure 9, MSW is classified by a combination bag breaker and gravity separator process, termed a "Kinetic Streamer." Oversize materials, which are basically inorganic, are directed either to a plastics recycler or a non-plastics recycling station, while the majority of waste (presumably organic) is directed to a dryer to remove entrained moisture. The dryer utilizes the latent heat inherent in the organic content of the waste to produce the heat necessary to drive the gasification process. The syngas can be fired in a waste heat boiler for steam and subsequent electric power production.

3.2.2 Pyrolysis

In pyrolysis, an organic waste (MSW) is heated without oxygen (or air), similar to the generation of coke from coal or charcoal from wood. Both a char and a gas are generated. The gas is burned out in a gaseous phase, requiring much less oxygen than incineration. The char will usually melt at the temperatures within the pyrolysis chamber and will be discharged along with a black gravel-like substance, termed frit. Advantages of this process are in the lack of air entering the chamber and the resulting smaller size of system components. Without air, there is little nitrogen oxide generation and low particulate (soot) formation. There have been many attempts to develop this technology outside a laboratory or a pilot plant. In full-scale demonstrations in the 1970s, it was difficult to maintain a sealed chamber to keep air out, and waste variability creates problems in maintaining consistent operation. When the pyrolysis gas is fired in a combustion chamber that is part of the system, the system is classified as an incinerator.

As shown in Figure 10, MSW is shredded into a uniform size capable of feeding into the thermal converter, or pyrolysis chamber. The pyrolysis gas generated is fired in a secondary combustion chamber, or thermal oxidizer, and passes through a waste heat boiler for heat recovery. Char drops out the bottom of the pyrolysis chamber for disposal or further processing for recovery of metals and other constituents. Although this system is marketed as a pyrolysis system, a combustion chamber is necessary for its operation (for

[12] Source: Entech.

destroying organics in the off-gas) and the presence of this chamber classifies the system as an incinerator.

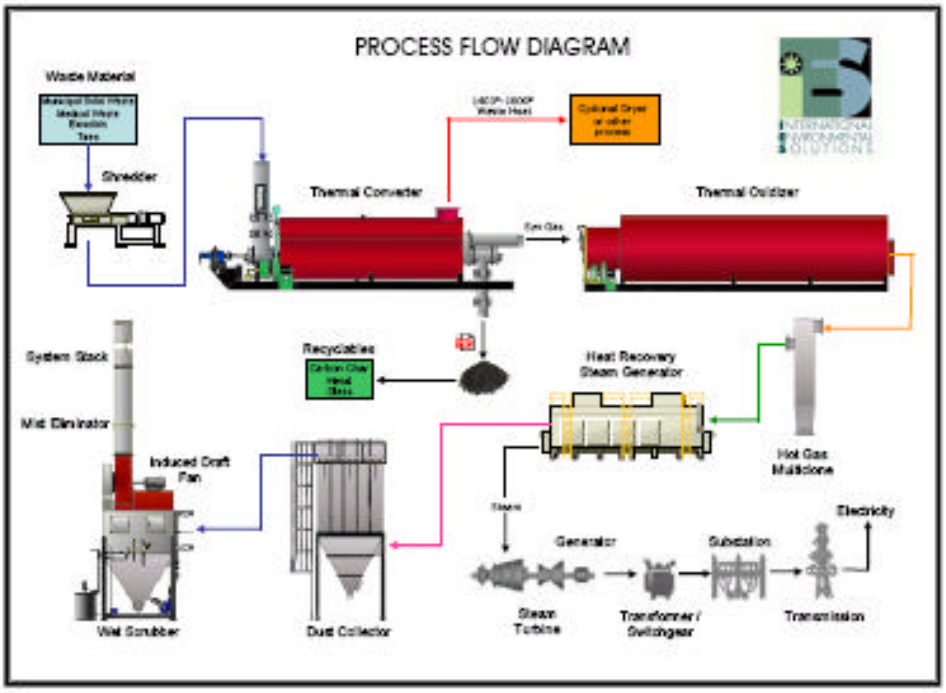


Figure 10 - Process Diagram of a Pyrolysis System[13]

3.2.3 Plasma Arc

Plasma arc technology is a gasification system that uses the intense heat generated by a plasma torch to drive the process. Net energy generation is not established based on Japanese and European experience. It is a pyrolysis-related process where little or no oxygen is injected into a reactor. A typical unit is shown in Figure 11.

Electric current is passed through a series of torches at the bottom of a reactor, which heat a process gas (not shown) to a temperature in excess of 5,000°F. This hot gas stream heats waste within the reactor to over 3,500°F and, as air is provided to the system at a low controlled rate, some of the waste will burn to help maintain reactor temperature. At this high temperature, organics within the waste will form elemental compounds, such as hydrogen, oxygen and carbon, with some of this carbon converting to carbon monoxide or methane. The gas flow will have a high enough heat content to be able to sustain its own combustion and be used as a fuel gas external to the system.

The inorganic portion of the waste will form a liquid slag which eventually drops from the reactor into a water bath. As soon as it hits the water, it will shatter into a glassy-looking residue or frit that may be suitable for fill or use as a construction material.

[13] Source: Integrated Energy Systems, Inc., Romoland, CA.

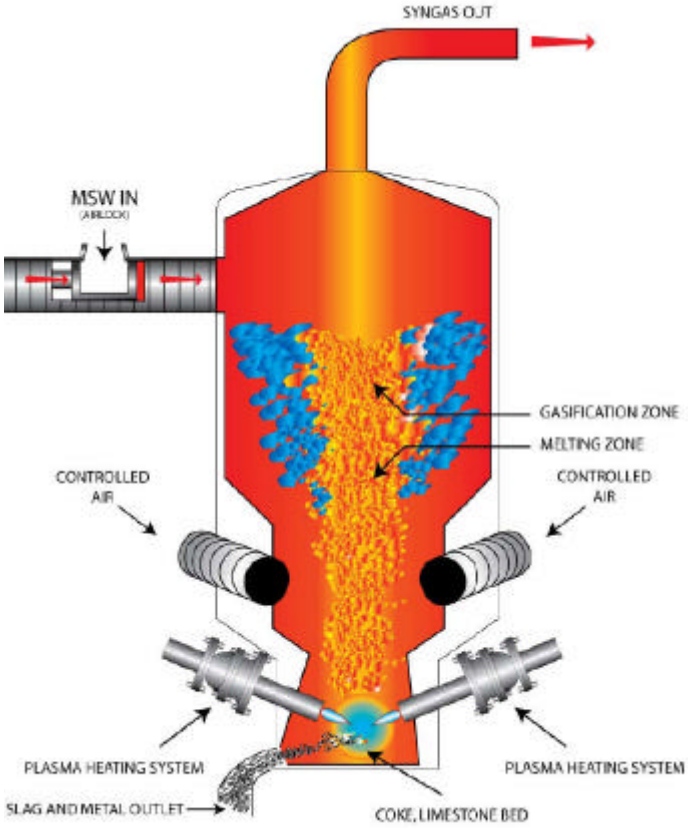


Figure 11 - Cross-Section of a Plasma Arc Furnace[14]

3.2.4 Biological Fuel Production

Producing a "fuel" product from organic materials in waste by biological processes is termed biological fuel production. Typically, this fuel product takes the form of combustible gas or liquid produced when organic material in waste breaks down. Decomposition of the organic portion of waste by microorganisms in the absence of oxygen, known as "anaerobic digesting," creates methane (CH_4) and other gases in combination with about half the energy of natural gas. This biogas can be used as a fuel and burned for energy or power production directly. It can also be refined to produce a pipeline-quality gas that is almost pure methane and further processed into a liquid fuel like methanol.

3.2.5 Cellulosic Ethanol

Ethyl alcohol, ethanol, is a biofuel that is usually produced from fermented corn sugar or starch but can be produced from wood, grasses, or other cellulose containing material, including the organic portion of solid waste. This is referred to as cellulosic ethanol. It is chemically identical to ethanol from other sources, such as corn starch or sugar, but has the advantage that the feedstock is lignocellulose raw material that is highly abundant and

[14] Geoplasma, Atlanta, GA.

diverse. (The word "cellulosic" simply refers to the source material.) However, it differs in that it requires a greater amount of processing to make the sugar monomers available to the microorganisms that are typically used to produce ethanol by fermentation.

According to U.S. Department of Energy studies conducted by the Argonne Laboratories of the University of Chicago, one of the benefits of cellulosic ethanol is that it reduces GHG by 85% over reformulated gasoline. By contrast, ethanol from corn, which most frequently uses natural gas to provide energy for the process, may not reduce GHG emissions at all depending on how the starch-based feedstock is produced.

There are five steps to produce ethanol using a biological approach:

- A "pretreatment" phase to make the lignocellulosic material, such as wood, straw or solid waste, amenable to hydrolysis, and to remove as many contaminants as possible.
- Cellulose hydrolysis (cellulolysis) to break down the molecules into sugars.
- Separation of the sugar solution from the residual materials, notably lignin.
- Microbial fermentation of the sugar solution.
- Distillation to produce 99.5% pure alcohol.

The process is shown graphically in Figure 12; however, steps 2, 3 and 4 are shown in one stage or process. Abengoa Bioenergy, a company that has developed several ethanol production facilities using agricultural residues such as wheat straw as the feedstock, accomplishes these steps in a single reactor.

- **Pretreatment**

The first stage is physical processing of the feedstock: size reduction and removal of contaminants. This is similar to the production of RDF. This is especially important with solid waste where the fermentable portion may only be 60% to 70% of the feed. Once the MSW is physically prepared cellulose, its susceptibility to fermentation is still curtailed by its rigid structure. As a result, an effective additional treatment is needed to liberate the cellulose from the lignin seal and its crystalline structure so as to render it accessible for a subsequent hydrolysis step. A number of pretreatment approaches have been developed to liberate the cellulose and increase its reactability. To date, the available pretreatment techniques include acid hydrolysis, steam explosion, ammonia fiber expansion, alkaline wet oxidation and ozone pretreatment. Besides effective cellulose liberation, an ideal pretreatment has to minimize the formation of degradation products because of their inhibitory effects on subsequent hydrolysis and fermentation processes.

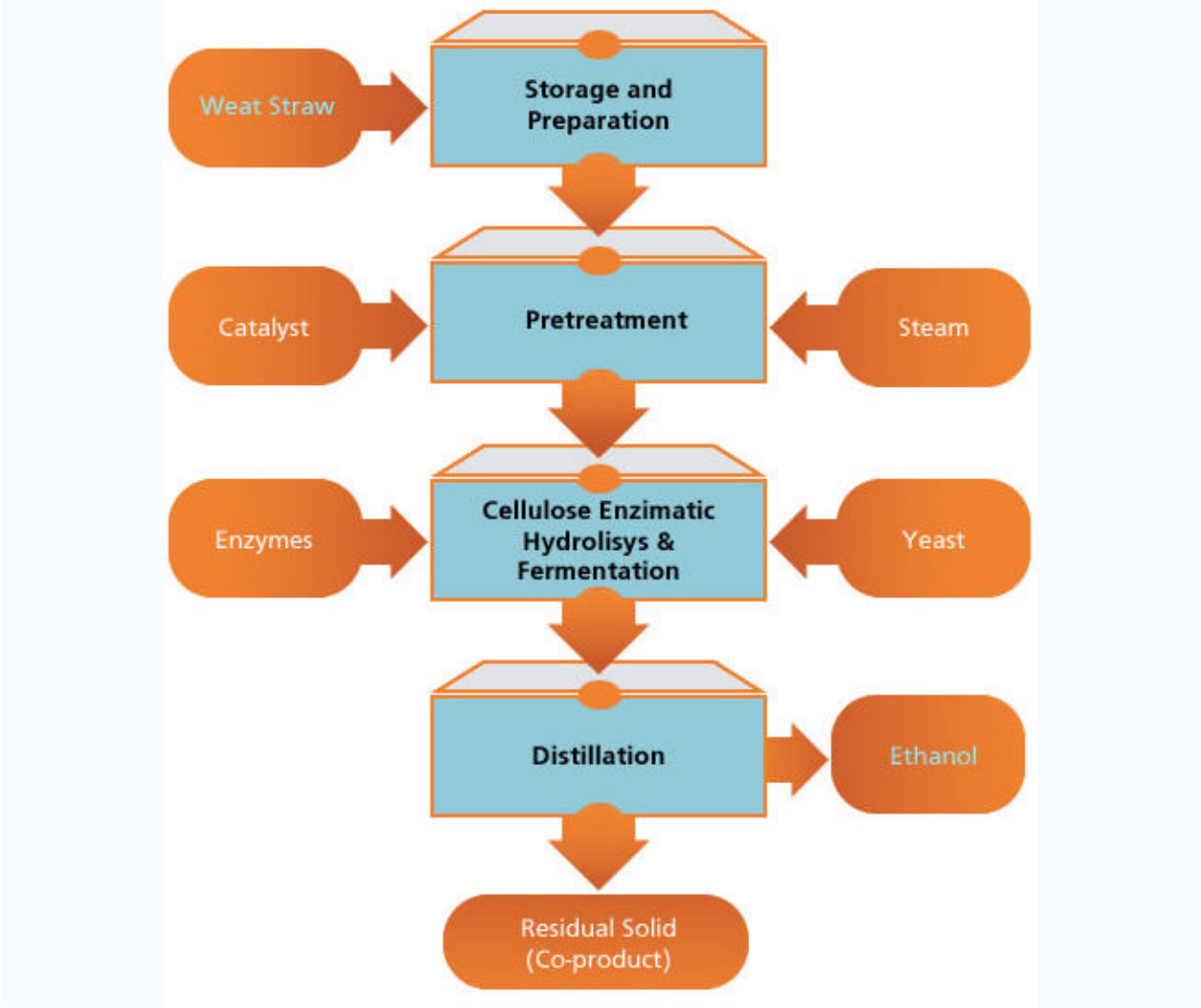


Figure 12 - Process Flow of the BCyL Biomass Ethanol Plant[15]

- **Hydrolysis**

The cellulose molecules are composed of long chains of sugar molecules. In order to break the cellulose down into sugars, the hydrolysis process is employed. There are two major cellulose hydrolysis processes:

- Acid hydrolysis - dilute acid may be used under high heat and high pressure, or more concentrated acid can be used at lower temperatures and pressure. A decrystalized cellulosic mixture of acid and sugars reacts in the presence of water to complete individual sugar molecules (hydrolysis).
- Enzymatic hydrolysis - uses several enzymes at various stages of this conversion and has the advantage that lignocellulosic materials can be hydrolyzed with

[15] Source: Abengoa Bioenergy

relatively mild processing conditions, which avoids the formation of byproducts that would otherwise inhibit enzyme activity.

These have been utilized singly or in combination to break the cellulose chains into free sugar, which is fermented for alcohol production.

- **Sugar Separation**

Approximately half of the energy value in the cellulosic feedstock is captured in the sugars produced in hydrolysis. Fermentation will be more efficient if this is separated from other compounds, especially lignin. This can be accomplished with membranes. The lignin also contains about half of the energy and can be used as an energy source for the process.

- **Fermentation**

Once the cellulose has been broken into sugars, microorganisms are used to ferment the sugar and produce ethanol. Traditionally, baker's yeast has long been used in the brewing industry to produce ethanol from hexoses (6-carbon sugar). When lignocellulosic biomass is hydrolyzed to produce sugars, several sugars are produced including xylose and arabinose (5-carbon sugars). As a result, specially engineered microorganisms, mainly yeasts, have been developed and utilized in fuel ethanol production from cellulose.

- **Distillation**

The liquid resulting from fermentation is separated from any solids and heated to volatize the ethyl alcohol which is then condensed. The process is repeated to increase the ethanol concentration. An adsorption technique may be used to remove the remaining water to produce anhydrous ethanol.

Because of the concern about using food crops to produce fuels and the potential cost savings, a large number of companies have developed cellulosic ethanol technologies, including:

- Abengoa Bioenergy
- Alico
- BlueFire Ethanol
- China Resources Alcohol Corporation (CRAC)
- Dyadic International, Inc.
- GreenField Ethanol
- Gulf Coast Energy
- Iogen Corporation
- Mascoma
- POET Biorefinery
- Range Fuels
- SunOpta Inc.
- Verenium Corporation
- Xethanol

3.2.6 Biogas

Roger Haug defines composting as "the biological decomposition and stabilization of organic substrates, under conditions that allow development of thermophilic temperatures as a result of biologically produced heat, to produce a final product that is stable, free of pathogens and plant seeds, and can be beneficially applied to land." [16] Composting of MSW or a portion of MSW such as yard waste is usually carried out in the presence of air (aerobically) to produce a soil amendment and to reduce the amount of MSW being deposited in landfills. When composting is done in the absence of air (anaerobically), the biogas produced contains a significant amount of methane, about 50%. To capture this biogas the process must be in a closed vessel.

When anaerobic digestion is applied to the organic fraction of MSW, the primary purpose of the facility shifts from landfill diversion to biogas production. There are many anaerobic digestion plants both in use today and historically that have been installed to produce and utilize biogas as well as manage a waste. However, most of these facilities utilize sewage sludge, animal manures and other homogeneous wastes as feedstock. Very few utilize MSW as a feedstock.

It has long been common practice in Europe to use anaerobic digestion at waste water treatment facilities to treat sewage sludge. It has been less common over the same period to use anaerobic digestion to treat industrial effluents and agricultural sludges, although there are a number of examples dating back to the 1950s. In the last 10 years or so in Europe, because of the introduction of a requirement that the separated organic fraction of MSW be treated before landfill disposal, anaerobic digestion has been adopted for this purpose. Anaerobic digestion has long been popular in India where a large number of small and simple facilities are in use processing farm wastes. Currently, a number of vendors are offering farm-based systems in both Europe and the United States.

The process of producing biogas from MSW by anaerobic digestion has similar steps to the production of liquid biofuel discussed above. The process includes:

- A "pretreatment" phase to make the organic material more available for digestion by size reduction and to remove recyclable materials and contaminates.
- Digestion of the organic material in a closed vessel by microorganisms.
- Treatment of the biogas to remove water, compress the gas, and other processes depending on the end use.
- Curing of the solid residue from the digestion to produce a compost product which may be marketable.

The longest established anaerobic treatment processes include:

- Anaerobic suspended growth
- Upflow and down-flow anaerobic attached growth
- Fluidized-bed attached growth
- Upflow anaerobic sludge blanket (uasb)
- Covered anaerobic lagoons
- Membrane separation anaerobic processes
- Dry process anaerobic digestion of MSW

[16] Roger T. Haug, The Practical Handbook of Compost Engineering, Lewis Publishers, 1993.

The above emerge in process designs, when developed and offered by the technology providers, which are either optimized to:

- Efficiently remove material (mostly organic) from liquid streams to permit discharge of a treated effluent to a specified water quality standard, and biogas production may be just incidental.
- To provide treatment of a waste material, including MSW, to make it suitable for diversion away from landfill, with biogas generation optimized for revenue creation, and potential sales of fibrous and liquid fertilizer by-products.

3.2.7 Anaerobic Digestion

As applied to the processing of MSW, anaerobic digestion is a wet treatment process where waste is first pre-sorted and then fed into water tanks. Using agitators, pumps, conveyors and other materials handling equipment, MSW is wetted and dissolved. Metals, glass and other constituents of MSW that have no affinity for water are eventually discharged from the system into dedicated containers for recycling, further processing or final disposal. The paper, garbage, soluble components, etc., generate "black water" which has a relatively high organic content. This stream is taken to a series of digesters where the time it sits in the chamber, the residence time, will be sufficient to generate an off-gas. The process is shown in the schematic in Figure 13.

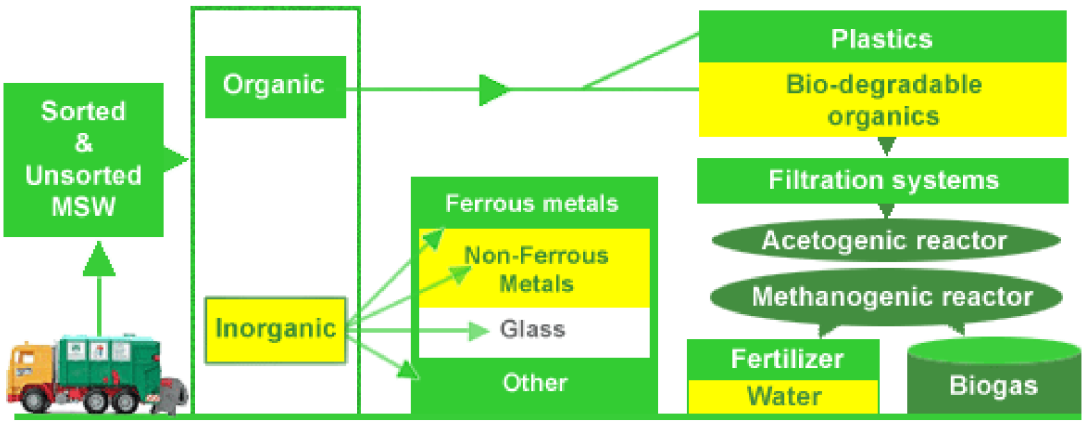


Figure 13 - Process Flow for Anaerobic Digestion System[17]

This gas is rich in methane and other organics and can be burned as a fuel for heating or for electric power generation. The solid residual from the digestion process is similar to compost and can be used as a soil amendment. The process also separates out recyclable materials such as glass and metals. There are many such facilities processing sewage sludge, manure and other homogeneous wastes.

ArrowBio of Haifa, Israel, is an example of a vendor that is offering to construct anaerobic digestion facilities to process MSW in the United States. They have responded to procurements in Los Angeles and New York. They operate a 300 tpd full-scale MSW demonstration process line in Tel Aviv, illustrated in Figure 14.[17]

[17] Source: ArrowBio, Haifa, Israel.

The system operates without high temperatures or pressure. In theory, it is extremely simple, relying on non-specialized mechanical equipment (pumps, screens, macerators, tanks, conveyors, etc.) for operation. Digestion occurs through the presence of natural microorganisms in MSW, so charging with specialty or unique bacteria is not necessary. It has a high resistance to upsets because of the scale of its operation, i.e., 300 tons of MSW entering the system per day, and any poisons that might threaten the digestion process (as has been experienced with sewage treatment plant digesters) are likely to be of such small fraction that it will have no significant effect on digester cultures.

The system is equipment and labor intensive. Although redundancy is normally built into the system, with multiple process lines and duplication of critical pumps, conveyors, etc., additional equipment adds to the number of separate processes and associated equipment necessary for operation. The Tel Aviv installation of Arrowbio has thus far experienced many shut-downs due to the presence of troublesome components in the input waste stream. To combat this, a higher level of pre-processing is being implemented so that future applications can operate more reliably.

Figure 14 - ArrowBio Facility in Israel

4. Worldwide Experience of Waste Processing Technologies and Vendors

This section presents an overview of the past and current experience of WPT in the U.S. and elsewhere.

4.1 Mass-Burn/Waterwall Combustion

No new mass-burn WTEF have been built in the United States for the past ten years, although there have been acquisitions and ownership and operator changes at certain existing facilities, as well as some facility expansions. As a result, the firms associated with mass-burn WTE are operators, owners, or owner/operators of existing facilities. As shown in the Table 4, Covanta and Wheelabrator own and operate the majority of privately-owned WTEF. Most of the WTEF, both public and private, are operated by Covanta, Montenay/Veolia or Wheelabrator. Table 4 also shows the range in tons processed per day between facility owners and operators, with publicly operated facilities processing smaller amounts of waste than those operated privately.

Table 4 - U.S. Mass-Burn / Waterwall Facilities[18]

Entity	Owned	Tons processed per day	Operated	Tons processed per day
Public	39	200 – 3,000	12	200 - 500
Covanta	11	400 – 3,000	27	400 – 3,000
Montenay/Veolia	2	500 – 1,200	9	500 – 3,000
Wheelabrator	10	200 – 2,250	16	200 – 2,250
Other	3	550 – 2,250	1	200 – 1,380
Total	**65**		**65**	

Some of the mass-burn technology had been purchased from American firms such as Detroit Stoker, Combustion Engineering and Babcock & Wilcox, but the majority of these existing systems are of European design. The two leading suppliers of WTE grate systems in the United States and overseas are The Martin Company of Germany and Von Roll of Switzerland.

While new WTE facility procurements have declined in the United States, the market for this equipment has increased in Europe and in Eastern Asia, with European and Japanese systems suppliers actively marketing their systems and consistently improving their performance. This technology is well tested and is used more than any other for large WTEF in the United States and overseas.

4.2 Mass-Burn/Modular Combustion

Modular systems are used for smaller WTEF (between 80 – 420 tpd) and for industrial applications. Unlike mass burn/waterwall systems, there are a number of American firms supplying such systems in the United States, and they are competitive in overseas markets as well. The more active of these suppliers are Consutech Systems of Richmond, Virginia, Enercon Systems, Inc. of Elyria, Ohio, and Basic Environmental Engineering of Chicago. They have each been supplying incineration systems for MSW and other wastes for over 25 years.

Other U.S. firms, such as Energy Answers of Albany, NY, and Covanta Energy of Fairfield, NJ, are marketing project development and management services for WTE modular facilities.

[18] Integrated Waste Services Association, 2004 Directory of WTEF.

4.3 Refuse-derived Fuel/Dedicated Boiler

As with mass-burn systems, there have not been any new Refuse-derived Fuel (RDF) systems constructed in the United States in the past decade. For most of the 12 RDF WTEF currently in operation, Excel, Veolia and Covanta Energy are the operating contractors. The front-end processing utilizes a variety of unit processes depending upon the boiler requirements and the design philosophy. The unit process equipment, shredders, magnetic separators, screens, conveyors, etc., are all standard items available from a variety of manufacturers.

Equipment used in this technology is adapted from equipment provided in coal-fired electricity generation facilities, and there are many established system and equipment suppliers marketing in the U.S., such as Foster Wheeler, Riley, Babcock and Wilcox, Detroit Stoker, ABB and Wärtsilä.

4.4 RDF/Fluidized Bed

While there are several RDF/fluid bed systems operating in Europe (particularly in Scandinavia, where a number of fluid bed incinerator manufacturers are located), there is only one such facility in operation with RDF from MSW in the United States, located in French Island, WI. It is owned and operated by Excel Energy of Minneapolis. The equipment was supplied by Energy Products of Idaho in Coeur d'Alene, the only U.S. firm currently manufacturing these furnaces for RDF firing.

4.5 Gasification

Japan currently has seven facilities operating with gasification technology. At least two of these facilities fire MSW, with the largest firing up to 700 tpd of MSW. In Europe and Asia, approximately 20 syngas gasification facilities are operating on MSW. Most of these facilities are relatively small, processing less than 10 tpd, with none designed to process more than 70 tpd.

4.6 Pyrolysis

With pyrolysis, MSW is heated in an oxygen-starved environment to produce a fuel gas that is then incinerated to generate steam and/or electricity. In the 1970s, a number of pyrolysis facilities were constructed using MSW as a feedstock. Several were built with partial funding provided by U.S. EPA. The largest of these was the Monsanto facility in Baltimore, MD, which had a capacity of 1,000 tpd. This facility did not meet its environmental requirements due to operational scale-up problems and was torn down. Other smaller, 100 to 200 tpd, MSW pyrolysis facilities were built at that time by Union Carbide, Andco Torrax, and Occidental Petroleum. These facilities were recipients of U.S. EPA grant funds and were closed for operational and financial reasons. Currently, there are no full-scale pyrolysis systems in commercial operation on MSW in the United States. A pilot demonstration system has been operating in southern California for two years. It was built and is operated by International Environmental Solutions, of Romoland, CA.

4.7 Plasma Arc

The plasma arc furnace is a commercial unit process made and marketed by Westinghouse. It has been successfully applied to a variety of industrial applications; however, there are no commercial-scale plasma arc systems firing MSW in the United States at this time. There are pilot facilities used for ash vitrification in Japan and a smaller Japanese facility firing MSW, but attempts to apply this process in the United States have not yet been successful. However, several vendors are advancing projects as described earlier. The electric power requirements for the torch are significant, and maintenance of torches and reactor refractory materials is also a significant expense item.

Few, if any, of the plasma arc pilot facilities have been able to generate a fuel gas (syngas), and air emissions have been found to be no better than conventional incineration systems. The Atlanta firm Geoplasma has a development contract and is negotiating a contract for implementation of a large plasma arc facility for MSW in St. Lucie County, Florida, which will also be used for processing mined landfill waste. Also, the City of Tallahassee, Florida approved the contract for Green Power Systems to begin development of a 1,000 tpd plasma gasification facility, which is scheduled to begin operations in 2010.

4.8 Biological Fuel Production

4.8.1 Cellulosic Ethanol

There are a number of commercial facilities in the U.S. (See Table 5) and worldwide producing cellulosic ethanol, a biofuel produced from lignocellulose, a structural material that comprises much of the mass of plants. These facilities utilize a variety of biomass feedstocks. Biomass is any living or recently dead biological material that can be used as fuel or for industrial production. Biomass feedstocks include crops grown specifically for use as a feedstock, such as corn or hemp, agricultural residues, and other organic residues and wastes, including the organic portion of MSW. Currently, no U.S. facilities are feeding MSW at a commercial scale, but a number of vendors are planning to use MSW as a feedstock, and various projects and procurements for ethanol production from MSW involving various companies have been reported.

Abengoa Bioenergy owns and operates five cellulosic ethanol facilities throughout the United States and Europe. It is currently the fifth largest producer of cellulosic ethanol in the United States with a total of four facilities located in Kansas, New Mexico, and Nebraska. The most recent began operations in mid 2007.

The world's first commercial scale demonstration biomass facility is being constructed by Abengoa Bioenergy to exhibit its biomass-to-ethanol process technology. Located in Babilafuente (Salamanca), Spain, the biomass facility will process 77 tons of agricultural residues, such as wheat straw, each day and produce over 1.3 million gallons of fuel grade ethanol per year. Bioethanol is most currently used in Brazil, where longstanding policies promote and encourage the use of bioethanol as fuel for transportation.

CleanTech Biofuels reportedly has a cellulosic ethanol pilot facility operating on MSW in Golden, Colorado.

Table 5 - Commercial Cellulosic Ethanol Facilities in the U.S. (Operational or Under Construction)[19]

Company	Location	Feedstock	Capacity (million gallons per year)
Abengoa Bioenergy	Hugoton, KS	Wheat straw	12
Alico	La Belle, FL	Multiple sources	N/A
BlueFire Ethanol	Irvine, CA	Multiple sources	17
Gulf Coast Energy	Mossy Head, FL	Wood waste	70
Mascoma	Lansing, MI	Wood	40
POET Biorefinery	Emmetsburg, IA	Corn cobs	25
Range Fuels	Treutlen County, GA	Wood waste	20
SunOpta	Little Falls, MN	Wood chips	10
Xethanol	Auburndale, FL	Citrus peels	8

None of the facilities shown in Table 5 uses MSW as feedstock. As of January 2008, U.S. Department of Energy (DOE) had made seven grants to help develop small-scale cellulosic ethanol facilities. These facilities will produce between 1.3 and 5.5 million gallons of ethanol per year. The feedstocks projected for these facilities include wood chips, switch grass, corn cobs, and agricultural and forest residues. None of the facilities are projected to use MSW. The aggregate total projected capital cost of these facilities is $634 million, with DOE contributing $199 million in the form of the grants.

4.8.2 Biogas - Anaerobic Digestion

Biogas or synthesis gas, a mixture of carbon monoxide and hydrogen, can be converted into liquid hydrocarbons of various forms. A number of technologies produce gas, primarily methane, which can be converted to liquid fuels utilizing Fischer-Tropsch Synthesis, a process developed in Germany in the early 20th Century. This process is a catalyzed chemical reaction which takes place at low temperatures (300° to 600°F) and at high pressure. The most common catalysts are based on iron and cobalt, although nickel and ruthenium have also been used. The process produces a synthetic petroleum substitute for use as synthetic fuel, biodiesel. The Fischer-Tropsch process has been used to convert gases from a variety of feedstocks to liquid fuel, including coal and biomass.

When biomass is used, the cellulosic materials must first be converted to biogas and then to liquid fuel using the Fischer-Tropsch process. The Fischer-Tropsch process is an established technology that has been applied on a large scale in some industrial sectors. Large-scale commercialization is impeded by high capital costs, high operation and maintenance costs, the uncertain and volatile price of crude oil, and environmental concerns.

As mentioned earlier, biogas production from wastes is a mature technology with both large and small-scale units in production worldwide. In India alone, there are over 2 million farm units that produce biogas from animal manures and other wastes. As of 2006, there were thousands of small plants in Europe; Germany alone had 3,500 that produced a total of 1,100 MW. The newest of these plants range between 400 and 800 KW, using crops and manure for feedstock. In southern Europe, the production of biogas is primarily from

[19] Source: Grainnet.com *Building Cellulose*

landfills. In 2007, a report on the potential of biogas in Europe by the Öko-Instituts and the Institut für Energetik in Leipzig concluded that Germany alone can produce more biogas by 2020 than all of the European Union's (EU) current natural gas imports from Russia.

5. Recent Research/Procurements for Waste Processing Technologies by Others

The most recently constructed MSW processing WTE facility in the U.S. commenced operations in 1996.[20] Since that time, no commercial plant has been implemented. Several reasons account for this lull of activity in the WTE field:

- Loss of Tax Credits – The 1986 Tax Reform Act eliminated the significant tax benefits for project owners/developers, contributing to the pipeline of projects.
- Environmental Activism – Misinformation about air pollution and ash impacts, and preferences for recycling, created public resistance.
- U.S. Supreme Court's Carbone Decision[21] (1994) – Effectively ended legislated flow control, creating uncertainty in the revenue stream for projects.
- Megafills – Large landfills with low tipping fees and no put-or-pay waste supply requirement out-competed WTE for the market.
- Amendment to the Clean Air Act (1998) – New regulations required retrofit on existing facilities and drove up WTE costs, effective as of December 2000.
- Lack of Federal Leadership (1990 – 2005) – Visible opposition by U.S. EPA to combustion and preference for waste reduction/recycling sent negative message about WTE.
- Moderate Fossil Fuel Costs – The rapidly increasing fossil fuel costs of the 1970s and '80s stabilized, reducing the projected value of the energy products from WTEFs, which were key drivers in facilities developed earlier, and making overall project economics less attractive.

In the past few years, however, interest in WTE and waste conversion has begun to grow again. This renewed interest in waste processing technologies is due to several factors:

- Proven WTE Track Record – superior environmental performance, reliability, advancements in technology and successful ash handling strategies have made WTE an acceptable option to consider as part of waste management planning.
- Increasing Fossil Fuel Costs – With the price of oil now over $100 per barrel, the cost of transportation fuels is making MSW hauling and landfilling more expensive. In addition, the cost of electricity from fossil fuels is increasing, making electricity from waste more valuable and making WTE more competitive.
- Growing Interest in Renewable Energy – Many states are requiring utilities to generate a portion of their electricity from renewable sources, which sometimes includes WTE; the Federal government has included WTE in its definition of renewable energy.

[20] Covanta's 2,250 tpd facility in Niagara Falls, NY.
[21] C & A Carbone, Inc. v. Town of Clarkstown, 511 U.S. 383 (1994).

- Change in Approach by U.S. EPA – In 2006, the U.S. EPA revised its waste management hierarchy to include WTE explicitly as the third priority after waste reduction and recycling/composting.
- Concern About Greenhouse Gases – WTE has a smaller carbon footprint than landfilling or fossil-fuel generated electricity[22].
- Reversal of Carbone – The 2007 Supreme Court decision in the Oneida-Herkimer case[23] effectively restored to local governments the ability to implement flow control (through legislation/ordinance, increasing the security of the waste stream to support the financing of WTE projects.
- Long distance transfer and disposal getting more expensive.

These and other local considerations have led a growing number of communities to re-investigate WPT as a component of their solid waste management systems. The following subsection describes some of the recent initiatives to evaluate and choose WPT – WTE and others – to handle significant waste streams in the future. Included is a summary of the technologies and vendors selected through these evaluation processes that represent the most promising alternatives as a waste disposal option.

5.1 Recent Research

5.1.1 New York City, NY[24]

In 2004, the City of New York commissioned a report to evaluate new and emerging waste management and recycling technologies and approaches. The objective of the evaluation was to provide information to assist the City in its ongoing planning efforts for its waste management system. The report identified which innovative technologies were available at present, i.e., commercially operational processing of MSW, and which were promising but in an earlier stage of development. It also compared the newer technologies to conventional WTE technology to identify the potential advantages and disadvantages that may exist in the pursuit of innovative technologies. Conventional WTE was chosen as a point of comparison since such technology was the most widely used technology available at the time for reducing the quantity of landfilled post-recycled waste.

The report was released in September 2004. The report indicated that 44 companies responded to the initial request for information. The City has commenced a siting Task Force to look at the five boroughs to identify a site on which to build a pilot facility. Once the site has been identified, an RFP will be issued based on the specifications and condition of the site and will be made available to all proven and unproven technology vendors.

As part of the process, the City collected information on capital cost from the suppliers. Based on six responses, the capital cost per installed ton for anaerobic digestion ranged from $74,000 (586 tpd) to $82,000 (500 tpd); for gasification, the range was $155,000

[22] Thorneloe, Susan A., Weitz, Keith A., Nishtala, Subba R., Yarkosky, Sherry, and Zanes, Maria. "The Impact of Municipal Solid Waste Management on Greenhouse Gas Emissions in the United States." Journal of the Air & Waste Management Association 52 (September 2002): 1000-1011.

[23] United Haulers Assn., Inc. v. Oneida-Herkimer Solid Waste Management Authority, No. 05-1345, 2007 WL 1237912 (U.S. April 30, 2007).

[24] Evaluation of New and Emerging Solid Waste Management Technologies, September 16, 2004.

(2,612 tpd) to $258,000 (2,959 tpd); one plasma arc gasification response gave a capital cost of $321,000 (2,729 tpd). These figures were for facilities of widely varying sizes and were not standardized.

5.1.2 City of Los Angeles, CA

Phase I[25]

In 2004, the City of Los Angeles, Bureau of Sanitation (Bureau) began a study to evaluate MSW alternative treatment technologies capable of processing Black Bin material (curbside-collected residential MSW) to significantly reduce the amount of such material going to landfills. The Bureau's overall objective was to select one or more suppliers to develop a facility using proven and commercialized technology to process the Black Bin material and produce usable by-products such as electricity, green fuel, and/or chemicals.

The first step of this project was to develop a comprehensive list of potential technologies and suppliers. About 225 suppliers were screened, and 26 suppliers were selected to submit their detailed qualifications to the City. In order to screen the technology suppliers, they were sent a brief survey based upon the technology screening criteria. The criteria applied were as follows:

- Waste Treatability: The supplier was screened on whether they have MSW or similar feedstock processing experience.
- Conversion Performance: The supplier was asked if their facility would produce marketable byproducts.
- Throughput Requirement: This criterion was already met because the technology passed the technology screen.
- Commercial Status: This criterion was already met because the technology passed the technology screen.
- Technology Capability: The supplier was asked if their technology had processed at least 25 tpd of feedstock.

Of the 26 suppliers requested to submit qualifications, 17 provided responses. These suppliers and their technologies were thoroughly evaluated, and an Evaluation Report was published in September 2005 with the findings and ranking of the technologies that had met the criteria.

In 2006, several suppliers were added to the short list, based on additional screening and a supplemental RFQ process.

As part of the process, the City collected information on capital cost from the suppliers. Based on responses, the capital cost per installed ton for anaerobic digestion ranged from $99,000 to $201,000; for gasification, the range was $50,000 to $266,000; for pyrolysis,

[25] Request for Proposals for a Development Partner(s) for Processing Municipal Solid Waste Utilizing Alternative Technologies premised on Resource Recovery for the City of Los Angeles, February 5, 2007.

the range was $60,000 to $221,000; one mixed waste composting proposer gave a capital cost of $114,000. These figures were for facilities of widely varying sizes and were not standardized.

Phase II[26]

On February 7, 2007, the City of Los Angeles released an RFP soliciting competitive proposals for a development partner(s) for processing MSW utilizing alternative technologies premised on resource recovery. The responsibilities of the development partners were to finance, design, build, own, and operate (with the option to transfer to the City after 20 years) the resource recovery facility, at a throughput rate of 200-1,000 tpd. The facility was expected to provide diversion from landfill of no less than 80% of the City's Black Bin (waste) material delivered to the facility. In addition, the City considered proposals from emerging/experimental technologies that could process less than 200 tpd as a potential second facility for testing emerging technologies. The emerging/experimental technology suppliers were to meet requirements outlined by the City in the RFP in order to be considered for the potential testing facility. Proposers of emerging/experimental technologies that did not meet those requirements were not evaluated further. A total of 12 technology suppliers submitted proposals in August 2007. The City of Los Angeles' Bureau of Sanitation has reviewed the proposals and received presentations by the proposers. The Bureau has conducted site analyses and visits to all facilities and is putting together a recommendation by December 2008 of the finalists to be further evaluated.

Phase III

Phase III started 2008. It will include developing contracts for selection and increasing the focus on public outreach.

5.1.3 Los Angeles County, CA

Phase I – Initial Technology Evaluation[27]

Beginning in 2004, Los Angeles County conducted a preliminary evaluation of a range of conversion technologies and technology suppliers, and initiated efforts to identify MRFs and transfer stations (TS) in Southern California that could potentially host a conversion technology facility. A scope of investigation beyond Los Angeles County itself was considered important, as stakeholders in the evaluation extended beyond the County and the implications of this effort would be regional.

In August 2005, the evaluation report was adopted. Phase I resulted in identification of a preliminary short list of technology suppliers and MRF/TS sites, along with development of a long-term strategy for implementation of a conversion technology demonstration facility at one of these sites. The County intentionally pursued integrating a conversion technology facility at a MRF/TS site in order to further divert post-recycling residual waste from landfilling and take advantage of a number of beneficial synergies from co-locating a conversion facility at a MRF.

[26] ibid.
[27] Los Angeles County Conversion Technology Evaluation Report ~ Phase II – Assessment, October 2007.

Phase II – Facilitation Efforts for Demonstration Facility[28]

In July 2006, the County further advanced its efforts to facilitate development of a conversion technology demonstration facility. The approach was multi-disciplined, including environmental analysis and constructability. Key Phase II study areas included:

- An independent evaluation and verification of the qualifications of selected technology suppliers and the capabilities of their conversion technologies.
- An independent evaluation of candidate MRF/TS sites, to determine suitability for installation, integration and operation of one of the technologies.
- A review of the required permits to facilitate the project.
- Identification of funding opportunities and financing means.
- Identification of potential County incentives (i.e., supporting benefits) to encourage facility development amongst potential project sponsors.
- Negotiation activities to assist parties in developing project teams and a demonstration project.

The Phase II report described progress to date on Phase II, and represented a culmination of approximately one year of work conducted by the County. Five companies were issued Request for Offers (RFO) early in 2008 for a demonstration to be constructed at any one of four sites by the selected vendor. The five conversion technology suppliers considered and their corresponding technologies offered were: Arrow Ecology utilizing anaerobic digestion; Changing World Technologies utilizing thermal depolymerization; International Environmental Solutions utilizing pyrolysis; Interstate Waste Technologies utilizing pyrolysis/gasification; and Ntech Environmental utilizing gasification. Five MRFs were considered for partnering with the technology supplier. Only one MRF, Community Recycling/Resource Recovery, Inc. MRF, is located in L.A. County. The Perris MRF/Transfer Station and the Robert A. Nelson Transfer Station and MRF (RANT) are located in Riverside County. Del Norte Regional Recycling and Transfer Station is situated in Ventura County and the Rainbow Disposal Co. Inc MRF is in Orange County.

Phase III – Evaluation and Presentation of Offers

Phase III of the project is expected to be finalized by the end of 2008. The County has received several offers, with a deadline of August 15, 2008 for receipt. It appears that Changing World Technologies is no longer participating and that the County is mostly working to locate these projects in privately owned MRFs in Riverside and Orange counties. Phase III will include the evaluation of these offers and the presentation of the results to the Board. Phase IV of the project is scheduled to begin in 2009.

[28] ibid.

5.2 Procurements

5.2.1 Frederick and Carroll Counties, MD

In May 2006, the Northeast Maryland Waste Disposal Authority (Authority) began a search for firms with Qualified Technologies to provide WTEF for Frederick and Carroll Counties. The Authority was seeking technologies that demonstrated success in the efficient and feasible conversion of MSW into marketable steam, thermal energy, fuel and electricity. Technologies that produced a fuel were to be considered if the fuel had been demonstrated to reliably and efficiently produce energy (Qualified Technologies). The Authority conducted a two-step procurement. The first step was the Request For Qualifications (RFQ) to identify firms with Qualified Technologies. Qualified Technologies were to be eligible for consideration in the second step, the Basis of Negotiation (BON). In order to be deemed a Qualified Technology, operating statistics from a reference facility had to be provided, with a minimum of three consecutive years of operating data, including waste processed, energy produced, air emissions and residue generation.

The size of each unit could be as small as 100 tpd and as large as 750 tpd. The selection of unit size for each project was to be determined during the BON phase.

In response to the directives, proposals were requested for the following three facility options:

- A 900 tpd resource recovery facility to be located in Frederick County to process residential and commercial waste generated in Frederick County.
- A 600 tpd resource recovery facility to be located in Carroll County to process residential and commercial waste generated in Carroll County.
- A 1,500 tpd resource recovery facility to be located in Carroll County to process residential and commercial waste generated in both Frederick and Carroll Counties.

After receipt of proposals from three vendors, the Authority, in conjunction with the participating jurisdictions, completed an initial review of the proposals and short-listed Covanta Energy and Wheelabrator Technologies. As part of the initial review, the Authority met with Covanta and Wheelabrator to clarify their proposals and to ensure that the initial financial modeling results correctly represented their proposals and met the needs of the local jurisdictions. The Authority is currently seeking approvals from the jurisdictions to begin formal negotiations with the vendors to arrive at a final contract to be voted on by the jurisdictions' Commissioners. If approved by the jurisdictions, the permitting and construction of the facilities could take up to five years.

5.2.2 Harford County, MD

In May 2006, the Northeast Maryland Waste Disposal Authority (Authority) began a search for firms with Qualified Technologies to provide an expansion of the WTE facility for Harford County, similar to the process conducted for Frederick and Carroll counties as described above.

In December 2006, The Authority issued a RFP for a Resource Recovery Facility (RRF) located in Harford County, Maryland. This was the second step in the two-step competitive procurement being conducted by the Authority. While the RFP was open to all interested and qualified vendors, only those technologies deemed qualified by the Authority were eligible for consideration.

The Authority has short-listed both Covanta Energy and Wheelabrator Technologies proposals as responsive and will continue the procurement process with those firms. The Authority is currently seeking approval from Harford County to begin formal negotiations with the vendors to arrive at a final contract to be voted on by the Harford County Council. Best and final offers have been requested from both companies and should be received by the end of September 2008, followed by final selection and negotiations.

5.2.3 City of Sacramento, CA

In August 2007, the City of Sacramento, CA issued an RFQ soliciting an experienced and qualified firm to partner with it to process MSW utilizing alternative technologies premised on resource recovery and/or energy creation. To qualify, firms must have had demonstrated experience and capacity to finance, design, build, own and operate a facility that processed MSW in excess of what the City currently disposes of, approximately 2,300 tpd after diversion. Sacramento was interested in a facility that used treatment technologies including, but not limited to, pyrolysis, gasification, advanced thermal recycling (a second generation advancement of mass-burn technologies), biological, chemical, physical and/or a combination thereof. They wanted technologies that were well proven at commercial scale, had high landfill diversion rates, and could generate a wide range of useful by-products that could be marketed for revenue sharing by the City and its development partner.

In October 2007, the City received 11 responses to the RFQ, not all of them waste processing technologies. The City performed a technical evaluation of the responses and went to the Council to request an Exclusive Negotiating Rights Agreement (ENRA) with a single company, U.S. Science and Technology. A plasma arc gasification project is being evaluated with due diligence expected to be completed in September 2008. City officials traveled to Japan to visit a facility that employs a similar technology at a commercial level (Westinghouse Plasma Corporation). A decision on the implementation of the project is expected in the near term.

5.2.4 Broward County, FL

The Broward County Solid Waste Disposal District (District) in July 2007 was considering changes to its solid waste management infrastructure in the near term. Because its disposal contracts with two privately-owned WTEF will reach the end of their initial service agreement terms in the near future, the District recognized that many options to be considered would require significant development time, and thus began the process to proactively evaluate such options. The District sought, through a Request for Expressions of Interest (RFEI), to identify firms that could meet all or a portion of the District's future solid waste processing and disposal requirements, and that were consistent with its long-term objectives. While this was not a procurement, it was understood that information obtained during the process would be used to support future procurement(s).

The expressions of interest were due by October 2007, and 25 vendors responded to the REFI. To date, the Broward County Solid Waste Disposal District, Resource Recovery Board has reviewed all the expressions of interest as well as presentations made to the Board by some of the respondents, and no further decisions have been made. Not all of the submittals were for WTE solutions. Negotiations for a contract extension are taking place with existing WTE facility contractor Wheelabrator, and a decision to move forward is expected in 2008.

5.2.5 St. Lucie County, FL

On April 30, 2006, the Board of County Commissioners, St. Lucie County, Florida, solicited qualifications for the purpose of obtaining services to permit, finance, construct, operate, and own a Plasma Arc Gasification Facility to process MSW for St. Lucie County. The due date for the qualifications was May 2006.

There was only one respondent to the RFQ issued by the County: Jacoby/Geoplasma. Subsequently, a development contract was signed, and the County is moving forward with the project. The developer plans to process 3,000 tpd, generating 120 megawatts of electricity, one-third of which will be consumed internally. According to the developer, the facility will cost over $425 million and take two years to construct. Construction is slated to begin pending receipt of permits.

5.2.6 Hillsborough and Lee Counties, FL

Two operating mass-burn waterwall facilities in Florida began expansions in 2007. In Lee County, the 1200 tpd facility will add a third line with a 636 tpd capacity, using the same Covanta technology as the two operating lines, at a cost of $123.2 million or $194,000 per ton of installed capacity. Hillsborough County sole-sourced to Covanta a new 600 tpd line to add to the two operating 600 tpd lines already in place. The cost to Hillsborough County for the new line will be $123 million or $205,000 per installed ton of capacity. The project is expected to be completed, tested and accepted by the County in July 2009.

5.2.7 City of Tallahassee, FL

The City of Tallahassee, FL, a public power community, in November 2006, issued a request for letter of interest to seven project developers requesting a two-page summary for consideration of their technology for development of a renewable energy facility serving the City of Tallahassee's service territory within Leon County, FL. The City received three written responses, all from developers using biomass as fuel for conventional steam generation. Two additional companies made formal presentations to City representatives for advanced gasification projects, one project utilizing MSW and the other utilizing woody biomass as fuel source. In January 2007, the City began direct negotiations with one of the companies that made the formal presentations, Green Power Systems based in Jacksonville, Florida. In June 2007, the City approved the contract for Green Power Systems to begin development of a 1,000 tpd plasma gasification facility generating 35 MW net electricity. The power purchase agreement for the sale of electricity to the City of Tallahassee was signed in June 2007. To date, Green Power Systems is conducting geo-technical work on site suitability as well as design and engineering work based on site suitability. Financing

reportedly has been secured for the development of the facility, and it is scheduled to begin operation in October 2010.

6. Technologies Chosen or Considered in Recent Research/Procurements

In the foregoing studies, reports and procurements, a total of 78 technology vendors were represented, evaluated, screened or selected in some way for consideration as waste processing solutions for the local entities. These 78 vendors offered 14 different technologies.

The most often cited technology is mass burn. Second on the list is gasification. Also mentioned are anaerobic digestion, plasma arc, pyrolysis and thermal depolymerization. While this review is not systematic, it does provide a summary of the firms and technologies that are most active in the field, and those that localities across the U.S have been most interested in considering as they contemplate alternatives to landfilling MSW. A comparative summary of waste processing technologies is presented in Table 6.

7. Opinion on Economic Feasibility, Effectiveness, and Environmental Issues of Waste Processing Technologies

7.1 Economic Feasibility of Waste Processing Technologies

The economic characteristics of the waste processing technologies, including capital and operating costs and risk, are summarized in Table 6.

Generally, capital costs for the proven technologies are in the range of $150,000 to $250,000 per ton of installed capacity, depending on size and facility configuration. Operating costs are in the range of $35 to $60 per ton processed, not including residue disposal, again dependent on size, equipment and operating profile, and assuming a private operator. These figures are based on industry rules-of-thumb, recent operating results from selected facilities, surveys of industry professionals and related references.

A significant factor in the net operating costs for these facilities is revenue from the sale of recovered energy and recyclables. The energy revenue is a function of negotiations between the facility operator and the energy markets, typically a utility, and may include, besides a power rate, revenue for capacity and a requirement for standby power. Capital equipment necessary for utility connections can also be part of the negotiations, and the actual figures have to be developed and refined for specific sites and requirements during a procurement/development and negotiation process.

7.2 Effectiveness of Waste Processing Technologies

Since any WPT will have some residual in need of disposal, when discussing effectiveness of a WPT, emphasis is placed on obtaining the least amount of residual material for final disposal. While combustion technologies significantly reduce the volume of material destined for landfills, the resulting ash must be managed. Typical management methods include disposal in a Subtitle D landfill or beneficial use in construction projects and alternative daily cover for landfill wastes. In Europe, where land for landfilling is scarce and several countries have banned landfills, the ash is processed to recycle the ferrous and nonferrous metals and the remainder is graded and used in road and other construction.

The biological processes produce residues as well. These are of two types: (1) inert residues that are landfilled and (2) organic residues that can be cured to be a soil amendment or compost. Biological WPT are mass reduction technologies so that contaminants such as heavy metals are concentrated in the residue. Tests for these contaminants need to be conducted during operations and appropriate measures taken.

For all but the high-temperature thermal options and the anaerobic digestion system, an ash will be generated. Bottom ash will be discharged from the bottom of the furnace chamber, and fly ash will be collected by the air pollution control system. In accordance with applicable law, WTE ash must be tested to ensure it is non-hazardous. The test is called the Toxicity Characteristic Leaching Procedure (TCLP).

Generally, the bottom ash has not been classified as a hazardous material, subject to ash testing and analysis. Fly ash, however, will have a higher concentration of heavy metals and may also contain residual organics. As such, it would likely be classified as a hazardous material if it fails toxicity testing, unless it is combined with bottom ash, as is the current U.S. practice.

Table 6 - Summary of Municipal Waste Processing Technologies

	Technology				Environmental Issues	Economic Issues		Risks/Liability*	Risk Summa
Alternative	**Description**	**Experience Record**	**Size Applicability**	**Reliability**		**Capital**	**Operations/ Maintenance**		
Mass-Burn/Waterwall	Unprocessed MSW fired in a chamber built of water tubes. Heat recovered for steam and/or electricity production	The predominant method of WTE in the US and overseas for decades. Over 60 facilities currently in commercial operation	Modules up to 750 tpd, with total facility size over 3,000 tpd	High proven reliability, over 90%	Air emissions (controlled by statute). Requires residual disposal.	$200k to $262k per installed ton (high)	$35 to $50/ton (moderate) O&M costs. Minimal materials recovery.	Proven commercial technology at appropriate scale.	Very Low
Mass-Burn/Modular	Unprocessed MSW fired in a series of refractory chambers followed by a heat recovery boiler for steam and/or electricity production	Substantial experience with facilities firing MSW in Europe and to a lesser extent in the U.S.	Modules up to 150 tpd, with total facility size up to 450 tpd	High proven reliability, over 90%	Air emissions (controlled by statute). Requires residual disposal.	$146k to $183k per installed ton (moderate)	$50 to $60/ton (high) O&M costs. Minimal materials recovery.	Proven commercial technology; limitations in scaling up to size needed.	Low
RDF/ Dedicated Boiler	Shredded MSW, with ferrous metals removed, and fired in a chamber built of water tubes. Preprocessing can increase materials recovery.	Dozens of facilities in operation since the 1970's	Modules up to 750 tpd, with total facility size over 3,000 tpd	Good proven reliability, over 80%	Air emissions (controlled by statute). Requires residual disposal.	$158k to $198k per installed ton (moderate)	$50 to $55/ton (high) O&M costs. Good materials recovery revenue potential.	Proven commercial technology at appropriate scale.	Low
RDF/Fluid Bed	Shredded MSW fired in a sand bed. Preprocessing can increase materials recovery.	One facility firing MSW in the US, other units in Europe and Japan	Facility size up to 460 tpd	Good proven reliability, over 80%	Air emissions (controlled by statute). Requires residual disposal.	High capital cost	High O&M costs. Good materials recovery revenue potential.	Proven technology; limited U.S commercial experience; scalability an issue.	Moderate
Pyrolysis	Heated MSW in oxygen-starved environment produces a fuel gas that is incinerated to generate usable energy - steam and/or electricity	One pilot facility in California operating for 2 years	Pilot facility sized for 50 tpd MSW	Insufficient experience to establish reliability estimate	Air emissions (controlled by statute), Odors from MSW transport. Residue may have beneficial use.	High capital cost	High O&M costs	High risk, uncertain commercial potential. No operating experience with large scale operations.	High
Gasification	Heated MSW in oxygen-starved environment generates a fuel gas that can be exported for heat or power generation	Two facilities firing MSW in Japan since 1998, 10 small units firing MSW in Europe and Asia	Multiple modules of 300 tpd MSW each	Insufficient experience to establish reliability estimate	Limited air emissions (controlled by statute), potential air emissions when gas is fired. Residue may have beneficial use.	High capital cost (one vendor estimates $235k-$250k/installed ton)	High O&M costs	Limited operating experience at only small scale. Subject to scale-up issues.	High
Anaerobic Digestion	Extensively preprocessed/shredded MSW directed to a series of digesters for gas generation that can be exported for heat or power generation	One facility in operation in Israel for less than two years; other limited facilities in Europe	Operating facilities up to 300 tpd	Insufficient experience to establish reliability estimate	Odor, potential air emissions when gas is fired. Residue may have beneficial use.	Low capital cost	High O&M costs. Several materials revenue streams may be available,	Limited operating experience at small scale. Subject to scale-up issues.	High
Plasma Arc	MSW heated by a plasma-arc in oxygen-starved environment produces a fuel gas that is incinerated to generate usable energy for steam and/or electricity. Similar to gasification.	Two pilot facilities in operation since 1999 in Japan	Less than 200 tpd MSW	Insufficient experience to establish reliability estimate	Air emissions (controlled by statute). Residue may have beneficial use.	Very high capital cost	Very high O&M costs	No commercial experience to date. Subject to scale-up issues.	High

* Does not include risks related to procurement, such as vendor quality and financial resources (ability to provide technical, construction and operating guarantees; underwrite risks, etc.)

It should be noted that communities with aggressive, comprehensive recycling programs and programs focused on removing toxics from the MSW stream, such as those to divert used electronics (e-waste), HHW, mercury thermometers, fluorescent light fixtures, batteries, various metals and white goods, and the like, could be expected to have a post-diversion MSW stream for combustion containing less toxic materials and thus the ash from combustion to have a lower potential to exhibit hazardous characteristics upon TCLP testing.

The solids residual from high temperature systems, such as plasma-arc or pyrolysis, may have a better opportunity for end-use applications and marketing. These glassy-type granules may be classified as non-hazardous and used in construction materials or as a fill.

Vendors claim the substrate after anaerobic digestion is beneficially processed and recovered, with the residue being nothing more than stones, glass or similar items, which is normally directed to a solid waste landfill. However, digestion, like combustion, is a concentrating process. This is the result of the organic matter being converted to gas and utilized or released into the atmosphere. As a result toxic materials in the waste will be part of the residue but in a higher concentration than in the original feedstock. These claims are unproven in facilities operating using MSW as feedstock.

7.3 Environmental Issues of Waste Processing Technologies

7.3.1 Air Quality

Applicable Regulations

Solid waste incinerators, which the U.S. EPA refers to as Municipal Waste Combustors, are regulated under the federal Clean Air Act, originally passed by Congress in 1963 and updated in 1967, 1970, 1977,1990 and 1995 and 1998. Numerous local governments have enacted similar legislation, either implementing federal programs or filling in locally important gaps in federal programs.

Section 111 of the federal Clean Air Act directs the U.S. EPA to establish pollution control requirements for certain industrial activities which emit significant "criteria air pollutants." These requirements are known as new source performance standards (NSPS) and regulate pollutants. For thermal destruction of solid waste, the NSPS control particulate matter (PM), sulfur dioxide(SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), hydrogen chloride (HCl), dioxins/furans, cadmium, lead, mercury, fugitive ash and opacity. NSPS are detailed in Chapter 40 of the Code of Federal Regulations, Part 60 (40 CFR Part 60), and are intended primarily to establish minimum nationwide requirements for new facilities.

Section 112 of the pre-1990 federal Clean Air Act directed the U.S. EPA to establish standards to reduce emissions of hazardous air pollutants (HAPs). These pollutants include asbestos, benzene, beryllium, inorganic arsenic, mercury, radionuclides, and vinyl chloride. National emission standards for hazardous air pollutants (NESHAPs) are detailed in 40 CFR Part 61 and establish minimum nationwide requirements for existing and new facilities.

The post-1990 NESHAPs require the maximum achievable control technology (MACT) for a particular industrial source category, and are often referred to as "MACT standards." The

pre-1990 Clean Air Act prescribed a risk-based chemical-by-chemical approach. The 1990 Clean Air Act Amendments outlined a new approach with two main components. The first component involves establishing technology-based source category standards, and the second component involves addressing any significant remaining risk after the national standards are in place. The NESHAPs promulgated under the 1990 Clean Air Act Amendments can be found in 40 CFR Part 63 and establish nationwide requirements for existing and new facilities.

The U.S. EPA may implement and enforce the requirements, or the U.S. EPA may delegate such authority to state or local regulatory agencies. Clean Air Act Sections 111 and 112 emissions limits applicable to new Municipal Waste Combustors are:

Dioxin/furan (CDD/CDF)	13 nanograms per dry standard cubic meter
Cadmium (Cd)	10 micrograms per dry standard cubic meter
Lead (Pb)	140 micrograms per dry standard cubic meter
Mercury (Hg)	50 micrograms per dry standard cubic meter
Particulate Matter (PM)	20 milligrams per dry standard cubic meter
Hydrogen chloride (HCl)	25 ppm or 95% reduction
Sulfur dioxide (SO_2)	30 ppm or 80% reduction
Nitrogen Oxides (NO_x)	180 ppm dry volume, and 150 ppm dry volume after first year of operation

A new source review (NSR) permit is required for a new municipal waste combustor and, in addition, depending on its size and emission quantities, it must meet the prevention of significant deterioration (PSD) permit requirements.

Air Quality Impacts

In the early 1980s, dioxins were discovered in the exhaust of a WTE facility on Long Island, NY. This chemical, toxic to animals in even very small quantities, was considered a major pollutant. Other WTE facilities were tested, as well as other industries, and were found to be a major dioxin source. In 1995, amendments to the Clean Air Act (CAA) were enacted to control the emissions of dioxins, as well as other toxins, such as mercury, hydrogen chloride and particulate matter.

With the implementation of the CAA requirements in the following years, dioxin emissions from WTE decreased significantly, as shown in Figure 15.[29] The U.S. EPA has stated that "Waste-to-Energy is no longer a major contributor of dioxin emissions."

[29] Emissions from Large MWC Units at MACT Compliance, Docket A-90-45 (Large MWCs), U.S. EPA, Research Triangle Park, NC.

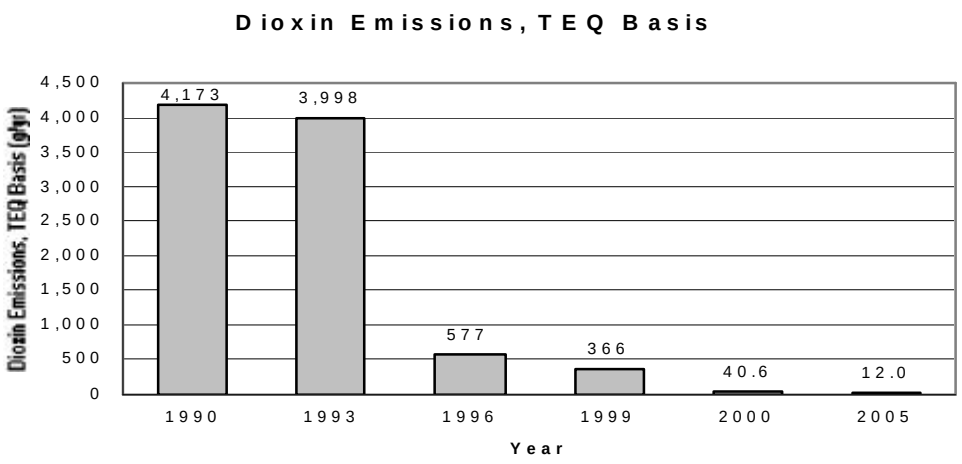


Figure 15 - Dioxin Emissions from WTEF, 1990 – 2005

Mercury is another toxin that was found in WTE exhaust and that was addressed in the CAA amendments. By modifications in the burning process and the use of activated carbon injection in the air pollution control system, dioxins and mercury, as well as hydrocarbons and other constituents, have effectively been removed from the gas stream. Mercury emissions from WTE have been reduced from 1990 levels, as shown in Figure 16.[30]

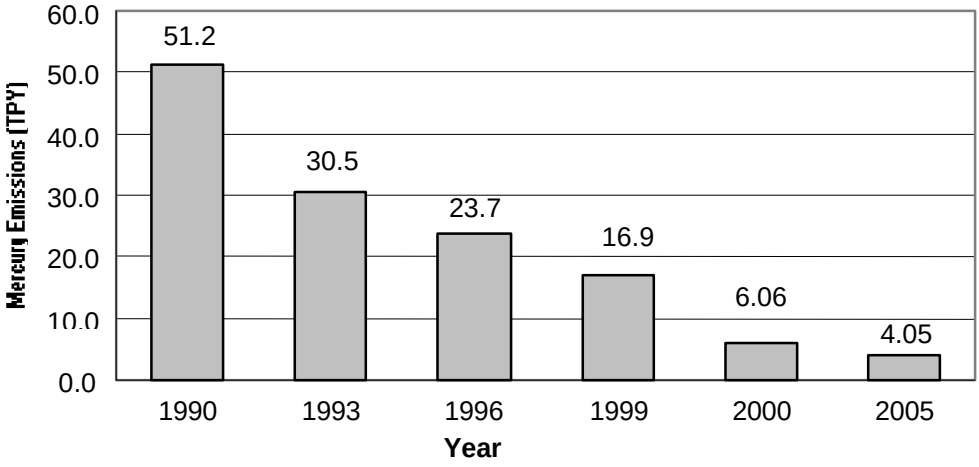


Figure 16 - Mercury Emission from WTEF, 1990 - 2005

7.3.2 Water

Mass-burn and RDF incineration technologies and any WTE that produces steam will require a water supply, and all types of projects have a wastewater discharge. Water is required for the boilers, and domestic water for workers is also needed.

[30] Ibid.

Non-potable water may be used as cooling water for the steam condensers, but the large cooling water supplies necessary for condenser cooling are normally not available, and cooling towers or cooling water ponds are provided as part of the facility. Air-cooled condensers are an option, but they increase capital costs and reduce net power production.

If the energy is going to a steam customer, the water requirement may be increased significantly from that needed for electricity generation, assuming that the customer generally does not return condensate. Some projects may cogenerate steam and electricity for sale, such as district heating/cooling projects or those with a significant steam user in proximity of the WTE facility site.

Technologies such as gasification and anaerobic digestion will not necessarily use a boiler. They may generate a gas stream for use off-site and not require a condenser cooling water system. They may utilize the gas to power a turbine or piston engine. These approaches are not inherent water users; however, gasification systems may require water in the gas cleanup and processing. Each system would need individual evaluation.

Biologic systems, including ethanol production and anaerobic digestion, are wet processes. The question to be examined is how much water is required and how much is recycled. The answers to these questions will be system-specific. For example, Arrow-Bio, which uses a water-based system, claims that no water is required for the process other than that in the waste, which is recycled.

Appendix B

White Paper on Waste Reduction Initiatives

Introduction

This White Paper was prepared to provide supplemental information to Chapter 3 – Waste Reduction /Prevention and Recycling Analysis. The purpose is to provide Marion County and the SWMAC with a list of waste prevention initiatives that might be considered in conjunction with other programs to reduce the per capita waste disposal rate. Some of these concepts are similar to programs already being carried out by the County. The information can be used as additional resources to consider in assessing future policies and programs.

Waste Reduction has been defined as: Actions taken before waste is generated to either reduce or completely prevent the generation of waste; Waste Prevention has been defined as: Actions or choices that prevent the generation of waste. Waste Reduction can be thought of as a combination of efforts of waste prevention, reuse, composting, and recycling practices. Reuse is a type of Waste Prevention; Waste Prevention is a type of Waste Reduction. Some entities use the terms Waste Reduction and Waste Prevention interchangeably, despite their slightly differing meanings, thus, it is important to understand the context and aim of the discussion. Waste Prevention is felt to be synonymous with Source Reduction, although the former has been indicated as easier to understand, thus more widely used in public education outside of solid waste professional's lexicon.[1]

Waste Reduction implies that some material, although a reduced quantity, may still enter the solid waste management system and be included in the waste generation statistics for the area, even if it is recycled. The practice of Waste Reduction relies on structural or behavioral changes made to eliminate the creation of material from activities which would then be managed as either a recyclable or a waste product; waste prevention aims to *not* create the waste or recyclable material at all in the first place. Waste prevention is sometimes very difficult to measure as it attempts to quantify what "was never or is no longer there."

Some general examples of waste reduction/prevention include:

- Double-sided printing (reducing the paper used from 2 sheets to 1).
- Electronic transmission of newsletters (preventing any paper use).

[1] California Integrated Waste Management Board, http://www.ciwmb.ca.gov/WPW/Define.htm#WastePrev , accessed 1/22/09.

- Use of durable water bottle or mug (preventing the use of single-serve/single-use water bottles or cups, even if destined for recycling).
- Corporate use of reusable shipping containers (preventing the use of cardboard boxes, even if destined for recycling).
- Design and manufacturing changes to packaging or products making them less resource-intensive such as "light weighting" packaging or creation of concentrate products and ultimately, consumer purchase and proper use of these products ("light weighting" of aluminum cans by the beverage industry has reduced the amount of aluminum needed to making a typical 12 ounce can by about 40% since 1970[2], meaning there are now 34 cans per pound versus the original 22 cans needed to make up a pound of recyclables; concentrated items, such as beverages, chemicals, or detergents, reduces the packaging size and eliminates transportation of bulking agents, such as water, by putting the product into a smaller original package which reduces the size of the plastic bottle package to be recycled, and having the consumer add the water or employ less actual product during final use).

Wide-spread waste reduction is difficult to affect as it involves corporate or individual choices most often outside of the realm of municipal control. However, some jurisdictions have attempted to reduce waste by passing various initiatives aimed at citizen and commercial generation and discards. In addition to the current waste reduction activities the County employs, some additional waste reduction initiatives that could be considered include:

- Enact ban or charge on certain materials, such as plastic bag distribution from grocery stores.
- Levy "Waste Tax," surcharge for waste disposed of in landfills or WTEF, with funds collected to be used for community education on waste reduction and recycling.
- Provide incentives and recognition for outstanding individual and/or business waste reduction activities and successes, such as the County's EarthWISE Program.
- Assure County and solid waste management system partners (WTEF, franchised haulers, local recyclers, contractors) set a good example by their own practices of waste reduction including:
    - Pass corporate-wide policies and practices for waste reduction- such as becoming active members in EarthWISE County Sustainable Business Program.
    - Distribute information in the least wasteful way (electronic, double-sided printing, recycled-content paper, etc.).
    - Provide promotions with waste reduction in mind (reusable mugs/pens/bags, minimal packaging, durable or consumable items rather than disposable).
    - Procure environmentally preferable products, including: recycled and recycled-content; bio-based; durable and long-lasting goods; bulk or reduced packaging; and other resource-efficient products and materials complying with any local environmentally-preferable guidelines or policies. Include

[2] Ball Corporation, http://www.ballcorporate.com/page.jsp?page=173 , accessed 1/22/09.

procurement of products assisting in waste reduction such as automatic double-siding printers.
    - Require all suppliers that provide documents or other materials, including proposals, to utilize a high post-consumer recycled content level papers.
    - Design and build facilities with US Green Building Council LEED (Leadership in Energy and Environmental Design) certification.
- Implement deposit fees on all C/D permits to be refunded upon the provision of recycling receipts for certain materials or a specific percentage of wastes.
- Enhance promotion of local reuse options prior to and located at disposal point (such as St. Vincent de Paul donation trailer at SKRTS), including internet-based options as well as local/community-based organizations, for the variety of materials applicable including construction materials, household goods, clothing, etc.
- Require recycling of certain, selected materials, encouraging a reduction in their initial generation in possible avoidance of having to arrange for recycling of them.
- Examine the unit-based-pricing (Pay-As-You-Throw/PAYT) structures of single-family and commercial business trash customers, providing fee structures which encourage reduction in total amount of waste and recyclables set out for collection, such as incorporation of a "mini-can" rate.
- Explore ban on grass clippings in residential waste and all yard trimmings in commercial waste to reduce the amount of trash collected and require compost/recycling of these materials from all sectors *(if not already done) [While* material is still generated, it is not collected into local waste management system but is managed by the generator (homeowner) on site (at home).
- Facilitate formation of business and/or residential groups to undertake discrete "waste reduction demonstration projects." County staff would provide support, potentially including outside consultancy, for projects involving a limited number of representative organizations, possibly in a particular area or neighborhood. Project would involve assistance in identifying opportunities for waste reduction, as well as each representative's regular interaction with other participants, allowing exchange of views and experience. As the benefits (both financial and environmental) emerge and are publicized, it is hoped that other groups will be stimulated into similar actions. Important learning aspects include the concept that financial savings may not be immediate but long-term savings can be achieved, in addition to environmental gains..
- Continue providing Grant funding for waste reduction initiatives to be developed and undertaken by businesses and community groups.
- Continue to educate community on waste reduction-option purchases in local stores, through possible in-store displays or information including promotion of: bulk purchase; purchasing concentrates; purchasing only the perishable items that will be consumed before spoilage; minimizing purchases in single-serving containers; considering recyclability of purchases; purchasing nontoxic alternatives to common household chemicals; and buying reusables versus disposables, while recognizing that stores often bow to consumer pressures and stock the types of items requested by their patrons.

Ultimately, it is an individual behavioral choice whether to utilize an item at all, use a waste-reduction option, a recyclable item, or a disposable/waste material. Constant vigilance in community education or waste reduction, reuse, and recycling will keep citizens and businesses mindful of the choices they make at work and home everyday which affect the amount of waste generated overall.

Appendix C – Cost Estimates

TABLE 1. ESTIMATED COST TO SITE, CONSTRUCT, AND OPERATE SUBTITLE D LANDFILL

(Waste Flow: 250,000 Tons/Year)

Category	Estimated Cost Range (2009 $)
Initial Capital Investment	
Siting and Permitting	
Siting Study	$ 200,000 - $ 300,000
Site Selection	500,000 - 800,000
Preliminary Design & Permitting	400,000 - 500,000
Site Purchase (300-400 Acres @ $20,000/Acre)	6,000,000 - 8,000,000
Siting and Permitting Subtotal	**$ 7,100,000 - $ 9,600,000**
Site Development	
Development ($150,000/Acre) (15 to 20 Acres)	$ 2,250,000 - $ 3,000,000
Support Facilities (Leachate, Roads, Fence, Scales	3,000,000 - 4,000,000
Surface Water Management	400,000 - 600,000
Environmental Monitoring	300,000 - 500,000
Subtotal	**$ 5,950,000 - $ 8,100,000**
Contingency (15%)	890,000 - 1,200,000
Legal, Admin, Permitting (7%)	420,000 - 570,000
Engineering (7%)	420,000 - 570,000
Construction Services (5%)	300,000 - 405,000
Site Development Subtotal	**$ 7,980,000 - $ 10,845,000**
Total Initial Capital Investment	**$ 15,080,000 - $ 20,445,000**
Annual Amortized Cost (20 years @ 7%)	$ 1,500,000 - $ 1,930,000
Cost per Ton for Initial Capital Investment (250,000 TPY)	**$6.00 - $7.72**
Equipment	$ 3,000,000 - $ 5,000,000
10 Years @ 7% (per year)	$430,000 - $712,000
Amortized Equipment/Ton	$1.75 - $2.85
Equipment Replacement/Ton	$2.00 - $3.00
Cost Per Ton for Equipment	**$3.75 - $5.85**
Operating Expenses	
Annual Operation & Maintenance Costs	$15.00 - $20.00
Closure	$3.00 - $3.00
Post Closure	$1.50 - $1.50
New Cell Development	$4.00 - $6.00
Operating Expenses Subtotal	**$23.50 - $30.50**
Total Cost per Ton (Rounded)	**$34.00 - $45.00**

The above is a planning level estimate intended to provide the County with general costs of constructing a new landfill.

2009 SWMP Cost Assumptions

Landfill Assumptions

250,000 TPY @ 50 years

20 Million Cubic Yards @ 50 ft Deep: 250 Acres

100 Acres Buffer

350 Total Acres

Use 300 to 400 Acres

Use 250,000 TPY Annual Capacity Based on Projections

TABLE 2. ESTIMATED COST TO ADD THIRD BOILER UNIT AT THE WASTE-TO-ENERGY FACILITY (WTEF)

The WTEF was designed and constructed with provisions to add a third boiler unit. Space has been provided to easily install the unit with air handling equipment. The existing receiving building and feed systems are in place.	
	Estimated Range of Cost (2009$)
Capital Cost to Install 3rd Boiler System $200,000/Ton to $250,000/ Ton of Installed Capacity @ 275 TPD	$55,000,000 - $ 69,000,000
Annual Debt Service (Assume 5% Interest - 20 Yrs) *	$4,400,000 - $ 5,540,000
Cost/Ton of New Capacity	**$48.00 - $60.00**
Cost/Ton of Facility Capacity @ 280,000 TPY	**$16.00 - $20.00**
Operating Cost (Assumed Incremental Cost 75% of $35/Ton)	$26.35
Ash Residue Disposal (System Cost)	$6.00
Total Operating Cost	**$32.35**
Estimated Revenue from Sale of Electric Power - $ 2,800,000/92,000 tons per year	**$30.43**
Estimated Net Tip Fee/Based on New Capacity (Per Ton)	**$50.00 - $ 62.00**
Estimated Net Tip Fee - Based on WTEF Total Capacity (Per Ton)	**$18.00 - $ 22.00**

* Note: Interest rate represents favorable bond conditions for projects with low risk.

Appendix D

Environmental Review of Process/Disposal Options – 2009 SWMP

Introduction

A summary review of potential environmental impacts of several options for processing and disposing of solid waste was prepared in a matrix format. It represents general information regarding these options and does not reflect specific impacts associated with Marion County's management system. Both Coffin Butte and NMCDF are engineered and constructed to meet stringent standards and designed to minimize environment or human health impacts. Likewise, the Covanta Marion WTEF includes modern air pollution control equipment designed to meet stringent emission control standards.

Marion County's solid waste management system is designed to follow a hierarchy for managing solid waste as adopted by the State of Oregon as well as EPA. This hierarchy is largely based at developing systems to have the least amount of impacts to the environment. The hierarchy states it is preferential to 1) reduce or prevent waste generation, 2) reuse materials, 3) recycle materials, 4) compost, 5) recover energy, and 6) landfill. This hierarchical approach is a primary driver of the Marion County SWMP. Currently, Marion County disposes of less than 25% of the waste generated in landfills. About half of the landfilled waste is ash residue having no impact on greenhouse gas (GHG), while the other half is MSW.

In presenting this information it is noted that solid waste management practices are highly regulated by federal, state and local laws. Standards for operating facilities and for ultimate disposal of solid waste are stringent and facilities are required to provide regular monitoring. Landfills that accept MSW are required to be located in specific areas that present a reduced risk to groundwater. Landfills are constructed with liner systems to collect any rain water that infiltrates into the waste. Monitoring wells are installed in specified areas to enable operators to sample groundwater for any discharges into natural waters. Landfills also are designed and operated to collect to the extent possible landfill gas generated during operation and after closure.

Compost facilities as not as regulated although the State of Oregon has recently adopted new requirements for these facilities.

WTEFs are constructed with air quality controls and treatment systems. They employ continuous monitoring equipment and instruments to ensure they meet regulatory requirements.

Alternative technologies, including gasification and pyrolysis, are not being considered as near term options because of the general lack of commercial scale plants processing MSW in the United States and the risks inherent in their performance and ability to obtain financing.

Table 1 – Environmental Review of Process / Disposal Options – 2009 SWMP

Process/ Disposal Alternative	Land	Air	Water
Landfill	Regional landfills can disturb from 300 to 1,000+ acres of land for many years, depending on size. Landfill activity typically impacts native wildlife and plants. Landfills tend to be located in remote areas; therefore, alternative uses for the land are typically limited to agricultural areas and natural settings. After landfill closure, the land has limited uses and is not typically suited for development.	Landfills produce landfill methane and other fugitive gases from decomposing garbage. During operations, an estimated 50% or more of landfill gas may be collected. After closure, over 95% of landfill gas is typically collected. Landfill gas is typically half methane and half carbon dioxide, with trace amounts of benzene, toluene, tetrachloroethene, and other NMVOC gasses. Condensate produced by anaerobic decomposition is typically put back into the landfill. Long-term monitoring is required after landfill closure, including mitigation of any problems. Carbon in nondecaying material is sequestered under anaerobic conditions.	Modern landfills are constructed with liners to collect leachate for treatment and protect groundwater, but landfills should still be located where risk to groundwater and freshwater are low. Leachate is created when rainwater infiltrates landfills, and typically includes heavy metals (Pb, Cu, Ni, Cr, Zn, Cd, Fe, Mn, Hg, Ba, Ag), poisons (arsenic, cyanide, etc), salts, nitrate, ammonia, and other hazardous chemicals. Long-term groundwater monitoring is required after landfill closure, including mitigation for any contamination.
WTE	Facilities are often sited in industrial areas and occupy 5-10 acres, therefore the impact on the land is limited. Ash residue may be disposed in landfill. Land required is only 10% of what would typically be required to send equivalent amount of MSW to landfill because of volume reduction. For instance, 50 acres accommodates 50 years of ash disposal at 50,000 tons per year.	WTEF can produce various gases such as mercury, dioxins, sulfur dioxide, ozone, methane, and other pollutants. Facilities have modern equipment designed to remove and/or treat these pollutants and meet stringent air emission standards. Air quality from Covanta's WTEF is well below the emission requirements. Exhaust gas from WTEF is monitored continuously, and DEQ, EPA and other environmental	Water is required by WTEF for boiler operations, and facilities treat and recycle most water on site. Water lost as steam during power plant operations must be replaced. Wastewater production is minimal. Leachate from ash disposal typically meets secondary water quality standards, except for conductivity.
Compost	Compost facilities require an estimate of 5-10 acres for smaller volumes to over 200 acres for larger volumes. Larger facilities (50,000+ TPY) should be located in agricultural or remote areas if possible. Some large in-vessel compost facilities may be located in urban areas. Small facilities (~30,000 TPY and smaller) may be located in urban and suburban areas. Composting operations may contaminate the top meter of soil, with the most serious contamination located in the top 15 cm. Soil contamination may include increased nitrogen levels (including NO_3 and NH_3), chlorine, and increased carbon levels.	Depending on facility size, source material, and compost method, odor may be an issue for the surrounding area. Compost facilities may release small quantities of volatile organic compounds. VOC levels may be controlled through best management practices. There are currently no standards or limits on organic dust (bioaerosols) from compost facilities. [1] Bioaerosols from compost facilities include live or dead bacteria, fungi, viruses, allergens, toxins, antigens, pollen, plant fiber, etc.	Compost facilities should be sited where contamination to groundwater and freshwater may be minimized. The risk of groundwater contamination depends on the soil type and the material to be composted. Composting on an impervious surface, implementing setbacks, using barriers, and proper site grading may also reduce the risk of freshwater and groundwater contamination. Facilities are typically required to collect and treat runoff prior to discharging it into sewers or storm drains. Runoff and leachate may contain heavy metals (Mn, Zn, Pb, Hg, etc), elevated nitrogen levels (NO_3, NH_3), and trace levels of E. coli and other bacteria. Actual chemicals and other pollutants in leachate vary depending on compost method and source material, and may be lower than federal standards for drinking water without treatment.

1 From "Compost Facilities: Off-Site Air Emissions and Health" by Cornell Waste Management Institute. Harrison, Ellen Z, Director. July 2007. (http://cwmi.css.cornell.edu/compostairemissions.pdf)

Appendix E

Public Meetings and Hearings on SWMP Update 2009

Introduction

The process used by Marion County to update the comprehensive Solid Waste Management Plan (SWMP) employed several means to inform the public and various stakeholders on how they can participate and provide input. The primary focus of this public participation process rested with the Solid Waste Management Advisory Council (SWMAC). This council is appointed by the Board of Commissioners (BOC) to provide oversight and guidance to the County in carrying out its responsibilities to manage solid waste. As such, they play an important role in providing input to the County on managing the system. The Public Works Environmental Services Division (PWES), whose job it is to manage the solid waste system, work in conjunction with Cities, franchised haulers and other private parties. They also staff the monthly SWMAC meetings.

In addition to regular meetings with SWMAC, PWES held several other events to solicit input/comments on the SWMP Update. The SWMP is updated every 5 to 10 years.

Marion County - SWMAC Meetings – The Solid Waste Management Advisory Council met each month to discuss elements of the Solid Waste Management Plan Update as they were prepared by the consultant team. The Agendas for each meeting are set in advance and are advertised. Each meeting is open to the public and contains a set time for the Council to hear comments from those in attendance. The following is the list of meetings held on the SWMP Update

Review of planning process and key issues	February 26, 2008
Introduction & Existing Conditions (Chapters 1&2)	March 25, 2008
Introduction and Existing Conditions (Chapters 1&2)	April 22, 2008
Waste Reduction/ Prevention & Recycling (Chapters 3)	May 27, 2008
Waste Reduction/ Prevention & Recycling (continued)	June 24, 2008
Collection & Transfer (Chapter 5)	July 22, 2008
Alternative Technology & Disposal (Chapter 6)	September 23, 2008
Alternative Technology & Disposal (continued)	October 28, 2008
Collection &Transfer (continued)	November 25, 2008

Administration & Enforcement (Chapter 7)	January 27, 2009
Processing & Recycling (Chapter 4)	February 24, 2009
Executive Summary & Implementation Schedule	March 24, 2009
Special Public Hearing - Draft SWMP Update Review	April 28, 2009
General Discussion	October 27, 2009
General Discussion & Motion for Approval	November 24, 2009

Board of Commissioners Work Sessions - These meetings, public noticed and open to the general public, were held to foster discussion and receive comments from the Board of Commissioners.

August 25, 2008

January 27, 2009

January 14, 2010

Board of Commissioners Public Hearing – This public hearing was held before the Board to present the recommendation of the Solid Waste Management Advisory Council that the Board adopt the Plan.

January 20, 2010

Disposal Alternative Workshop (South Salem High School) – This special workshop focused on the status of Alternative Technologies used to process and dispose of solid waste that is not recycled. It included a review of the current Waste to Energy Facility (WTEF) and a comprehensive review of the status of other technologies that could be an option for Marion County. The information assembled for this workshop is presented in Appendix A of the SWMP Update

Alternative Technology and Disposal Workshop	September 22, 2008

League of Women Voter Forums (3)

1. Waste Reduction/Recycling	January 22, 2009
2. Disposal Options (Included WTEF & Alternative Technology)	February 26, 2009
3. Draft SWMP Update	March 26, 2009

Presentations of Draft Final Plan to City Councils

City of Salem	May 11, 2009
City of Woodburn	June 8, 2009
City of Stayton	July 6, 2009
City of Keizer	August 10, 2009

Public Workshops on Draft Final SWMP Update

City of Salem (part of SWMAC meeting)	April 28, 2009
City of Stayton	June 11, 2009
City of Woodburn	June 18, 2009