SCS ENGINEERS

FINAL REPORT

Solid Waste and Recycling Management Plan

Presented to:

Municipality of Skagway

P.O. Box 415
Skagway, Alaska 99840
(907) 983-2297

Presented by:

SCS ENGINEERS
2405 140th Avenue NE, Suite 107
Bellevue, Washington 98005
(425) 746-4600

February 28, 2013
File No. 09212033.00

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ABBREVIATIONS AND ACRONYMS

ACME	Acme Transfer
AD	Anaerobic Digestion
ADEC	Alaska Department of Environmental Conservation
ADLWD	Alaska Department of Labor and Workforce Development
APES	Alaska Pacific Environmental Services
AML/L	Alaska Marine Lines/Lynden Transport
Arrow	Arrow Refuse
Capitol	Capitol Disposal
CBJ	City and Borough of Juneau
C&D	Construction and Demolition
Committee	Recycling Committee
CWS	Community Waste Solutions
DRC	Gustavus Disposal and Recycling Center
EPA	U.S. Environmental Protection Agency
EPP	Environmentally Preferable Purchasing
HFR	Haines Friends of Recycling
HHW	Household Hazardous Waste
KGRNHP	Klondike Gold Rush National Historical Park
MOS	Municipality of Skagway
MRF	Materials Recovery Facility
MSA	Master Services Agreement
MSW	Municipal Solid Waste
NPS	National Park Service
PILT	Payment in Lieu of Taxes
Plan	Comprehensive Plan
PM	P&M Recycling
PSI	Product Stewardship Institute
PWD	Skagway Public Works Department
Raven	Raven Recycling Society
RCA	Regulatory Commission of Alaska
RFP	Request for Proposal
SCS	SCS Engineers
SEASWA	Southeast Alaska Solid Waste Authority
SOA	State of Alaska
STC	Skagway Traditional Council
SWRMP	Solid Waste and Recycling Management Plan
USFS	United State Forest Service
WMI	Waste Management, Inc.
WPYR	White Pass and Yukon Route Railroad
YT	Yukon Territory

EXECUTIVE SUMMARY

The purpose of the Solid Waste and Recycling Management Plan (SWRMP) is to develop a long-range strategic plan for solid waste management including recycling. This effort took into consideration the significant challenges that the Municipality of Skagway (MOS) has in meeting local needs due to its small population and geographic location in Southeast Alaska. Mayor Stan Selmer established a Recycling Committee (Committee) to help assist this effort. SCS Engineers (SCS) was subsequently engaged by the MOS in September 2012 to help assist the Committee during the course of the SWRMP. This SWRMP is designed to summarize SCS' findings and recommendations and, with direction from the Committee, outlines a strategic roadmap for the MOS's solid waste and recycling program.

OUTLINE OF THE SWRMP

A brief section-by-section overview of the following sections in the SWRMP is provided below:

- Section 1 provides a general introduction to the SWRMP.
- Section 3 consists of a summary of the existing solid waste system in MOS including its solid waste collection program, operation of the Incinerator, and financial program.
- Section 4 describes the results of three public opinion surveys undertaken by the Committee as part of this study.
- Section 5 presents the results of a waste composition study conducted to characterize the MOS solid waste stream delivered to the Incinerator.
- Section 6 provides an overview of recent trends in solid waste management and recycling across the United States.
- Section 7 reviews other solid waste and recycling programs in the region including Whitehorse, in the Yukon, Canada, Haines AK, Gustavus, AK, Juneau, AK and the Southeast Alaska Regional Solid Waste Authority.
- Section 8 provides a general overview of the potential recycling markets for the MOS and transportation costs.
- Section 9 provides an overview of the potential options for the MOS in terms of improved solid waste collection and disposal and enhancement of recycling.
- Section 10 presents findings and recommendations of the study team and the Committee.
- Section 11 provides a series of references used in completion of this study.

PAST PLANNING EFFORTS

The MOS has had an active solid waste planning program dating back to 1988 when its first solid waste plan was developed. At that time, the impact of the cruise ships visits and RV campers on the community's waste generation rate was starting to reveal itself. The report recommended that the MOS develop a new landfill to replace the 3.5 Mile Landfill. At the time, the facility was operated as a "burning landfill" causing a plume of smoke to drift up and down the Skagway valley as trash was being burned.

In 1991, the MOS commissioned a study to further evaluate recycling options as a means to divert solid waste from the landfill. This report detailed existing recycling efforts within the MOS and identified MOS's remote location and the high costs of recycling and transporting material to markets as key barriers to recycling.

In October 1993, the MOS constructed a lined landfill (6 Mile Landfill) that had a projected life expectancy of three to five years. Although the site had an aggressive cover program, problems with wind-blown debris still existed. Furthermore, the growth of residential developments in the area minimized the appeal of expansion at this site and reduced the MOS's enthusiasm for continuing sanitary landfilling as the disposal method of choice. These problems were exacerbated by a shortage of flat land within Skagway for solid waste disposal purposes. Additionally, in 1996 the Alaska Department of Environmental Conservation (ADEC) promulgated new regulations designed to promote recycling and regional approaches at larger communities, further reducing the interest in landfilling.

After several years, the MOS undertook a cost analysis of various options, including landfilling, baling, shipping of wastes, and incineration and elected to pursue a combination of incineration with an "aggressive recycling program" to reduce the volume of material landfilled. In 1996, the MOS hired a consulting firm to compile a list of options and their associated 10-year costs, to address long-term solid waste planning needs. Based on this report and its findings, the Assembly made a decision to incinerate solid waste and dispose the ash in a lined ash landfill, to be constructed adjacent to the facility. The MOS issued a RFP in February 1997 for services related to the permitting, design, engineering, and construction oversight of a thermal oxidation system. The Incinerator went online in 1998.

Lastly, the 2020 Skagway Comprehensive Plan (Plan) was adopted by the Assembly. The latest Plan update builds upon findings and recommendations contained in the Municipality's 1988 and 2008 Comprehensive Plan updates. While providing a brief commentary on the current status of the Municipality solid waste system, the Plan lists a number of goals and implementing actions related to solid waste management issues, specifically to recycling. The goals and the implementing actions are intended to be accomplished during the next decade. The SWRMP builds upon these recommended actions.

CURRENT SOLID WASTE COLLECTION AND DISPOSAL PROGRAM

The MOS has progressed from operating a series of open dumps on the road to Dyea to the construction and operation of a small municipal waste combustor (Incinerator).

Collection

The Skagway Public Works Department (PWD) provides residential and commercial collection services using municipal employees. Two full-time employees are assigned to solid waste collection and Incinerator operation. Residential pickup service, using rear-loader trucks, is once per week, with commercial dumpster and garbage can service three or more times per week. Many businesses close during the winter months resulting in either a suspension of service or a reduced frequency of collection for these businesses.

A long-term waste collection problem in Skagway are bear-related complaints related to overturned residential cans and unlatched commercial dumpsters. Similar to many areas that are located near traditional bear pathways or are adjacent to bear habitat, Skagway has experienced the problem of bears becoming conditioned to eating garbage.

Financial System

The MOS tracks its residential and commercial accounts and then bills its customers quarterly along with municipal sewer and water charges. The last evaluation of customer rates and fees was conducted in 2005. The most recent quarterly billing reveals that Skagway has 125 and 394 commercial and residential accounts, respectively. The most recent FY 2012 budget indicates that MOS relies on a transfer from the Alaska Excise Tax to fully fund the approved solid waste budget. Further, funds from the Sales Tax Fund are used to pay 100% of the annual debt service for the Incinerator ($120,934).

Disposal

Since its construction in 1988, the community has depended on the municipal-owned Incinerator for its waste disposal needs.

Pursuant to its air quality permit from the State of Alaska (Permit 9711- BA 002), the facility is permitted to combust a maximum of eight tons per day. Currently, the Incinerator is operated three to four days a week during the summer season (May to September) and one to two days a week during the winter months (October to April). Based on current statistics, the MOS incinerates about 1,100 tons of wastes per year. The Incinerator has had a major replacement of refractory brick and duct work in 2012.

The MOS and STC operate a series of household hazardous waste and E-waste collection events within the MOS to prevent these materials from being incinerated and to promote recycling.

Recycling

There are several public and private recycling efforts underway in the MOS. PWD provides a mobile dumpster outside the Public Works Yard to collect aluminum cans and glass bottles. Once full, the dumpster is transported to the Incinerator where the materials are separated for further processing. An aluminum can flattening system is used at the Incinerator to flatten the cans into 25-pound “bricks”, which enables the cans to be stored for eventual delivery to recyclers outside of Skagway. Cardboard delivered to the Incinerator is compacted and eventually transported to markets in Seattle.

The Municipality Recreation Center also sponsors an annual community rummage sale event where Skagway residents' unwanted household items are collected and sold for reuse. Leftover items considered to be in excellent condition are boxed and transported to the Salvation Army in Whitehorse. Remaining items are taken to the Incinerator for disposal.

The PWD operates a yard debris disposal site in the Seven Pastures area. Individual generators self-haul their vegetation wastes for free. The PWD does not have a formal composting program, although it attempts to chip and mulch the materials with existing Municipality equipment. The eventual product is given away for free to city residents.

PUBLIC OPINION SURVEYS

Three distinct public opinion surveys were developed jointly by SCS and the MOS Recycling Committee and deployed from September to December 2012. The purpose of these surveys was to obtain information from Skagway businesses and residents. The target audience for the business survey (roughly 200 potential respondents) was private businesses of varying sizes located throughout the MOS, as well as local government offices. The residential survey (roughly 400 potential respondents) targeted customers receiving quarterly utility bills from the MOS. The Committee also made the surveys available at public areas such as City Hall and the library.

The overall results of three surveys indicate that residents and business owners in Skagway are already recycling in a significant way. Additionally, as the surveys indicate, many are going to considerable lengths to recycle (e.g., driving several hours to Whitehorse, or carrying recyclables on the Ferry, etc.) with 41 percent of residential respondents indicating they carry their recyclables to Whitehorse to recycle. Furthermore, those who recycle a little bit, or not at all indicate they would do more if it was more convenient; there is overwhelming support for the development of a recycling center in Skagway. Therefore, the following conclusions can be made:

- A centrally located recycling "convenience center" would promote more participation from both citizens and businesses. The convenience center would need to be downtown, or close to downtown, as several responses indicated that the Incinerator is too far away to take recyclables.

- A recycling education and outreach program is essential to increasing recycling rates. Even now, a considerate amount of both business and residential respondents stated they currently do not know where or what to recycle.

WASTE COMPOSITION STUDY

As part of this study, SCS conducted a waste composition analysis of waste generated in the MOS. The primary objectives of the analysis were as follows:

- To estimate types and quantities of recyclable and compostable waste components in the residential waste stream; and

- To identify opportunities for greater waste stream diversion

Exhibit 1 summarizes the overall composition of the waste stream (residential and commercial). The results showed that a significant portion of the waste stream is compostable or recyclable. Some materials, such as Wax Coated Paper, Other Glass, and Plastic Film (largely plastic bags and packaging), are considered trash since these materials do not currently have obvious markets for recycling or composting.

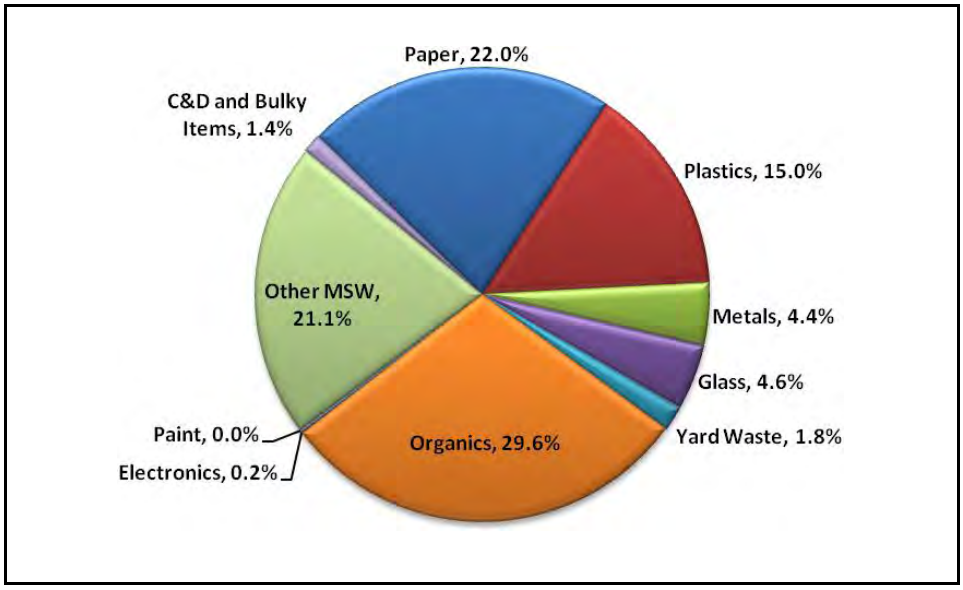

Exhibit 1. Overall Waste Composition

The largest diversion opportunities (by weight) for the MOS are capturing recyclable paper and composting organics (Exhibits 2 and 3) . According to the waste characterization, approximately 67 percent of the overall waste stream is considered recyclable or compostable. Compostable materials such as food waste were more prevalent in the commercial waste stream, and some recyclable materials such as paper were more prevalent in the residential waste stream.

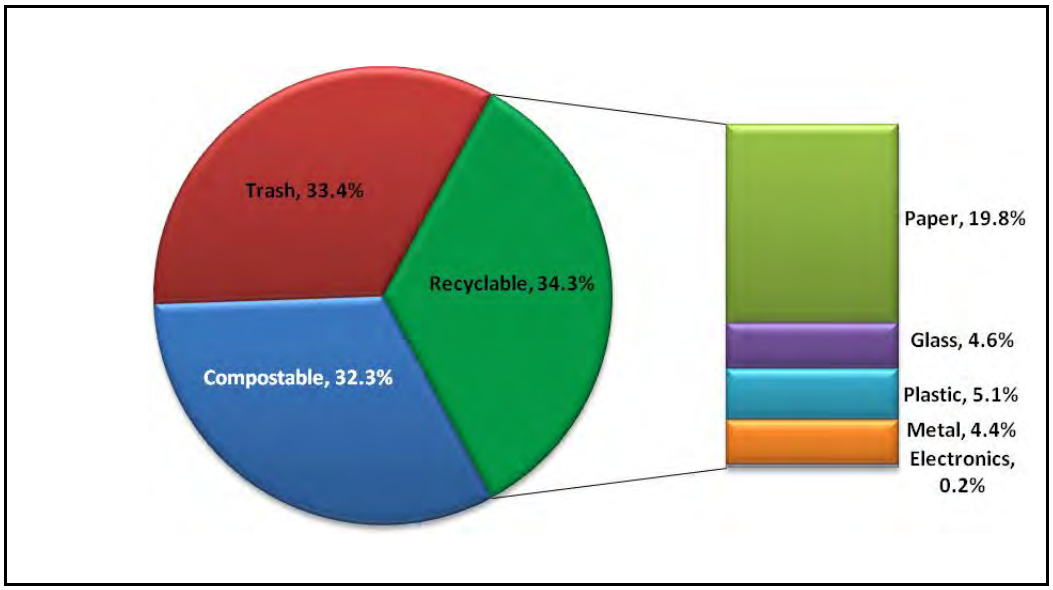

Exhibit 2. Recyclable Diversion Opportunities – Overall Waste Stream

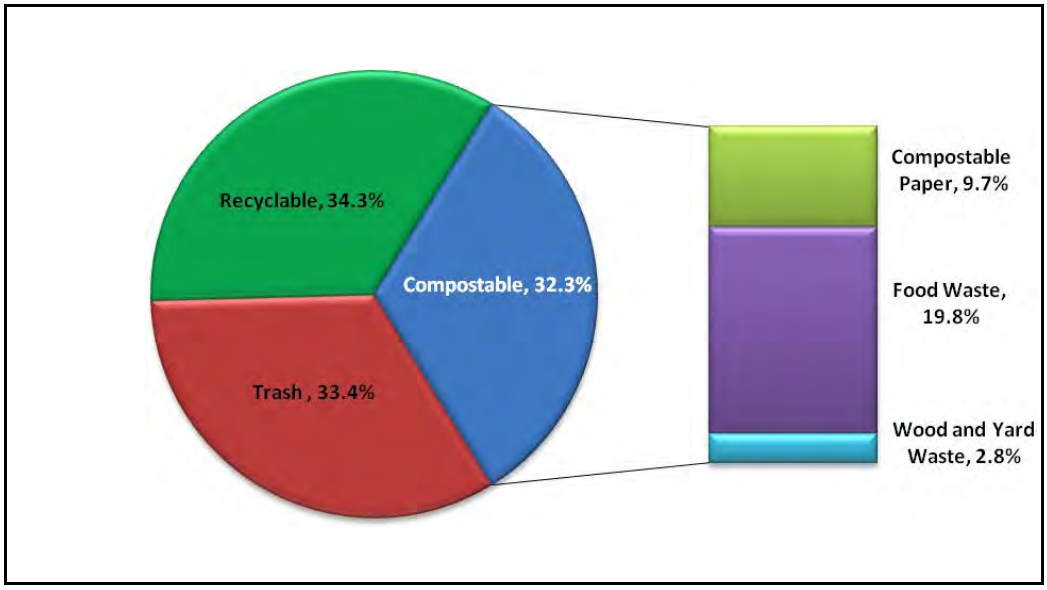

Exhibit 3.Composting Diversion Opportunities – Overall Waste Stream

NATIONAL SOLID WASTE TRENDS

The SWRMP reviews a variety of national solid waste and recycling trends. These include waste reduction, source separation of recyclables, and composting as well as Green Purchasing programs that have been implemented by communities similar to size and demographics to the

MOS. Other newly emerging waste conversion systems, such as plasma-arc gasification and anaerobic digestion, are being considered by many communities in North America, but they are not yet cost-effective or proven at the levels of solid waste generated by the MOS. The MOS should continue, however, to monitor these technologies as more communities implement facilities using these technologies over the next decade.

REGIONAL WASTE AND RECYCLING MARKETS

The MOS is remote, and transportation costs to move collected solid waste or recyclables to markets in the Lower 48 are substantial. Nonetheless, our research showed many communities in the Yukon and in Southeast Alaska where waste reduction and recycling programs are currently successful, providing cost-effective solutions to their customers. MOS can benchmark these operations as its own recycling and composting programs are developed to gain valuable "hands-on" lessons to avoid potential operational difficulties.

Currently, the MOS has two viable markets for the sale of collected recyclables – one by land and one by water. The first option involves transporting recyclables to recyclers in Whitehorse; the second involves transporting recyclables to Seattle using AML/L. A Pro Forma economic model was constructed to help evaluate these potential business arrangements. One of the first steps in implementing a comprehensive recycling program involves negotiating a long-term transportation and recyclables processing arrangement with a potential partner.

RECOMMENDED PROGRAMS

The SWRMP included a comprehensive assessment of the MOS's long-term solid waste disposal needs. A series of six different program scenarios were developed with the assistance of the Recycling Committee. Each option was evaluated against five criteria:

- Promotes waste reduction, recycling, and/or composting.
- Supports a sustainable solid waste management system.
- Complies with and supports State solid waste laws, regulations and goals as well as goals in the Comprehensive Plan.
- Provides cost-effective, efficient services and programs.
- Enhances regional cooperation, education, and communication efforts.

SCS recommends that "Scenario 5" in the SWRMP be adopted and implemented by the Assembly. This scenario requires the planning and eventual construction/operation of a recycling center, compost facility, solid waste transfer facility, and the eventual closure of the Incinerator. This program is in line with the mandates of the 2020 Comprehensive Plan and offers the community a cost-effective, long-term and sustainable solid waste solution.

SCS recommends that the Assembly adopt the following 10 implementation actions:

1. Approve the SWRMP.

2. Enact a resolution establishing recycling goals (50% recycling and composting rate by 2016) and to provide overall direction for this new program.

3. Initiate negotiations with a solid waste/recyclables service provider for the transport and processing of recyclable and solid waste not recycled or composted.

4. Create a permanent Solid Waste Advisory Committee to address required policy guidance to the PWD and the Assembly on the development of new facilities, programs, public education, revisions to the Municipal Code, budgets, and development of an annual work plan.

5. Hire a permanent full-time or part-time employee within the PWD to manage the day-to-day direction of this new program, develop the public education program, and assist in preparing grants to help fund future capital improvements.

6. Institute and perform a solid waste rate study for FY 2013/2014.

7. Conduct a life-extension study for the Incinerator to help quantify current operating conditions and future MOS equipment renewal and replacement needs.

8. Conduct a solid waste collection feasibility study to evaluate the need for new collection vehicles and containers.

9. Initiate a green purchasing program for MOS governmental departments.

10. Conduct a solid waste facilities master plan which will finalize site locations, feasibility, and designs with the assistance of a consulting engineering company with experience in these fields.

1 INTRODUCTION

This section briefly reviews the purpose of this study, general demographics of the area, and history of past solid waste studies for the community.

PURPOSE OF THE STUDY

According to a 2008 Community Opinion Survey performed by the McDowell Group as part of the 2020 Comprehensive Plan[1], there is more support for developing a comprehensive solid waste management and recycling program than any other municipal project. This echoes the results from a similar 1998 Community Opinion Survey that was undertaken as part of the Municipality of Skagway (MOS) 1998 Comprehensive Plan process. As this section will demonstrate, the MOS has had a long history of solid waste planning initiatives dating back to the 1970s as the community embarked on efforts to transition from raw landfilling to waste incineration. These initiatives culminated with the construction and operation of a waste incinerator in 1998. Over the years, the community has had several evaluations of an expanded solid waste recycling program.

The purpose of the current plan (SWRMP) is to develop a long-range, strategic plan for solid waste management[2] including recycling. This effort will take into consideration of all the significant challenges that the MOS has in meeting local needs due to its small population and geographic location in Southeast Alaska. The MOS received a grant from the State of Alaska (SOA) to assist in this planning effort. Mayor Stan Selmer established a Recycling Committee (Committee) to help guide this effort. SCS Engineers (SCS) was engaged by the MOS in September 2012 to help provide guidance to the Committee during the course of the study. This Plan is designed to summarize our firm's findings and recommendations and outlines a strategic roadmap for the MOS's solid waste and recycling program.

THE MUNICIPALITY OF SKAGWAY

Location

The MOS (Exhibit 4) is a small borough in a beautiful and rugged area with a rich history steeped in the 1898 Klondike Gold Rush era. Located at the northern end of Southeast Alaska's "Inside Passage", connected to Lake Bennett by the White Pass and Yukon Route Railroad (WPYR), and its Klondike Highway connection through Canada to the rest of Alaska and the Yukon enables the municipality to attract almost one million cruise ship visitors per year.

[1] Comprehensive Plan completed in 2009 as the 2020 Comprehensive Plan.
[2] The solid waste industry defines municipal solid waste to include garbage, rubbish refuse, recyclables, special waste, and other discarded materials collected from residential, commercial, and governmental operations, Skagway also incinerates municipal solid waste, some medical waste and sewage sludge (biosolids). The latter two items are not included in the traditional definition of municipal solid waste.

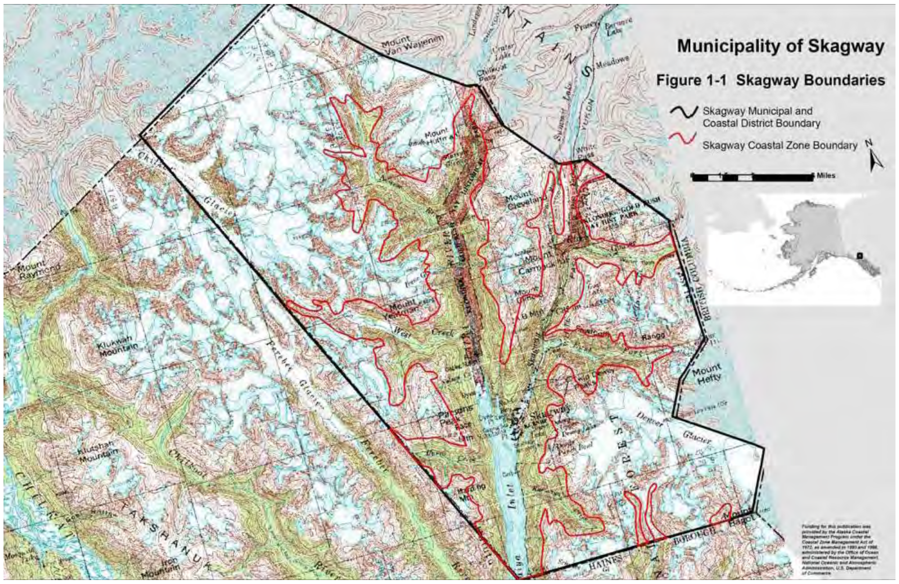

Exhibit 4. Municipal Boundaries

Community Demographics

According to the most recent census, the Alaska Department of Labor and Workforce Development (ADLWD) has determined that Skagway's 2010 population is 968, just slightly higher than it was in 1910 (Exhibit 5). During the Klondike Gold Rush in 1889, estimates are that Skagway's population was nearly 10,000. However, when the gold rush era came to an abrupt end at the turn of the last century, Skagway experienced a steep population decline. As noted in the Comprehensive Plan (Plan), the community's population dropped as low as 490 in the 1920s and 30s.

Construction of the Klondike Highway in the 1970s, restoration work by the National Park Service (NPR) of the Klondike Gold Rush National Historical Park[3], reopening of the WPYR to cater to visitors[4], the shipment of the FARO Mine ore through the Port of Skagway, and the inclusion of Skagway on cruise ship visitations stimulated population growth and tourism-related employment. From 1970 to 1980 population of the MOS grew close to 14 percent (annual increase of 1.2 percent). During the 1990s, annual growth increased to 2.2 percent.

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3 Klondike Gold Rush National Historical Park is a United States National Historical Park commemorating the Klondike Gold Rush of the late 1890s. The gold rush was in the Yukon Territory, and this park comprises staging areas for the trek there, and routes leading in its direction. The park was established in Skagway in 1976.

4 Built in 1898 during the Klondike Gold Rush, this narrow gauge railroad is an International Historic Civil Engineering Landmark, a designation shared with the Panama Canal, the Eiffel Tower and the Statue of Liberty. The WPYR closed in 1982 because of the opening of the Klondike Highway and declines in Yukon mining. It reopened in 1988 as a seasonal tourist operation.

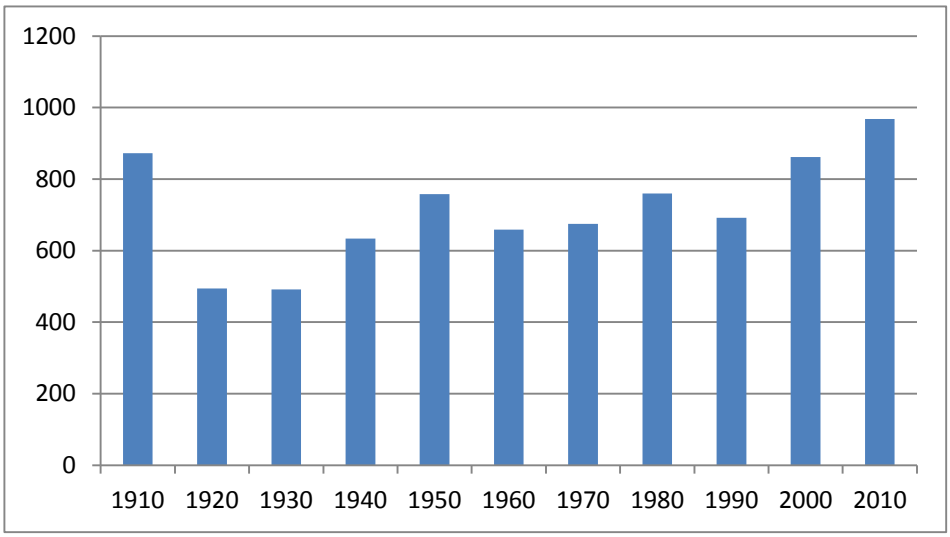


Exhibit 5. Skagway Population 1910-2010
Source: ADLWD, 2010.

In addition to its official population reported in the 2010 Census of 968, MOS experiences a significant influx of tourism-related summer employees, which is estimated to double or even triple the city's year-round population.

Population projections for the MOS have been developed by the State of Alaska using models which take into account anticipated births, deaths, and in-migration into the Borough. These are shown in Exhibit 6 for the period of 2010 to 2035 for each five-year increment.

Exhibit 6. Municipality Population Projections, 2010-2035

Year	Population
2010	968
2015	1,018
2020	1,064
2025	1,100
2030	1,111
2035	1,126

Source: ADLWD, 2012

Quality of Life

As described in the introduction to its Comprehensive Plan, the MOS is a small city located in a rugged area of southeast Alaska. The MOS exhibits a rural lifestyle during the winter months punctuated with the hustle bustle of tourists during the summer months. Community opinion surveys conducted by the MOS clearly show that the residents value the small town atmosphere in Skagway where there is time for family and friends, a feeling of relative safety, the ability to make a decent living, and easy access to the area's outdoor recreation opportunities. Issues that the community is or will have to deal with include the following: the demands for the one

million visitors during the summer, the need for more year-round employment, an aging permanent population, and access to medical care and housing.

Economy

The MOS's summer tourism-based economy (May through September) over the past 20 years has been very strong enabling it to generate significant revenue from sales tax and tourism taxes to fund a wide variety of capital improvement projects. In fact, the Municipality ranks 3rd highest in Alaska in per capita tax revenue. The MOS's total 2011 tax revenue of $8.1 million yields a per-person revenue of approximately $8,400. Three-quarters of the Municipality's tax revenue comes from its sales tax levies (5 percent in summer and 3 percent in the winter).

HISTORY OF SOLID WASTE MANAGEMENT IN SKAGWAY

The MOS has progressed from operating a series of open dumps on the road to Dyea to the construction and operation of a small municipal waste combustor (Incinerator). Not unlike many communities in the United States, the MOS operated a municipal dump for many years with open burning with eventual cover with imported cover materials.

Hansen Engineering Report

Hansen Engineering Inc (Hansen) was engaged by the MOS in 1988 to help develop its first major solid waste management plan. At the time of the report, the impact of the cruise ships visits (242,959 in 1988) and RV campers on the community's waste generation rate was starting to reveal itself. The report builds upon earlier capital improvement studies undertaken by the MOS to evaluate its waste disposal options (landfilling, incineration, and export of waste). The following reports were included in this evaluation:

- Municipal Improvements, Quadra Engineering, 1982
- Coastal Land Management Study, Kramer, Chin, and Mayo, Inc., 1981

Briefly, the report reviews the early history of Skagway's solid waste landfill program, its possible development of alternative landfill sites (Taiya Valley, Yakutania Point, Northeast of Reid Creek, and Northeast of Liarsville Camp Ground), and possible incinerator locations downtown in the wastewater plant building or the old high school, Taiya Valley, U.S. Forest Service lands along the Klondike Highway, and northeast of Liarsville.

The report details possible options for the MOS including the further development of a new landfill, shipping Municipality waste to Carcross, Haines, Juneau, or Whitehorse, and transporting waste via barges to remote landfills in Washington and Oregon. The report recommends that the MOS develop a new landfill to replace the 3.5 Mile Landfill, which was operated at that time as a "burning landfill" causing a plume of smoke from burning trash drifting up and down the Skagway valley. The report provides a thorough analysis of the pros and cons of the possible new landfill locations, incineration, as well as the other out-of-area disposal options**.** It is interesting to note that no discussion is included in the entire report on possible recycling options for Skagway.

Based on its analysis, Hansen recommended that the MOS proceed on a landfill option (a site northeast of Liarsville) because, in their opinion, this option was considerably less expensive than the other alternatives:

- The MOS would not be vulnerable to actions by a third-party not under control of the City (e.g., Alaska Marine Highway System or the City of Whitehorse).
- With the export options, the City would still need a location for storage of junked cars and bulky unburnables such as demolition debris.
- Incineration would cost almost twice as much as landfilling with a greater likelihood that the costs provided were underestimated (by Hansen) as opposed to a "simple" landfilling operation.

1991 Recycling Study

The MOS issued a Request for Proposal (RFP) in October 1990 for consultants to review Municipality options for recycling. A local group made up of three individuals (Gary Hanson, Mike Sica, and Marnie Chapman) won the bid to conduct the recycling study.

Briefly, their report provides the following information for the MOS to consider at that time:

- Recycling efforts by local businesses (details recycling efforts by 20 local business, the City, and local organizations (Boy Scouts))
- Estimated volumes of wastes generated (750 annual tons)
- Estimated amounts of Skagway recyclables based on national and regional statistics
    - Paper Products 42%
    - Other 14% (wood wastes, leather, textiles, unknown)
    - Yard Wastes 10%
    - Food Wastes 10%
    - Glass 9%
    - Metals 9%
    - Plastics 7%
- Collection of recyclables (commingled versus segregated collection, central collection versus curbside collection)
- A cost comparison of a processing and/or Drop Off Facility
- Possible regional cooperation

The study provided a cost comparison (lowest to highest) for the following alternatives considered by the study team at that time:

- Delivery by individual generators of comingled recyclables to a drop off facility to be constructed at the Old High School ($6,900)
- Delivery by individual generators of segregated recyclables to a drop off facility to be constructed at the Old High School ($9,200 - $20,125)
- Delivery by individual generators of segregated recyclables to a drop off facility to be constructed at the Sewage Treatment Plan ($10,753 - $22,770)
- Comingled collection of recyclables by City personnel to a drop off facility to be constructed at the Old High School ($27,600)
- Curbside collection of segregated recyclables for delivery by City personnel to a drop off center to be constructed at the Old High School Gym ($28,750 to $33,925)

Request for Proposals (RFP) for Thermal Oxidation System

In October 1993, the MOS constructed a lined landfill (6 Mile Landfill) that had a projected life expectancy of three to five years. However, the growth of residential developments in the area minimized the appeal of expansion at this site. In addition, difficulties with wind and vector carried debris, in spite of an aggressive cover program, had reduced the Municipality's enthusiasm for continuing sanitary landfilling as the for disposal choice of solid waste. These problems were exacerbated by a shortage of flat land within Skagway for dedication of solid waste disposal. Further, in 1996 the Alaska Department of Environmental Conservation (ADEC) promulgated new regulations designed to promote recycling and regional approaches at larger communities. These new regulations also put pressure on landfills like Skagway's that attracted animals and/or created air and water pollution problems.

After several years, the MOS undertook a cost analysis of various options, including landfilling, baling, shipping of wastes, and incineration and elected to pursue a combination of incineration with an "aggressive recycling program" to reduce the volume of material to be landfilled. Four sites were identified for the incinerator:

- 6 Mile Landfill
- 3.5 Mile Landfill
- Waterfront site west of the Ore Terminal
- White Pass Tank Farm

In 1996, the MOS hired a consulting firm to compile a list of options and their 10-year costs to help the Assembly decide long-term solid waste planning options. Based on this report and its findings, the Assembly made a decision to incinerate solid waste and dispose of ash into a lined ash landfill, which would be constructed adjacent to the facility. While landfill was the least expensive option, the Assembly decided that the MOS no longer wanted to deal with the bear and litter control problems at the 6 Mile Landfill. The most expensive option was to ship solid waste south to landfills in Washington and Oregon. The decision to go forward with the

incineration project was made in order to protect autonomy, as well as to have a solution that was environmentally sound.

At that time, an October 1, 1996 letter from the MOS City Manager to the U.S. Forest Service (USFS) urged the agency to consider the municipality's request for available Federal land at the potential 6 Mile site for construction and operation of an incinerator. This request was granted after the MOS agreed to investigate recycling and to encourage it as an augmentation of its solid waste disposal program.

With that agreement in place, the MOS issued a RFP in February 1997 for services related to the permitting, design, engineering, and construction oversight of a thermal oxidation system. The Incinerator went online in 1998.

2020 Comprehensive Plan Update

The 2020 Skagway Comprehensive Plan (Plan) was adopted by ordinance by the MOS Borough Assembly. This latest update builds upon findings and recommendations contained in the Municipality 1988 and 2008 Comprehensive Plan updates. While providing a brief commentary on the current status of the Municipality solid waste system, the Plan lists a number of goals and implementing actions which relate to solid waste management issues, specifically to recycling, which the community would like to accomplish during the next decade. These are listed in the paragraphs below matching the Plan chapter in which they are presented:

- Section 10.0 Utilities
    - Goals:
        - 10.2 Continue to provide safe and environmentally sound solid and hazardous waste disposal that does not adversely impact air, land and water quality.
        - 10.3 Support and expand the municipal bio-fuel generation program.
        - 10.4. Plan and budget to reline the incinerator stack and provide for other regular maintenance.
        - 10.5 Identify a new ash fill site.
        - 10.6 Complete close-out and remediation actions for the former landfill site at 4 Mile Dyea Road.
        - 10.7 Analyze the best long-term plan for solid waste disposal. Investigate capital and operating costs and environmental implications of continued incineration (a new incinerator will eventually be required), shipping out solid waste, opening a new landfill site, participating in a regional solid waste solution, and newer incinerator/co-generation options.
    - Implementing Actions:

- ***A. Maintain recycling collection stations.***
- ***B. Assist public works and organizations in investigating markets for recyclables; do not exclude Whitehorse and Canadian markets from consideration; team with Haines as appropriate.***
- ***C. Replace Styrofoam and other non-recyclable materials used in Borough facilities with recyclable products where feasible.***
- ***D. Create incentives for businesses that implement a waste reduction plan.***
- ***F. Provide public education and publicity to enlist community efforts to prevent bears from gaining access to garbage.***
- ***G. Institute a program to require a construction and use of bear-proof garbage/recycling storage facilities in proper locations for all new developments. Retrofit municipal waste disposal containers. Require existing buildings and dwellings to come into compliance over time.***

McDowell Group Public Opinion Survey

As part of the Comprehensive Plan update in 2010, the McDowell Group conducted a survey of Skagway residents. This random telephone survey (307 residents, maximum margin of error at the 95 percent confidence level +-4.3 percent). This survey asked whether they supported or opposed the Municipality financially supporting a wide variety of projects. Among the projects gaining the strongest support included improving Skagway's recycling program with 90 percent supportive of this proposed program with only seven percent voicing opposition.

OUTLINE OF THIS PLAN

A brief section-by-section overview of the following sections in this Plan is provided here:

- Section 2 consists of a summary of the existing solid waste system in Municipality of Skagway including its solid waste collection program, operation of the Incinerator, and financial program.
- Section 3 describes the results of three public opinion surveys undertaken by the Recycling Committee as part of this study.
- Section 4 presents the results of a waste composition study conducted by the SWRMP team to characterize the MOS solid waste stream delivered to the Incinerator.
- Section 5 is designed to provide an overview of recent trends in solid waste management and recycling across the United States.

- Section 6 reviews other solid waste and recycling programs in the region such as Whitehorse, in the Yukon, Canada, Haines AK, Gustavus, AK, Juneau, AK and the Southeast Alaska Regional Solid Waste Authority.

- Section 7 is designed to provide a general overview of the potential recycling markets for the MOS and transportation costs.

- Section 8 provides an overview of the potential options for the MOS in terms of improved solid waste collection and disposal and enhancement of recycling.

- Section 9 presents findings and recommendations of the SWRMP team and the Recycling Committee.

- Section 10 provides a series of references used in completion of this SWRMP.

2 CURRENT SOLID WASTE SYSTEM

This section briefly reviews the operation of the existing solid waste system.

SOLID WASTE COLLECTION

The Skagway Public Works Department (PWD) is responsible for solid waste, wastewater, potable waste, grounds keeping, and roads and streets. Currently, the PWD has seven full-time employees as well as two summer positions to accomplish these tasks.

The PWD provides residential and commercial collection services using municipal employees. Two full time employees are assigned to solid waste collection (Exhibit 7) and incinerator operation. Residential pickup service is once per week, with commercial dumpster (Exhibit 7) and can service (Exhibit 8) three or more times per week. Many businesses, which close their businesses during the winter months, either suspend their service or reduce the frequency of collection.

Exhibit 7. Skagway Solid Waste Collection Truck

The collection routes typically start from the municipal waterfront area, north to the 23rd avenue bridge and to Dairy Road. Service on Klondike Highway includes the Alaska Department of Transportation maintenance shop, the Mt Vernon campground and RV areas, and the heavy construction and auto maintenance shops.

Currently, the MOS does not provide curbside or dumpster service for residences on Dyea Road. The MOS does, however, provide a communal dumpster, which is located near the 23rd Avenue Bridge, where waste is self-hauled by these residences.

A long-term, waste collection problem in Skagway are bear-related complaints related to overturned residential cans and unlatched commercial dumpsters (Exhibit 8). Similar to many areas that sit aside traditional bear pathways or are adjacent to bear habitat, Skagway has experienced the problem of bears becoming conditioned to eating garbage. Given a food reward, normally shy-bears become more and more comfortable around homes and people, which lead to conflicts with people and their property and oftentimes results in the death of the bear. The MOS has discussed the need to require bear-proof cans for its residential customers. The Skagway Traditional Council has already purchased types of residential receptacles for its members (Exhibit 9). As shown in Exhibit 10, most of the MOS commercial dumpsters are currently bear-proof.

Exhibit 8. Existing Can Service (Not Bear-Proof)

Exhibit 9. Typical Type of Bear-Proof Container

Exhibit 10. Municipality Commercial Dumpster with Bear-Proof Latches

ACCOUNTS AND FEES

The MOS tracks its residential and commercial accounts and then bills its customers quarterly along with municipal sewer and water charges. Exhibit 11 shows the current fees and charges for solid waste collection and disposal pursuant to the municipality's most recent rate resolution

(2005). The most recent quarterly billing (October 2012) reveals that Skagway has 125 and 394 commercial and residential accounts, respectively.

Exhibit 12 shows the proposed FY 2013 budget for the Municipality's solid waste system along with the approved FY 2012 and 2011 budgets. As noted, the budgets rely on a transfer from the Alaska Excise Tax to fully fund the approved budgets. Further, funds from the Sales Tax Fund ($120,934) are used to pay 100% of the annual debt service for the incinerator ($120,934).

Exhibit 11. Current Solid Waste Fees and Charges, City of Skagway

Account Classification	Quarterly Fees or Charges ($)
Residential:	
Weekly Service, One 30 Gallon Can *Weekly Service, Two 30 Gallon Cans*	69.36 108.96
Per Can In Excess of Two Cans Per Quarter	47.58
Dumpster Service Per Pickup	39.12
Dyea Dumpster	27.60
Commercial:	
One 30 Gallon Can *Two 30 Gallon Cans*	80.74 118.32
Per Can Excess of Two Cans Per Quarter	51.36
Dumpster Service, Per Pick Up	39.12
Ships/Vessels:	
Less Than 125 Passengers Per ½ Hour	366.00
More Than 125 Passengers Per ½ Hour	666.00
Dumping Fees:	
Minimum Tipping Fee At Incinerator (Up to Six Cans or One Cubic Yard) *Surcharge (Per Can in Excess of Six)* *Surcharge (Per Cubic Yard in Excess of One)*	12.00 3.60 14.40
Appliances, Furnaces	8.00
Automobiles	168.00
Tires *Per Tire* *Per Tire (Larger Than 20" Rim)*	 6.00 12.00
Dumpster Fees:	
Quarterly Dumpster Rental	*138.00*
Dumpster Purchase	*Actual Cost Plus Freight*
Repairs on Owned Equipment	*22.00/Hour + Parts*
Special or Extra Pick Up Service:	
2 Cubic Yard Minimum *In Excess of 2 Cubic Yard*	48.00 22.20

Source: City of Skagway, Resolution No. 05-15R, June 5, 2005.

Exhibit 12. Proposed FY 2013 Budget, City of Skagway

Item	FY 13 Adopted Budget	FY 12 Approved Budget	FY 11 Approved Budget
Revenue:			
Dumpster Leases	33,511	16,000	16,000
Recycling Revenue	6,934	7,000	7,000
Service Charges	400,000	400,000	400,000
Transfer From Excise Tax	293,493	173,594	269,514
Transfer From Sales Tax	50,000	0	0
Total Revenues	**783,938**	**596,594**	**692,514**
Expenses:			
Administration	9,000	9,000	9,000
Capital Outlay	14,000	13,000	33,000
Contractual	45,000	45,000	45,000
Employee Public Retirement	75,149	20,303	82,368
Employee Health Insurance	86,478	62,889	0
Solid Waste Salaries	157,586	133,861	132,536
Equipment	10,000	12,500	15,000
Hazardous Waste	20,000	25,300	25,300
Incinerator Repair & Maintenance	20,000	19,500	64,000
Insurance	12,425	12,425	12,375
Payments in Lieu of Taxes (PILT)	0	4,160	4,160
Recycle Expense	110,000	60,000	60,000
Repairs/Maintenance	19,000	6,865	26,000
Travel/Training	4,000	3,000	2,000
Utilities Incinerator	201,300	168,791	146,775
Landfill Closure	0	0	0
Total Expenses	**$783,938**	**$596,594**	**$692,514**

Source: Municipality of Skagway, 2012

ESTIMATED WASTE QUANTITIES GENERATED

The MOS does not have scales installed at the Incinerator to weigh municipal solid waste (MSW) or biosolids (sludge from the MOS wastewater treatment plant). However, the solid waste collection vehicle used to collect both residential and commercial waste incorporates an onboard scale, which is used to provide detailed daily weigh records at the end of each route before delivery to the Incinerator. Appendix A contains is the most recent annual summary of onboard truck scales (September 2011 – October 1, 2012). Added to this overall total are the waste quantities transported out of Skagway when the Incinerator was inoperative (due to the plant refractory installation) and an estimate of the biosolids tonnages delivered to the Incinerator during this same time period.

RECYCLING PROGRAMS

The following paragraphs briefly describe the current public and private recycling programs taking place in Skagway.

Aluminum Cans and Glass

PWD provides a mobile dumpster outside the Public Works Yard to collect aluminum cans and glass bottles (Exhibit 13). Once full, the dumpster is transported to the Incinerator where these materials are separated for further processing. A can flattening system is used at the Incinerator (Exhibit 10) to flatten the cans into 25-pound "bricks", which enables the cans to be efficiently stored for eventual delivery to aluminum markets outside of Skagway. Historically, the PWD ships these bricks for further recycling (Exhibit 14). The far left bin in Exhibit 10, labeled "ALUM", used to be labeled "TIN", but was changed to "ALUM" because the tin was not being recycled by the PWD and is incinerated. Glass is still being collected by the PWD as a way to divert glass into the landfill and bypassing the incineration process. Also, there is a bulb breaker at the Incinerator for proper disposal of ballast-style, fluorescent bulbs.

Exhibit 13. Aluminum Can Collection Dumpster at Public Works Yard

Biohazard Materials

Biohazard materials are collected and stored by the Health Clinic in a locked Biohazard Room (Exhibit 16). These materials are collected by the PWD and are combusted when the Incinerator is actively burned. In addition, the Fire Department issues free sharps containers for approximately 100 patients in Skagway, and their contents are ultimately burned at the Incinerator. When the containers are full, residents are able to trade them in for new ones at the PWD.

Exhibit 14. Can Flattening System at Incinerator

Exhibit 15. Flattened Aluminum Cans Stored in Incinerator Landfill

Exhibit 16. Biohazard Materials Collected at Skagway Clinic

Cardboard

Many businesses in Skagway recycle cardboard products (Exhibit 17). Corrugated cardboard is currently self-hauled by businesses to the Incinerator (Exhibit 17) where it is placed into an onsite Marathon compactor system for volume reduction. Once full, the PWD arranges for transport to a recycler in Seattle.

Exhibit 17. Cardboard Being Stored at Fire Department

Exhibit 18. Cardboard Delivered to Incinerator; Marathon Compactor in Background

E-Waste

The PWD collects E-Waste at the Incinerator year round, which in the past has been shipped to a licensed waste recycler in Seattle when sufficient quantities are collected for efficient shipment.

Over the past two years, the Skagway Traditional Council (STC) has conducted an annual collection program for electronics recycling in the MOS. The STC currently receives grant funds (Indian General Assistance Program) and donation of port fees, drop off and pick of full containers and shipment to Seattle by Alaska Marine Lines/Lynden (AML/L) to partially subsidize the program. Generators pay a flat charge of $0.25 a pound for materials delivered to the STC's facility at 253 11th Avenue in Skagway. The STC's recycler for the E-Waste is Total Reclaim, which is located in Seattle, Washington.

The STC has undertaken the E-Waste recycling event for the past two years and has developed a comprehensive event program (Exhibit 19), which details all the steps from advertising the event (via the Municipality, Chamber of Commerce, KHNS, and Skagway News), publishing the flyer, making the arrangements with AML/L, staging the event, weighing the E-Waste, placing the E-Waste on the corresponding pallet, and then preparing the items for shipment to AML/L. The 2012 community-wide event collected nearly 9,000 pounds of E-Waste, which includes E-Waste collected by the PWD at the Incinerator.

Exhibit 19. STC E-Waste Event Flyer

Food and Used Cooking Oils

For many years, the MOS has conducted a bio-fuel recycling program at the wastewater treatment plant, which was used as heating fuel. The PWD has equipment to help produce biodiesel but with ongoing construction at the wastewater plant, PWD has had to temporarily suspend this program. Another person in the Skagway area is also in the process of setting up his own biodiesel production business and has expressed an interest in obtaining the raw oils from the MOS. Also, a company in Whitehorse that currently produces biodiesel has expressed an interest in tapping into the resource.

Currently, restaurant owners/operators bring their used waste oil in five gallon pails and leave it at the plant. This oil is then dumped into larger plastic containers for transport outside of Skagway (Exhibit 20). The PWD currently has a total of approximately 2,400 gallons of oils in addition to "aged drums", which are located adjacent to the wastewater plant. Discussions with the PWD indicated that processing the older drums will involve a lot of time and labor to sort through to produce a usable volume for fuel conversion. With the summer tourism season at an end, PWD estimates that it has a total of 3,000 gallons of oil collected this past summer. If the local and regional interest in biodiesel does not solidify soon, PWD anticipates that the entire load will have to be shipped to Seattle recyclers at a cost of $3,300 in freight.

Exhibit 20. Used Fryer Oil Stored Near Municipal Wastewater Treatment Plant

Glass

Glass is another potentially recyclable commodity that is not currently being recycled in Skagway. Glass bottles, which are self-hauled by individual generators in Municipality, are currently being crushed and used as inert fill and cover in the Incinerator landfill (Exhibit 21).

Exhibit 21. Glass Bottles Crushed for Disposal in Incinerator Ash Monofill

Metals

A variety of different scrap metals are collected and stored at the Incinerator yard and scrapped vehicles stacked on 5th and Alaska Street near the airport, where they are stockpiled (Exhibit 22). Historically, the PWD has stored the metal until there is enough volume to transport by barge south to recyclers in Seattle.

Exhibit 22. Metals Stored in Incinerator Yard

Swap Shop and Community Sale

"Skagway Swap" was created by Ms. Kim Burnham as a way to encourage "collaborative consumption". It has been in existence for less than year (started January 2012) and currently, at the time of this writing, has 705 members on Facebook. It has diverted a significant number of items from the Incinerator.

The Municipality Recreation Center also sponsors an annual sale event where the staff sorts and displays materials for the day of the sale (Exhibit 23). Leftover items considered to be in excellent condition are boxed and transported to the Salvation Army in Whitehorse. Remaining items are taken to the Incinerator for disposal.

Exhibit 23. Skagway Community Garage Sale

Tires

Passenger and truck tires generated in the Municipality are currently delivered to the Incinerator where they are stored (Exhibit 24). Typically, the attendants pull a few tires from the pile and place them within the combustion chamber for each burn.

Exhibit 24. Tires Stored at Incinerator for Combustion

Office Paper

There is no active program in Skagway to collect and recycle office papers. However, in discussions with waste generators within the municipality, it appears that many collect and store their used office paper for transport to Raven Recycling in Whitehorse (Exhibit 25).

Exhibit 25. Office Paper Being Stored at the Municipality Health Clinic

Yard Waste

The PWD operates a yard debris disposal site in the Seven Pastures area (Exhibit 26). Individual generators self-haul their vegetation wastes for free. The PWD does not have a formal composting program, although it attempts to chip and mulch the materials with existing Municipality equipment. The eventual product is given away for free to city residents.

Exhibit 26. Yard Waste Delivered to Seven Pastures Site

INCINERATOR

After a long and involved planning process, the Incinerator was constructed in 1998 on a municipal-owned site at Mile 6 on Klondike Road (Exhibit 27). The total cost for the project for the Incinerator and landfill was $2.4 million, which was financed under a low interest loan from the ADEC. Up until that time, solid waste within Skagway was landfilled. However, due to increasing citizen complaints with the Municipality's landfill program, the Borough Assembly made the decision to finance, construct, and operate a small municipal waste combustion unit.

The Incinerator is a batch oxidation unit with a two primary combustion chambers and a single secondary combustion chamber. Pursuant to its air quality permit from the State of Alaska (Permit 9711- BA 002), the facility is permitted to combust a maximum of eight tons per day. Currently, the Incinerator is operated three to four days a week during the summer season (May to September) and one to two days a week during the winter months (October to April).

Briefly, waste is transported into the primary oxidation chambers using a small Bobcat which places waste or biosolids, and possibly some tires, onto movable conveyors. Once each chamber is fully loaded, the chamber lid is closed and combustion is initiated using diesel fuel oil which enables the chamber to reach approximately the 1,000 degrees F design temperature. Combustion is monitored by the attendants using a computer-monitored instrumentation system. After approximately 20 minutes of firing, the waste in the primary chamber begins burning and maintains its own fire. The diesel fuel is then shut off. The air distribution under the primary chambers allows for a starved air operation.

The exhaust gas from the primary chambers duct into a secondary afterburning chamber where gases reach about 1,650 to 1,850 degrees F for over one second. Gases are then vented through a stack to the atmosphere. When each burn is complete, the bottom part of the primary chamber is opened and the remaining ash is scooped up and placed into the lined (60 mil HDPE over a woven geotextile fabric cushion on a four-inch layer of sand) landfill cell, which is located

adjacent to the Incinerator (Exhibit 27). The leachate is typically pumped out of the storage ponds by the PWD staff and diverted to the MOS's wastewater plant for treatment and disposal (Exhibit 28).

A brief review of the plans for the landfill suggests that a significant portion of the permitted capacity has already been used. Diversion of unburnable or inert materials, such as ferrous/metals in the waste stream and glass bottles would enable the MOS to reserve a major portion of the remaining capacity for ash from the Incinerator. Further, expansion of the landfill in the future at the existing site would require construction of cells closer to the Skagway River that runs below it, posing a potential contamination risk.

Exhibit 27. Municipal Incinerator

As shown in Exhibit 27, the MOS has installed a roll-off self-contained Marathon compactor in one of the loading bays. This unit has an oversized feed opening designed to store and transport recyclables and solid waste. Currently, the unit is used to compact and store cardboard before sending these materials to market in Seattle using the Alaska marine ferry system. While the Incinerator was inoperable during its recent retrofit, this unit was used to store and compact MSW for delivery to landfills in the Lower 48.

The Incinerator also includes a small baler, which has been used in the past to bale aluminum cans. A review of the specifications for this equipment suggests that it would not provide enough processing capacity, should the MOS decide to enhance and enlarge its recycling program in the future.

Exhibit 28. Stormwater and Leachate at the Incinerator Landfill

The Skagway Incinerator was one of the first large thermal-oxidation units installed in Alaska by its manufacturer. As such, the facility has experienced several major operational issues. For example, the primary chambers of the unit were designed to burn at approximately 1,000 degrees F. However, either due to the large size of the chambers and the higher Btu value of the waste during the summer months (less moisture due to more packaging materials from retail stores), the plant has experienced increased time for the "cool down" phase of the burn that has caused, at times, the combustion cycle to exceed 24 hours. Larger blowers for the combustion air were installed to help shorten the burn time in the primary chambers. However, this resulted in a hotter combustion temperature that resulted in a warping of the refractory bricks. A water misting system was later installed in the primary chambers to help mitigate this combustion temperature problem.

Fuel usage is another issue that has confronted operators since the plant went online. The Municipality made a commitment of no visible emissions from the facility. Although the plant has generally remained within legal air quality opacity limits, fuel is burned in the secondary chamber throughout the cool-down phase, increasing both fuel cost and usage.

Durability of the refractory brick liners is also a continuing problem with operations. The materials installed with the facility were intended by the manufacturer to last the life of the unit. However, during operations the refractory was found to be sensitive to heat deformation and warped at higher temperatures. Other materials have been utilized by the Municipality, but these are easily damaged by heavy items that are fed into the primary chambers during loading. Replacement of the refractory is a constant maintenance issue.

Further, this constant thermal cycling of the oxidation units has resulted in significant wear and tear of the facility, resulting in early failure of the refractory within the primary chambers and the lining of the stack. The most recent rehabilitation of these materials took place this year at considerable cost to the MOS, both in terms of cost and facility downtime.

Estimated Cost of Operation

To develop a baseline cost estimate of Incinerator operations to compare against alternative solid waste and recycling programs, SCS conducted a comprehensive review of actual and budgeted expenses over the past five fiscal years. Financial data were requested from the Borough's Treasurer and Clerk. Interviews were then held with the Public Works Director to review plant operations to enable estimates of labor costs to be developed. Exhibit 29 is an Excel spreadsheet, Proforma Model, which was developed to help summarize these operating costs for the Incinerator. Exhibit 30 shows estimated labor costs for the Incinerator. A brief summary of the major components in this Model is provided in the following paragraphs:

- Escalation and Inflation – Assumed to be 2 percent per year.
- Plant Waste Throughput - The MOS's solid waste collection vehicles have on- board scales. Data from the last two fiscal years were requested from the PWD. Added to these total waste tonnages were estimates of the number of tires burned in the Incinerator, as well as sludge from the MOS's Wastewater treatment plant and biomedical waste from the Clinic. To arrive at these estimates of waste tonnages for these materials, SCS used typical solid waste industry benchmarks.
- Utilities - The Incinerator requires utilities such as electricity and diesel fuel for normal plant operations.
- Labor Costs - The Incinerator is operated on a periodic basis. That is, three to four burns per week during the peak summer months; one to two times during the winter months. Each burn sequence requires the assistance of two PWD staff members, averaging three hours each per burn. The Clerk's Office provided benefit costs provided by the MOS. These were added to the labor costs to arrive at a fully-burdened hourly rate and then multiplied by the estimated annual labor hours for these two staff members ($34,239 in 2012).
- Maintenance Costs - The PWD budgets the costs of typical annual maintenance costs for the Incinerator, which includes simple repair of plant components such as lubricants, tubing, welding, and purchase of small tools.
- Capital Repair Costs - These costs include major repairs to the Incinerator that have occurred in recent years such as replacement of the refractory brick, stack, seals, and ancillary equipment. The last major repair was conducted this past year. These costs were used to develop an estimate of projected capital repairs over the next five years.
- Debt Service Payments - The MOS continues to pay an annual debt service for the Incinerator of $120,934. The last debt service payment will be made in 2019.
- Estimated Total Operating Cost Per Ton - The estimated operating costs were then totaled through 2019. These costs were then divided by the estimated plant waste throughput to arrive at an estimated operating cost per ton for the facility. Annual costs were then averaged to arrive at an estimated operating cost per ton through 2019.

Exhibit 29. Estimated Incinerator Costs of Operation

		2012	2013	2014	2015	2016	2017	2018	2019
MSW Incinerated (1)		1,024	1,055	1,087	1,119	1,153	1,187	1,223	1,260
Expenses									
Utilities (2)		201,300	207,339	213,559	219,966	226,565	233,362	240,363	247,574
Repair and Maintenance (2)		20,000	20,600	21,218	21,855	22,510	23,185	23,881	24,597
Labor (3)		34,239	35,266	36,324	37,414	38,537	39,693	40,883	42,110
	Subtotal	255,539	263,205	271,102	279,235	287,612	296,240	305,127	314,281
Capital Projects									
Major Rehabilitation Projects (4)		483,051	0	0	0	0	559,989	0	0
	Subtotal	483,051	0	0	0	0	559,989	0	0
Debt Service									
Debt Service Payment (5)		120,934	120,934	120,934	120,934	120,934	120,934	120,934	120,934
	Subtotal	120,934	120,934	120,934	120,934	120,934	120,934	120,934	120,934
TOTAL EXPENSES		**$859,524**	**$384,139**	**$392,036**	**$400,169**	**$408,546**	**$977,162**	**$426,061**	**$435,215**
COST PER TON INCINERATED		**$839.11**	**$364.09**	**$360.75**	**$357.51**	**$354.37**	**$822.89**	**$348.34**	**$345.46**
AVERAGE COST PER TON INCINERATED		**$474.07**							

Notes:
(1) Waste collected and weighed; waste transported during incinerator rehab; sludge quantities (cubic yards) incinerated (see Appendix A).
(2) Borough of Skagway budget.
(3) Estimated cost of labor.
(4) Cost of refractory replacement. Estimated five year rehab interval
(5) Annual debt service payment through January 2019.

Sources:
Borough of Skagway, 2012.

Exhibit 30. Estimated Incinerator Labor Costs

Staff	Hourly Wage ($)	Estimated Number of Monthly Hours For		Total Monthly Wages		Total Monthly FICA		Total Monthly Retirement		Total Monthly Gross Less Retirement		Total Monthly Unemployment Insurance		Total Monthly Blue Cross		Total Monthly Life Insurance	
		Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Operator 1	25.69	45.15	19.35	1,159.90	497.10	88.73	38.03	258.19	110.65	901.71	386.45	15.78	6.76	202.63	86.84	0.63	0.63
Operator 2	32.26	45.15	19.35	1,456.54	624.23	111.43	47.75	324.23	138.95	1,132.31	485.28	19.82	8.49	640.77	274.62	0.63	0.63
			Subtotals	**$13,082.21**	**$7,849.33**	**$1,000.79**	**$600.47**	**$2,912.10**	**$1,747.26**	**$10,170.11**	**$6,102.07**	**$177.98**	**$106.79**	**$4,216.98**	**$2,530.19**	**$6.30**	**$8.82**

Total Number of Annual Manhours	**722**
Fully Burdened Hourly Rate	**$47.40**
Annual Labor Costs	**$34,239.22**

Assumptions:

(1) Three Hours Per Staff Member Per Burn
(2) Summer 3.5 Burns Per Week
(3) Winter 1.5 Burns Per Week
(4) Summer Season - May to September (5 Months)
(5) Winter Season - October to April (7 Months)
(6) 4.3 Weeks Per Month
(7) Blue Cross/Blue Shield Monthly 771.91 Operator 1
Blue Cross/Blue Shield Month 2441.03 Operator 2
(8) Total Number of Staff Hours Per Year 2,064 or 172 per month

CLOSED LANDFILLS

As noted in the paragraphs above, the Municipality filled and closed two landfills before the incinerator was constructed in 1998. The Mile 3.2 Landfill, located on Dyea Road, was closed in 1991 and is currently being used as a fire department training and storage area. The second, the Mile 4.2 Landfill, was closed in 2010 with installation of impervious geotextile cap overlain by cover soil and a passive vent system for landfill gas (Exhibit 31). The Skagway Rifle Range is located adjacent to the site.

Exhibit 31. Mile 4.5 Landfill with Cap and Passive Venting System

MUNICIPAL CODE

Chapter 13.20 consists of MOS's Municipal Code as it relates to solid waste collection and disposal. The Code, which was recently updated in February 2012, includes the following sections on these subjects:

- 13.20.010 – Purpose
- 13.20.020 – Definitions
- 13.20.030 – Responsibility for Administration
- 13.20.040 – Preparation of Solid Wastes for Collection
- 13.20.050 – Refuse Containers

- 13.20.060 – Storage and Removal of Refuse
- 13.020.070 – Limitation on Collection
- 13.020.080 – Disposal Area
- 13.020.090 – Protection From Damage
- 13.020.100 – Penalties
- 13.020.110 – Application for Service
- 13.020.120 – Discontinuance For Service
- 13.020.130 – Billing and Payment
- 13.020.140 – Charges For Solid Waste Service

A brief review of these Code sections suggests that they have not been updated since 1984 and do not adequately address recycling-related issues as well as issues related to bear-proof containers. Further discussion on possible Code changes or revisions is provided in later sections of this report.

3 PUBLIC AND BUSINESS OPINION SURVEYS

INTRODUCTION

Three distinct public opinion surveys were developed jointly by SCS and the MOS Recycling Committee and deployed from September to December 2012. The purpose of these surveys was to obtain information from Skagway businesses and residents. The target audience for the business survey (roughly 200 potential respondents) was private businesses of varying sizes located throughout the MOS, as well as local government offices. The residential survey (roughly 400 potential respondents) targeted customers receiving quarterly utility bills from the MOS. The Recycling Committee also made the surveys available at public areas such as City Hall and the library. Results of these two surveys helped the project team identify the types of materials already being recycled by residents and businesses, materials that might be recycled if new programs are implemented, and the current impediments to existing and enhanced recycling within the MOS. As detailed further in this section, about 89 percent of the residential respondents and 73 percent of business survey respondents claimed to recycle either frequently or occasionally. The most commonly recycled material among resident respondents is aluminum, while business respondents report cardboard as being the most commonly recycled.

In addition to questions regarding how much and what items are recycled, survey respondents were asked about barriers to recycling. Residential respondents were also asked where they currently take their recyclables. A follow-up survey was disbursed to those respondents who claimed to take their recyclables to Whitehorse in an attempt to ascertain how often they travel to Whitehorse and what and how much people are recycling there. This section details the survey results and summarizes its overall effect.

SURVEY METHODOLOGY

Survey Description

The survey was developed by SCS, with input from the MOS Recycling Committee. The purpose of the surveys was to obtain general information in a short amount of time about what is being recycled in the community and where people are taking their recyclables. The survey also was used to analyze the motivations and barriers to recycling.

There were nine questions on the business survey and six questions on the residential survey. The survey forms are included in Appendix B.

Conducting the Survey

The surveys were distributed in September – November 2012, with results being returned through December 2012. For the business sector surveys, a volunteer personally went from business-to-business asking respondents to fill out the survey. For the residential surveys, the MOS included the surveys in the October quarterly utility bills and asked residents to return the survey either in person, by fax or by mail. There were approximately 400 utility bills sent out with the "survey stuffer." Additionally, surveys were made available in several public areas like the Library and City Hall for those citizens who do not directly receive utility bills, and thus may

not have received the bill stuffer. The survey was designed to take approximately three minutes to complete.

BUSINESS SURVEY RESULTS

There were 200 surveys handed out to Skagway businesses, of which 82 were completed, with nearly half (49%) categorized by the respondents as representing retail businesses. Exhibit 32 summarizes all the respondent categories. Summary sheets for survey results (by number and percentage) for all questions are included in Appendix B.

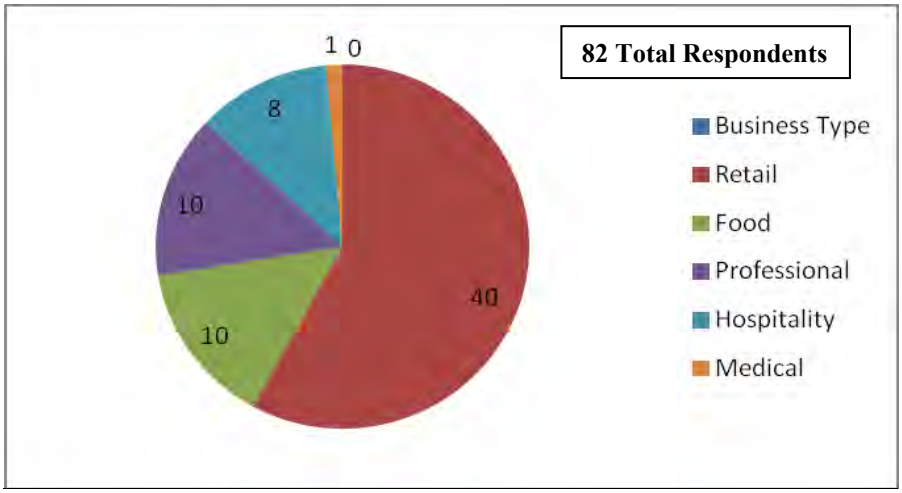


Exhibit 32. Respondents by Business Type

Frequency of Business Recycling

Of the businesses that responded to the survey 73% indicated that they recycle frequently or occasionally, while 27 % claimed to not recycle (Exhibit 33).

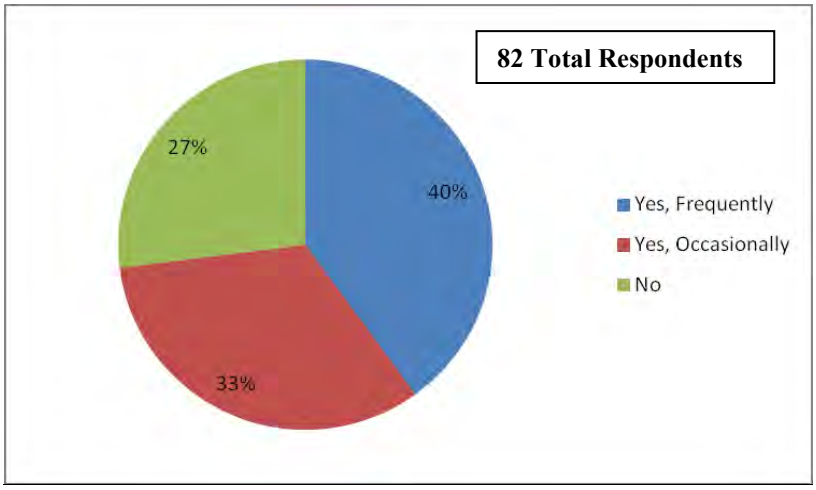


Exhibit 33. Recycling Frequency Among Businesses

Those who indicated that they recycled were then asked what materials they recycle. Exhibit 34 shows the breakdown of the responses which were obtained from the 59 respondents. It appears that cardboard is the most predominant material currently recycled followed by aluminum/tin cans.

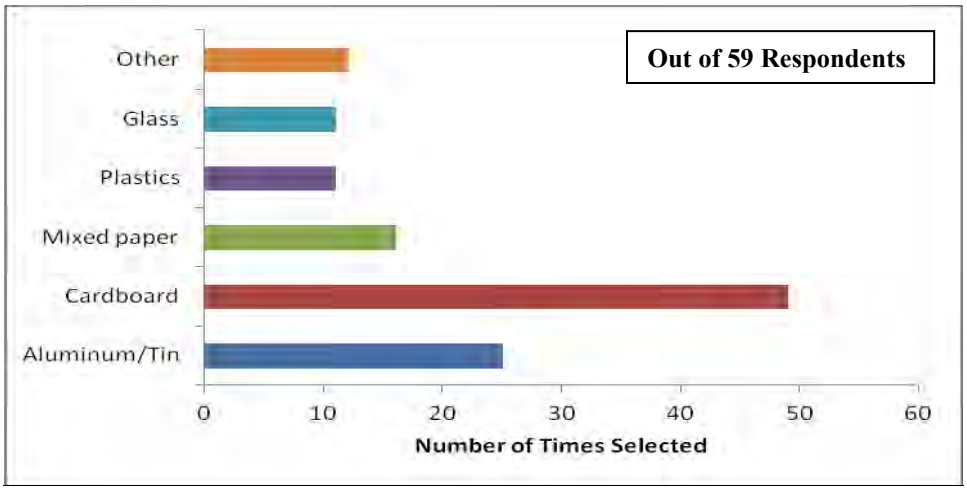


Exhibit 34. Types of Materials Recycled, By Material Type

Recycling Opportunities

The respondents were asked to rate potential quantities of recyclable materials in their waste stream: 43 percent of respondents selected cardboard as their first or second choice, while 22% selected paper as their first or second choice. A total of 68 responses were analyzed for this question. Exhibit 35 summarizes the results.

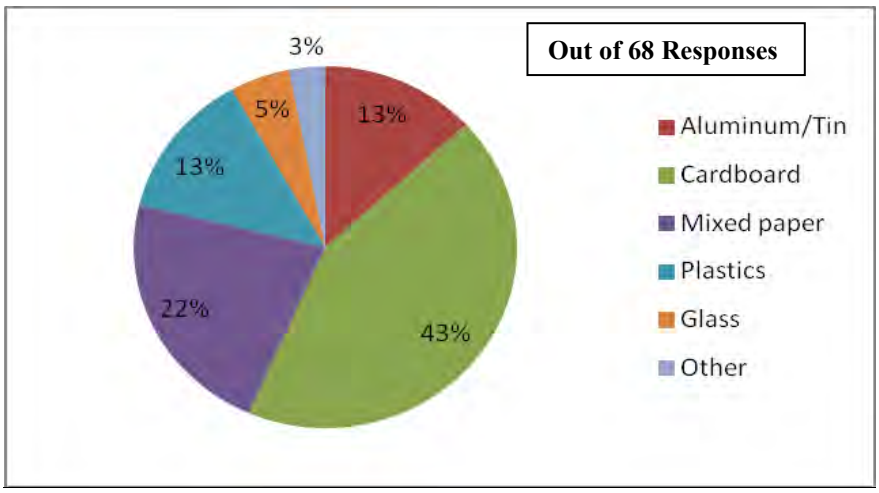


Exhibit 35. Availability of Recyclable Materials in Waste Stream

Respondents were also asked "***What percentage of the entire waste generated by your business could be recycled?***" Results to this question are summarized in Exhibit 36. Finally, respondents

were asked if their businesses generated enough cardboard to justify a cardboard-only container onsite, of which 58% responded "yes" and 42% responded "no."

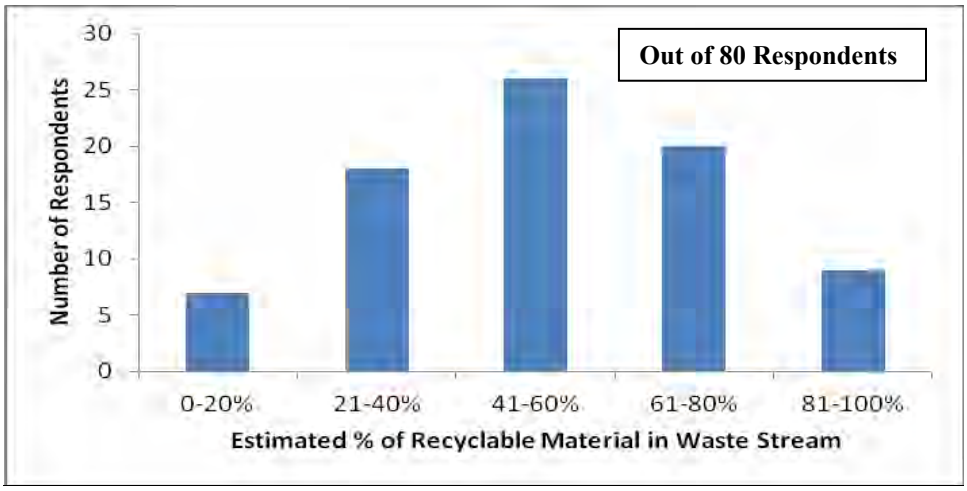


Exhibit 36. Estimated Percent of Recyclable Material

Barriers to Recycling

If the respondents indicated that they do not recycle, they were then asked "***why not?***" Respondents could select as many options that applied to them or they could write in a response under "other." Exhibit 37 summarizes the responses to this specific question. As shown, the most common barrier to recycling expressed by the respondents were the lack of recycling drop boxes and the lack of space at their business to store recyclables.

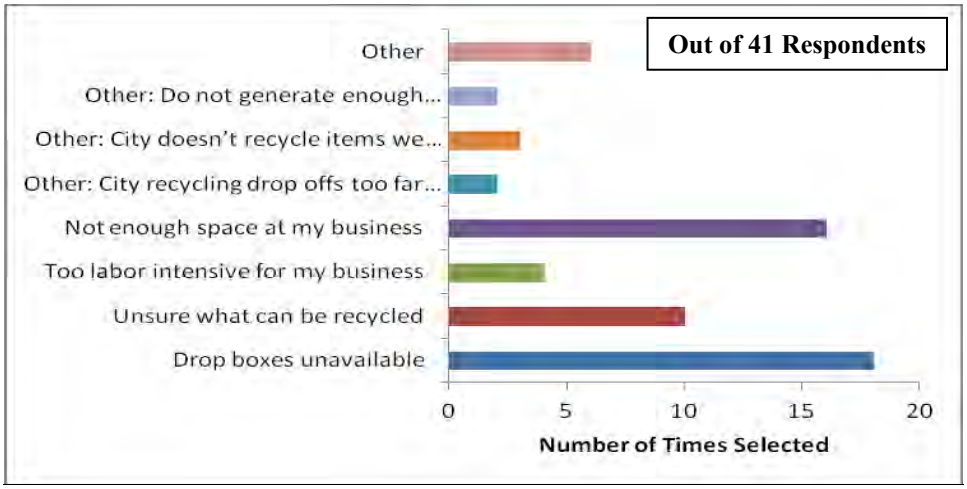


Exhibit 37. Reasons for Not Recycling

RESIDENTIAL SURVEY RESULTS

There were approximately 400 surveys mailed out in the quarterly fall utility bills, of which 92 were completed and returned.

Frequency of Residential Recycling

Of the residents who responded to the Committee's survey, 89% indicated that they recycle frequently or occasionally, while 11 % claimed to not recycle (Exhibit 38).

Those who answered "yes" were then asked what materials they recycle. Exhibit 39 shows the percentage of materials currently recycled by the respondents. Based on the survey results, aluminum and cardboard are the most common materials recycled by residences in the MOS.

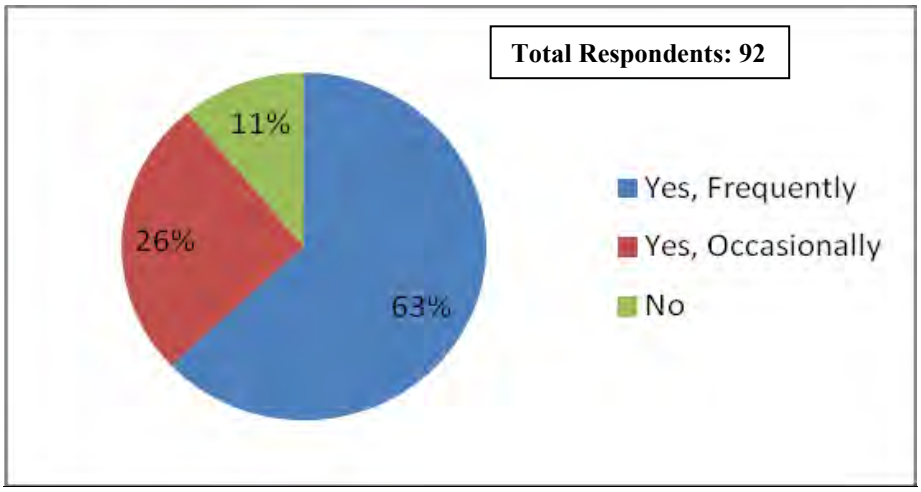


Exhibit 38. Recycling Frequency Among Residents

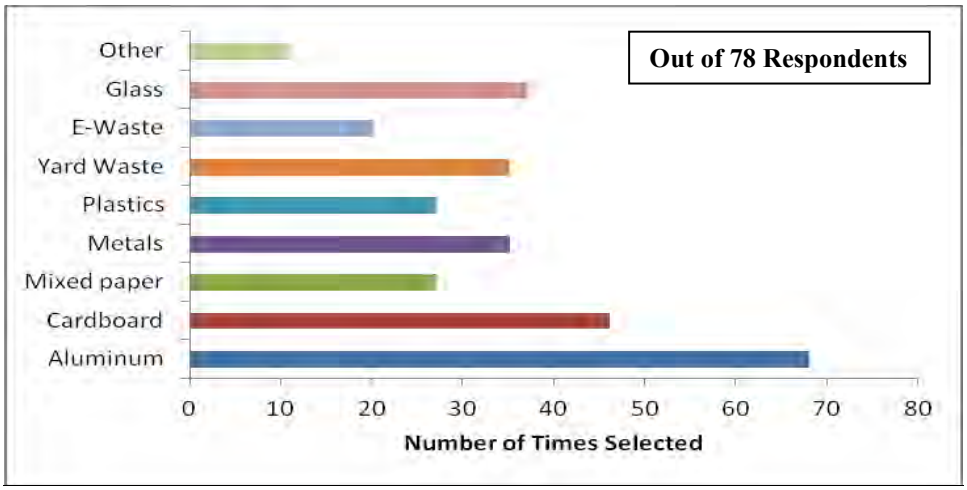


Exhibit 39. Types of Materials Recycled, By Material Type

Recycling Locations—Current and Future

The respondents were also asked where they take their recyclables. Based on the survey responses, 85 percent appear to utilize the Skagway PWD drop-off facility and 37 percent claim they take their recyclables to Raven Recycling in Whitehorse, in the Canadian Yukon. Exhibit 37 summarizes these results.

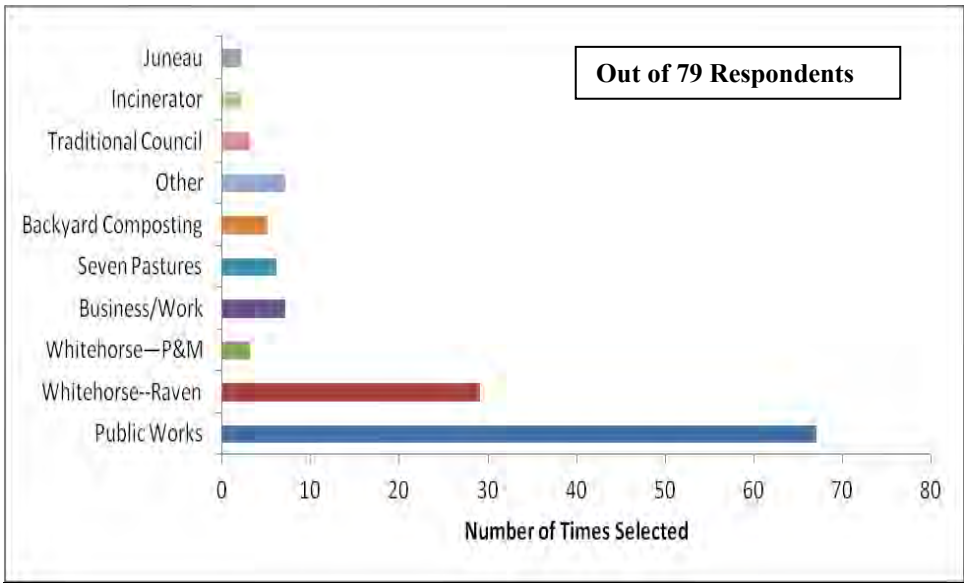


Exhibit 40. Where Residential Survey Respondents Are Recycling

Participants were then asked "***Would a downtown recycling center be more convenient and increase your recycling?***" 83% answered "yes" while 6% responded "no" to this question; an additional 11% gave other responses. Exhibit 41 summarizes the findings for this question.

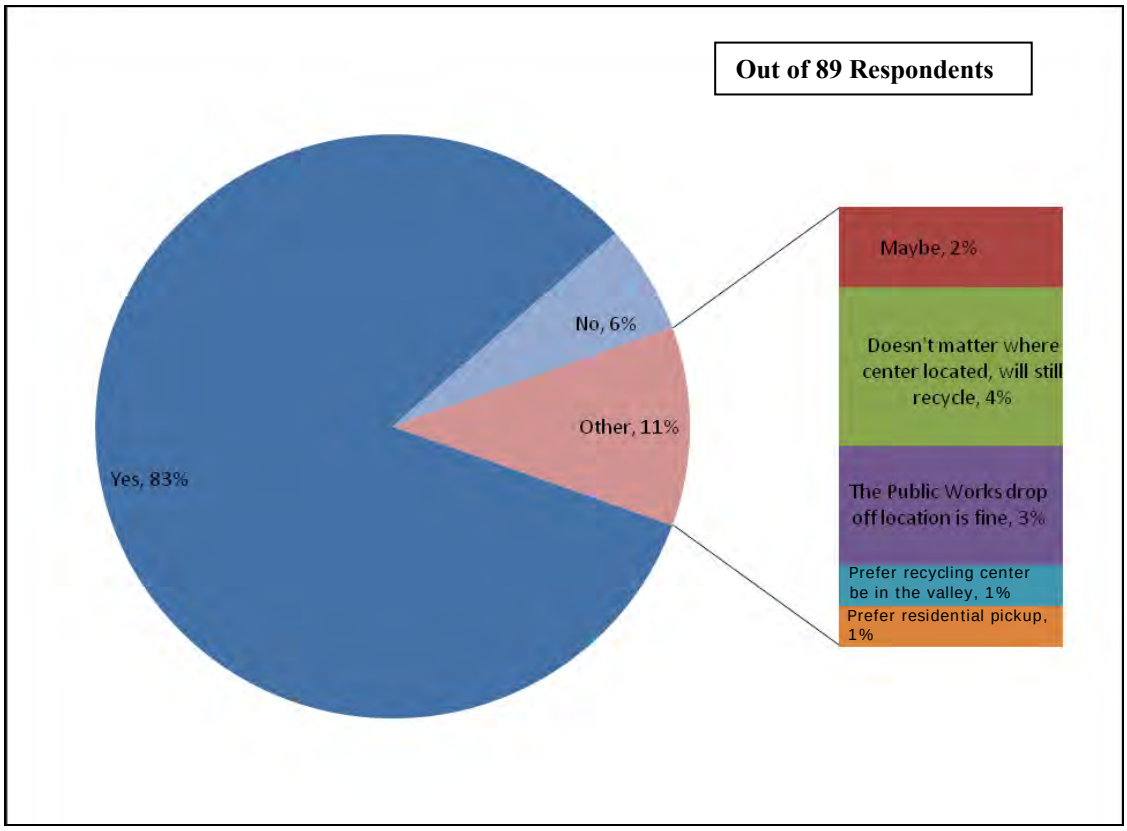


Exhibit 41. Would a Downtown Recycling Center Increase Your Recycling?

Barriers to Recycling

If respondents indicated that they do not recycle, they were asked "***why not?***" Respondents could select as many options that applied to them or they could write in a response under "other." Exhibit 42 shows the reasons for not recycling from the 32 respondents. Barriers identified varied but, in our opinion, centered on lack of convenience for recycling, as well as lack of information about the types of materials that could be potentially recycled. The fact that a number of respondents said "they do not generate enough to recycle" indicates a need for more recycling education within the community, since an estimated 75% of materials in a person's waste stream can be recycled. In our opinion, an education and outreach plan will need to be developed should the MOS recycling program be implemented.

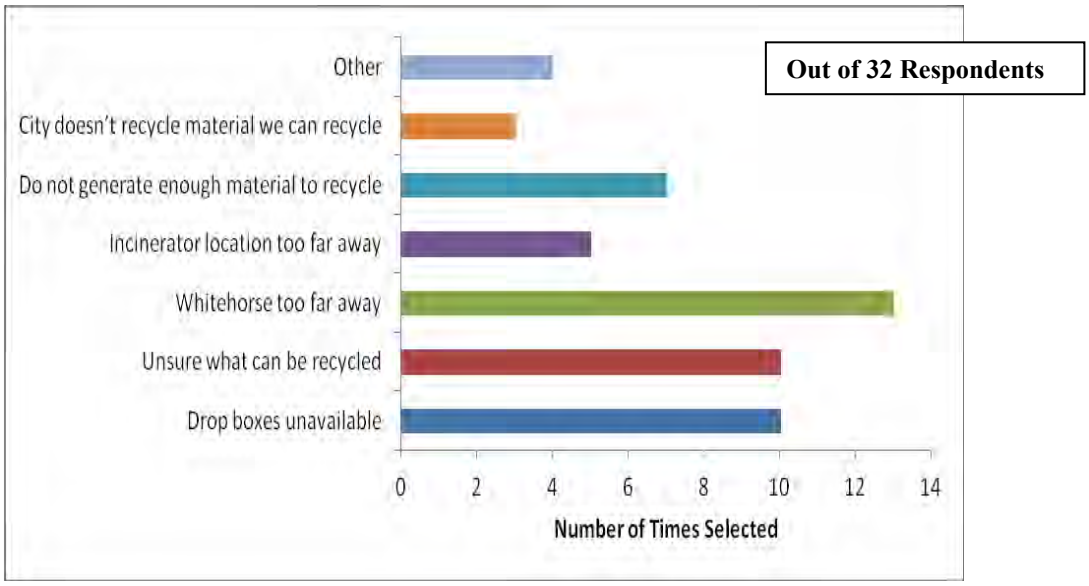


Exhibit 42. Reasons for Not Recycling

SUPPLEMENTAL SURVEY RESULTS

Based on the residential and commercial survey results, it appeared that 41 percent of residential respondents indicated they deliver their recyclables to Whitehorse for recycling at either Raven or P&M Recycling. As a result of this last finding, a three-question, a supplemental follow-up survey was conducted with those who travel to Whitehorse in order to find out how often they go and how much they are recycling. As of this writing, there were nine responses to this supplemental survey.

Most respondents indicated they recycled all items listed on the survey form (i.e., corrugated cardboard, boxboard, office paper, mixed paper, newspaper, glass, aluminum, tin, 1&2 plastics and other plastics) when they travel to Whitehorse. Volume of material ranged from one full 30-gallon garbage can to a truck load or small trailer load.

Unfortunately, it is impossible to estimate the actual volumes or weights attributed to this activity due to other unknowns, such as percentage of different material types (for example, 80 percent cans and 20 percent plastics, or vice versa) and whether the material was crushed or not. However, by assuming a 30-gallon can of recyclables weighs about 40 pounds; SCS developed a rough estimate using the available data from the supplemental survey. Our analysis indicates that about 3.5 tons is recycled per year by these nine survey participants. A summary of these findings are listed in Exhibit 43.

Extrapolating these data for the 32 residents who indicated in the Residential Survey that they take their recyclables to Whitehorse means the amount of recycling being carried out of Skagway could potentially range from 5 to 13 tons per year. Again, this information is a "best guess" estimate; the only real way to know how much material is available for recycling is to install scales and conduct a pilot recycling program.

Exhibit 43. Supplemental Survey - Where Respondents are Recycling

How often do you bring your recycling to Whitehorse?	Approx. how much recycling is taken each trip to Whitehorse?	What do you recycle in Whitehorse?	SCS Estimated Weight (at 40 lbs/can)	Notes
2x/yr	Two 30-gallon trash can	Tin	160	
Every 2-3 months	Two 30-gallon trash can	OCC, box board, newspaper, tin, 1&2 plastics, other plastics	480	
2x/month in summer	Three 30-gallon trash cans	See Notes: 1	1,200	
2x/yr	Three 30-gallon trash cans	See Notes: 1	240	
1x/month	Three 30-gallon trash cans	See Notes: 1	480	
6x/year	A full truck load & sometimes a small trailer too	See Notes: 1	1,440	Assume 6, 30-gallon can size)
6x/year	8 30-gallon cans	See Notes: 1	1,920	
1x/month	Two 30-gallon trash can	See Notes: 1	960	
Varies	One 30-gallon trash can	See Notes: 1	160	Assume 4x/year
Total-Pounds			**7,040**	
Total-Tons			**3.52**	
Ave. pounds per response			**782.22**	

Notes:
1. Corrugated cardboard, box board, office paper, mixed paper, newspaper, glass, aluminum, tin, 1 and 2 Plastics, Other plastics

CONCLUSIONS

The overall results of three surveys indicate that residents and business owners in Skagway are already recycling in a significant way. Additionally, as the surveys indicate, many are going to considerable lengths to recycle(e.g., driving several hours to Whitehorse, or carrying recyclables on the Ferry, etc.) with 41 percent of residential respondents indicating they carry their recyclables to Whitehorse to recycle. Furthermore, those who recycle a little bit or not all indicate they would do more if it was made more convenient; there is overwhelming support for the development of a recycling center in Skagway. Therefore, the following conclusions can be made:

- A centrally located recycling "convenience center" would promote more participation from both citizens and businesses. The convenience center would need to be downtown, or close to downtown, as several responses indicated that the incinerator is too far away to take recyclables.
- A recycling education and outreach program is essential to increasing recycling rates. Even now, a considerate amount of both business and residential respondents stated they currently do not know where or what to recycle.

4 WASTE COMPOSITION STUDY

This section provides a brief summary of the waste composition analysis for the MOS.

INTRODUCTION

As part of this SWRMP, SCS conducted a waste composition analysis of waste generated in the Municipality. The primary objectives of the analysis were as follows:

- To estimate types and quantities of recyclable and compostable waste components in the residential waste stream; and
- To identify opportunities for greater waste stream diversion

The basis for this waste characterization consists of a sampling event, conducted at the Municipality's incinerator. The data generated by the field activities will be used by the Municipality to develop long-term waste management strategies and to evaluate the effectiveness of current recycling programs. This section presents the data collected during the September 2012 field activities.

METHODS

The methods used to characterize the waste stream generated in Skagway are summarized below. Sorting activities for the SWRMP took place from September 11th through September 13, 2012. Waste characterization activities were performed by manually sorting samples from residential and commercial solid waste (MSW) into distinct waste categories.

Waste Sampling

Waste sorting was performed at the Incinerator during the operating hours of the facility. Given the limited size of the data set, it was important that unrepresentative data were avoided. PWD collection vehicles carrying waste from targeted areas of the Municipality were directed to dump their waste loads near the sorting area. Representatives of SCS manually gathered samples (Exhibit 44) from a random portion of each target load (approximately two hundred pounds per sample) for classification (sorting). Two important procedural factors were considered:

- The target vehicle selected for sampling contained MSW that was representative of the type of waste typically generated in that sector; and
- The process of acquiring the waste sample did not, in itself, alter the apparent MSW composition.

After being filled with solid waste, the trash cans were weighed and set aside until at least two hundred pounds from the discharged load had been selected for characterization. This process was repeated until samples had been collected from all of the targeted loads (Exhibit 45).

Exhibit 44. Waste Being Acquired For Sample

Exhibit 45. Samples Being Stored From Targeted Loads

Number of Samples

A total of 12 samples were collected during the week, six from residential routes and six from commercial routes.

WASTE SORTING

The sorting and weighing program for samples entailed the use of two SCS employees. During each day of fieldwork, samples were collected from waste loads that were discharged at the incinerator. The basic procedures and objectives for sorting (as described below) were identical

for each sample, each day. Sorting was performed as follows:

1. The sort crew transferred the refuse sample onto the sorting table (Exhibit 46) until it was full and then began sorting activities. Large or heavy waste items, such as bags of yard waste, were torn open, examined and then placed directly into the appropriate waste container for subsequent weighing.

Exhibit 46. Transport Refuse Sample to Sorting Table

2. Plastic bags of refuse were opened and sort crew members manually segregated each item of waste according to categories (Exhibit 46) defined in Exhibit 49 placing it in the appropriate waste container. These steps were repeated until the entire sample was sorted.

Exhibit 47. Waste Segregated into Categories

3. At the completion of sorting, the waste containers were moved to the scale where a representative of SCS weighed each category and recorded the net weight on the Sort Data Sheet (Exhibit 48). Measurements were made to the nearest 0.1 pounds.

Exhibit 48. Electronic Weigh Scale

4. After each waste category was recorded, the waste was piled onto the incinerator conveyor belts.

This four-step process was repeated until all of the day's samples were characterized. Waste samples were maintained in as-disposed condition or as close to this state as possible until the actual sorting began. Proper site layout and close supervision of sampling was maintained to avoid the need to repeatedly handle sampled wastes.

Members of the sorting crew were fully equipped with high visibility vests, puncture/cut resistant gloves, safety glasses, and Tyvek suits.

Consistent with good practice in such sampling programs, efforts were made to minimize sampling bias or other impacts on the integrity of the database. To this end, field sampling had been coordinated to avoid holidays and other out of ordinary events.

Exhibit 49. Description of Waste Categories

Major Waste Fractions	Waste Component Categories	Examples
Paper	Newspaper/print	Daily, weekly newspapers
	Corrugated Cardboard	Packing/shipping boxes
	Magazines/Catalogs/ Other Books	TV Guide, Periodicals, Journals, Other Paper
	Kraft Paper/Paperboard	Grocery bags, deli packaging
	High Grade Office Paper/Misc. Paper	Copy paper, computer printouts, junk mail, notebook paper
	Wax Coated Containers	Milk and Juice Cartons
Plastic	PET (#1) Bottles	Water, Soda
	HDPE (#2) Bottles	Milk, Detergent
	Other (#3-#7) Bottles	Prescriptions
	Jars, Jugs, Tubs, Trays	Yogurt, Butter
	Films	Garbage bags, bubble wrap
	Shopping Bags	Grocery bags
	Polystyrene	Expanded or regular clamshells, cutlery, cups
	Other Rigid Plastic	Buckets, storage totes, furniture, toys
Metal	Ferrous Cans	Pet food cans, soup cans, aerosols
	Other Ferrous	Ferrous scrap metals
	Aluminum Cans	Soda cans, beer cans
	Aluminum Tin/Foil	Tin Foil
Organics	Vegetative Food	Salads, fruits, vegetables
	Non-Vegetative Food	Meats, dairy products
	Compostable Paper	Tissues, napkins, paper towels
Glass	Glass Bottles/Jars	Beer, wine
Yard Waste	Yard Waste	Foliage, lawn clippings, brush/branches
Electronics	Electronics	Cell phones, radios
Paint	Paint	All paint
C&D and Bulky Wastes	Wood/Lumber	Forklift pallets
	Furniture	Tables, chairs
	Concrete/Brick/Rock/Dirt	Gravel, bricks, stones, broken-up asphalt, concrete
	Sheet Rock	Drywall
	Carpet/Carpet Padding	Carpet and carpet padding
	Shingles	Asphalt shingles
Other MSW	Other MSW	Garbage, misc not characterized above, like clothing, or products that contain combinations of materials, such as frozen juice cans. This category also includes material unable to be captured because it is too small or indistinguishable, such as kitty litter, sweepings, mashed food, etc.

DATA REDUCTION

There were 12 samples manually sorted during the September 2012 field activities. Data presented include mean percentages by weight, standard deviations, and statistical confidence intervals (95 percent confidence interval) for each group of data. Derivation of this data is as follows:

$$Mean\ (\bar{X}) = \sum_{i=1}^{n} x_i * \frac{1}{n};$$

$$Standard\ Deviation\ (s) = \sqrt{\frac{\left(\sum x^2 - \left(\sum x\right)^2\right)}{n(n-1)}};\ \text{and}$$

$$Upper/Lower\ Confidence\ Interval\ Limits = \bar{X} \pm \left[1.96 * \left(\frac{\sigma}{\sqrt{n}}\right)\right]$$

Where: n = number of samples; and
x = sample percentage.

Waste samples are acquired to estimate the Municipality's true residential waste composition (i.e., the proportion of each waste component present in residential waste collected in the Municipality). The mean is the arithmetic average of all data and the standard deviation is a measure of the dispersion in the data. Together, the mean and standard deviation determine the confidence interval. A 95 percent confidence interval contains the true proportion of a waste component with 95 percent confidence (i.e., similar studies will produce the same results 95 percent of the time).

SUMMARY OF RESULTS

MSW Composition

Residential

Exhibit 50 presents a compilation of the six residential waste samples collected on September 11th. The composition includes confidence intervals based on the number of samples and variability between the samples. Based on the samples collected, the three largest subcomponents, by weight, of the residential waste stream are: Other MSW (23.4 percent), Compostable Paper (8.8 percent), and Vegetative Food (8.7 percent). The three largest recyclable subcomponents (Exhibit 51) are Magazines/Catalogs/Other Books (7.1 percent), Office Paper/Other Paper (5.4 percent), and Paperboard (4.5 percent).

Exhibit 50. Residential Waste Composition

Material Components	Mean Composition	Standard Deviation	95% Confidence Limits Lower	95% Confidence Limits Upper
PAPER				
1 Newspaper/print	2.3%	2.4%	0.3%	4.2%
2 Corrugated Cardboard	3.0%	0.8%	2.4%	3.7%
3 Magzines/Catalogs/Other Books	7.1%	4.4%	3.6%	10.7%
4 Kraft Paper/Paperboard	4.5%	0.9%	3.8%	5.3%
5 Office Paper/Other Paper	5.4%	2.3%	3.6%	7.2%
6 Wax Coated Containers	0.7%	0.3%	0.5%	1.0%
Total Paper	**23.1%**			
PLASTIC				
7 PET #1 Bottles	2.3%	1.0%	1.5%	3.1%
8 HDPE #2 Bottles	0.7%	0.5%	0.3%	1.1%
9 #3-#7 Plastic Bottles	<0.1%	<0.1%	<0.1%	<0.1%
10 Jars, Jugs, Tubs, and Trays	1.9%	0.6%	1.4%	2.3%
11 Plastic Films	7.3%	1.8%	5.9%	8.7%
12 Shopping Bags	0.6%	0.4%	0.2%	1.0%
13 Polystyrene	1.2%	0.5%	0.8%	1.6%
14 Other Rigid Plastic	1.2%	1.2%	0.2%	2.2%
Total Plastic	**15.2%**			
METAL				
15 Ferrous Cans	2.2%	1.2%	1.2%	3.1%
16 Other Ferrous	0.9%	2.0%	<0.1%	2.4%
17 Aluminum Cans	0.8%	0.2%	0.7%	1.0%
18 Aluminum Tins/Foil	0.4%	0.2%	0.3%	0.6%
Recyclable Metals	**4.3%**			
Organics				
19 Vegetative Food	8.6%	2.6%	6.4%	10.7%
20 Non-Vegetative Food	8.7%	4.2%	5.3%	12.1%
21 Compostable Paper	8.8%	1.0%	8.0%	9.6%
Organics	**26.0%**			
GLASS				
22 Glass Bottle/Jars	3.5%	1.3%	2.4%	4.6%
YARD WASTE				
23 Yard Waste	3.5%	2.9%	1.2%	5.8%
Total Yard Waste	**3.5%**			
ELECTRONICS				
24 Electronics	0.4%	1.0%	<0.1%	1.2%
Paint				
25 Paint	<0.1%	<0.1%	<0.1%	<0.1%
Other MSW				
26 Other MSW	23.4%	3.9%	20.3%	26.5%
C&D and Bulky Wastes				
27 Wood/Lumber	0.3%	0.6%	<0.1%	0.8%
28 Furniture	<0.1%	<0.1%	<0.1%	<0.1%
29 Concrete/Brick/Rock	<0.1%	<0.1%	<0.1%	<0.1%
30 Sheet Rock	0.2%	0.6%	<0.1%	0.7%
31 Carpet/Carpet Padding	<0.1%	<0.1%	<0.1%	<0.1%
32 Shingles	<0.1%	<0.1%	<0.1%	<0.1%
Total C&D and Bulky Wastes	**0.6%**			
TOTALS	**100.0%**			

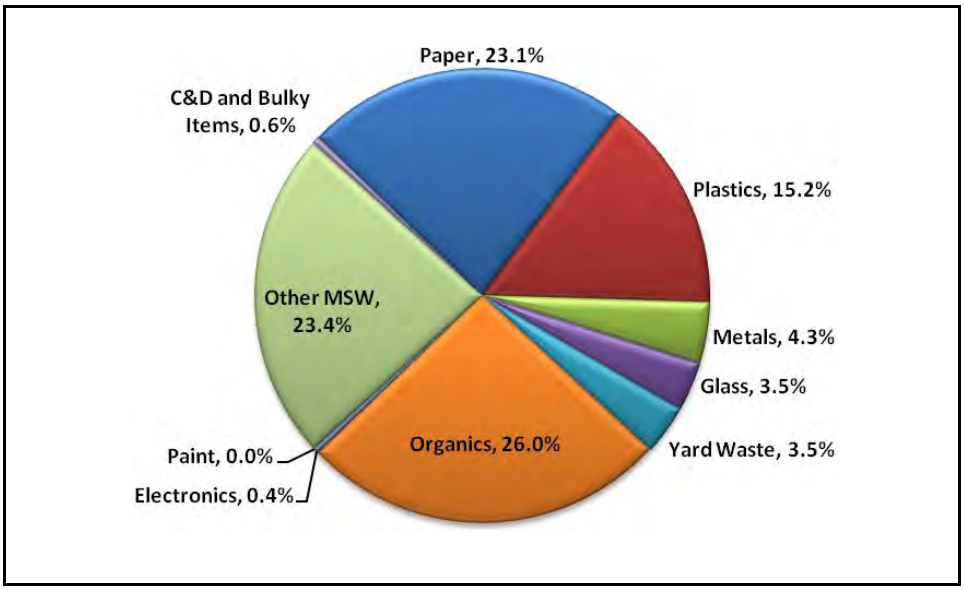


Exhibit 51. Residential Waste Composition

Commercial

Exhibit 52 presents a compilation of the six waste samples collected on September 12th. The composition includes confidence intervals based on the number of samples and variability between the samples. Based on the samples collected, the three largest subcomponents, by weight, of the commercial waste stream are: Other MSW (18.7 percent), Non-Vegetative Food (13.5 percent) and Vegetative Food (10.7 percent). The three largest recyclable subcomponents are Corrugated Cardboard (6.3 percent), Glass Bottles/Jars (5.8 percent), and Paperboard (3.7 percent).

During field activities it was noted that paper coffee cups (Wax Coated Containers) and restaurant food waste were very common in the waste stream.

Exhibit 52. Commercial Waste Composition

Material Components	Mean Composition	Standard Deviation	95% Confidence Limits Lower	95% Confidence Limits Upper
PAPER				
1 Newspaper/print	0.9%	0.8%	0.3%	1.5%
2 Corrugated Cardboard	6.3%	2.9%	4.0%	8.6%
3 Magzines/Catalogs/Other Books	3.0%	1.9%	1.4%	4.5%
4 Kraft Paper/Paperboard	3.7%	1.4%	2.5%	4.8%
5 Office Paper/Other Paper	3.4%	1.3%	2.4%	4.5%
6 Wax Coated Containers	3.6%	1.2%	2.6%	4.5%
Total Paper	**20.9%**			
PLASTIC				
7 PET #1 Bottles	1.7%	0.5%	1.3%	2.1%
8 HDPE #2 Bottles	1.4%	0.7%	0.8%	2.0%
9 #3-#7 Plastic Bottles	<0.1%	<0.1%	<0.1%	<0.1%
10 Jars, Jugs, Tubs, and Trays	1.2%	0.7%	0.6%	1.7%
11 Plastic Films	8.5%	3.2%	6.0%	11.0%
12 Shopping Bags	0.5%	0.3%	0.3%	0.8%
13 Polystyrene	0.8%	0.5%	0.4%	1.2%
14 Other Rigid Plastic	0.7%	0.7%	0.2%	1.3%
Total Plastic	**14.8%**			
METAL				
15 Ferrous Cans	2.1%	1.0%	1.3%	3.0%
16 Other Ferrous	0.6%	1.0%	<0.1%	1.5%
17 Aluminum Cans	1.4%	1.1%	0.6%	2.3%
18 Aluminum Tins/Foil	0.4%	0.2%	0.2%	0.5%
Recyclable Metals	**4.6%**			
Organics				
19 Vegetative Food	8.9%	4.5%	5.3%	12.6%
20 Non-Vegetative Food	13.5%	7.0%	7.9%	19.0%
21 Compostable Paper	10.7%	3.2%	8.1%	13.2%
Organics	**33.1%**			
GLASS				
22 Glass Bottle/Jars	5.8%	3.5%	3.0%	8.6%
YARD WASTE				
23 Yard Waste	<0.1%	<0.1%	<0.1%	<0.1%
Total Yard Waste	**0.0%**			
ELECTRONICS				
24 Electronics	<0.1%	<0.1%	<0.1%	<0.1%
Paint				
25 Paint	<0.1%	<0.1%	<0.1%	<0.1%
Other MSW				
26 Other MSW	18.7%	5.3%	14.5%	23.0%
C&D and Bulky Wastes				
27 Wood/Lumber	1.6%	2.7%	<0.1%	3.8%
28 Furniture	<0.1%	<0.1%	<0.1%	<0.1%
29 Concrete/Brick/Rock	<0.1%	<0.1%	<0.1%	<0.1%
30 Sheet Rock	0.3%	0.7%	<0.1%	0.9%
31 Carpet/Carpet Padding	0.2%	0.5%	<0.1%	0.6%
32 Shingles	<0.1%	<0.1%	<0.1%	<0.1%
Total C&D and Bulky Wastes	**2.1%**			
TOTALS	**100.0%**			

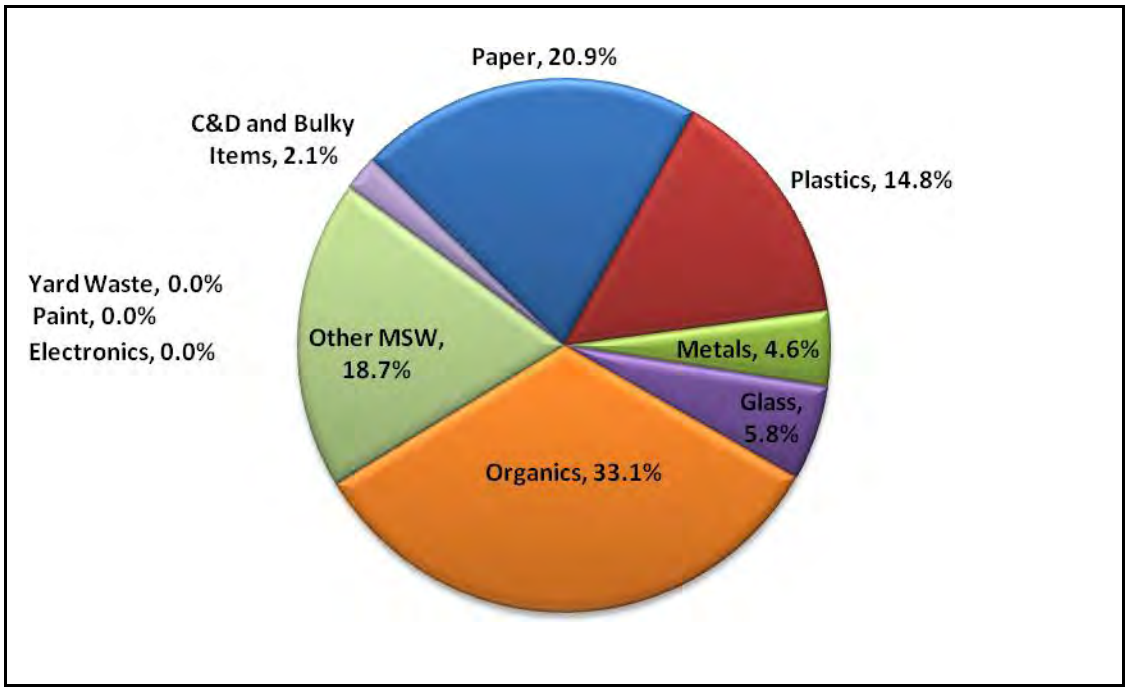


Exhibit 53. Commercial Waste Composition

Overall Waste Stream

Table 54 presents a compilation of the 12 residential and commercial samples collected on September 11th and 12th. This composition is based on the combination of the six residential and six commercial samples. The composition includes confidence intervals based on the number of samples and variability between the samples. Based on the samples collected, the three largest subcomponents, by weight, of the overall waste stream are (Exhibit 55): Other MSW (21.1 percent), Non-Vegetative Food (11.1 percent) and Compostable Paper (9.7 percent). The three largest recyclable subcomponents are Magazines/Catalogs/Books (5.0 percent), Corrugated Cardboard (4.7 percent), and Office Paper/Other Paper (4.4 percent). Moisture affects the weights of paper and absorbent materials more than other. Moisture was a factor during the waste composition due to recent precipitation events. Some waste composition studies make adjustments for moisture content to compensate for liquids absorbed by waste materials. Laboratory methods for estimating moisture content are available, but are usually expensive and may overestimate moisture. In addition, materials received at disposal facilities are generally measured on an "as is" basis and thus reflect comparable weights as were acquired for this SWRMP. Therefore, SCS did not include an analysis of, or adjustments for moisture content as part of this SWRMP.

Exhibit 54. Overall Waste Composition

Material Components	Mean Composition	Standard Deviation	95% Confidence Limits Lower	95% Confidence Limits Upper
PAPER				
1 Newspaper/print	1.6%	1.8%	0.1%	3.0%
2 Corrugated Cardboard	4.7%	2.6%	2.6%	6.8%
3 Magzines/Catalogs/Other Books	5.0%	3.9%	1.9%	8.2%
4 Kraft Paper/Paperboard	4.1%	1.2%	3.1%	5.1%
5 Office Paper/Other Paper	4.4%	2.1%	2.8%	6.1%
6 Wax Coated Containers	2.1%	1.7%	0.8%	3.5%
Total Paper	**22.0%**			
PLASTIC				
7 PET #1 Bottles	2.0%	0.8%	1.4%	2.6%
8 HDPE #2 Bottles	1.0%	0.7%	0.5%	1.6%
9 #3-#7 Plastic Bottles	<0.1%	<0.1%	<0.1%	<0.1%
10 Jars, Jugs, Tubs, and Trays	1.5%	0.7%	1.0%	2.1%
11 Plastic Films	7.9%	2.5%	5.9%	9.9%
12 Shopping Bags	0.6%	0.4%	0.3%	0.9%
13 Polystyrene	1.0%	0.5%	0.6%	1.4%
14 Other Rigid Plastic	1.0%	1.0%	0.2%	1.8%
Total Plastic	**15.0%**			
METAL				
15 Ferrous Cans	2.2%	1.1%	1.3%	3.0%
16 Other Ferrous	0.8%	1.5%	<0.1%	2.0%
17 Aluminum Cans	1.1%	0.8%	0.5%	1.8%
18 Aluminum Tins/Foil	0.4%	0.2%	0.2%	0.6%
Recyclable Metals	**4.4%**			
Organics				
19 Vegetative Food	8.7%	3.5%	5.9%	11.6%
20 Non-Vegetative Food	11.1%	6.0%	6.2%	15.9%
21 Compostable Paper	9.7%	2.5%	7.8%	11.7%
Organics	**29.6%**			
GLASS				
22 Glass Bottle/Jars	4.6%	2.8%	2.4%	6.9%
YARD WASTE				
23 Yard Waste	1.8%	2.7%	<0.1%	3.9%
Total Yard Waste	**1.8%**			
ELECTRONICS				
24 Electronics	0.2%	0.7%	<0.1%	0.8%
Paint				
25 Paint	<0.1%	<0.1%	<0.1%	<0.1%
Other MSW				
26 Other MSW	21.1%	5.1%	17.0%	25.1%
C&D and Bulky Wastes				
27 Wood/Lumber	1.0%	2.0%	<0.1%	2.6%
28 Furniture	<0.1%	<0.1%	<0.1%	<0.1%
29 Concrete/Brick/Rock	<0.1%	<0.1%	<0.1%	<0.1%
30 Sheet Rock	0.3%	0.6%	<0.1%	0.8%
31 Carpet/Carpet Padding	0.1%	0.4%	<0.1%	0.4%
32 Shingles	<0.1%	<0.1%	<0.1%	<0.1%
Total C&D and Bulky Wastes	**1.4%**			
TOTALS	**100.0%**			

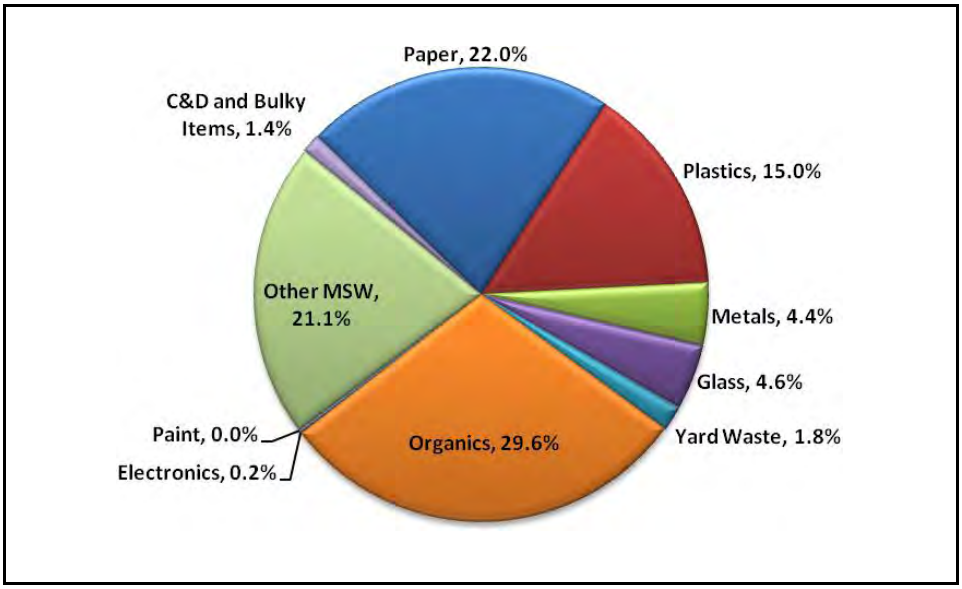


Exhibit 55. Overall Waste Composition

DIVERSION OPPORTUNITIES

A significant portion of the waste stream is compostable or recyclable. Some materials, such as Wax Coated Paper, Other Glass, and Plastic Film (largely plastic bags and packaging), are considered trash since these materials do not currently have obvious markets for recycling or composting. Exhibit 56 details the materials included in the compostable, recyclable, and trash classifications used for this section.

Exhibit 56. Compostable, Recyclable, and Trash Classifications for Waste Materials

Compostable	Recyclable		Trash
Compostable Paper	Newspaper	Shopping Bags	Wax Coated Containers
Vegetative Food	Corrugated Cardboard	Steel Food Cans	#3-7 Plastic Bottles
Non-Vegetative Food	Paperboard/Kraft Paper	Other Ferrous	Plastic Films
Yard Waste	Office/Mixed Paper	Aluminum Cans	Rigid Plastics
Wood/Lumber	Magazines/Books	Other Aluminum	Paint
	PET #1 Bottles	Glass Bottles/Jars	Other MSW
	HDPE #2 Bottles	Electronics	Furniture
	Jars/Tubs/Trays		Concrete/Brick/Rock
			Sheet Rock
			Carpet/Carpet Padding
			Shingles

The largest diversion opportunities (by weight) for the Municipality are capturing recyclable paper and composting organics. Exhibits 57 and 58 portray the waste composition by recyclable and compostable materials. According to the waste characterization, approximately 67 percent

of the overall waste stream is considered recyclable or compostable. Compostable materials such as food waste were more prevalent in the commercial waste stream, and some recyclable materials such as paper were more prevalent in the residential waste stream. The following exhibits are based on the Municipality's overall waste stream (residential and commercial combined).

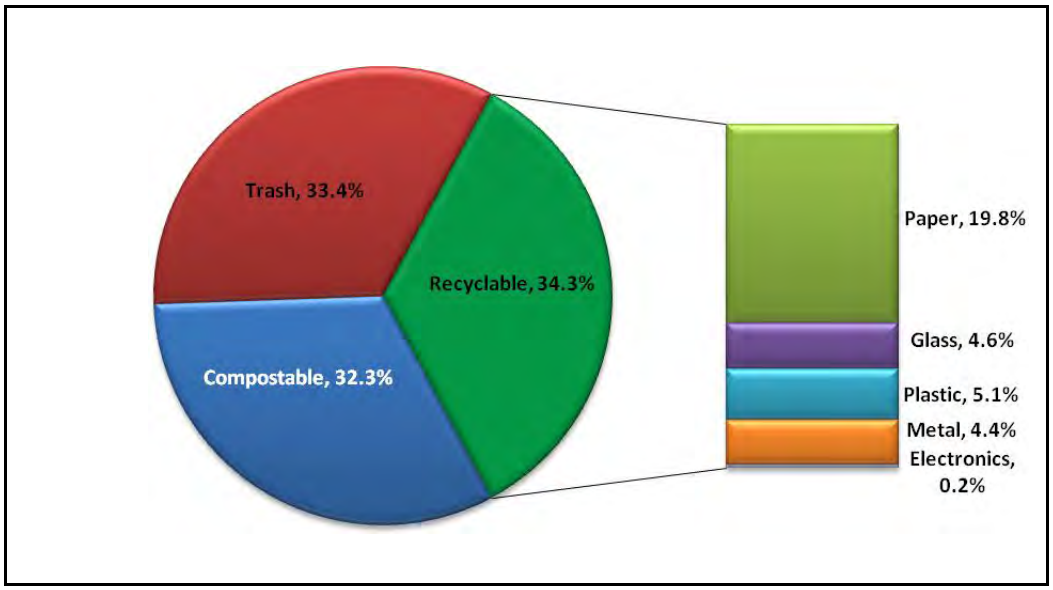


Exhibit 57. Recyclable Diversion Opportunities – Overall Waste Stream

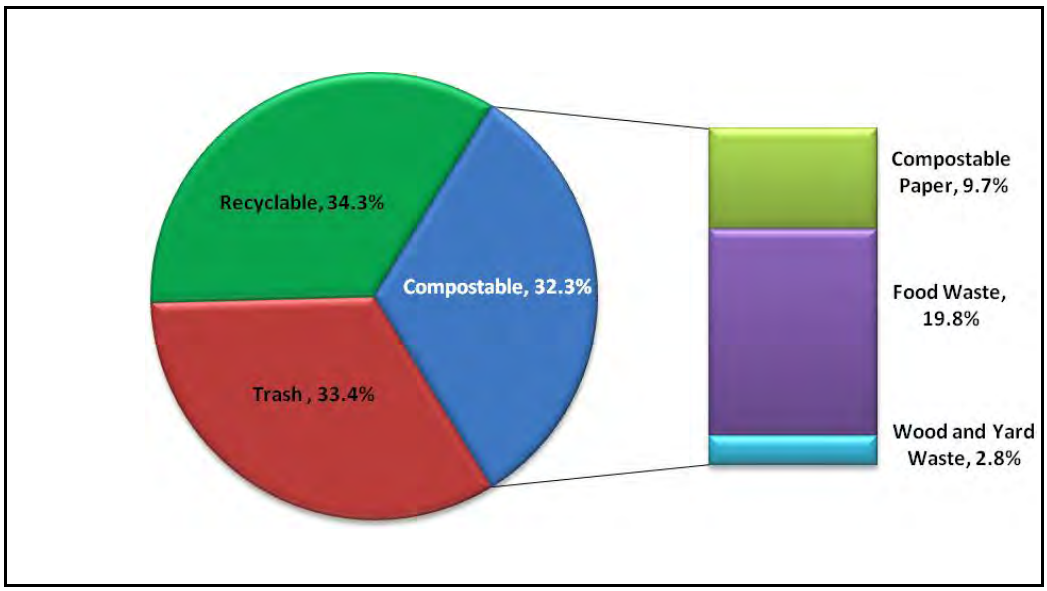


Exhibit 58. Composting Diversion Opportunities – Overall Waste Stream

5 CURRENT RECYCLING PROGRAMS AND TRENDS NATIONWIDE

This section is designed to provide an overview of recent trends in solid waste management and recycling across the United States.

INTRODUCTION

Before discussing specific solid waste management and recycling (SWM) options for the MOS, an overview of current SWM trends around the country is presented in the following section. The U.S. Environmental Protection Agency (EPA), as well as most states and local government entities tasked with SWM, subscribe to the "solid waste hierarchy", or triangle (Exhibit 59), for rankings of SWM priorities. This hierarchy emphasizes source reduction (including reuse) as the most preferred method, followed by recycling and composting, energy recovery, and, finally, treatment and disposal. With this hierarchy in mind, the SWM categories are described below, and presented along with case studies or examples that represent best management practices (BMPs) for each level of the triangle.

Exhibit 59. EPA's Solid Waste Management Hierarchy
Source: U.S. EPA

WASTE REDUCTION AND REUSE

The following section provides a brief discussion on source reduction and reuse, including examples of how communities are encouraging residents to re-think what waste is, and to aim toward the concept of "zero waste". Source reduction and reuse involves re-educating municipal staff and residents with the goal of optimizing, to the extent possible, the reduction of "waste" materials at the source, or the productive reuse of those materials we now consider as waste.

Waste Reduction

Activities and practices that reduce the amount of wastes that are created are classified by solid waste professionals as "waste reduction". Waste reduction differs from the other two waste diversion techniques (recycling and composting) because the other methods deal with wastes after the wastes have been generated.

Waste reduction is the highest priority for solid waste management according to the solid waste hierarchy, and is preferred over recycling and composting because the social, environmental and economic costs are typically lower for waste reduction. All three methods avoid the cost of disposing the diverted materials as garbage, but recycling and composting frequently require significant additional expenses for collecting and processing the materials. Importantly, efforts to reduce and reuse waste translate directly into cost savings as the disposal tonnage and associated costs are reduced. Collection costs can also potentially be reduced.

Source reduction is dependent on several factors including:

- Changing the usage and purchasing habits of residents and the City.
- Changes that businesses undertake voluntarily to reduce the amount of potential waste material associated with products.
- Increasing internal re-use of materials, donations or exchange of old for new items.

These ideas are discussed further in the paragraphs below.

Product Stewardship

Product stewardship is a national initiative aimed at restructuring the way manufacturers design and market products so that they optimize recycling of materials, minimize packaging, and actually design their products in a way that will enable complete recycling of the used product in lieu of disposing the used product. It is essentially a "cradle to cradle" strategy instead of a "cradle to grave" approach.

The Product Stewardship Institute (PSI) is a national non-profit membership-based organization located in Boston. PSI works with state and local government agencies to partner with manufacturers, retailers, environmental groups, federal agencies, and other key stakeholders to reduce the health and environmental impacts of consumer products. PSI takes a unique product stewardship approach to solving waste management problems by encouraging product design changes and mediating stakeholder dialogues. Several states have or are considering initiatives and laws that would encourage or require manufacturers to improve their product designs in this manner.

Economic prosperity has increased per capita spending over the past several years and increased the need for local governments to provide expanded recycling and disposal programs. Product stewardship is a concept designed to alleviate the burden on local governments of end-of-life product management. Product stewardship is a product-centered approach that emphasizes a shared responsibility for reducing the environmental impacts of products. This approach calls on the various waste generators to help minimize their wastes:

- Manufacturers: To reduce use of toxic substances, to design for durability, reuse, and recyclability, and to take increasing responsibility for the end-of-life management of products they produce.

- Retailers: To use product providers who offer greater environmental performance, to educate consumers on environmentally preferable products, and to enable consumers to return products for recycling.

- Consumers: To make responsible buying choices that consider environmental impacts, to purchase and use products efficiently, and to recycle the products they no longer need.

- Government: To launch cooperative efforts with industry, to use market leverage through purchasing programs for development of products with stronger environmental attributes, and to develop product stewardship legislation for selected products.

The principles of product stewardship recommend that a role of government is to provide leadership in promoting the practices of product stewardship through procurement and market development. Environmentally Preferable Purchasing (EPP) is a practice that can be used to fulfill this role. EPP involves purchasing products or services that have reduced negative effects on human health and the environment when compared with competing products or services that serve the same purpose. They include products that have recycled content, reduce waste, use less energy, are less toxic, and are more durable.

Procurement Practices

Local, state, and federal government agencies can and do use their tremendous purchasing power to influence the products that manufacturers bring to the marketplace. In the last decade or so, most efforts have focused on encouraging procurement of products made from recycled content. The goal of these procurement programs is to create viable, long-term markets for recovered materials. The EPA has developed a list of designated products and associated recycled content recommendations for federal agencies to use when making purchases. These are known as Comprehensive Procurement Guidelines. To date, EPA has developed more than 60 guidelines that fall into the general categories of construction products, landscaping products, non-paper office products, paper and paper products, park and recreation products, transportation products, vehicular products, and miscellaneous products. For example, federal agencies are instructed to buy printing or writing paper that contains at least 30% post-consumer recycled content.

Zero Waste Initiatives

Many municipalities have investigated and taken on the concept of “Zero Waste”. This is currently the most comprehensive all-around way of looking at the concept of source reduction or waste reduction, and there are many sources of information and examples of how the MOS could consider adopting a goal of this type, for advancing waste reduction. It is important to note that “Zero Waste” does not mean that all waste materials will disappear, but that, to the maximum extent possible, source reduction, recycling and waste diversion will have removed all materials that can be utilized in some way. Instead of seeing used materials as garbage in need of disposal, discards are seen as potentially valuable resources. A pile of "trash" represents jobs, financial opportunity, and raw material for new products. Zero Waste is a “whole system”

approach to resource management that maximizes recycling, minimizes waste, reduces consumption and ensures that products

Reuse

Swap Shops and/or Thrift Stores provide a good venue for promoting the reuse of household items. Many communities have informal reuse centers located at their waste collection/drop-off centers, some which are operated by volunteers. Promoting the reuse of building materials is also prevalent in communities looking for ways to divert materials from disposal. Another reuse avenue becoming more popular is the use of website exchanges, such as the FreeCycle Network, Craigslist, and Skagway Swap.

Community Co-ops & Exchanges

Many communities are initiating cooperatives or exchanges for specific products or interests—such as bicycles or books—in order to facilitate knowledge about a product or subject, assist in repairs and generally promoting a sense of sustainability. Examples of communities who have implemented these programs are included below.

Waste Reduction: Best Practices

Zero Waste: Anchorage, AK

While there are many communities, especially on the west coast of the U.S., who have adopted formal waste reduction programs, the City of Anchorage is a good example of such efforts in Alaska and provides examples of a range of information that has been developed, including information of interest and elements that can be considered by Skagway.

In 2008, the City of Anchorage passed a Zero Waste resolution which encourages all Municipal operations to engage in Zero Waste practices:

> "NOW, THEREFORE, BE IT RESOLVED, that the Municipality of Anchorage will support, encourage, identify and engage in Zero Waste practices as a guiding principle for all Municipality of Anchorage operations, including the day-to-day outreach and community actions within the Municipality."

As a result of this resolution, the Municipality generates a publication called *Anchorage to Zero Waste* twice a year in order to provide educational information about reducing, reusing and recycling waste. The Zero Waste guide is a part of a broader education and outreach campaign designed to further reduce, reuse and recycle tenants. Anchorage has also developed an extensive website with information on residential, commercial, school and public space recycling. The website also provides information on composting such as backyard composting tips and locations for dropping off yard waste and compostable material.

In addition, the City has implemented an extensive community-wide recycling program, which includes the following:

- Automated curbside collection to 10,000 homeowners throughout the Borough.

- Community Recycling Centers where residents can drop-off recyclables at several convenient centers.
- School Recycling – All School District schools and facilities have access to mixed paper recycling.
- Public Space Recycling – Recycling bins in all public buildings.
- Composting – Several locations for drop off of yard waste and manure.

Zero Waste: Boulder, Colorado

Adopted in 2006 by the City of Boulder, Colorado, the resolution below shows how a city can approach the concept of source reduction through advancing Zero Waste goals throughout the entire city, including:

- City planning and budgeting.
- Educational principles.
- Procurement policy.
- City department awareness and examples.
- Encouragement of voluntary programs.

Excerpts from the resolution are listed below:

> *"The city of Boulder hereby encourages the pursuit of Zero Waste as a long-term goal in order to eliminate waste and pollution in the manufacture, use, storage, and recycling of materials. This goal must be addressed through the choices Council will make in the context of the city's Business Plan and annual budget processes, by initiating action plans and measures that significantly reduce waste and pollution. These measures will include encouraging residents, businesses and agencies through incentives and legislation to judiciously use, reuse, and recycle materials, as well as to motivate businesses to manufacture and market less toxic and more durable, repairable, reusable, recycled, and recyclable products. In all cases, the guiding principles of the city's Master Plan for Waste Reduction will be followed. "*
>
> *"Mandatory programs will be employed only if the infrastructure exists and if convenient, voluntary programs prove not to be successful."*
>
> *"The city of Boulder will also review its own policies, contracts, and standard operating procedures to incorporate zero waste provisions and actions into all aspects of its organizational culture to encourage the use of materials and products that are durable, repairable, and reusable, have a minimum of packaging, toxic content or chemical hazard potential, are resource and energy efficient in their manufacture, use and*

disposal, and in their use or disposal minimize or eliminate the city's potential environmental liability."

Boulder prepared a Master Plan for Waste Reduction as a means for implementation of its adopted zero waste goal and has achieved close to a 50 percent waste diversion rate at this time.

Co-ops & Exchanges

C.A.R.E. Project ReUse--Charlotte County, FL Swap Shop

The Center for Abuse and Rape Emergencies (C.A.R.E.) Project ReUse is a community effort to improve the quality of life in Charlotte County, Florida. C.A.R.E. Project ReUse is a collaborative project with the Charlotte County Environmental & Extension Services to keep usable items out of the local landfill, and at the same time, augment funding to assist victims of domestic violence, sexual assault, and other violent crimes. There are two ReUse stores in the county both co-located with the mini-transfer stations used for collecting recyclables. Participants can drop off usable items, such as clothes, furniture or kitchen supplies free of charge at the C.A.R.E. stores (Exhibit 60).

Exhibit 60. Charlotte County's C.A.R.E Stores

The Community Chest, Gustavus, AK

The goal of the Gustavus Disposal and Recycling Center (DRC) and Community Chest is to reuse locally or to recycle as much material from the community's waste stream as possible (Exhibit 61). The Community Chest accepts gently used clothes, household goods, books, hardware and small electronic devices to be resold through their volunteer-staffed store, with all proceeds benefitting the DRC. The DRC manager indicated that there is a need and a demand to provide the same kind of service for construction and demolition (C&D) debris, but there is not room for it at the current location. The Community Chest generates a sizable amount of income for the DRC, but the manager believes much more money could be made if C&D were accepted and if the thrift store was located directly adjacent to the DRC, which it currently is not.

Exhibit 61. The Gustavus Community Chest

Davis Bicycle Collective—Davis, California

The Davis Bicycle Collective in Davis, California is a volunteer-run non-profit community bicycle organization (Exhibit 62). They provide a public do-it-yourself shop, Bike Forth, where folks share tools, skills, and knowledge about bike maintenance and repair. They utilize donations of used bicycles and parts from the community and, in turn, make used parts available for anyone else to build or repair a bicycle. Patrons are asked to contribute financially to the cooperative shop, but nobody is turned away for lack of funds. Their aim is to empower confident and committed cyclists through education and community building, and to encourage more cyclists by making bikes and bike maintenance, fun, safe and accessible for everyone.

Exhibit 62. City of Davis, CA Bicycle Cooperative

Little Free Libraries

Another idea taking hold across the country is The Little Free Library concept (Exhibit 63). The Little Free Library works on the premise of take a book/leave a book in a little library, which is typically an over-sized birdhouse-size structure attached to a post and installed outdoors—either

in someone's yard at their home, or in a public space—making books accessible to the public 24/7. These structures could also serve as an exchange for magazines, CDs, etc.

Exhibit 63. Little Free Libraries

RECYCLING PROGRAMS

There are three major steps involved with implementing a recycling program: collecting the recyclables, processing the material and then getting the material to market. The practices involving the first two steps are explained in more detail below. The marketing aspect is further discussed in Section 6.

Collection

Recyclables can be self-hauled, meaning residents and business owners collect and carry their recyclables to a designated drop off area, or they can be collected curbside, with either an automated truck or manually by solid waste collection workers. The following section describes the different types of collection and processing options available for recycling.

Single Stream Recycling

Single stream recycling refers to collection in which all recyclable material is placed in one container. Programs that provide residents and business owner's convenience and ease of use tend to achieve higher recovery rates and operational efficiencies. Single stream collection eliminates the need for customers and/or collection crews to sort recyclables. Communities that have adopted single stream collection programs have achieved significant increases in participation and tonnage recycled. However, single stream collection requires single-stream processing, which requires additional equipment and capital.

Dual-Stream Recycling

Dual stream recycling collection is a recycling scheme in which paper products (newspaper, cardboard, magazines, office paper, etc.) are collected in one container, while everything else (metals, plastics, etc) is placed in another one. Recyclables that are collected in this way tend to

receive a higher per ton revenue due to a cleaner product as opposed to single stream collection, where contamination is more prevalent. However, dual-stream tends to be more labor intensive and thus there is a lower recycling capture rate, which results in a higher overall disposal cost. Many older dual stream, materials recovery facilities (MRFs) are converting to single stream as better separation equipment becomes more economical.

Self-Haul

Many communities choose to have recyclables self-hauled by their residents and business owners to a central drop-off location, such as a transfer station or to several recycling drop-boxes located around town. This option works well for smaller or rural communities who do not have the economies of scale to warrant curbside recyclable pickup. However, if these drop-off areas are not manned, there is a high likelihood of contamination with typical municipal solid wastes.

Public Areas and Event Recycling

An area often neglected in formulating recycling programs is that of public area and event recycling. With its considerable public presence, its buildings and facilities, and responsibilities for public space and events, Cities can take a lead role in promoting recycling and showing that government and public employees make waste diversion a normal part of all activities.

Placing recycling bins prominently alongside trash bins in public area—such as along downtown streets, or in recreational parks, can greatly enhance public area recycling. These bins should be of a different design from the trash bins to clearly distinguish which materials are accepted. Additionally, providing portable recycling containers free of charge to organizations holding public events throughout the year can also increase recycling during holiday parades, festivals or for other public events.

Collection: Best Management Practices

Event Recycling—California Strawberry Festival

Since 2007, the California Strawberry Festival has implemented a comprehensive diversion program for vendors and participants of the festival (Exhibit 64). The two-day festival attracts 70,000 attendees, 50 food and beverage concessionaires, and 420 arts and craft booths. The program includes the following elements:

- Prepare the plan for the festival's sustainability programs
- Developed diversion program policies and procedures for staff, vendors, concessionaires, and attendees
- Identify equipment and products needed to make the event eco-friendly
- Informed and trained volunteers, vendors, concessionaires, and festival staff on diversion program procedures through presentations and printed materials in contracts
- Supervise and monitor that volunteers, staff, vendors, and concessionaires are following the diversion procedures

- Evaluate contamination levels of the recycling containers at the material recovery facility to monitor contamination levels after the event
- Development of a public awareness campaign to make the recycling program visible through the program, local newspaper, event posters, web-site, and internet social marketing tools (i.e. Facebook).
- Prepare final report on the sustainability program procedures, challenges, recommendations, tons diverted, and diversion results.

Exhibit 64. California Strawberry Festival

Processing

Once recyclables are collected, the materials have to be processed. There are several levels of processing, ranging from a small shed with a few balers, to a full-scale MRF that separates out the recyclables. A summary of these different technologies is detailed below.

Source-Separated Recycling Drop-Off Facility

A source-separated recycling drop-off facility provides minimum processing of recyclables. Most of these facilities contain various forms of balers that can condense and bale recyclables by material type. For example, there may be a paper baler and a metals baler onsite. Material delivered here is usually sorted by the person dropping of the recyclables; although some facilities employ workers to assist with this task and still others depend on volunteers. There is very little garbage or contaminants associated with this type of collection system, so they tend to be more acceptable to communities when they are going through the facility siting process.

Some communities elect to have a non-profit community recycling facility, similar to the Raven Recycling Facility in Whitehorse, Yukon, and the Friends of Recycling in Haines. The general setup of these facilities is to have customers self-haul and source separate materials onsite. Oftentimes the facility is operated by part-time employees or on a volunteer basis. Funding for the facility is typically solely dependent upon memberships and/or the sale of recycled material.

Single or Dual Stream Materials Recovery Facility

A "clean MRF" refers to a MRF that accepts recyclable commingled materials that have already been separated at the source from municipal solid waste generated by either residential or commercial sources. There are a variety of clean MRFs, with the most common being single stream where all recyclable material is mixed, or dual stream, where source-separated recyclables are delivered in a mixed container stream. With the advancement of automated single stream MRFs and the increasing sophistication of new material separation equipment, modern single stream facilities are "state of the art" in terms of use of technology and ability to achieve end product quality that is acceptable to most product buyers. The worldwide market for recycled materials is continuing to evolve, and is expected to remain subject to variability in economic conditions generally, while offering opportunities for refinement and diversification of the materials that are separated. Accordingly, markets will be driven by new technical advances and ability to provide better quality of separation, which in turn will induce equipment suppliers and MRF operators to provide better equipment as prices and demand dictate.

Mixed Waste Processing Facility

Mixed Waste Processing Facilities (also referred to as a "dirty" MRF") receive mixed solid waste (meaning recyclable and non-recyclable materials, unseparated) which is sorted to separate recyclable material that is then processed. Because Mixed Waste Processing Facilities accept one unsorted stream of waste and recyclable materials, they allow for lower collection costs. Capital and operating costs are typically higher than a conventional MRF due to the need for more extensive sorting equipment and labor. The potential for contamination is higher; resulting in lower quality recovered materials, as well as lower recovery rates, which can contribute to lower revenue from recyclable material sales. Mixed Waste Processing Facilities are able to achieve recovery rates of 45 percent up to 70 percent of the incoming waste as recyclable and compostable materials.

The nation is currently trending towards single-stream recycling collection and processing facilities. Every week news articles can be found reporting a municipality or county making the switch from source-separated to single-stream. However, it is important to realize the role population plays in the decision to go source-separated as opposed to single-stream: the larger a community, the more they stand to gain from going to single-stream. The advantage of single-stream is that although source-separated has the potential to generate more income per ton due to cleaner material, the sheer volume increase associated with single-stream creates an overall economic advantage for this system. Therefore, the smaller a community, the less they have to gain from volumetric increases, and thus may choose to rely on cleaner, source-separated material to gain an economic edge, which is the strategy most used by communities in southeast Alaska, as found in Section 7.

YARD WASTE AND OTHER ORGANICS

Composting is the most prevalent method of recovering organic materials. Organic materials contain rich nutrients that can play an important role in rebuilding soil structures. According to the U.S. Composting Council, compost's useful properties lead to healthier soil and plants, better nutrient cycling and greater fertility, and also aid in erosion control and storm water

management. Additionally, composting produces a material that can be used to enhance the local soil. Since Skagway has very rocky soil, augmenting it with compost could be very beneficial to local gardeners. Despite Alaska's cold climate and short growing season, year-round composting is still feasible for Skagway.

Backyard Composting

Backyard composting is a viable method of yard and organic waste reduction for those residences and properties that have space available and are inclined to consider this possibility (Exhibit 65). Backyard composting can be as simple as a backyard pile, which takes a relatively long time to turn to compost, to a tumbler where, if turned everyday could make compost rather quickly. The organics utilized for backyard composting include yard waste as well as kitchen vegetable and fruit scraps.

Exhibit 65. Backyard Composting Unit

Collection of Food Scraps and Other Organics

Some cities in the US and Canada are asking, or even requiring, food scraps and other organics to be source-separated from the MSW stream (Exhibit 66). The communities are using the organics to create compost on a scale much larger than what is being done at the backyard level. When a municipality decides to compost on a larger scale there are several options available. These options are discussed below.

Exhibit 66. Source Separation of Food Scraps

Larger-Scale Compost Facility

Overview

Composting involves the aerobic biological decomposition of organic materials to produce a stable, humus-like material. Composting happens naturally in the environment when organic material falls to the soil surface. There are many compost technology options for managing most organic materials in the waste stream, each striving to optimize the biological conditions in the mass of material to achieve the most uniform, mature compost in a reasonable amount of time.

The composting process is somewhat forgiving in practice, so it is not always necessary to meet ideal conditions for making good compost, but, the closer the system can get to the ideal, the better and more consistent the product will be. The resultant compost product makes a valuable soil amendment due to its high organic matter content. Because compost contains high levels of organic carbon, which can fuel key ecosystem functions like nutrient cycling, water retention, and erosion control, it can also help rebuild soils.

Composting methods can be classified by the level of sophistication of the operation, as follows:

- "Minimal" Technology
- "Low-Level" Technology
- "Intermediate-Level" Technology
- "High-Level" Technology

When evaluating alternative processing methods or technologies, key criteria include available land and labor. One distinct advantage that composting has compared to other organic treatment systems is its ability to work at a wide range of scales with both low technology and high technology systems. A homeowner's backyard compost bin or pile can be an effective method for recycling household food scraps and yard trimmings. On a larger scale, municipal and private facilities can recycle from as little as a few hundred cubic yards of organics to more than

200,000 cubic yards each year and handle a variety of materials, including yard trimmings, food scraps, manure, biosolids, and mixed solid waste.

Minimal or passive composting systems with limited management requirements will use more land area and take more time. More active composting systems with greater management requirements can process the materials more quickly using less land. While it is important to be aware of odor concerns, a well-run composting system will not create problematic, persistent odors, regardless of the technology.

Compost Technology Evaluation (Centralized Facilities)

The majority of centralized yard waste composting facilities (i.e., excludes backyard composting) utilize low-level or intermediate technology (i.e., the turned windrow method) for ease and lower capital required. Other facilities simply use a static pile (i.e., minimal technology). Finally, some facilities use high-level technology that includes forced aeration or a vessel/building, at least for the initial phases of composting. Each technology is discussed below.

When composting food residuals, the risk of odors and excess moisture is more significant, and temperatures sufficient to kill pathogens must be ensured. Besides the technology, an understanding of operational methods is needed when considering food residuals.

High-Level Technology

There are several different systems which consist of a "high-level" technology method. These require less space and provide greater operational control and usually result in shorter composting time than other composting methods.

In-vessel composting is a high technology approach consisting of different proprietary systems that usually involve mechanical agitation and forced aeration, and may be enclosed in a building. These are the most capital intensive and result in the greatest level of process and odor control, as well as the shortest composting time required. These systems are generally used for composting sludge and/or solid waste, other than simply yard waste.

The aerated static pile is another example of a higher technology approach. In an aerated static pile or forced aeration composting, piles of organic material are aerated from below by blowers, controlled by timers or temperature feedback, moving the air through perforated pipes. Turning is required periodically to exchange inner and outer material. Onondaga County's facility (see case study below) is an example of a forced aeration composting facility.

Low-level or Intermediate Technology

Low-level and intermediate technology methods utilize a windrow composting system. The organic feedstock is formed into long narrow piles (windrows) and periodically turned, based on temperature and time. The turning serves to mix and break up material; aerate the windrow; and, release excess moisture.

Low-level technology is the recommended option for most municipalities, especially when composting yard waste only. Low-level technology includes modest operation and maintenance

requirements and limited equipment needs. Typically, windrows are turned every 3 to 4 weeks by a front-end loader. This type of low-level technology is what the communities of Gustavus and Whitehorse are using with their composting systems.

Intermediate-level technology is the same as the low-level method, but utilizes more sophisticated and expensive windrow turning machines instead of front-end loaders for aerating and turning the windrows. Front-end loaders may be used to initially form the windrows, but a windrow turning machine is used to shred, turn and aerate the leaves, resulting in a more thorough and efficient blending and aerating than a front-end loader can achieve.

The turned windrow method is commonly used in yard waste composting facilities as it is a versatile, low-tech method which can be adapted to changing conditions. Using turned windrows to manage food residuals is a versatile system that can be easily adjusted to accommodate changing conditions.

Compost Technology Summary (Centralized Facilities)

A summary of the pros and cons of the turned windrow (low-tech) and forced aeration (high-tech) methods is as follows:

- Windrows are low/no-tech, while forced aeration requires a blower system, and personnel to maintain and repair it (costs).
- In turned windrows, the recipe and pile structure can be adjusted after piled, while forced aeration requires proper mixing before placing piles (versatility).
- Windrows can be turned and moved at will, while a forced aeration system must be disassembled before moving materials (versatility).
- Negative pressure forced aeration can help control odors by collecting air into the suction pipe, enabling filtration before discharging. Windrows require turning to aerate and can release odors as the pile is opened (odor, pest and public management).
- Positive pressure-forced aeration can eliminate excess moisture and excessively high temperatures by pumping higher volumes of air into the pile than the negative pressure system can pull in. Turned windrows must be turned repeatedly, or mixed with drier materials, to reduce moisture and temperature (moisture control, temperature control; odor, pest and public management).
- During dry weather periods, windrows will hold moisture better than piles processed with forced aeration.
- Forced air piles can be built as an extended pile, reducing the size of the "footprint" needed to process a given amount of material.
- Forced air systems need an engineer to design the system to assure the air flow will be sufficient for the amount to be composted.

Composting: Best Practices

Some cities in the US and Canada are using a three-bin recycling system in which a green organics bin is added to the collection mix in addition to recyclables (blue) and trash (black). The City of San Francisco is a leading example of this approach and is accepting the materials listed below (for composting at an out-of-city regional facility) in its green bins with good success:

- Food Scraps (anything that used to be alive)
  - Bread, grains and pasta
  - Coffee grounds with paper filter
  - Dairy
  - Eggshells and eggs
  - Fruit (pits and shells too)
  - Leftovers and spoiled food
  - Meat (including bones)
  - Seafood (including shellfish)
  - Tea and tea bags
  - Vegetables

- Food-soiled Paper
  - Coffee filters
  - Pizza boxes
  - Paper cups and plates
  - Paper ice cream containers (metal or plastic rim is OK)
  - Paper bags, napkins, tissues and towels
  - Paper take-out boxes and containers (metal handle OK)
  - Waxy paper milk and juice cartons (no foil liner, plastic spout OK)

- Plants (extra yard trimmings must be boxed, bundled or placed in brown paper bags less than 40 pounds per item and placed next to the green cart for collection.)
  - Branches and brush
  - Flowers and floral trimmings
  - Grasses and weeds
  - Leaves
  - Tree trimmings (less than 6 inches in diameter and 4 feet long)

- Other
  - Cotton balls and cotton swabs
  - Hair, fur, and feathers (non-synthetic)
  - Plastic and cutlery clearly labeled "Compostable" (green stripe or sticker to allow for easy identification)
  - Vegetable wood crates (metal wire is okay)
  - Waxed cardboard and paper
  - Wood - small pieces of lumber or sawdust from clean wood only (no plywood, pressboard, painted, stained or treated wood)
  - Wooden chop sticks

Cornell

Cornell's composting operation manages food scraps and animal bedding, and reduces the university's total waste stream by half (Exhibit 67). Cornell Farm Services, which runs the operation, trucks organic materials from 57 campus waste streams -- from dining halls to greenhouses -- each year. Cornell's composting facility is eight acres and is a mile off campus.

In 2009, the facility received 850 tons of food scraps and biodegradable utensils from 11 dining halls and other food locations; 3,300 tons of animal manure and bedding; and 300 tons of plant material and soil from greenhouses.

The site produces up to 6,000 tons (4,000 cubic yards) of compost each year that is used to nurture plant growth on campus or sold to local landscapers, garden centers, vineyards and farms for $15 per cubic yard. Through compost sales and tipping fees for moving the waste, the compost site is largely self-funded and is set up to run as a not-for-profit facility.

Exhibit 67. Cornell Composting Site

Cornell Dining sends both wastes from food preparation and plate scrapings and compostable packaging, cups and cutlery made from corn or potato starch from dining halls, to the compost site. Two Cornell Dining student coordinators have the job of raising awareness about composting in all dining halls and campus food retail outlets, working to educate diners about separating trash from compostable and recyclable items. Also, the dining hall kitchens use pulping machines to turn food waste into a pulp before it is trucked away.

At the compost site, the material is spread into 18-foot-wide, 7-foot-tall windrows. About 15 windrows sit on a four-acre gravel pad reinforced with a geotextile fabric. A compost turner is used. Fabric and berms create channels along either side of the pad to direct storm water runoff into a 250,000-gallon retention pond. The water from the pond can be pumped back onto the windrows to keep them moist. The water is also sprinkled on a 30-acre field on a hill above the windrows where grass and soil filter the water before it re-enters the watershed. In six to nine months, the compost is ready for use.

Onondaga County

In March 2007, Onondaga County Resource Recovery Agency (OCRRA) began a pilot food waste composting project by collecting pre-consumer food wastes from the New York State Fair and other area zero-waste events in Onondaga County. In December 2008, OCRRA converted from windrow composting to aerated static pile composting. A pilot project tested the technical and economic feasibility of composting pre-consumer food waste from County businesses and institutions. The goal is to compost over 18,000 cubic yards of food waste per year by the year 2015.

The food waste collected for the pilot project is pre-consumer food waste. Pre-consumer food waste is usually generated during meal preparation at large institutions or at grocery stores. The food waste is mixed at a 3 to 1 ratio with a bulking agent (yard waste and wood chips) and is placed into extended aerated static piles, underlain by piping. Through use of a blower, the pipes allow air to circulate through the piles and create optimal conditions for decomposition. After the food waste has decomposed and has met all of the temperature and monitoring requirements, the finished compost is screened for use as a soil amendment.

Anaerobic Digestion

Anaerobic digestion (AD) involves decomposition of organic waste in an oxygen-deficient atmosphere, which results in production of methane-rich biogas. Digestate is the solid material that remains after digestion, which is then composted or disposed. The biogas is typically used in a boiler to produce thermal energy or in an engine to produce electricity. AD projects are generally classified as high solids (dry) or low solids (wet).

The first commercial-scale dry AD system to begin operation in North America is a facility located on the campus of the University of Wisconsin-Oshkosh. After 28 days, digestate is transported to a commercial composting site. Feedstocks for the digester comes from campus dining halls and landscaping trimmings, as well as from the city of Oshkosh.

PUBLIC EDUCATION AND OUTREACH

Successful recycling programs know that public education is an important component. Education programs increase awareness of the benefits of increasing recycling and reducing the amount of waste that is generated as well as promoting outlets for reuse or exchange of materials. Making information easily available to residents and bringing opportunities to their attention usually are effective in promoting and increasing recycling. The following paragraphs provide more detail related to various education and outreach initiatives.

Web Sites

Web sites have become a very important and key way to publicize waste reduction and recycling, and are presented in a variety of forms and methods very much dependent on each individual city history, procedures and focus. A key element is the commitment and energy put into the program by elected officials and department heads in assisting with coordination between multiple departments with overlapping solid waste responsibilities and interests. The web site

designer needs to be well informed and provided with continually updated information on needs and priorities, as well as the ability to design and illustrate the programs.

Information on many other city programs is provided in other report sections and indicates varying amounts of information available. Several of these cities could be models for Skagway to use in updating its web sites

Print Material

Other forms of print material can also be effective forms of education and outreach and can include the following:

- Billing Stuffers
- Direct Mailings
- Phone Book Section Insert

These avenues of advertising are most effective for permanent residents of the community.

Signage

Taking advantage of colorful signs displayed around town can be effective in communities that have a large transient population or to those who host large numbers of tourists (Exhibit 68). Establishing a recognizable mascot or theme that is found at different venues frequented by this population can help encourage recycling participation. Establishing clear messages as to what is and is not recyclable also helps in fostering an increase in source separated recycling in public areas.

Exhibit 68. Signage Used At Sea-Tac Airport

America Recycles Day and Earth Day

Since 1997, communities across the country have come together on November 15 to celebrate America Recycles Day. America Recycles Day is dedicated to the promotion of recycling programs in the United States.

Earth Day, usually in April, is another day when events can be planned that includes recycling information and provides opportunities for city officials to publicize or speak about recycling.

Events and Awards

Making recycling a part of the planning and implementation of all City public events is a good way to increase awareness beyond routine information. Similarly, developing award programs, such as a green business recognition program, are other ways to build recognition and "branding" for recycling.

Technical Assistance to School and Businesses

Volunteers, or paid recycling coordinators are instrumental in providing technical assistance to teachers and administrations at schools and to managers and employees at local businesses. Engaging these sectors and providing useful instruction and incentives to them can greatly enhance a community's recycling program. Additionally, these sectors provide a viable population for embarking upon pilot studies for various recycling programs, such as a food waste diversion program.

Outreach Programs at Fairs/Festivals

Displaying or handing out useful recycling information at community-wide festivals, fair and other events can also be an avenue for reaching residents in the community.

Public Education: Best Management Practices

Zero Waste Technical Assistance to Local Restaurants—Irvine, CA

In July 2007, the City of Irvine passed a resolution adopting Zero Waste as a long-term goal for the City, in order to eliminate waste and pollution in the manufacture, use, storage, and recycling of materials. Reaching this goal will involve the active encouragement of residents, businesses, and agencies to use, reuse, and recycle materials judiciously, in addition to encouraging manufacturers to produce and market less toxic and more durable, repairable, reusable, recycled, and recyclable products.

The first project to be undertaken under this directive is an outreach and technical assistance program for food service establishments in the City. This project worked with restaurants to promote Zero Waste concepts, and identify ways to help them reduce waste and work towards Zero Waste.

The City to develop a community-based social marketing

approach to promoting Zero Waste through the utilization of motivators and reduction of barriers identified during a pre-project survey.

Based on survey results, the City developed public relations and "nuts and bolts" strategies to encourage restaurants to adopt Zero Waste activities. These strategies include:

- Customized Zero Waste plans with waste reduction and cost-saving elements.
- Site visits with a focus on product stewardship, consumer action, economic benefits, and education.
- Updating the City's website.
- Certification program.
- Preparation of background materials items to further educate and motivate businesses to adopt Zero Waste principles.
- Workshops.
- Developing a competition between participating businesses.
- Site visit follow-up and technical assistance, which include securing vendors, staff training, speaking with corporate managers, and cost analysis of zero waste implementation.

SOLID WASTE COLLECTION SYSTEM

Self-Haul

As described above in the recycling section, self-haul waste collection requires that the residents or business owners deliver their garbage to a central collection location. This option works well for smaller or rural communities who do not have the economies of scale to warrant curbside collection.

Residential Curbside Collection

Manual

Manual pickup has traditionally been the dominating type of collection since curbside garbage collection services began. This entails garbage collectors jumping off the garbage truck and manually lifting garbage cans to empty. Although this practice has dominated garbage collection for a long time, many communities are moving towards semi-automated and automated systems in order to minimize work-related injuries and for other reasons that are addressed below.

Semi-Automated

Semi-automated garbage collection is a hybrid between manual and automated systems (Exhibit 69). With semi-automated vehicles, crews wheel the carts to the collection vehicle and line them up with "flippers" (i.e., hydraulic lifting devices mounted on the truck body), activate the lifting mechanism, then return empty containers to the collection point. The use of semi-automated vehicles decreases demand for manual lifting, but it does not eliminate the need for manual labor. However, semi-automated trucks can be significantly smaller and thus are more conducive for neighborhoods with narrow streets and alley ways.

Exhibit 69. Semi-Automated Collection Vehicle

Fully-Automated

Automated side-loader trucks were first implemented in the City of Phoenix in the 1970s with the aim of ending the back-breaking nature of residential, solid waste collection, and to minimize worker injuries. Since then thousands of public agencies and private haulers have moved from the once, traditional read-loader method of waste collection to one that also provides the customer with a variety of choices in standardized, rollout carts. These has enabled communities throughout the country to significantly reduce worker compensation claims, minimize insurance expenses, while at the same time offering opportunities to workers who are not selected for their work assignment based solely on physical skills.

Modern Application of Automation

For this type of collection system, residents are provided a standardized container into which they place their waste (Exhibit 70). Residents must place their cart at the curb on collection day. During collection, the driver positions the collection vehicle beside the cart. Using controls inside the cab of the vehicle, the driver maneuvers a side-mounted arm to pick up the container and dump its contents into the hopper of the vehicle. The driver then uses the arm to place the container back onto the curb. Under this type of collection system, the driver is able to service the entire route; the need for additional manual labor is eliminated. The savings in personnel and worker's compensation costs, as well as the increase in crew productivity for automated collected, are well documented throughout the solid waste industry.

Currently, the Waste Equipment Technology Association (WASTEC) estimates that there are roughly about 120,000 solid waste vehicles on the road in the United States with about 15% of all new waste collection vehicles purchased in 2003 (the most recent statistics available) were automated. There is a real sense in the solid waste industry today that automated trucks are significantly increasing their share of the new sales in recent years. SCS is of the opinion that this trend is rapidly increasing as many agencies and private haulers attempt to minimize their

increasing insurance costs and more effectively control their cost of labor, while at the same time provide increased customer service levels and opportunities for an aging work force.

Exhibit 70. Example of Automated Side-Loader by the City of Scottsdale, Arizona

Advantages of Automated Collection Systems

Some of the general advantages of automated collection often touted by its proponents include the following:

For Residents

- Convenient and easy method for residents to dispose of trash
- Wheeled containers are easier, more maneuverable, and safer for residents because there is no carrying or lifting of heavy trash cans
- The capacity of most cans provided in these programs are equal to three or four regular trash cans
- The containers keep rodents and pets out of trash given the tight lids
- Cleaner, healthier neighborhoods with no litter on streets after pickup

For the Municipality

- Improved collection efficiency and reduced costs
- Reduced employee injuries

- Lower turnover rate and increased productivity due to less time missed by injured employees
- Reduced Worker's Compensation claims and insurance premiums
- Reduced rodent problems

The following paragraphs briefly discuss these general disadvantages to automated collection.

Disadvantages of Automated Collection Programs

The primary disadvantage of automated collection is the initial costs of purchasing specialized vehicles and providing carts to homeowners. On average, the capital cost of an automated side-loader is 20 percent more than that of a manual rear loader. Additionally, the useful life of an automated vehicle is often less than a rear loader. Cart costs generally average between $35 and $50 each depending on container size. Additional general disadvantages include the following:

- Automated vehicles require more maintenance than traditional rear end load vehicles and require specialized training of technicians.
- Homeowners must be educated on where to place bins and what kinds of trash can be collected. Bulky items that do not fit in the cart usually require a separate collection. Overloaded containers, or waste left on the ground can impact the productivity of collection. Ordinances prohibiting waste left on the ground should be developed, while additional containers can help discourage the practice.
- Some cities have chosen to automate yard waste collection as part of a transition to automation; however the size and volume of yard waste makes it less conducive to cart programs, and typically requires separate collection with different vehicle types (claw-type trucks or rear end load units). In order to effectively automate yard waste collection, yard waste size limits must be enforced, and alternate methods developed to collect larger, bulk debris items. Some jurisdictions have instituted a volume-based fee for yard waste that exceeds a predefined limit, making the system conducive to automation.
- Automated collection also does not work in densely populated areas with on-street parking on collection days. However, on-street parking does not prevent a cart based approach to collection. A hybrid system can be employed in these cases where carts are collected in a semi-automated fashion and many cart system benefits can still be enjoyed.

Pay-As-You-Throw Collection System

Pay As You Throw (PAYT) collection system is a solid waste rate strategy that charges households a higher amount for putting out more trash for collection (Exhibit 71). As of data

from 2006, more than 7,000 (25 percent)[5] communities in the U.S. agreed to use some form of PAYT.

For a number of years, the US Environmental Protection Agency (EPA) at the national level has promoted PAYT, and currently is funding a non-profit (Econservation Institute) to provide free nationwide PAYT webinars to help communities across the country learn about PAYT. Dubbed "PAYT-Now", the program has a dedicated website (www.paytnow.org) with PAYT resources available to communities everywhere.[6]

Exhibit 71. PAYT System With Different Carts

PAYT (also called variable rates, volume-based rates, user pay, and other similar names) provide a different way to bill for all or portions of solid waste services. Instead of paying a fixed bill, or including all costs in the general fund tax rate for unlimited collection, these systems require households to pay more if they put out more garbage – usually measured either by the can/cart or bag of garbage. Paying by volume provides households with an incentive to recycle more and reduce disposal.

Communities have been implementing PAYT solid waste rate incentives in earnest since the late 1980s. The programs can provide a cost-effective method of reducing disposal tonnage, increasing recycling and improving equity, among other effects. Experience in 7,000 communities, which are distributed across North America, shows these systems work well in a variety of situations. Examples of each of the following configurations are available in many states:

- Private haulers, multiple haulers, or municipal collection.

[5] Skumatz, Lisa A., and Juri Freeman, "PAYT: 2006 Update", for US EPA and SERA, Skumatz Economic Research Associates, Superior, CO.
[6] Everywhere literally - the last U.S. EPA webinar had registrants from Croatia, Ireland, Bahrain, Mexico, UK, as well as communities across North America.

- Manual or automated collection trucks.
- Wheeled carts, bags or other types of containers.
- Urban, suburban, small / rural, and isolated communities.

Collection: Best Management Practices

Automated, PAYT Collection System, Gainesville, Florida

The Gainesville program, with 48,000 households, has been in place in since 1994. While the weather and demographics in Gainesville may be different than Skagway, there are still take away lessons that the PAYT program provides for any municipality interested in pursuing this type of collection system. According to data provided by City officials, Gainesville saw an 18 percent decrease in the amount of solid waste collected, and a 25 percent increase in recyclables recovered during its first year alone.

One of the major "lessons learned" by Gainesville concerned the use of smaller-sized cans (e.g., 20 and 35-gallon). At the outset of the PAYT and automated collection programs, Gainesville had a few problems with the hydraulic arms not getting a good enough grip on the smaller cans, resulting in the cans being dropped into the garbage truck. By tweaking the truck arm hydraulics on all the collection trucks, they were able to adjust and solve this problem.

E-Waste Collection

Electronic wastes or "E-waste" has become one of the most persistent waste problems affecting communities today. Common practices for collecting e-waste include community "roundups" held once or twice a year. Larger communities accept self-hauled e-waste at their transfer station or disposal area year round. Donating used electronics for reuse extends the lives of valuable products. Recycling electronics prevents valuable materials from going into the waste stream. Consumers now have many options to recycle or donate for reuse their used electronics. Many computer, TV, and cell phone manufacturers, as well as electronics retailers offer some kind of take back program or sponsor recycling events.

E-Waste: Best Practices

New York

In New York State, the Electronic Equipment Recycling and Reuse Act (Article 27, Title 26 of the Environmental Conservation Law) was signed into law by the Governor on May 28, 2010. The New York law ensures that every New Yorker will have the opportunity to recycle their electronic waste in an environmentally responsible manner. Similar to the proposed Massachusetts E-waste bill, the New York law requires manufacturers to implement and maintain an acceptance program for the discarded electronic waste.

Manufacturers were required to implement their program by April 1, 2011. The manufacturers must provide for the convenient collection, handling and recycling or reuse of electronic waste via at least one reasonably convenient method of collection within each county, and within each municipality with a population greater than 10,000 at no cost to the consumer.

Other

Other states in the northeast that also have extended producer responsibility laws in effect includes Connecticut, Rhode Island, New Jersey and Maine. These laws have lead to the formation of collectives which represent groups of manufacturers that provide the collection and/or recycling on behalf of the manufacturers.

In summary, best management practices for E-waste include the following activities:

- Publication and dissemination of information (including via the internet) about E-waste, including the donation and reuse options or drop off and mail in programs.
- Periodic collection or drop-off at licensed facilities.
- Availability of additional information that may be needed or requested for making proper disposal decisions.
- Encouragement for local companies and merchants to provide product recycling or take-back opportunities.

SOLID WASTE TRANSFER

Drop Boxes

Drop boxes are designated areas in which residents or businesses can deposit their solid waste and/or recyclables. The drop boxes can accept single materials or multi-materials. The drop box may vary from a trailer with designated holes for different material types, to a large compactor in which waste is deposited. In many instances, drop boxes are not manned and thus there is a high likelihood that contamination can occur.

Community Transfer Station

Transfer stations are utilized by both self-haul customers and private haulers who bring waste for disposal. In most cases, solid wastes are unloaded into transfer trailers for transport and disposal offsite. Most transfer stations accept various material types from regular MSW to household hazardous waste and recyclables. In most cases, transfer stations also contain scales for weighing waste.

WASTE INCINERATION AND ALTERNATIVE WASTE CONVERSION TECHNOLOGIES

Basic Combustion System

The incineration of solid waste is accomplished in a furnace with the following components:

- Some type of structure to house the furnace and its appurtenances;
- A "tipping floor" where the solid waste from collection and transfer vehicles is deposited;

- A storage pit or floor to store the solid waste delivered; storage space is provided to enable this continuous operation);
- A charging system which mixes the various solid wastes received to develop a somewhat uniform material and then lifts it from the storage pit or floor and feeds (charges)the furnace;
- One or more furnace subsystems (sometimes referred to as combustion trains), which receive and burn the solid waste;
- Air pollution control subsystems to clean up the combustion gases; and
- An ash handling subsystem to manage the fly ash and bottom ash produced from the combustion of solid waste.

Stages of Combustion

Solid waste normally has a moisture content of 20-25% by weight. In order to successfully burn solid waste in a furnace, this moisture must be evaporated. Generally, most solid waste combustion units have three stages of reaction:

- Drying -moisture driven off.
- Ignition -solid waste ignited.
- Burnout -solid waste is gradually moved through the furnace by the grate subsystem where the combustible organic fraction of the solid waste is burned out.

Successful combustion of solid waste is accomplished by controlling the "3 Ts of Combustion"- Time, Temperature and Turbulence.

- Time -the period taken for solid waste to pass from the charging hopper until the bottom ash is discharged at the end of the grate subsystem (usually 45-60 minutes);
- Temperature -usually exceeds 1,800'F (980'C) within the furnace and is directly proportional to the residence time. If there is insufficient time in the furnace, the combustion reaction cannot proceed to completion and temperature declines; and
- Turbulence -provided by the grate subsystem moving the solid waste downward through the furnace to expose it to and mix it with air.

Normally, solid waste combustors reduce the original weight of the solid waste by 75+% and the volume by 85 to 90%.

Products of Combustion

Other than the release of energy in the form of heat, the products of combustion of solid waste are fly ash and bottom ash.

Fly ash is carried in the combustion gas, which also contains a number of contaminants, including acid gases, and other products of incomplete combustion. The gases are passed through a variety of air pollution control devices for cleanup before being discharged out of the stack into the atmosphere.

Bottom ash is the non-combusted material, which is discharged at the end of the grate subsystem. The bottom ash, as it is discharged from the grates, is still burning and is normally quenched by water. In the United States, the two ash streams -fly ash and bottom ash, are normally combined for management. The two combined dash streams are commonly referred to as solid waste combustor ash, or just ash.

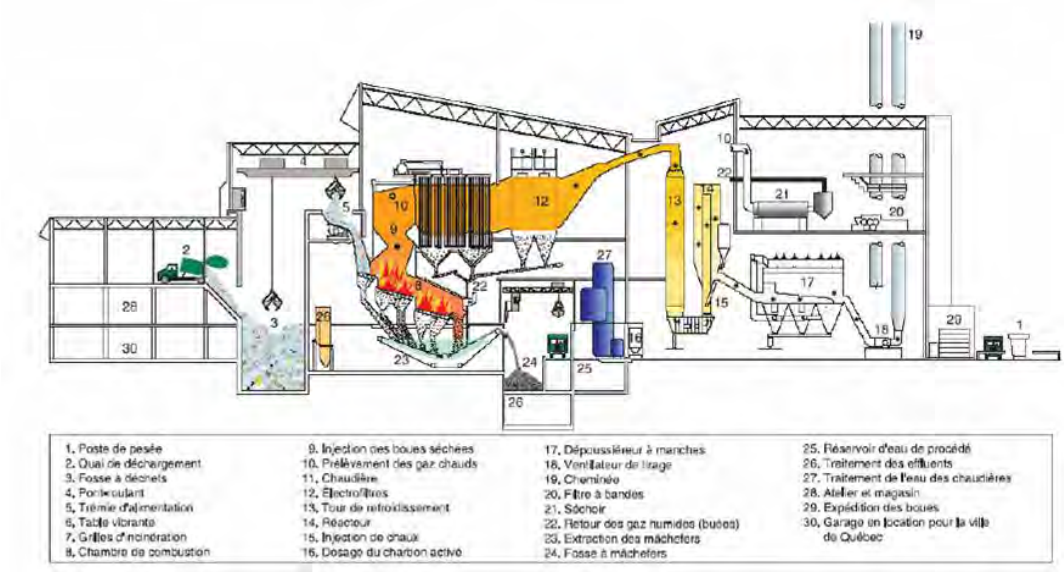
MASS BURNING

"Mass-burning" refers to the generic name for the type of technology used to incinerate unprocessed solid waste, and thereby releasing its heat energy. The thermal reduction of solid waste through mass-burning has been a common procedure throughout the world. There are decades of experience in constructing and operating some 500 mass burn facilities in the United States and Europe. Such facilities were in operation as early as 1896 in Hamburg, Germany, converting solid waste into electricity.

Process Description

An illustration of a typical mass-fired, incineration facility is shown in Exhibit 72. Solid waste collection and transfer vehicles proceed into a tipping area where their waste is discharged into a large storage pit, which is usually sized to allow two to three days storage or stockpiling of refuse so that plant operations can continue over weekends and holidays when deliveries will not be accepted. There are some facilities which differ in design by utilizing a tipping floor with a front-end loader and belt conveyor system as their form of storage and feed system. In almost all facilities, however, the refuse is fed into the furnaces by means of overhead cranes manipulated by a crane operator. Much of the success of the operation depends upon the skill of the crane operator to remove large or unusual objects in the waste stream that would otherwise prove to be a problem if fed into the boiler. The operator is also responsible to observe the nature of the incoming waste so that materials with different moisture contents are gradually intermixed to try to get uniform moisture content.

The refuse is then discharged into refuse feed hoppers, which meter out the refuse into the combustion chamber, either by gravity feeding or by a hydraulic feeding device. In a majority of systems, the waste is then pushed onto an inclined, step-like, mechanical grate system which continuously rocks, tumbles, and agitates the refuse bed by forcing burning refuse underneath newly fed refuse. Generally, most systems have three zones of activity along the grates: drying, ignition, and burnout. Holes in each grate bar allow underfire air to pass through the grates resulting in cooling and, thus, preventing thermal damage to the grate system. The width of the grate and the number of grate steps is dependent not only upon the manufacturer's specifications, but also on the overall size of the EfW system.



Source: Deltaway Energy

Exhibit 72. Example of Cross-Section of a Mass-Fired Waterwall Facility

Facilities using mass-burn technologies have been designed with either refractory or waterwall furnace systems. The major difference between these systems is the location of the boiler. Refractory units have their boiler located downstream of the combustion chamber, whereas waterwall constructed with water tube membrane walls to recover the heat energy. A majority of mass burn facilities constructed have waterwall systems because of their greater thermal efficiency which is generally between 60 to 75%.

Recovery of ferrous and non-ferrous materials from the ash residue is possible in mass-burn systems. Many facilities have successfully utilized magnetic separators (with or without trommels) to recover ferrous material from the ash. Some systems have attempted to recover the remaining non-magnetic fraction in the ash, such as aluminum and glass, using various trommels, screens, jigs and fluid separators.

Operations Experience

Mass burning incinerators have been used in Europe and Japan for municipal solid waste disposal for nearly 30 years where their acceptance has been rapid and widespread. With over 500 facilities in operation worldwide in sizes ranging from 60 to 3,500 tons per day, mass fired incineration is the most thoroughly demonstrated technology in the WTE field at this time.

MODULAR COMBUSTION

A modular incinerator is a type of mass-burning unit which is prefabricated on a standardized modular basis in a factory. These plants operate a starved air basis. Such units are shipped to the site in modules, ranging in design capacity from ten tons per day to 200 tons per day, where they are installed. Several modules can be grouped together at a single location. These "off the

shelf" units can often be less costly to fabricate than the larger mass-burn facilities which require more costly field erection. Modular plants can also typically be constructed in some 15 to 20 months.

Process System

Modular incinerators have been designed and constructed in the United States with different process configurations. Some units have been designed to incinerate solid waste under excess air conditions with either refractory furnaces or waste heat boilers or with waterwall boilers. A majority of most units, however, have been designed to operate under starved air conditions with refractory furnaces and waste heat boilers.

A cross section view of a typical modular combustion unit is illustrated in Exhibit 73. A majority of modular facilities have a tipping floor and utilize a front-end loader for simplicity in waste storage and feeding. Combusting takes place in either two or three stages. First, solid waste, which is delivered to the facility, is fed into the initial combustion chamber using a ram-type feeder. A moving ram slides back and forth over fixed steps within the chamber, causing the waste to tumble down one fixed section of the grate to the next fixed section. The waste is then transformed into a low-Btu gas which is then combusted in the secondary chamber, where auxiliary fuel is often fired under excess air conditions. A discharge ram on the back end of the combustion chamber feeds this incinerated waste into an ash quench bath.

The low-Btu gases produced by the combustion process in the first chamber are typically introduced into a secondary chamber where they are burned at temperatures ranging from 1,800 to 2,000 degrees F. Heat energy is recovered by convection in waste heat boilers in this secondary chamber, although waterwall boiler units for the primary and secondary chambers have been constructed.

In recent years, several manufacturers have entered the modular plant marketplace using a batch oxidation process (BOS – Exhibit 74). The batch process integrates slow gasification and long exposure time at moderate temperatures followed by turbulent oxidation of gases at high temperature. After the waste is loaded into the primary chamber and sealed tight, an auxiliary burner is ignited to raise temperatures to about 200 degrees C. The interior temperature is them monitored with controls and maintained by allowing sub-stoichiometric amounts of air into the chamber during the gasification process. The combination of relatively low temperatures and only sub-stoichiometric amounts of air in the primary chamber during gasification do not disturb the gasification bed, which is said to minimize particulate emissions, heavy metals, and many combustion gasses. Depending on the waste type and system layout, the waste reduction process in the primary chamber will take approximately 10 to 15 hours.

Emissions produced during the gasification process pass through to the preheated secondary chamber also called an "afterburner" where most of the remaining air emissions are eliminated. As the gasses from the primary chamber enter a preheated secondary chamber, auxiliary burners and excess oxygen create a very turbulent high temperature environment (typically between 850 degrees C and 1,200 degrees C). For most applications within the European Union (EU) 850 degrees C is the required minimum, though 1,100 degrees C is required for halogenated wastes, and in North America, 982 degrees C is usually required. Additionally, residence time in the

secondary chamber is important for proper destruction of emissions from the primary chamber. In both the EU and North America, a minimum residence time of two seconds is required.

These modular technologies, while being cheaper, provide a burn out that oftentimes is not as good as mass burn. Also energy recovery is lower because of the size of the boiler is quite small in comparison to mass burn heat surface ratios. Life expectancy of such a plant is also anticipated around 10 to 15 years versus 30 years for mass burn.

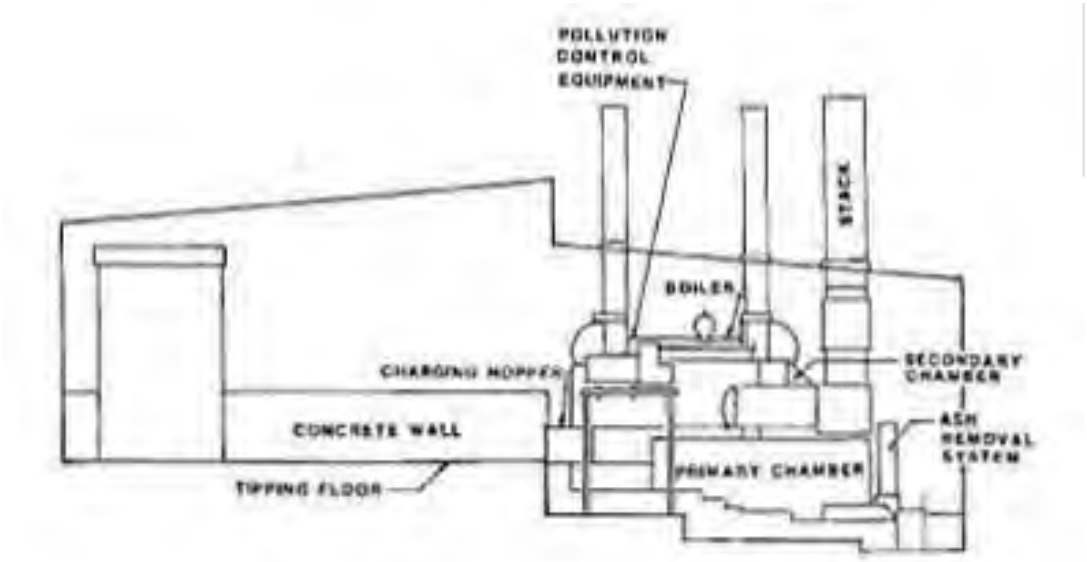
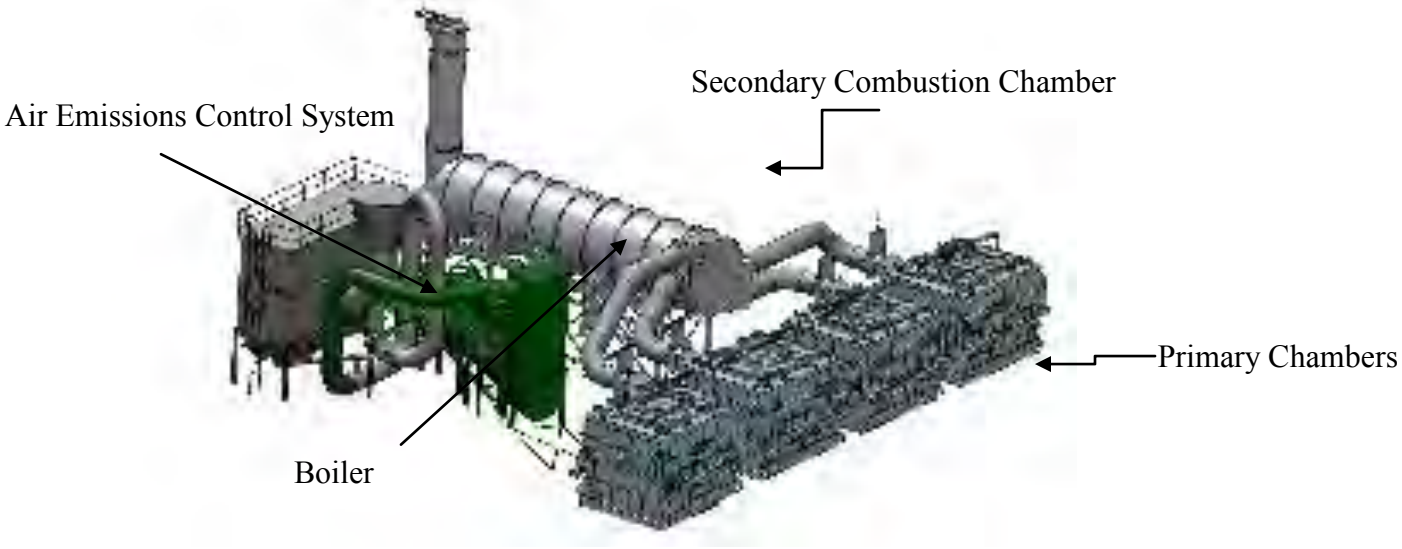


Exhibit 73. Cross-section of Typical Modular Facility



Source: Waste2Energy, Inc., 2009

Exhibit 74. Cross Section of Batch Oxidation System, Modular Facility

Operating Facilities

There have been many more modular incinerators constructed in the United States than either the mass-burn or refuse-derived fuel systems. In 1977, the first modular incinerator began operations in North Little Rock, Arkansas to produce steam for the Koppers Industry's Forest Products Division. Since that time, some 50 modular systems have been built in the United States (Exhibit 75).

Modular combustion units offer a lower capital cost and simplicity to communities considering field-erected mass-burning systems. These systems are generally reliable and are backed by many years of successful operating experience. The newer BOS systems appear to offer substantially lower costs of operations and maintenance. For example, the manpower required to operate these systems is generally minimal with one worker required to load the primary chamber and discharge the ash stream within an hour. Many suppliers claim nearly complete burn out between energy recovery and recycling. The ash remaining is reported to be about three to eight percent of the original volume (depending on waste composition). Lastly, these systems are modular and can be used or decreased in size easily.

Exhibit 75. Comparison of Active Modular Combustion Facilities

Location	Startup	Design Capacity (tons/day)	Energy Generation	Capital Cost ($ millions)
Auburn, ME	1992	200	Steam	4.0
Joppa, MD	1988	360	Steam	10.0
Pittsfield, MA	1981	360	Steam	10.8
Alexandria, MN	1987	80	Steam/Electricity (0.5 MW)	4.2
Fosston. MN	1988	80	Steam	4.5
Perham, MN	1986/2002	116	Steam/Electric (2.5 MW)	6.0
Red Wing, MN	1982	90	Steam	2.5
Fulton, NY	1985	200	Steam/Electric (4 MW)	14.5
Almena, WI	1986	100	Steam/Electric (0.27 MW)	2.7
Husavik Municipality, Iceland	2006	20	Steam	3.5
Scotget, Scotland	2009	180	Electricity	40.0
Turks and Caicos Island	2008	4	None	1.0
U.S. Air Force, Wake Island	2009	1.5	None	0.5
U.S. Department of Defense, Kwajalein Atoll	2007	32	None	5.0

EMERGING WASTE CONVERSION TECHNOLOGIES

Summary of Technologies

Conversion technologies include an array of emerging technologies that are capable of converting post-recycling residual solid waste into useful products and chemicals, including ethanol and biodiesel, and clean renewable energy. The technologies may be thermal, chemical or biological. These technologies have been used successfully to manage MSW in Europe and Asia, but commercial development in the United States is still in the design stage.

Technologies that appears amenable for converting organic and other materials into energy, ethanol, and other products include hydrolysis, gasification, anaerobic digestion, and plasma arc. The following sections briefly describe these technologies; Exhibit 76 provides a very general comparative overview of these technologies. Throughout this section, we use the terms conversion technologies and alternative technologies interchangeably to describe technologies that are being considered for MSW processing and conversion to energy and other products.

Exhibit 76. General Overview of Conversion Technologies

Technology	Amenable Feedstock	Feedstock Requirements	Emissions/Residues
Acid or Enzyme Hydrolysis	Cellulosic material	Cellulosic feedstock	Wastewater, CO_2
Gasification	Biomass, MSW	Drier feedstock, high carbon	Ammonia, NO_x, tars, oil
Anaerobic Digestion	Manure, Biosolids	Wet material, High nitrogen	Wastewater, CH_4, CO_2, H_2S
Plasma Arc	MSW	?	Slag, scrubber water

Hydrolysis

Hydrolysis is a chemical decomposition process that uses water to split chemical bonds of substances. There are two types of hydrolysis, acid and enzymatic. Feedstock that may be appropriate for acid or enzymatic hydrolysis typically is plant-based materials containing cellulose. These include forest material and sawmill residue, agricultural residue, urban waste, and waste paper.

Ethanol facilities could be co-located at MRFs where existing materials are already collected and the existing solid waste transportation infrastructure could be utilized. Ethanol facilities co-located at MRFs could take advantage of the existing solid waste collection and transportation infrastructure. Exhibit 77 includes a typical hydrolysis process.

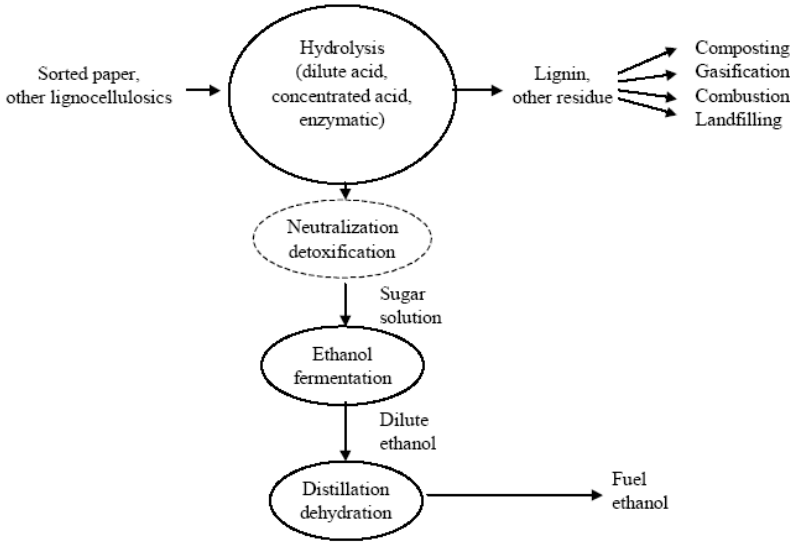


Exhibit 77. Typical Hydrolysis Process

Gasification

Gasification is a process that uses heat, pressure, and steam to convert materials directly into a gas composed primarily of carbon monoxide and hydrogen. Gasification technologies differ in many aspects but rely on four key engineering factors:

- Gasification reactor atmosphere (level of oxygen or air content).
- Reactor design.
- Internal and external heating.
- Operating temperature.

Typical raw materials used in gasification are coal, petroleum-based materials, and organic materials. The feedstock is prepared and fed, in either dry or slurried form, into a sealed reactor chamber called a gasifier. The feedstock is subjected to high heat, pressure, and either an oxygen-rich or oxygen-starved environment within the gasifier. Most commercial gasification technologies do not use oxygen. All require an energy source to generate heat and begin processing.

There are three primary products from gasification:

- Hydrocarbon gases (also called syngas)
- Hydrocarbon liquids (oils)
- Char (carbon black and ash)

Syngas is primarily carbon monoxide and hydrogen (more than 85 percent by volume) and smaller quantities of carbon dioxide and methane. Syngas can be used as a fuel to generate electricity or steam, or as a basic chemical building block for a multitude of uses. When mixed with air, syngas can be used in gasoline or diesel engines with few modifications to the engine.

As in the case of ethanol conversion facilities, gasification facilities could be co-located at MRFs to take advantage of the current solid waste transportation infrastructure. In addition, co-location at MRFs would ensure that recyclable materials would be removed beforehand and only residuals would be sent to a gasifier. If a gasification facility is co-located at a landfill that accepts MRF residuals, the gasification facility could utilize landfill gas in the gasification process or could work in tandem with a landfill gas-to-electricity project. Exhibit 78 shows a typical gasification system.

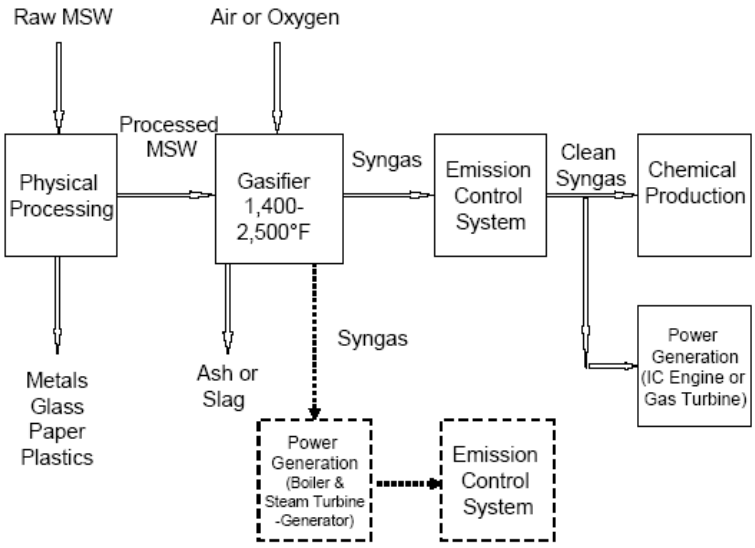


Exhibit 78. Typical Gasification System for Power Generation or Chemical Production

Anaerobic Digestion

Anaerobic digestion is the bacterial breakdown of organic materials in the absence of oxygen. This biological process produces a gas, sometimes called biogas, principally composed of methane and carbon dioxide. This gas is produced from feedstock such as biosolids, livestock manure, and wet organic materials.

The anaerobic digestion process occurs in three steps:

- Decomposition of plant or animal matter by bacteria into molecules such as sugar
- Conversion of decomposed matter to organic acids
- Organic acid conversion to methane gas

Anaerobic processes can occur naturally or in a controlled environment such as a biogas plant. In controlled environments, organic materials such as biosolids and other relatively wet organic materials, along with various types of bacteria, are put in an airtight container called a digester where the process occurs. Depending on the waste feedstock and the system design, biogas is typically 55 to 75 percent pure methane. A typical anaerobic digestion process system is shown in Exhibit 79.

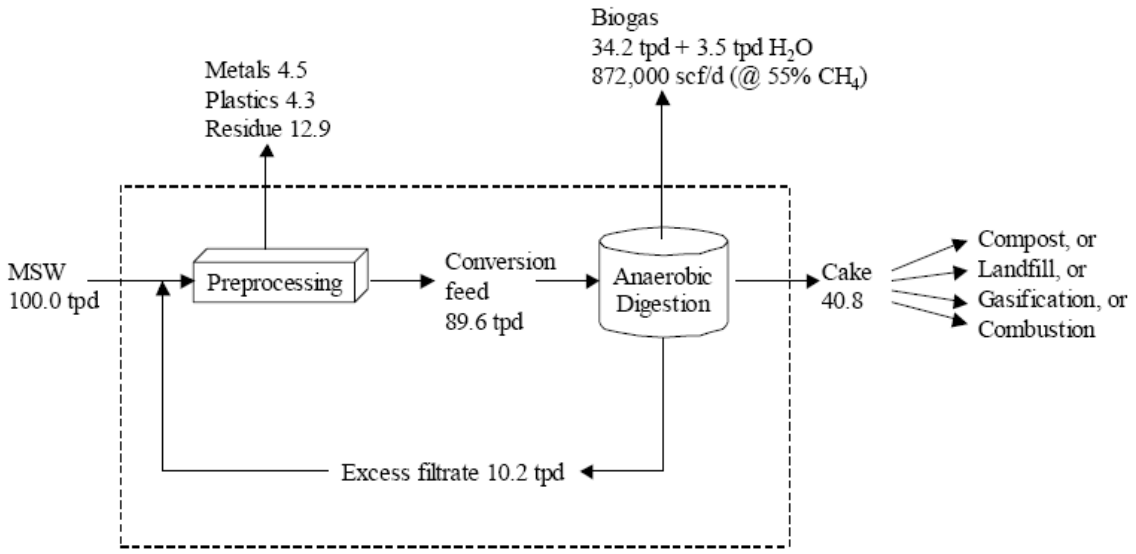


Exhibit 79. Typical MSW Anaerobic Digestion Process System

Plasma Arc

Plasma arc technology is a non-incineration thermal process that uses extremely high temperatures in an oxygen-starved environment to completely decompose waste into very simple molecules. Plasma arc technology has been used for many years for metals processing. The heat source is a plasma arc torch, a device that produces a very high temperature plasma gas. A plasma gas is the hottest, sustainable heat source available, with temperatures ranging from 2,700 to 12,000 degrees F. A plasma arc system is designed specifically for the type, size and quantity of waste material to be processed. The very high temperature profile of the plasma gas provides an optimal processing zone with the reactor vessel through which all input material is forced to pass. The reactor vessel operates at atmospheric pressure.

The feedstock can be almost completely gasified, while non-combustible material, including glass and metal, is reduced to an inert slag. The product gas typically has a heating value approximately 1/4 to 1/3 the heating value of natural gas (natural gas has a value of approximately 1,040 Btu/standard cubic foot); therefore, it may be used as an efficient fuel source for industrial processes, including the generation of electricity, and the production of methanol and ethanol. The slag can be used in the construction industry or for road paving. All other byproducts, such as scrubber water and cyclone catch material, can be recycled into the process for reprocessing to alleviate disposal requirements. A typical plasma gasification system is shown in Exhibit 80.

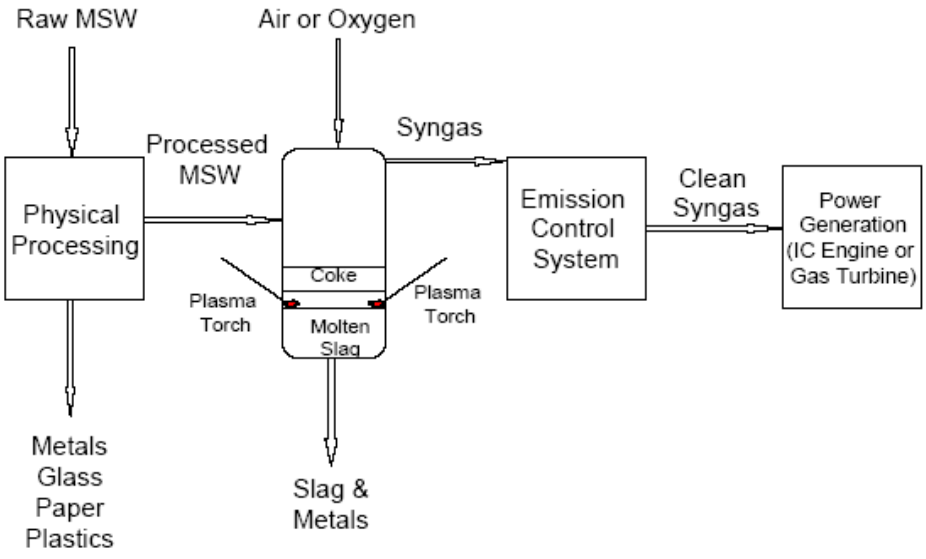


Exhibit 80. Typical Plasma Gasification System

6 EXISTING RECYCLING PROGRAMS IN THE REGION

As part of this Plan, other solid waste and recycling programs in the region were evaluated. The scope of exploration included the following communities: Whitehorse, in the Yukon, Canada, Haines AK, Gustavus, AK, Juneau, AK and the Southeast Alaska Regional Solid Waste Authority (Exhibit 81). A summary of our interviews is included in Appendix C.

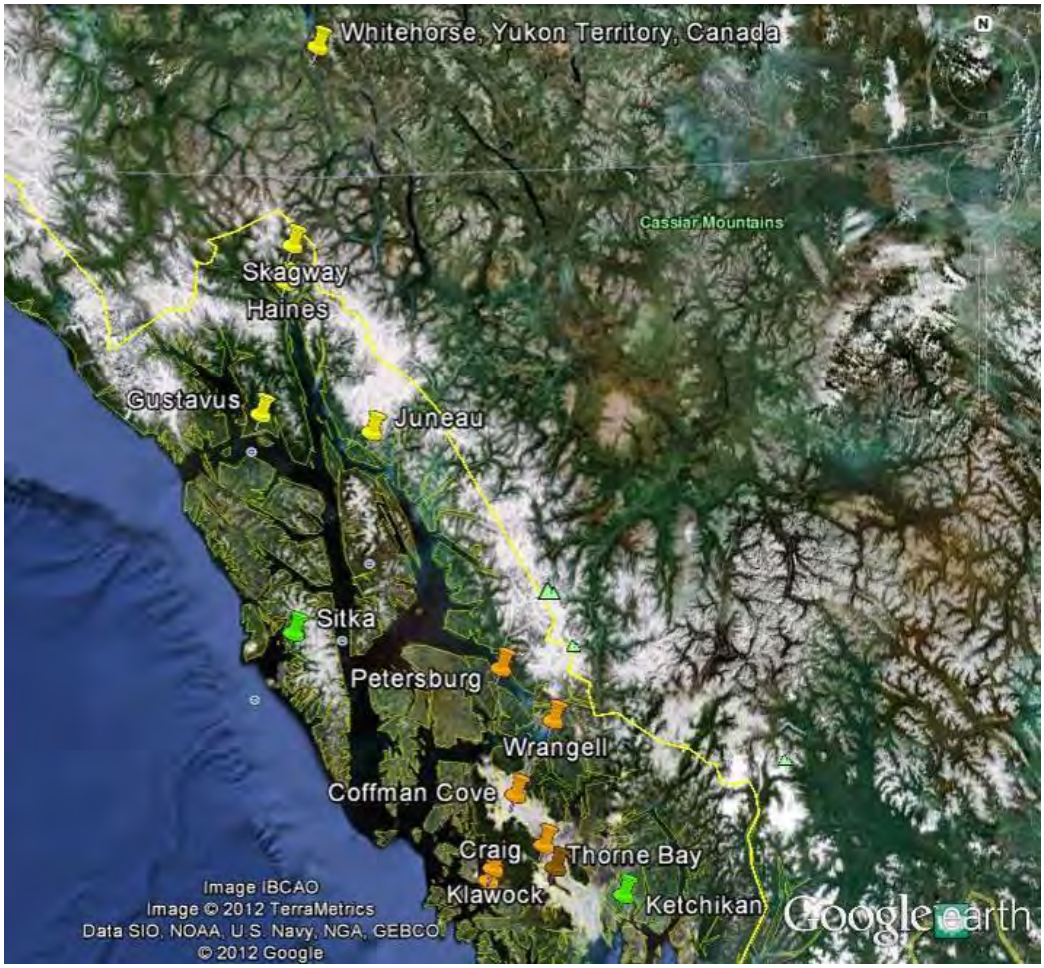


Exhibit 81. Existing Solid Waste and Recycling Programs in the Region

Independent Communities (Analyzed for possible SWMP options)

Member Communities of the Southeast Alaska Regional Solid Waste Authority (Analyzed for possible SWMP options)

Regional Independent Communities (Not analyzed for possible SWMP options due to distance)

GUSTAVUS, ALASKA

The City of Gustavus is a small community located in Glacier Bay, 60 miles west of Juneau. The population is estimated at 450. The community is very isolated making it difficult to dispose of and recycle wastes. The City owns and operates a small local landfill, but reducing, reusing and recycling waste is a priority for the population in this community.

Gustavus Disposal & Recycling Center

The community operates the Gustavus Disposal & Recycling Center (DRC), which is largely a self-supporting business unit of the City, managed as an integrated resource recovery and waste disposal facility. This facility is an enclosed building where recyclables are processed and stored. The City has purchased a baler to reduce the volume of shipped materials. Operating funds are generated from user fees; the sale of reusable items, the sale of DRC generated products such as compost, and the sale of recyclable commodities such as aluminum. Capital and special project funds are raised through grants from public and private agencies, and from donations. The City provides financial support for employee training and any other function or need approved by the City Council. As a unit of the City of Gustavus, the DRC is responsible to the City Council, and conforms to all city administrative policies, procedures, and ordinances.

The DRC Advisory Committee is comprised of three to five community members, appointed by the Mayor and approved by the City Council to two year terms, except that the City Council may initially appoint seats for one year to provide for staggered term expirations.

Collection

The DRC operates as a customer self-haul facility. The facility collects aluminum, non-ferrous, cardboard, #1-#7 plastics, mixed paper, oil filters, used oil, scrap metal, e-waste and fluorescent bulbs. The DRC charges by the pound for dropping off all material except aluminum and certain non-ferrous metals. The DRC also operates a volunteer-staffed store, called the Community Chest, for accepting gently used items such as clothing, household goods, books and electronic devices for resale.

Processing and Marketing

Gustavus recycled (55 tons of material in FY 2012

- 22 tons baled and shipped,
- 17 tons of organics were composted, and
- 16 of glass was pulverized for local use.

The DRC has published a detailed plan for its recycling and composting operation and can be found at the following address: http://cms.gustavus-ak.gov/government/committees/disposal-recycling-center/Planning/CompostPlan.htm.

Transportation

The DRC stockpiles and transports the collected recyclables to Seattle one to four times per year. The shipment for FY 2012 consisted of 43 bales of material in one shipment, while the shipment for FY2011 contained 27 bales shipped over the course of four shipments.

Labor and Resources

The DRC contains one full-time employee, a Public Education Manager/Operator who is responsible for administration, planning, budgeting, public relations, agency contacts, permitting, and regulatory compliance, supervision of DRC employees and volunteers and general operation of DRC facilities. They also have two part-time employees: an assistant operator and a grant writer or special projects coordinator.

The facility collects fees for most recyclables dropped off by its residents. The DRC also maintains a robust composting program where food and yard waste scraps are composted and then sold back to the community ($80.50 per "large bobcat bucket"; $11.50 per 30-gallon bucket and $3.45 per gallon bucket).

Overall, however, the facility operates at a slight loss: For FY 2012, DRC's income was $38,450 and their expenses were $39,175, leaving a shortfall of $725. The total cost of recyclables amounts to $0.25/per pound, equal to $500/ton.

HAINES, ALASKA

Haines has a population of around 2,300. It is located south of Skagway, 350 miles away by road, but only 20 miles by water, taking about one hour to travel by ferry. The solid waste management is primarily handled by two private companies, Acme Transfer and Community Waste Solutions, and one non-profit recycling center, Haines Friends of Recycling.

ACME Transfer Co.

ACME Transfer Co. (ACME) is a private waste hauler that collects and disposes of waste at their own facilities, as well as ships out waste to other facilities in the Seattle area. The company offers a variety of waste collection options for residents and business owners of Haines, as noted in the paragraphs below.

MSW Waste Collection and Disposal

Collection

ACME provides curbside collection in areas outside of the town limits, as CWS has the contract to collect waste inside the town limits. ACMS also accepts drop off/self-haul services to its transfer station which operates in Haines. The costs associated with customer self-haul are $0.25/lb for MSW. They accept aluminum cans and glass for free.

Disposal

All MSW received by ACME is shipped south via AML/L to Seattle to be landfilled in eastern Washington state.

Recycling Program

Collection

ACME has very limited recycling. They accept glass and aluminum for free at their drop off center. They also divert other valuable metals from the MSW (such as copper) for recycling. However, they do not divert plastics, paper or cardboard for recycling.

Processing and Marketing

They currently do not have a baler for their cans; they simply crush the cans with the same equipment they use for compacting MSW. The glass is crushed and utilized locally for road fill. The cans are placed in an AML/L container for shipment to Seattle to whatever metal processor offers the highest price at the time. ACME does not make any money from their recyclables; it is economically feasible in that it pays for its own shipment. In other words, it saves ACME costs it would otherwise pay for shipment and disposal if the metal were sent to a landfill.

Transportation

Recycled material and solid waste are transported to Seattle by AML/L. The company responsible for final disposal of the MSW provides shipping containers, while ACME rents containers from AML/L for shipping recyclables (aluminum only).

Community Waste Solutions (CWS)

CWS is a private waste hauler that collects and disposes of waste at their own facilities, as well as ships out waste to other facilities in the Seattle area. The company offers a variety of waste collection options for residents and business owners of Haines, as noted in the paragraphs below.

MSW Waste Collection and Disposal

Collection

CWS provides curbside collection as well as customer drop off/self-haul services. Customers can elect to dispose of mixed waste or they can separate out their waste (single-stream recyclables and organics waste) for a reduced rate. The monthly curbside collection rate for 2012 is $63.54 per month for 1 35-lb can/1x/week of mixed waste, and $55.95 per month for 1 35-lb can/1x/week for separated waste. This averages out to $0.42/lb and $0.37/lb, respectively, for waste collection and disposal. The costs associated with customer self-haul are $0.31 for mixed waste drop off and disposal and $0.25 for waste that is separated.

Disposal

CWS owns and operates a landfill in Haines. Because the landfill was built in the 1970s and is unlined, the only materials deposited into the CWS landfill are Construction and Demolition (C&D) debris and hand-screened inert materials. All other materials received by CWS are recycled, composted, or if necessary, shipped south to Seattle to be landfilled at Columbia Ridge Landfill in eastern Washington State. Twice per year, once each spring and once each fall, CWS buries all exposed materials deposited into the landfill.

CWS also operates an in-vessel composting system to process mixed waste. In operation since 2002, the system is the largest in-vessel composter in Alaska. The compost is monitored on a dedicated computer network 24/7 in order to monitor temperature trends throughout the process. Insulated digesting containers assists in composting materials throughout even the coldest parts of winter. However, the facility has had difficulties in processing since operations commenced.

Recycling Program

Collection

CWS recently implemented single-stream recycling for both curbside and self-haul services. The single-stream recycling and composting are offered at a discounted rate compared to traditional mixed waste. If customers elect to separate waste, they are given specific bags to do so—a blue bag for recyclables and a green bag for compostables (.food wastes, leafy wastes, etc.). CWS charges a $0.20 "deposit" per bag, which gets reimbursed to the customer when they return the bags full of recyclables. The deposit is to ensure the bags are being utilized for their intended purpose. CWS also pulls out an average of two yards a day from incoming waste streams to re-direct as recycling. Recyclable materials accepted include mixed paper, newspaper, paper board, cardboard, #1-#7 plastics, aluminum, other non-ferrous and ferrous metals and glass.

Processing and Marketing

The single-stream recyclable material collected is baled together and then shipped to a MRF in the Seattle area for further processing. The compostable material is processed in CWS's in-vessel composter. In spring 2012, CWS modified the composting system to process single-stream, organic wastes into value-added soil. The new feedstocks are composed mainly of food wastes, processed biosolids, cardboard and other waste papers.

Transportation

Recycled material is transported to Seattle by AML/L. Since the program is so new, CWS is only just beginning the process of shipping their first bale. According to the company, there may be areas in which they will have to modify the shipping process, such as including more glass, or removing glass, and so forth.

Haines Friends of Recycling

The Haines Friends of Recycling (HFR) is a 501(c)(3) non-profit organization that collects recyclables from the community. Although drop-off of recyclables is free, the organization depends on donations, as well as 220 households, businesses and organizations that pay membership fees to HFR. Activities of the organization are coordinated by the Board of Directors with board members serving staggered terms.

Collection

Citizens and business owners self-haul their recyclables to the main drop off center. In the summertime, HFR sets up portable recycling collection trailers in their downtown area in order to capture recyclables generated in the public realm. Customers are asked to "voluntarily" sort their own recyclables at the drop off locations; otherwise, volunteers have to do it. The HFR accepts mixed paper, cardboard, metal and #1 and #2 plastics.

HFR also loans out recycling collection containers for aluminum and #1 plastic bottles for organizations and groups holding large events in the community. The organization, individual, or family borrowing the containers is responsible for them and must arrange for pick-up and return.

Processing and Marketing

HFR sent 263,755 lbs of recyclables to different companies in Seattle in 2011 (about 132 tons). HFR also sent eight barrels (at 500 lbs ea.) of fluorescent tube glass and mercury, as well as printer and copier cartridges collected. HFR generates revenue from the sale of #1 and #2 plastics, metal, paper and cardboard, which goes back into paying for their operating costs.

Transportation

AML/L backhauls recyclables from HFR free to Seattle. Reportedly, there are different arrangements for different companies to pick up recyclables at the dock; some charge and others pick up the material for free.

Labor and Resources

The HFR employs one part-time employee at 10 hours/week @ $12/hour and one 20 hour/week staff person. Equipment at the facility entails one fork lift-skid steer and one baler that can bale 500 lbs of product at a time. In 2011, HFR had over 50 volunteers assist in sorting and baling throughout the year.

In addition to the membership fees, HFR receives various grant monies to help with operation costs, including a RuralCAP grant received in partnership with Chilkoot Indian Association. The Haines Borough also provides local government funding to cover 25% of HFR's general operating expenses.

Public Education

HFR is very active in community events where recyclable products are generated. Aside from making temporary recycling containers available for special event use at no cost, they also have compostable plates, napkins, cups, "silverware" available for purchase and use at events.

JUNEAU

Juneau is the capital of Alaska and is located about 100 miles south of Skagway. With a population of around 32,000 it is the largest community in the Southeast Alaska region. Solid waste collection and disposal services in the City and Borough of Juneau (CBJ) are currently provided through the private sector.

MSW Waste Collection and Disposal: Arrow Refuse

Under the terms of the Regulatory Commission of Alaska Certificate, refuse collection is solely provided by Arrow Refuse (Arrow), a subsidiary of Alaska Pacific Environmental Services (APES). Service is not mandatory within the CBJ, however, and residences and businesses may self-haul solid waste to the landfill. Arrow currently uses rear-loader packer trucks for curbside collection of its residential and commercial subscription customers. Collection rates charged by Arrow are set by the RCA based on an evaluation of Revenue Requirement Study, which is filed by Arrow with the State of Alaska.

Solid waste collected by Arrow or self-hauled is delivered to a state permitted landfill (Landfill), which is located in the CBJ. This 45-acre Landfill is owned and operated by Capitol Disposal (Capitol), a subsidiary of Waste Management Inc. (WMI). The Landfill has an estimated life of 30 years. Arrow and Capitol have a 10 year contract for solid waste disposal, which stipulates that Arrow will take all solid waste collected within the CBJ to the Landfill. A consultant study in 2008 projected that the annual solid waste stream in the CBJ requiring disposal would increase from an estimated 23,800 tons in 2008 to nearly 28,400 tons in 2038.

Recycling: Arrow Refuse

Arrow is also one of two recyclers in Juneau and implements a single-stream recycling program to its curbside collection customers.

Collection

Arrow collects single-streamed recyclables from its 96-gallon curbside recycling carts every other week. They accept aluminum, steel and tin cans, mixed paper, newspaper, cardboard and plastic. They do not accept glass or hardbound books. The service costs residents $3.11/month.

Recycling: Juneau Recycling Center

In addition to managing the Landfill, Capitol operates the Juneau Recycling Center under contract with the CBJ, which is located in a building that once housed two solid waste incinerators at the Landfill.

Collection

Under the current contract, the Recycling Center has been accepting recyclable materials (glass containers, aluminum cans, tin/steel cans, newspapers, cardboard, white paper, mixed waste water, PET and HDPE plastic containers) five days a week (Tuesday through Saturday). Materials must be source-separated at the facility.

Processing and Marketing

There are no long-standing contracts with material processors for the recyclables collected and shipped. WMI sends material wherever they can get the best price. Glass is not recycled, but is reused by grounding it down and using it for landfill cover. Everything else is baled according to material type and sent to Seattle.

According to Mr. Jim Penor, the CBJ's Solid Waste Coordinator, the CBJ is continuing to move forward on a 10-year agreement ($1.4M) with WMI for a comprehensive recycling facility program, which will include development of five drop-off facilities.

Transportation

The CBJ is in negotiations to secure a reduced rate for recyclables being shipped via Alaska Marine Lines to Seattle ports.

Labor and Resources

The CBJ funds the contract operation of the Recycling Center ($165,000 annual fee to Capitol) by imposing a CBJ wide fee of $4 per month on all residential properties, which also funds the operation of Household Hazardous Waste (HHW) Program by PSC Burlington Environmental Inc. for HHW collection events. The CBJ, in cooperation with Capitol, has implemented a Commercial Recycling Pilot Program, which enables commercial businesses to deliver recyclables at a flat fee of $100 per year (Commercial Recycling Permit).

CBJ's only direct involvement with solid waste management consists of three separate contracts for the handling of junked vehicles, HHW, and recyclables, which is managed by the Public Works Department. The Junked Vehicle Program is funded primarily through a vehicle registration fee, although the CBJ Assembly approved an additional $180,000 in funding for FY 2008 to ensure that two events were held. These events serve as an incentive for residents to bring junked vehicles to communitywide events rather than improperly abandon their vehicles.

SOUTHEAST ALASKA REGIONAL SOLID WASTE AUTHORITY

Organizational Arrangement

The Southeast Alaska Solid Waste Authority (SEASWA) is a solid waste authority made up of five communities for the purpose of developing a viable, cost stable solution to solid waste disposal for Southeast Alaska. Section 29.35.800 of Alaska Statutes gives authority to cities to join together for this purpose as a solid waste authority if local municipal governing bodies authorize the action and if the action is approved by the community's registered voters. Voters of Craig, Thorne Bay, Petersburg and Wrangel approved ballot measures to create SEASWA in

2009, while Klawock officially joined in 2010. The formation of SEASWA aims to provide a formal mechanism under which the communities can work together on long-term goals for disposal of municipal solid waste from Southeast Alaska. The organization is guided by a Board of Directors, which is responsible for creating and passing bylaws, preparing budgets and recruiting members to SEASWA.

Processing and Marketing

Although SEASWA initially conceived waste from the region being collected and disposed of within the region, the group decided it was more beneficial to ship the trash south. Therefore, SEASWA recently signed a master services agreement (MSA) with Republic Services for the collection and disposal of their wastes. The new system will utilize two collection points, Klawock and Thorne Bay, for consolidation points of solid waste and recyclables.

Transportation

Republic Services has a long-running contract with AML/L to haul garbage and recycling containers loaded onto barges. The barges first stop in Seattle for dropping of recyclables at Republic's recycling center, and then the garbage containers are loaded onto the company's trains at an adjacent rail yard to be taken to Republic-owned Roosevelt Landfill in rural Klickitat County, Washington.

Labor and Resources

Initial start-up funding of $125,000 for the creation of SEASWA was received from a Denali Commission grant and from the member communities' contributions. The organization also received state funding through the Commerce, Community and Economic Development Agency for FY 2012 in the amount of $125,000 to assist in further research, planning and development of the regional solid waste disposal project.

WHITEHORSE, YT, CANADA

The City of Whitehorse is located approximately 100 miles north of Skagway in the Yukon Territory, Canada. The Yukon Territory (YT) has a total population of around 30,000, of which 23,000 live in Whitehorse. Recycling is a high priority in the YT, with a current 50% diversion goal and a long-term "zero waste" goal by 2040. The Yukon has a beverage container deposit and refund recycling program in place to assist in these goals. The two recyclers interviewed in Whitehorse each serve as depots for this program.

MSW Waste Collection and Disposal

The City of Whitehorse operates a regional landfill facility, which is the only managed landfill in the territory. The landfill has no engineered liner and does not have a leachate collection system. The City of Whitehorse charges a monthly fee ($8.09) to residents for garbage collection. Whitehorse also operates a composting operation. The City of Whitehorse requests residents to separate their wastes into two bins: a green bin for compostables and a black bin for garbage. Garbage trucks that collect these materials deliver the garbage to the landfill, while the organic

wastes are deposited into large windrows to make compost which is eventually sold to Yukon residents ($4.76 per 25-lb bag; $19.05 per cubic yard or $47.62 per ton).

Raven Recycling

Raven Recycling Society (Raven) is a non-profit social enterprise that does not receive direct government funding, therefore, operates much like a business. Located in Whitehorse, Raven is one of the most prominent recyclers in the Yukon Territory for household and commercial waste.

Collection

Raven currently accepts over 30 different household commodities for recycling. In general, Raven pays for aluminum, but charge for processing of tin cans, glass, plastic and paper because processing costs are so high for these materials. Prices paid for aluminum and charged for other products changes from month to month, depending on the market. The public drop-off areas are open 24 hours a day, seven days a week.

Historically, customers have been required to sort recyclables, but they have recently implemented a "mini MRF" onsite for sorting recyclables. Therefore, they now accept dual stream: clean paper products and then everything else. Raven also has a 'Free Store', where clean working items can be exchanged at no cost.

Processing and Marketing

Transportation

Raven sends its paper products from Skagway. They typically deliver materials to Skagway once a week w/ 60,000 lbs (30 tons) worth of paper products. They ship all other recyclables to Vancouver, via backhauling with trucks who have delivered products to Whitehorse and would otherwise be returning to their destinations with empty trailers. This reduces transportation costs dramatically.

Labor and Resources

Approximately 20 people are employed by Raven Recycling. The facility has also recently invested in materials processing capability.

Public Education

Raven Recycling has a strong commitment to educating the public about the 3Rs (Reduce, Reuse and Recycle). In addition to this, Raven has now adopted "Rethink as a 4th R", which promotes consumer responsibility and purchase choices in light of their effects on the environment. Raven functions as a private contractor for Environment Yukon for the purpose of administrating the Recycling Club program, an educational program for children in the Yukon. Raven provides research, consulting, public and school education programs, and advising various levels of government about the benefits of waste Reduction, Reuse and Recycling.

P&M Recycling

P&M Recycling is a private recycler located in Whitehorse.

Collection

P&M accepts self-hauled recyclables at their drop off facility in Whitehorse. They accept bottles, cans, #1-#7 plastics (including plastic bags), cardboard and glass.

Processing and Marketing

Transportation

P&M sends its recyclables to Vancouver or Tacoma, wherever the market is better. If they go to Tacoma, they go through the port at Skagway. The owner of P&M indicated that they could easily assist in shipping Skagway's cardboard, along with their own normal shipment in order to capitalize on the economies-of-scale associated with a larger shipment of cardboard. However, their use of Tacoma markets is not dependable. They could just as easily truck the cardboard to Vancouver if the pricing is right.

Labor and Resources

P&M has recently made the news for the "plastic to oil" technology they have implemented at their operations. The continuous-feed plastics-to-oil machine utilized the plastic from plastic bags to process 10 liters of synthetic oil per hour. The project is a partnership with the Yukon College's Cold Climate Innovation research center, which was awarded a grant to assist with the $200,000 cost of the machine. It is currently undergoing testing, with P&M using the synthetic oil to heat the plant.

7 OVERVIEW OF MARKETS AND TRANSPORTATION COSTS

This section is designed to provide a general overview of the potential recycling markets and transportation costs for MOS.

MARKETS

Recyclables are a commodity that can be sold. Material such as aluminum, cardboard, paper and plastic can be broken down into raw materials again and sold to manufacturers. The value of the sale and processing of these materials fluctuate depending on the demand, thus the term "recycling markets." Scrap dealers, recyclers and processors all refer to operations associated with the intermediary market, which means these entities purchase secondary materials from collectors (e.g. a community directly, or from a hauler with whom a community has contracted for collection) for sale to an end user (e.g. a paper mill or a steel mill). Sometimes a community or recycling collector sells directly to the end user, but this is rare, as most material requires processing before it can be used as raw material again. An advantage to contracting with a large company for recycling collection (such as Republic or Waste Management) is that many times these companies have long standing relationships with the intermediary market players, and thus are more likely to get higher prices for their recyclable material as compared to an individual community.

Maximizing revenues from recyclables depends on many factors, such as type and amount of recyclables generated, whether the materials are source separated or commingled, how recyclables are processed (i.e. loose or baled), and the cost of shipping. As introduced in Chapter 6, there are several types of recycling collections, most notably source-separated, which entails the customer manually separating recyclables by material type, and single-stream recycling, where all recyclables are disposed of together. Generally, source separated schemes are more cost effective for many communities, as separated materials bring in more money for the recycling program.

Current Markets Overview

The market prices paid by processers/brokers for recyclables fluctuate dramatically in very short periods of time. This market variability is demonstrated below in Exhibit 82, which compares the most recent Waste and Recycling News markets assessment for the Pacific Northwest Region (dated August 14, 2012) with quotes obtained from Seattle-area brokers/processers by SCS in November 2012. A listing of these recyclers and their quoted prices are included in Appendix C.

Exhibit 82. Recent Recyclables Market Prices in Pacific Northwest

Commodity	August 2012 (As Reported in Waste and Recycling News)	November 2012 (As Quoted to SCS)
Mixed Paper	$80 to $90/ ton	$35 to $45/ ton
Corrugated Containers/Cardboard	$110 to $115/ ton	$40 to $80/ ton
Sorted Office Paper	$180 to $190/ ton	No quote provided
Sorted White Ledger	$250 to $280/ ton	$70/ ton
Colored Paper	Not quoted	$55/ ton
Newspaper	Not quoted	$35 to $45/ ton
Aluminum	$0.60 to $0.62/ lb.	$0.27 to $0.50/ lb.
Glass	$13 to $15/ ton	No quote provided
Colored HDP Plastic (#2)	$0.18 to $0.20/ lb.	$0.09/ lb.
PET Plastic (#1)	$0.18 to $0.23/lb.	$0.15/ lb.
Steel Tin Cans	Not quoted	$0.50 to $0.80/ lb.

Sources: Waste and Recycling News, August 20, 2012 and SCS interviews, November 2012.

The market variability is primarily due to fluctuations in the international markets. Much of the recyclables in the Pacific Northwest, such as mixed paper and cardboard, are sold to markets in Asia where they are in turn converted back into paper and box products for sale to North American markets. The historic fluctuations in the market prices of these recyclable commodities are enormous, suggesting that communities or generators selling these materials should work with larger brokers or integrated waste management firms (e.g., Republic and Waste Connections, and Waste Management) who are better able to weather these fluctuating markets and offer these communities stable market prices.

Depending on the type of recycling program initiated, a community can plan for market fluctuations by allowing enough space to accommodate the stockpiling of material when markets are down. This is very common for organizations who market their own material. Monitoring the market in this fashion, however, will require significant effort and staff time. Compare this to an agreement where a community has negotiated a flat rate or a percentage of income with a private hauler or a non-profit recycling operation. The community may lose out on some of the profits when the markets are high, but it is insulated from losses when the markets dip.
Transportation

For most Alaskan communities, due to shipping distances to markets in the Pacific Northwest, free or extremely reduced shipping for recyclable material is absolutely necessary for a recycling program to be economically successful. As such, many Alaskan communities have worked out arrangements with local barge/air transport companies to backhaul free-of-charge to Seattle buy-back centers or to the Anchorage/Bethel area.

Backhauling is the practice of utilizing shipping space (whether it be in a truck, barge, etc) to send cargo after a company has already delivered its original goods to their intended destination. For example, if a trucking company delivers a truckload of freight from a major metropolitan area to a grocery store in a remote area, the store might set up an agreement with the trucking company to backhaul, or carry back to the metropolitan area, all of their recyclable cardboard. The practice of backhauling is becoming more popular as companies are seeking to improve their

corporate "green image" or they believe it is part of their corporate social responsibility. Companies that have participated in these programs in Alaska include Totem Ocean Trailer Express, Horizon Lines, AML/L, the Alaska Railroad and Northland Services, as well as Northern Air Cargo and other airlines of the Alaska Air Carriers Association who provide free back-hauling for cans and bottles for rural communities through the Alaskans for Litter Prevention and Recycling's Flying Cans program.

Since shipping costs present the largest stumbling block to recycling programs in Alaska, the most important goal of shipping is to be as efficient as possible. In most cases, this means investing in a baler to reduce volume. It also means utilizing the biggest shipping container (to hold the most products) and ship as few times as possible. Of course, space issues may hinder a community from stockpiling goods for as long as they would like, forcing communities "to move" the recyclables constantly. Additionally, market prices may influence when a community ships. If cardboard is going for the highest price in two years, it oftentimes does not make sense to hold back shipment because the truck is only two thirds full.

The amount of product able to be shipped at one time varies according to material type and the density and size of bale produced, if any. The standard industry bale size is a 60"(w) x 30"(l) x 48"(h), and usually ranging in weight from 800 to 1,200 lbs., although this can vary greatly. Typically, most of the southeast Alaska communities produce smaller bales than this standard because of the lower volumes of material generated in the communities and the cost for larger baling equipment. For example, Skagway utilizes a Marathon compactor rather than a traditional baler.

Shipping by Sea

AML/L uses 20-ft and 40-ft shipping containers that they rent to customers. These containers can be delivered directly to the customer by AML/L trucks. Conversely, some customers own their own containers for which they arrange delivery and pickup through the ferry system. As mentioned above, using and filling the largest container possible for shipping is always the most economical, so for the purposes of this analysis the 40-ft container was used. The maximum tonnage allowed for 40-ft container is 36,000 lbs, or 18 tons. Therefore, it assumed that approximately 36 bales, weighing an average of 1,000 lbs (18 tons) each, can be delivered in one shipment. Other costs that may be associated with this method of shipping includes fuel surcharges and spotting charges, or pick up fees charged by the processors who pick up the goods at the dock to take back to their facilities.

Shipping by Land

A variety of trucking options exist for shipping products on land. Trucks can utilize roll-off containers or trailers. Roll-off boxes are measured in cubic yards, the smallest being 15-cy, although it is more common to see 20, 30 and 40-CY roll-offs being used.

The most common trailer sizes range from 48-ft and 53-ft. For the purpose of this analysis, a 48-ft trailer was assumed by SCS is help illustrate in the paragraphs that follow to estimate shipping costs to Whitehorse, since it is the most comparable to the 40-ft container used in barge shipping. A 48-ft trailer can hold 38 standard-sized bales weighing an average of 1,000 lbs.

CURRENT TRANSPORTATION LOGISTICS USED BY REGIONAL MUNICIPALITIES

Whitehorse

Raven Recycling currently ships all paper products on AML/L out of Skagway's port. They backhaul the rest of their recyclables on trucks headed south to Vancouver. The cost for backhauling ranges across the board, but, in our discussions with them, they suggested that they generally try not to pay more than $2,000 for a single shipment of recyclables. A full load on a truck is 40,000 lbs (20 tons) of plastics and metals, while the trailers carrying paper products can generally carry up to 60,000 lbs (30 tons) of material.

Haines

Haines Friends of Recycling Haines has an agreement with AML/L to take six free shipments of recyclables a year. All of their recyclables are transported to Seattle, but to different processors.

The other Haines recycler, CWS, plans to send their single-stream recyclables to a MRF in Seattle via AML/L. No cost estimates for shipping were provided to SCS.

Gustavus

Gustavus Disposal and Recycling sends its recyclables to via Northland Services to Juneau and then on AML/L to Seattle. They load everything up in an old FedEx van (no longer used for FedEx) and once the material gets to Juneau it gets transferred to a 40-foot shipping container. They have historically made between three and five shipments per year.

Juneau

The City and Bureau of Juneau is in negotiations to secure a reduced rate for recyclables being shipped via AML/L to Seattle ports. No shipping cost data are currently available.

Historical Transportation Costs for Skagway

Skagway has shipped cardboard on AML in recent years to Seattle for recycling. During 2012, the municipality paid $1,414 to AML for shipping 11.75 tons to Seattle, along with a $250 pickup charge from the processor.

POTENTIAL TRANSPORTATION OPTIONS FOR SKAGWAY

The following section provides details of an illustrative Pro Forma Model (Exhibits 83 and 84) used by SCS to illustrate potential revenues and costs for the two general options available to the MOS.

Transportation by Water

SCS' research determined that AML/L is providing backhauling or provides deep discount to those entities hauling recyclables in southeast Alaska. SCS contacted a representative for

AML/L, the most likely transporter, to ascertain information regarding their policy and/or rates related to shipping/backhauling recyclables. The representative was non-committal and said they do not have a blanket policy regarding this type of shipment and that they address recycling shipment requests on a case-by-case basis. Consequently, they were unable to provide updated quotes, which would include any "deep discounts". Prior to SCS being engaged for this assignment, AML/L provided several quotes to the Recycling Committee for transportation of recyclables.

Therefore, our research focused on evaluating the recent MSA for solid waste disposal and recycling that was entered between Republic Services (Regional Disposal Company) and various members of the Southeast Alaska Solid Waste Authority this past fall. The MSA was concluded after a rigorous, structured approach (bids from Republic, Waste Connections, and Waste Management) from the largest regional waste management companies to secure the best long-term prices for both recyclables processing, revenues, and transportation costs for Southeast Alaskan communities. According to the Authority, this model agreement for communities and Republic does not require any long-term commitments to the Authority and is solely a direct agreement with Republic and the individual municipality.

Briefly, this MSA includes standardized fees for transportation, processing, and fuel surcharges for both the Regional disposal Company, which operates a large MRF in Seattle, and the AML/L:

- A transportation component and a transportation fuel surcharge are applicable to loads of recyclables (either source separated or commingled).
- Revenue pass-back – 100% of the revenues for the sale of the recyclables accrues to the jurisdiction. This revenue is expected to vary by commodity type and will be the actual price per month for sale of that commodity by the Regional Disposal Company at the Seattle MRF.
- There is a recycling component cost related to the various handling, baling, storage, and marketing activities performed at the Seattle MRF for both source separated and commingled materials. These operations include activities such as removing each bale individually from shipping containers, breaking apart small bales and then re-baling material into larger bales for further shipment.
- For commingled recyclable materials, there is an additional recycling processing component fee assessed for the manual and mechanical operations needed to segregate commingled recyclables into separate commodities.

Currently, the MSA has the following business cost structure conditions:

- The transportation component is $44.15 per ton.
- The fuel surcharge is $8.85 per ton.
- Recyclables processing fee is $51.50 per ton.

- For commingled recyclables an additional $30 per ton processing fee is added to the total per ton cost or $14.50 per ton.

Based on currently available information from the MSA, as noted in the paragraphs above, SCS developed a Pro Forma Model (Exhibit 83), which contains some illustrative scenarios for estimating possible revenues and costs associated with shipping MOS recyclables to Seattle at various recycling capture rates. The row depicted in "Yellow" in the exhibit, "50% capture", is what SCS assumes to be the most probable initial recycling rate for the proposed MOS customer drop-off program.

Transportation by Land

If MOS decides to pursue sending recyclables to Whitehorse, they may decide to invest in a truck and trailer, costs that were assumed in the transportation calculation. However, an even more cost effective strategy may be to approach Raven Recycling (or P&M Recycling) to work out a deal in which they pick up Skagway's paper products to ship by barge from the Skagway port, along with their own paper material, so that both organizations can capitalize on the economies of scale. MOS could then deliver all of its other recyclables to Whitehorse to be delivered with their other material to Vancouver. Both Raven and P&M have expressed a potential willingness to work out some kind of agreement similar to the one described here. Assuming that the MOS would decide to own and operate the needed trucking equipment, SCS included the following assumptions for the Model (Exhibit 84):

- A truck fuel efficiency of 5.5 miles per gallon'
- A diesel fuel price of $4.36/gallon'
- Driver labor of $47.20/hour (includes MOS benefits)
- A 220-mile round trip to Whitehorse and back to MOS.
- The costs associated with owning, operating and maintaining a tractor truck and trailer'
- A $200/ton processing fee assessed on mixed plastics and glass material delivered to the Raven Whitehorse recycling facility.
- Mixed paper and OCC would be shipped from the Skagway Port assuming the Republic MSA (described above).

As shown in Exhibit 84, this particular business arrangement does not appear to produce any net revenues for the MOS because of the $200 a ton tipping fees imposed by Raven and the estimated costs of transportation. For example, at the assumed 50% capture rate[7] of recyclables

[7] The "capture rate" is calculated from records of the community (Appendix A) in conjunction with estimates of waste composition (Section 4). The capture rate tells us how much of what should be recycled is actually recycled. In other words, out of all of the MSW generated, how much is making its way into the recycling bin or recycling center? Capture rates vary from commodity to commodity, the level of customer participation, convenience, and any financial

(row in "yellow"), the MOS would be expending nearly $10,000 a year to partner with Raven in Whitehorse.

If the MOS decided to move forward with sending recyclables across the Canadian border, then a number of administrative details would have to be considered:

- Development of a detailed manifest would have to be developed for each load crossing the Canadian border.
- A review of the listing of tariff codes posted by the Canadian government for proposed recycling commodities indicates no current fees are required (aluminum cans – 7602; glass bottles – 7010.90; plastics bottles – 3915; and tin cans – 8002). However, more research would have to be done on individual commodities other than these materials (www.cbsa.gc.ca)
- Payment of a "user fee" of $10.75 per load to cross the U.S. border on the Klondike Highway with an empty truck on returning to the U.S.

incentives (e.g., Pay-As-You-Throw). A 50% capture rate is a conservative number for a small community like MOS. With a good education program and incentives, MOS could achieve higher rates of capture for recyclables. However, this number is considered conservative by most solid waste industry observers for planning assessments.

Exhibit 83. Shipping By Water - Estimated Revenues and Costs

Capture Rate (% of Recyclables	Total Tons MSW	Estimated Tons							Estimated Revenues[1]									
		Total Tons Recyclables	Plastics	Glass	Aluminum	Mixed Paper	OCC	Steel Cans	Plastics	Glass		Aluminum	Mixed Paper	OCC	Steel Cans	Source Separated	Commingled w/o Glass	Commingled w/Glass
10	89	32	3	4	2	12	9	2	$282	($429)		$2,204	$48	$403	$40	$2,549	($910)	($3,167)
20	178	64	5	8	4	25	18	4	$565	($858)		$4,408	$96	$805	$80	$5,098	($1,820)	($2,267)
30	268	96	8	12	5	37	27	6	$847	($1,286)		$6,612	$145	$1,208	$121	$7,647	($2,730)	($3,401)
35	312	112	9	14	6	44	31	7	$988	($1,501)		$7,714	$169	$1,410	$141	$8,921	($3,185)	($3,968)
40	357	128	11	16	7	50	36	8	$1,129	($1,715)		$8,817	$193	$1,611	$161	$10,195	($3,640)	($4,535)
50	446	160	13	21	9	62	45	10	$1,412	($2,144)		$11,021	$241	$2,014	$201	$12,744	($4,551)	($5,668)
60	535	192	16	25	11	75	54	12	$1,694	($2,573)		$13,225	$289	$2,416	$241	$15,293	($5,461)	($5,668)
70	624	224	19	29	12	87	62	14	$1,976	($3,001)		$17,633	$337	$2,819	$282	$20,046	($6,371)	($7,935)
80	714	255	21	33	14	100	71	16	$2,259	($3,430)		$17,633	$386	$3,222	$322	$20,391	($7,281)	($9,069)
90	803	287	24	37	16	112	80	18	$2,541	($3,859)		$19,837	$434	$3,625	$362	$22,940	($8,191)	($10,203)
100	892	319	27	41	18	125	89	20	$2,823	($4,288)		$22,041	$482	$4,027	$402	$25,488	($9,101)	($11,336)

1. Based on MSA with Regional Disposal Company.

Exhibit 84. Shipping by Land--Estimated Costs

Capture Rate (% of Recyclables	Total Tons MSW	Estimated Tons							Estimated Revenues								
		Total Tons Recyclables	Plastics	Glass	Aluminum	Mixed Paper	OCC	Steel Cans	Plastics	Glass	Aluminum	Mixed Paper	OCC	Steel Cans	Total Estimated Revenues	Total Estimated Transportation Costs	Net Revenues or Costs
10	89	32	3	4	2	12	9	2	($535)	($821)	$803	$201	$403	($392)	($342)	(590.00)	($932)
20	178	64	5	8	4	25	18	4	($1,070)	($1,641)	$1,606	$401	$805	($785)	($685)	(590.00)	($1,275)
30	268	96	8	12	5	37	27	6	($1,606)	($2,462)	$2,408	$602	$1,208	($1,177)	($1,027)	(1,180.00)	($2,207)
35	312	112	9	14	6	44	31	7	($1,873)	($2,872)	$2,810	$602	$1,410	($1,374)	($1,298)	(5,739.00)	($7,037)
40	357	128	11	16	7	50	36	8	($2,141)	($3,283)	$3,211	$702	$1,611	($1,570)	($1,469)	(6,457.00)	($7,926)
50	446	160	13	21	9	62	45	10	($2,676)	($4,103)	$4,014	$802	$2,014	($1,962)	($1,912)	(7,174.00)	($9,086)
60	535	192	16	25	11	75	54	12	($3,211)	($4,924)	$4,817	$1,003	$2,416	($2,355)	($2,254)	(8,609.00)	($10,863)
70	624	224	19	29	12	87	62	14	($3,746)	($5,744)	$5,620	$1,404	$2,819	($2,747)	($2,396)	(10,044.00)	($12,440)
80	714	255	21	33	14	100	71	16	($4,282)	($6,565)	$6,422	$1,604	$3,222	($3,140)	($2,738)	(11,478.00)	($14,216)
90	803	287	24	37	16	112	80	18	($4,817)	($7,386)	$7,225	$1,805	$3,625	($3,532)	($3,080)	(12,913.00)	($15,993)
100	892	319	27	41	18	125	89	20	($5,352)	($8,206)	$8,028	$2,005	$4,027	($3,925)	($3,423)	(14,313.00)	($17,736)

1. Based upon 48-foot trailer holding 38 standard-size bales @ 1000 lbs ea.
2. Total $2.68 per mile. Based upon truck with a 5.5 miles/gallon fuel efficiency travelling 220 miles roundtrip, with a fuel price of $4.36/gallon, the average price of diesel in Alaska on 11/21/2012. (www.fuelgaugereport.aaa.com). This also includes costs associated with owning and operating a truck and trailer, which averages $0.85/mile. Driver labor costs are based upon a $26/hour rate plus typical MOS fringe benefits which equals $0.92/mile. Total cost per trip: $590.
3. $200/ton is the highest drop-off fee Raven Recycling charges for municipalities delivering mixed recyclables to its facility.
4. Paper is assumed to be picked up by Raven on the way to Skagway's port and thus is not included in trucking costs.
5. Current price for aluminum as of 11/21/2012 is $0.45/ton ($900/ton). Calculation assumes split revenue in half with Raven, meaning Skagway would earn $450/ton for aluminum.

8 SOLID WASTE AND RECYCLING PROGRAM COMPONENTS

On the basis of our review of the MOS's solid waste program and data analysis during the course of this SWRMP, a number of feasible solid waste and recycling program components were developed, as discussed in the paragraphs below. This section briefly reviews possible options, discusses possible advantages and disadvantages, and provides estimated, planning-level, capital and operating costs. Exhibit 85 provides a brief chart illustrating how these options and subcategories fit into the MOS's basic programs of collection, recycling, disposal, and administration.

Exhibit 85. Possible MOS Solid Waste and Recycling Program Options

Major Programs	Categories	Options
Collection	Vehicles:	Purchase Similar MOS Equipment Purchase New Types of Equipment
	Containers:	Develop New Container/Littering Ordinance MOS to Purchase Standardize Containers MOS to Purchase Bear-Proof Containers
	Special Waste:	Continue Partnership With STC Develop HHW Program Under "Clean Sweep" Develop Biofuels Recycling Program
Recycling	Collection:	Develop Curbside Collection Program Develop Recycling and Composting Facility(s) Purchase Recycling Containers for Downtown and Cruise Docks
	Public Education:	Develop Public Education Program Hire an Educational and Outreach Coordinator Provide Technical Assistance to Businesses Develop Logo and Signage
	Green Purchasing:	Develop City Green Purchasing Program
Disposal	Incinerator:	Continue Operation Reduce Normal Burns
	Ship MSW and Other Waste Out of MOS:	Close Incinerator and Negotiate Agreement to Ship South
Administrative	Procurement:	Develop RFPs for Facility Design and Construction
	Staffing:	Realign Current Collection Staff Hire Educational and Outreach Coordinator
	Financial:	Conduct Cost of Solid Waste Program Study

SOLID WASTE COLLECTION

Collection Vehicle

The existing, rear-loader, solid waste collection vehicle was purchased five to seven years ago. Typically, with proper maintenance these types of facilities can be expected to have a life expectancy of roughly ten years, based on current solid waste industry benchmarks. Therefore, the MOS has a window of opportunity to replace the current vehicle type within an estimated three to four years under the current MOS vehicle replacement schedule. At that time, the MOS has a series of equipment replacement options, which can allow the MOS to potentially change the residential and commercial collection program for residents and businesses within the MOS without having to purchase an additional truck.

Purchase Of A Similar, Rear-loader, Packer Truck With Hydraulic Lifters.

This option essentially would allow the PWD to continue operation of the collection system with no real changes, except perhaps with respect residential containers (described below).

Cost: The estimated cost associated with a new rear-loader collection vehicle is between $200,000 and $250,000.

Purchase Of An Automated, Front-loader (AFL), Collection Truck With A "Curotto Can System."

This type of configuration would enable the PWD residential and commercial routes to be run with a single PWD employee (driver), freeing up the extra staff member who was formerly the "collector" in the current system to possibly help run the recycling and composting facilities. The advantage of this approach is that it minimizes the potential of worker injury and utilizes the automated equipment to increase efficiency. The Curotto Can System, which is used to tip large, wheeled carts, can be unhinged from the arms of the AFL truck and then be ready to conduct the commercial routes (see Exhibit 86).

The Curotto Can AFL combination has a fast load time (four to five seconds), which translates into a significant productivity advantage. Based on historic solid waste operating experience, AFL's have proven to be extremely rugged for use with commercial accounts. When combined with the Curotto Can option, the AFL can provide all of the advantages of the automated side-loader without the disadvantage of high maintenance costs for typical automated side loader vehicles. Given the MOS's remote location this would be a significant advantage in terms of parts and servicing of hydraulic arms.

This option has worked well in the past in similar collection situations to the MOS (e.g., alleys, hanging overhead electric lines, historic areas, etc.). However, as with any new application, the MOS would have to conduct a feasibility study to evaluate potential operational issues such a placement of the standardized cans, truck maneuverability, spare equipment, and need for backup collection equipment.

Exhibit 86. Traditional Automatic Front Loader Truck with Curotto Can System

Cost: The estimated cost associated with a new AFL and Curotto Can is between $235,000 to $285,000; $10,000 for backup Curotto Can package.

Collection Containers

The type of collection vehicle selected is also highly dependent upon the type of collection container a community prefers. Currently, on MOS trash days you can see bags, loose trash, broken plastic cans, cans with lids and without, new wheeled cans, and rusted old metal cans. Very few of the containers on the PWD's residential and commercial routes are "standardized," nor are they "bear proof". This provides an attraction for bears and other animals, and provides an opportunity for wind-blown littering, although the PWD collection crews do an outstanding job of keeping the city streets and alleys remarkably clean under these conditions. The following options can be considered for addressing these issues:

Maintain Current Container (30 Gallon) Collection System With A Concentration On Enforcing Relevant Container Ordinances.

Costs: The resources associated with enforcing the solid waste container code will entail dedicating staff time to this task. Although it is not necessary to hire additional staff for code enforcement, a concerted effort to allocate staff accordingly will be required.

Standardize Containers Or Implement A "Pay-As-You Throw" Collection System Within The Downtown Collection Area.

If the MOS decides to move towards automated collection, it will have to transition to standardized containers, as these are necessary for the automated hydraulic-armed trucks. Furthermore, if the MOS decides to pursue a comprehensive recycling program, the traditional disposal needs of its customers could be reduced significantly allowing the MOS to offer a "pay-

as-you-throw" billing program for solid waste and recycling. That is, those customers who decide to recycle more could opt for a smaller-sized container (15 or 30 gallon), and thus pay less for their normal trash collection service. Those who decide that they cannot recycle adequately could continue with either a single 30 gallon container for trash, or request a second can. The rates for solid waste collection and recycling could then be set based on the results of a "solid waste rate study" to help establish the proper customer fees for these services.

Costs: The price range of standard 15, 30, and 64-gallon wheeled carts average between $35 and $75 each ("piggybacking" on other municipal agreement with large national container supplier (e.g., Otto, Toter, etc.). It is assumed that the PWD will procure roughly 400 carts with a backup of approximately 10 percent. Typically, most communities implementing a cart program procure all of the carts through a citywide bid process, and include these costs in the solid waste rate base. Typically, these carts come with a 10-year manufacturer's warranty and they tend to last well beyond this period before they need to be replaced.

Provide Bear-Proof Solid Waste Containers To Residents.

To mitigate animal nuisance (bears, dogs and birds), wind, and other littering issues the MOS could consider purchasing bear-proof containers with latches. These types of containers can be compatible with an automated collection system (as shown in Alaska); however, it will take significant public education to coordinate such a program. It would also require the driver to get out of the cab and unlash the can lid before the container is dumped. An alternative to having a single bear-proof container for each home would be to purchase and deploy several cans per residential block specifically for "compostable" materials. However, this option appears to have serious implementation issues due to the current MOS billing system and the ability to jointly bill for collection service. Although there are examples in larger communities, SCS was unable to locate another jurisdiction who has implemented a similar collection system for an urbanized area like MOS

Costs: The costs of 30 to 64-gallon wheeled "bear-proof" carts average $75 - $100 each. Based on experience with other similar communities, it is anticipated that the MOS could see customer cost increases of approximately $10 per year.

Special Waste Collection

Solid waste agencies across the U.S. have developed a variety of different programs to collect both HHW and E-Waste. These programs range from operating permanent, centralized facilities run by the local government agency for year-round collection to holding pre-scheduled "special events".

Typically, smaller communities like Skagway conduct the latter type of collection programs, either in concert with local sponsors (e.g., waste haulers, large box retailers (Lowe's, Home Depot), and non-profit organizations). These periodic events are structured around collection of items such as: household chemicals, paints, motor oils, antifreeze, etc. According to the ADEC, Alaska residents are expected to generate about five gallons of HHW each year. The objective is to minimize inadvertent disposal of these materials in landfills and incineration facilities and help protect human health, safety, and the environment. The following options are applicable:

Partner With STC On E-Waste Collection Program.

For the last several years, the STC has managed an annual E-Waste collection event where residents and businesses self-haul their E-Wastes to a warehouse facility, which is located on the STC campus, where these wastes are weighed and packaged for container delivery to a recycler located in the Seattle area. The program is partially supported by a Federal grant and through fees charged to those delivering E-Wastes to the STC facility. It is unknown whether or not the government grant and STC interest in this E-Waste collection program will continue in the future.

Costs: Direct MOS costs will be minimal if the STC grant continues. The MOS currently provides in-kind services from PWD and co-sponsoring advertising costs for the event.

Develop A MOS E-Waste And Household Hazardous Waste (HHW) Periodic Event.

MOS has conducted an HHW event in July of each year with a regional effort and an annual E-Waste event with STC. If the STC grant is not renewed, an alternative option is for the MOS to develop a combined community-wide special E waste recycling and HHW event at the proposed Recycling Facility, perhaps to coincide with "Clean Sweep".

Costs: Quarterly MOS sponsored events for HHW – $5,000 per event

Explore MOS Biofuels Recycling Program

With respect to HHW, the MOS currently has a small program to recycle restaurant fryer oils, which are now stored in large containers/barrels, that are located adjacent to the Wastewater Treatment Plant. The MOS's plans to turn these materials into biofuels have been put on hold. A few potential local biofuels processers have expressed interest but no definitive proposals have been submitted to the MOS. This option would involve the MOS to continue transport of these materials outside MOS, issue RFP for private sector interest, or evaluate a MOS biofuels processing facility after a detailed feasibility study is conducted.

Costs: Variable based on option and technology considered. Private sector involvement would have the lowest costs for the MOS.

Recycling Program

The following paragraphs briefly discuss potential options to enhance the MOS's recycling program.

Implement Curbside Collection Of Recyclables

For small communities, it is SCS's experience that weekly curbside collection of recyclables, either source separated at the curb or collected single-stream, is not economically feasible usually due to the lack of economies of scale (high capital and operating costs). However, many communities of similar size to Skagway have implemented curbside recyclables collection programs with scheduled pickups every other week, which is what the MOS would need to do in order to realistically pursue this option. There are potential options in Whitehorse and Seattle to

accept single-stream recyclables, although at a higher processing costs and lower revenue to MOS.

Develop A Recycling Drop-Off Facility For Residents To Self-Haul Recyclables.

As an alternative to curbside collection of recyclables, most communities typically construct and maintain a single or series of recycling drop-off centers where solid waste collection customers self-haul their recyclables to the facility or facilities. The paragraphs below briefly provide detail on this option and estimated costs.

Exhibit 87 illustrates an initial conceptual design of the proposed Recycling Facility. As shown, the facility has the following design elements:

- Facility would be located in a convenient location so as to minimize transportation costs for customers and MOS operations for exports of recyclables to markets.
- Paved, fenced, "bear-proof", and designed with stormwater and runoff control to maximize vector and bear control, odors, security of recyclables, and with well designed landscaping plan.
- Attended operation to eliminate possibility of illegal dumping of MSW and contamination of recyclables.
- Enclosed recyclables and other wastes "storage building" to enable "all-weather" operation (sufficient floor space to work materials and provide loading of materials into roll off box or marine trailer, one overhead door for trailer access, etc.).
- Facility designed to receive all MOS' recyclables, host special events for household hazardous wastes and E-waste, if needed.

Cost: Exhibit 88 provides a summary of planning-level capital costs for a proposed Recycling Facility.

Develop A Composting Facility For Residents To Self-Haul Organic Materials.

Exhibit 89 illustrates a conceptual site plan of the proposed windrow Composting Facility. In windrow composting systems, the feedstock is formed into long, narrow piles in which composting takes place. These piles are usually six to 20 feet wide, as high as 12 feet, and generally trapezoidal in cross section. The length can vary, but 300 feet is typical.

Aeration is supplied by mixing or turning the windrow. In small systems, windrow turning is frequently accomplished by using a front-end loader. Specialized windrow turners are used to help control the process. Because of the simplicity and low cost, windrow systems have been widely applied for green wastes composting.

To develop the specific area requirements for a proposed MOS facility, the volume of yard waste materials and potentially compostable materials in the MOS MSW waste stream were calculated. These volumes were then converted to tons delivered to the facility using an appropriate waste

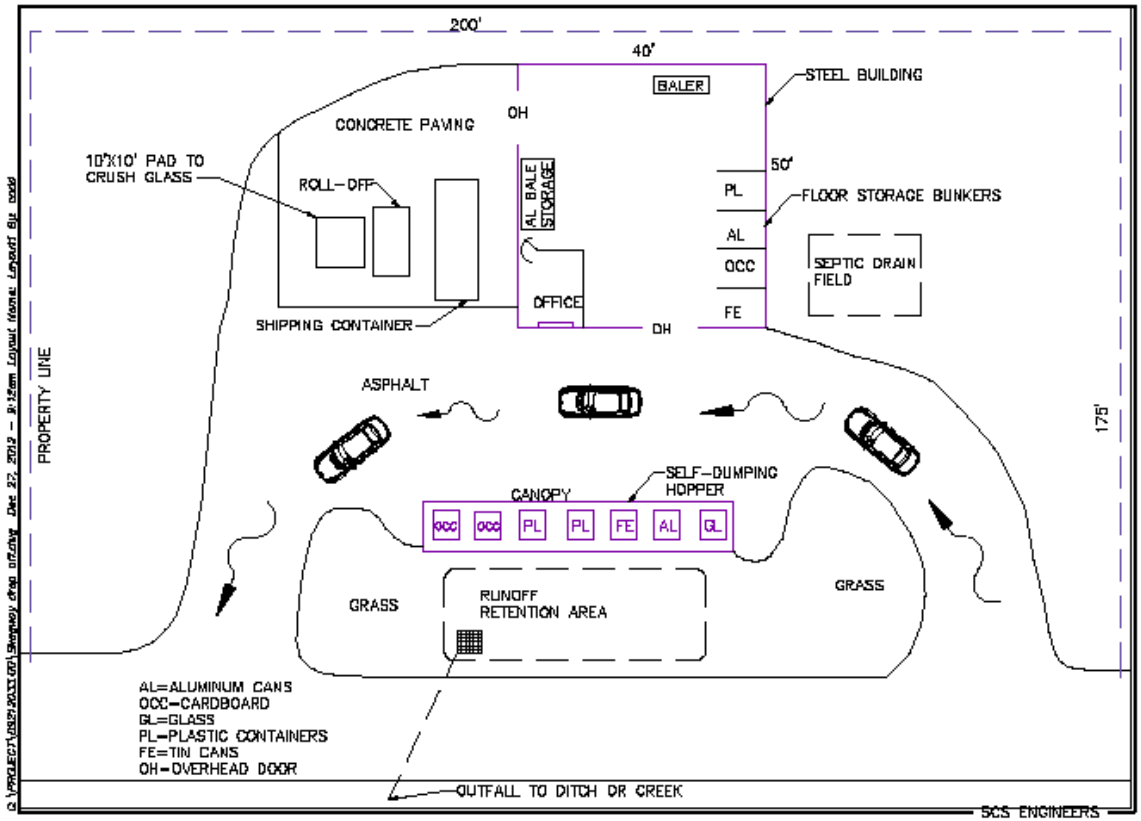
density. This calculation determined how many windrows would be needed to accommodate the amount of material received. An appropriate engineering factor was then used by SCS to determine the number of aisles between pairs of windrows, equipment movement space, and ultimately the width and length of the processing area needed. Added to this total was a calculation for the storage and buffer area needed to arrive at the total site area.

Due to their relatively low capital and operating costs, most small municipalities like Skagway commonly opt to implement windrow composting. However, due to space limitations within Skagway, available municipal and private land may not be available for this type of composting option. A number of alternative technologies were evaluated (e.g. HOTROT, Marathon and Totally Green food aerobic digesters, and aerobic digesters (Appendix D) to see if they could provide compost food waste, other compostable paper products in the MOS waste stream, biosolids, and yard wastes, which are currently delivered to the Seven Pastures site. Unlike the windrow composting technology, many of these technologies have only been applied either to food wastes or have limited municipal applications. Several of these provide "grey water" that needs to be disposed as opposed to a usable compost product.

It was difficult to gather definitive cost and design proposals given the budget and time limitations for this SWRMP. However, we are of the opinion that the preliminary information provided suggest that the cost estimate prepared for the windrow facility is conservative and useful for planning-level decisions by the Assembly until the final technology and associated costs are determined. Should the Assembly move forward on a composting element to the overall plan, SCS recommends that a composting feasibility study of various technologies be conducted followed by a pilot composting program. This would enable the MOS to assess the most appropriate technologies and the final cost estimates for these technologies.

Cost: Exhibit 90 provides a detailed, planning-level, capital cost estimate for this facility.

Exhibit 87. Proposed Site Plan for the Recycling Facility

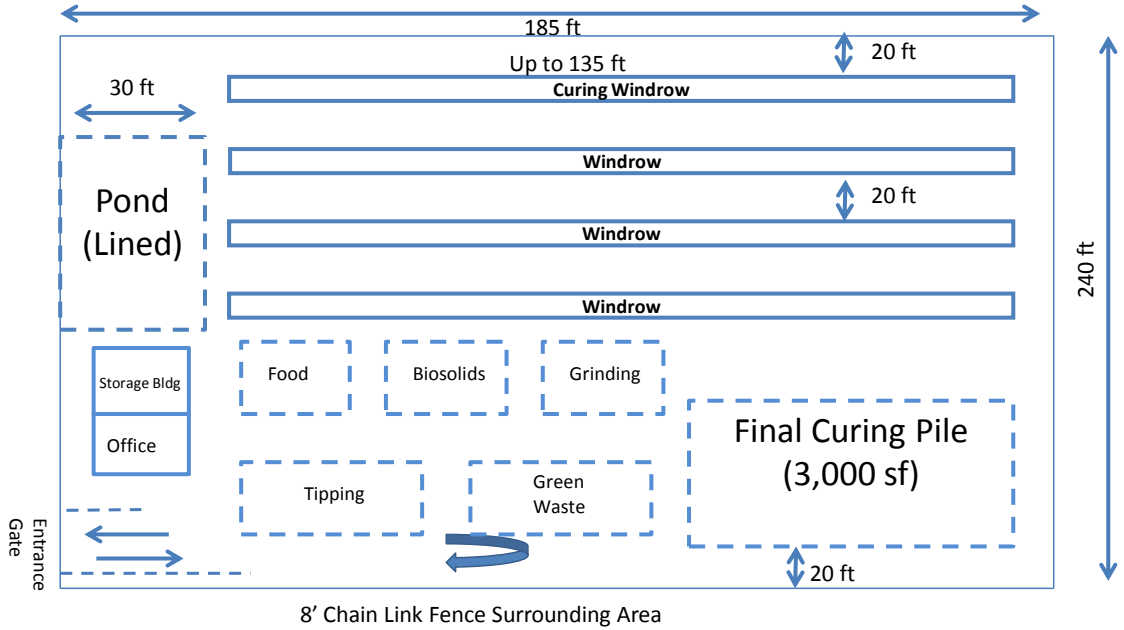


CITIZEN'S RECYCLING DROP-OFF FACILITY

Exhibit 88. Estimated Implementation Cost for Proposed MOS Recycling Facility

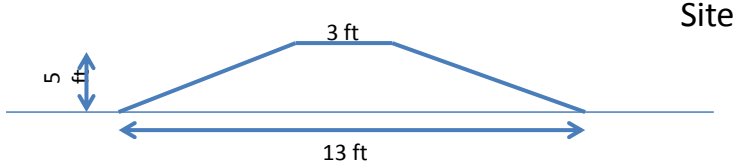
Item Description	Quantity	Units	Unit Price	Amount ($)
1. Steel Storage Bldg.	2000	SF	65	130,000
2. Office Enclosure	100	SF	60	6,000
3. Rolling Stock				
a. LP Fork Lift Truck (late used)	1	EA	25,000	25,000
b. Self-dumping Bins	8	EA	2,000	16,000
4. Retention Pond (unlined)	100	CY	40	4,000
5. Site clearing and grubbing	0.8	AC	4,000	3,200
6. Site grading	0.8	AC	5,000	4,000
7. Storm Drain Inlets, Headwall & Outlet	1	EA	5,000	5,000
8. Gates	2	EA	3,000	6,000
9. Site electric	1	LS	30,000	30,000
10. Septic Tank	1	LS	4,000	4,000
11. Fill	1500	CY	10	15,000
12. Storm Drain Piping (24 inch dia.)	100	LF	30	3,000
13. Asphalt Paving	6,000	SF	8	48,000
14. Concrete Paving	1800	SF	24	43,200
15. Concrete glass Pad	225	SF	16	3,600
16. Cardboard Bin Canopy	600	SF	24	14,400
17. Landscaping & grass	1	LS	8,000	8,000
18. Striping and Signage	1	LS	4,000	4,000
19. Baler	1	LS	75,000	75,000
20. Bunker Walls	4	EA	2,000	8,000
21. Land	0.5	AC	100,000	50,000
21. Contingency 25%				126,350

Exhibit 89. Conceptual Composting Facility Site Plan



8' Chain Link Fence Surrounding Area

Site Size = 1.02 Acres



Curing Windrow Section

Not To Scale

1

Exhibit 90. Estimated Implementation Cost for Proposed MOS Composting Facility

Item Description	Quantity	Units	Unit Price	Amount ($)
1. Office Trailer (new)	300	SF	40	12,000
2. Steel Storage Bldg.	900	SF	65	58,500
3. Rolling Stock				0
a. Front End Loader (new)	1	EA	50,000	50,000
b. Mini Dump truck (late used)	1	EA	25,000	25,000
4. Leachate Pond (Lined)	200	CY	60	12,000
5. Pond Liner	1100	SF	8	8,800
6. Site clearing and grubbing	1.1	AC	4,000	4,400
7. Site grading	1.1	AC	5,000	5,500
8. Galv. Steel Fencing - 8 ft.	850	LF	60	51,000
9. Entrance Gate	1	LS	3,000	3,000
10. Site electric	1	LS	30,000	30,000
11. Portable Septic Tanks & Plumbing	1	LS	6,000	6,000
12. Fill	1,600	CY	10	16,000
13. Small limb & brush Chipper (late used)	1	LS	50,000	50,000
14. Office and Tipping Paving	4,000	SF	8	32,000
15. Pond Aerator	1	LS	10,000	10,000
16. Land	Acre	LS	100,000	100,000
13. Contingency 25%				118,550

Develop A Public Education Program.

The extent that education and outreach program is developed depends upon the other options from this plan selected for implementation. Therefore, selection of the education options should follow the selection of the other elements. The most feasible and applicable education and outreach options are as follows:

Utility Billing Stuffers

The use of in-house utility billing stuffers is an effective way to reach a large majority of solid waste system customers. This activity is a cost effective alternative because the MOS already pays for the postage associated with the utility bill.

Direct Mailing Newsletter

This option would include the mailing of an annual or twice yearly newsletter mailed directly to each household in the MOS. Content of the newsletter would include information on recycling, waste reduction, solid and hazardous waste disposal, and littering and solid waste enforcement issues. This option would provide guaranteed information dissemination to every household in the MOS at least once a year and would allow for changes in the program could be easily communicated. A newsletter could also provide a mechanism for public feedback in the form of surveys.

Cost: $1,500 (twice a year).

Web Site

Little information currently is offered on the MOS's website concerning solid waste or recycling program activities. This option assumes a major redesign of the MOS website to incorporate new solid waste and recycling information. People generally are comfortable using the Internet as a place to go for information and most often have access to a computer. The MOS should update its website to be a successful component of a waste reduction and recycling education campaign. As with any promotional medium, the website must be user-friendly, accurate, and interesting. The website should be professionally designed, if possible. In addition, the MOS should utilize community-based social marketing (Facebook) to help promote the program, as well as provide a link to the Skagway Swap site.

Cost: $2,500

Hire An Education And Outreach Coordinator.

The most integral part of any education and outreach program is a paid position to coordinate important solid waste and recycling activities such as:

- Overseeing collection, transportation and processing operations for collection
- Facilitating recycling and waste reduction efforts for public events
- Providing administrative support for local recycling programs and projects

- Acting as liaison with the public, schools, community groups, businesses and local government agencies
- Providing technical assistance on recycling related issues
- Developing and distributing promotional and educational materials
- Directing the work of recycling center attendants, program assistants, volunteers and temporary staff
- Apply for grant funding
- Processing or marketing recovered materials
- Monitoring commodity market prices
- Reporting to elected officials on the success and needs of the program
- Developing and managing budgets
- Tracks program statistics for auditing purposes

Cost: Full-Time Position - $62,381.61 to $65,351.74 (payroll and benefit Costs); Part-time Position - $31,190.1 to $32,675.87 (payroll and benefit Costs).

Provide Technical Assistance To Schools And Businesses.

This option recognizes the need to reach schools and businesses regarding their handling of waste—making commercial waste recycling a priority. Outreach to schools and businesses would offer free technical assistance and waste audits, as well as distribution of newsletter at schools. Given the influence of tourism on the economy, commercial sources produce a significant portion of solid waste in Skagway during the summer months. Focusing waste reduction efforts towards the business sector can have a large impact on the waste stream as a whole. Measurable data would be much easier to obtain from businesses rather than residents. It is also important to provide waste audit assistance to schools. A functional waste reduction and recycling program in a school yields daily reminders to the students of their direct impacts on the environment. However, developing a technical assistance program is staff intensive; a full-time education and outreach coordinator would most likely be needed in order to adopt this initiative.

Cost: Labor costs provided by Recycling Coordinator; $500 to $1,000 annual expenses.

Install An Adequate Amount Of Source-Separated Recycling Cans At The Cruise Docks And Near Downtown.

Residents and tourists alike need to have access to frequent and convenient recycling bins when visiting common areas like the port, downtown, parks and other recreation areas. The bins should allow for source separation for at least paper, plastics and aluminum, more if possible.

Cost: $6,000 at 300 each for a minimum of 20 recycling containers scattered along the routes leading from the cruise docks, boat basin and in the downtown area.

Recycling Logo and Signage

This option involves developing an identifiable recycling logo and making it omnipresent for both residents and tourists visiting the MOS. This option is very important in setting the tone or

the "recycling culture" of Skagway, especially to visiting tourists, for some who may expect these activities and for others who need to be informed of how and where to recycle. The signs should be placed on recycling bins and should describe the overall recycling guidelines. Additionally, residential "thank you" signs can be installed, as well as roadside signs indicating the presence of the recycling site.

Cost: $1,000 honorarium to MOS resident or schoolchild as part of a borough-wide recycling logo contest; five signs, each at $100 each provided by PWD sign shop.

Encourage A Shift In Green Procurement/Purchasing And Conservation Practices Beginning At The Governmental Level And Eventually Extend To Businesses, Schools, And Residents.

The MOS should consider passing a proclamation with policies for governmental green practices, including a commitment to recycling and purchasing environmentally-friendly products such as recycled paper. In doing so, the governmental level can provide community leadership in moving towards a more sustainable society.

Cost: In-kind services provided by Recycling Committee.

Solid Waste Disposal

Based on our review of the MOS's current solid waste disposal system and possible improvements, the following potential options appear feasible:

Continued Incinerator Operation

The existing Incinerator was constructed and went online in 1998. Based on our observations, review of available records, and discussions with key PWD staff, it appears that this facility has had significant maintenance expenses over the years, principally to replace refractory and duct work. Much is of this is due to the fact that the plant has been operated in a "batch mode" and the constant thermal cycling has impacted the life of the brick refractory inside the burning chambers. There is a significant amount of oxidation within the facility perhaps due to reduced preventative maintenance over the years.

In our opinion, for proper financial planning, it is important that the MOS have a clear understanding of the current condition of the facility, whether or not the facility will be able to provide effective long-term service to the MOS, and if modifications and improvements in preventative maintenance procedures could enhance the capability of the facility to provide long-term service to the MOS well beyond the period when the bonded debt is defeased. Typically, answers to all of these questions can be provided by conducting a Life Extension Study, which is described in the paragraphs below.

Document Review

- Review records of all failures in the past five years (fans, pumps, tubing, etc.).
- Review plant performance records (MSW processed, trend data on facility instrumentation computer).

- Review outage reports for the past five years (ultrasonic tests of duct work thickness, instrument calibrations, motor megger tests, etc.).
- Environmental compliance. Review quarterly air permit reports for the past five years. Review any reports on ash disposal (bottom and fly ash).

On-Site Inspection

- Review plant drawings.
- Inspect condition of refractory and past repairs.
- Inspect the condition of all air pollution control equipment.
- Have all major motors megger tested (fan motors, feed water pump motors, cooling water pump motors).
- Have all mechanical equipment tested (fans, pumps, etc.).
- Look for past inspections of the switchyard. Look for oil leaks on the transformers.
- Inspect the general condition of plant buildings – roofs, walls, floors, doors, lighting, rest rooms/locker rooms, emergency systems, fire protection, etc.
- Review ash landfill drawings and make an estimate of remaining capacity, operation of the leachate control system, etc.
- Inspect the general condition of plant roads and parking areas.
- Inspect condition of plant grounds – landscaping, fences, gates, outdoor lighting, security systems, etc.

Post-Inspection and Report

At the conclusion of the Life Extension Study, the selected inspector or consulting engineering firm would be able to provide the MOS with a series of opinions on the current operating condition of the Incinerator, possible procedures and modifications to the facility which would improve its operating condition and reduce maintenance and operating expenses, and means to extend the life of the facility. The report would provide the MOS with a detailed capital improvement plan and an estimated schedule of maintenance costs. This would provide improved estimates of future maintenance costs.

Cost: An experienced inspector could do all of the on-site work within one week, with careful pre-planning. Cost for the Life Extension Study could range from $35,000 to $50,000 plus travel expenses.

Reduce Normal Incinerator Burns

With the roll-out of the enhanced recyclables and organics composting programs, it is anticipated that MSW from the MOS will be diverted from the Incinerator. As such, the normal number of

burns that were formerly conducted during the summer (3-4 times a week) and in the winter (1 to 2 times per week) will be reduced significantly.

Cost: While normal maintenance activities will continue to be provided by PWD staff, the amount of utilities such as diesel fuel and electric power used by the Incinerator will be reduced significantly as the recycling and organics diversion program continues to grow. Of course, this cost reduction trend will be subject to the level of public education provided to Skagway residents and businesses, their participation in these programs, and the amount of material captured by these programs.

As an historic "rule of thumb", each burn costs the MOS approximately $5,000 on average, assuming current budgeted costs, the cost of the debt service, and anticipated renewal and replacement costs for the Incinerator.

Close the Incinerator

An alternative to continued PWD operation of the Incinerator is to close the facility and ship all of the MOS's MSW south to private landfills. During the time period when the Incinerator was undergoing refractory installation and duct work replacement, the PWD had entered into an agreement with Republic to ship the MOS's entire waste stream south (including sewer sludge (biosolids) and biohazardous materials) to the company's landfill in eastern Oregon. The charge at that time was approximately $150 per ton with the company paying all of the shipping and disposal costs to the landfill. This option would require some sort of waste transfer equipment be installed (similar to the current Marathon compactor system) at the Incinerator or another site and provisions be made for disposal of MSW, dead animals, sewage sludge and biomedical waste. A preliminary discussion made with Republic suggests that these waste streams can be shipped south to their facilities for ultimate disposal.

Many of the cities in Southeastern Alaska have entered into long-term disposal agreements and either closed their incinerators or landfills. Similarly, the MOS could develop a waste disposal bid document and advertise for private sector providers to submit long-term bids for MOS's waste stream. Clearly, when compared with the MOS's current estimated operating costs for the Incinerator ($475 per ton), this waste disposal alternative could be potentially advantageous to the MOS. However, one downside of this alternative is that once the MOS closes the Incinerator it would be potentially subject to increasing costs of transportation, long distance transportation issues due to the remoteness of Skagway to the ultimate landfills (more than 1,000 miles), and environmental restrictions in the states where the landfills are located. For example, these states could restrict the disposal of out-of-region MSW or place an additional fees for MSW disposal from outside their states. This option also does not address the need for MOS to manage its own waste disposal within its own community.

Should the MOS decide to close the Incinerator, the ashfill could be closed and environmentally capped pursuant to the existing State permit. The MOS would be required to continue ground water monitoring and submit periodic inspection reports to the ADEC. The Incinerator equipment and building could be disassembled and sold for scrap, or the building used for other MOS purposes (e.g., long-term storage of equipment, records, etc.)..

Cost: Currently, solid waste service providers in the "Lower 48" are offering Southeastern Alaskan communities disposal rates of approximately $100 to150 a ton including shipping.

Administrative Issues

These are a variety of administrative and staff issues that may need to be addressed. Various options and their estimated costs are provided in the following paragraphs.

Develop A Request For Proposal To Secure Formal Commitments And Prices Relative To Transportation And Recyclables Revenues

A significant step in deciding what options to implement when implementing a comprehensive recycling program is to develop partnerships with neighboring communities. An interlocal or contractual partnership would allow for economies of scale and non-duplication of efforts as it relates to recycling. Throughout the course of this plan's development, a significant amount of time was devoted to analyzing what is happening around southeast Alaska and in the Yukon so as to determine how Skagway can best utilize these neighboring resources, as were outlined in previous sections of this plan. The next step in this process is for the MOS to develop a formal RFP so as to ascertain the extent and seriousness of neighboring communities, businesses and nonprofits in partnering with Skagway in implementing a recycling program. The RFP should contain language that asks for specific costs and logistics involved with such an arrangement. At a minimum, the RFP should be sent to Raven Recycling and P&M Recycling in Whitehorse, Haines Friends of Recycling, Community Waste Solutions, The City and Bureau of Juneau Municipality of Juneau and Republic Services.

Cost: In Kind services for development of the RFP by Recycling Committee and MOS staff.

Conduct A Solid Waste Cost Of Services/Rate Study

Based on our review of the MOS budgets and interviews of PWD staff, it appears that it has been many years since a formal cost of service or rate study has been performed for the MOS solid waste program. As a consequence, many of the customer rates appear out of alignment with the current system revenues requiring the MOS to subsidize the program with transfers and excise tax revenues from the General Fund. In light of proposed enhancements in recycling and a review of the Incinerator, one option is to conduct a rate system. This study would review current operating expenses, required improvements in collection, recycling, and incineration, and explore revenue sufficiency.

Cost: Roughly 120 to 160 man-hours by MOS senior staff or $15,000 to $20,000 outside consultant.

Realign Current PWD Staff

With the current MOS budget, the PWD provides two staff members to support the solid waste collection program and provide administrative support to operate the Incinerator. If the MOS decides to implement the various recycling program options, it is anticipated that the number of Incinerator burns will be reduced as more recyclables and organics are diverted from the Incinerator. This may free up these man-hours to assist in the operations in the Recycling

Facility and Composting Facility should waste generators Initially, these facilities will be operated on a part-time basis to match the number of reduced burns in the Incinerator. It is assumed that at least one new position would be needed to provide public education for the recycling and composting facilities, as well to provide administrative support. All these positions would require new or modified position descriptions.

Cost: Full Time Position - $62,381.61 to $65,351.74 (payroll and benefit Costs) for public education.

9 IMPLEMENTATION

This section contains the proposed implementation strategy for the SWRWP. It includes a list of recommended actions, implementation schedule, and proposed expenditures for several major scenarios for evaluation by the Recycling Committee and the Assembly.

Priorities, funding, and expenses for this SWRWP are intended as guidelines, which will, and can be reassessed and revisited, as developments occur. Therefore, recommendations throughout this SWRWP reflect reviews of programs and recommendations by the MOS Recycling Committee. Implementation of the recommendations made in this plan will take place on a continuous basis. The time required to implement recommendations vary from a few weeks or months for single events, to ongoing programs that take place over many years.

PRO FORMA MODELING

A Pro forma, economic model (Model) was developed to compare and assess the current solid waste program with proposed enhancements to recycling in terms of current garbage user fees and MOS subsidies to its Garbage Enterprise Fund, as well as potential MOS cost savings with respect to the current system. As noted above, the intent of this modeling effort was to provide the Recycling Committee and the Assembly with discrete program options for policymaking purposes, assuming the most conservative cost estimates.

Scenarios

The Model evaluated six economic scenarios:

1. "No Change Scenario" – This scenario assumes that the MOS would not implement any substantial improvements in its solid waste and recycling program, as outlined in this SWRMP.

2. "Recycling Facility Only Scenario" – This scenario assumes that the MOS would implement a Recycling Facility and ship its recyclables to a broker/processer south in Seattle.

3. "Composting Facility Only Scenario" – This scenario assumes that the MOS would implement a Composting Facility and process self-hauled organics at this facility.

4. "Recycling and Composting Facilities Scenario" – This scenario assumes that the MOS would construct both a Recycling and Composting Facility and send the remaining MSW and other special waste to the Incinerator for disposal. .

5. "Recycling and Composting Facilities and Close Incinerator Scenario" – This scenario assumes that the MOS would construct both a Recycling and Composting Facility and close the Incinerator with the balance of the MSW shipped to landfills in the Lower 48. The MOS would develop a small waste transfer facility for transport.

6. "Close Incinerator Scenario" – This scenario assumes that the MOS would not implement a recycling and composting program. The Incinerator would be closed and all of the MOS

MSW and special wastes would be shipped to landfills in the Lower 48. The MOS would develop a somewhat larger waste transfer facility for transport.

Assumptions

Exhibit 89 lists the major assumptions for the Model and the six scenarios.

Exhibit 91. Major Assumptions Used for the Pro Forma Model

Item	Assumption
Annual Inflation	2%
Potential Recyclables in MOS Waste Stream (Based on Waste Composition Sort)	
Aluminum	2.0%
Glass	4.6%
Cardboard	10.0%
Mixed Paper	14.0%
Plastics	3.0%
Steel Cans	2.2%
Compostable Organics	30%
Recyclables Shipping Cost (AML to Republic MRF Seattle)	
Source Separated	$104.50
Commingled	$134.50
MSW Transportation and Disposal Cost	$104.50
Recyclables Market Price (MSA With Republic Per Ton December 2012)	
Aluminum	$1,340.00
Glass	$0.00
Cardboard	$149.65
Mixed Paper	$108.36
Plastics	$210.00
Steel Cans	$125.00
Capital Cost of Facilities	
Recycling Facility	$631,750
Composting Facility	$592,750
Operating Cost of Facilities	
Recycling Facility	Based on SCS benchmarking data and industry practices
Composting Facility	
Financing	
Alaska Loan Program	1.5% Interest 20 Year Term

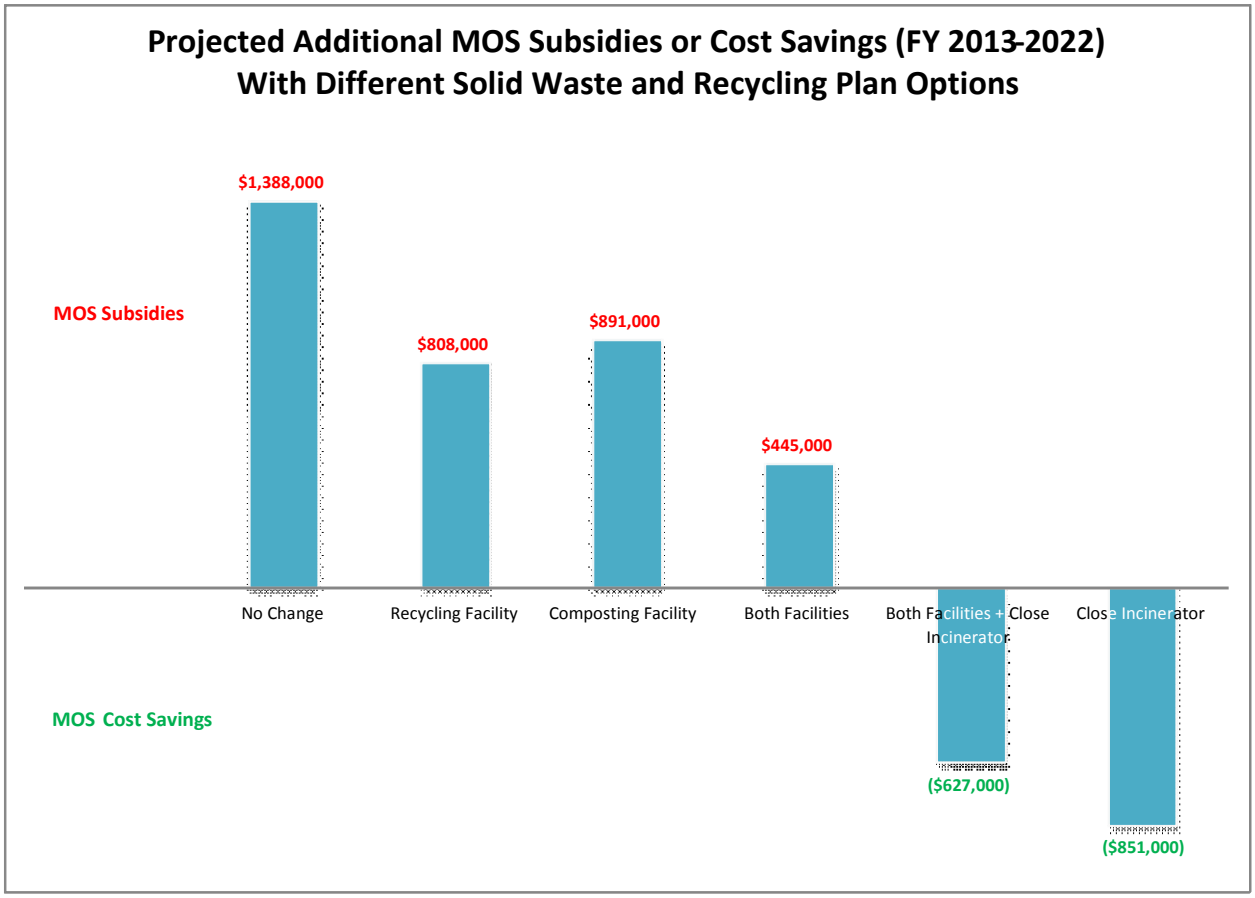
Source: MOS Solid Waste Enterprise Budgets; SCS Engineers records; Southeast Alaska Solid Waste Authority MSA with Republic, 2012.

Results

Appendix E contains the results of the spreadsheet, pro forma models constructed to analyze the estimated financial impacts of these six program options for the next 10-year operating period (2013-2022). Exhibit 92 graphically illustrates the projected additional MOS solid waste

program subsidies, and also any cost savings with implementation of these six different program scenarios.

Exhibit 92. Projected Scenario MOS Subsidies and Cost Savings Results



Briefly, a pro forma model was developed ("no change scenario") that projected operating costs for the MOS solid waste program assuming current subsidies from the MOS to the Solid Waste Fund such as revenues from the MOS sales and excise taxes and Bond Fund. The MOS also currently funds the payment of the remaining debt service for the Incinerator from a citywide Bond Fund. The predicted "net revenues or losses" shown for each year (2013-2022) are the increased subsidies ($1,387,937), which will be required, either in the form of increased sales or excise taxes, increased garbage service fees such as quarterly utility billings, or governmental grants.

The next scenario, "Recycling Facility Only", uses the same general assumption that no additional revenues will be forthcoming, except for increased revenues from the sale of recyclables dropped off by the public or businesses as a proposed recycling facility. SCS made assumptions for the projected reduction in the annual amount of Incinerator burns (20%) and the construction and operating costs of the proposed recycling. We assumed that current PWD staffing would be available for operations at the recycling facility due to decreased Incinerator burns and reduced solid waste setouts. A part-time, recycling and solid waste coordinator

position was assumed, however, to assist in coordinating the enhanced solid waste and recycling programs and help in education and outreach. The scenario projects an estimated MOS subsidy of $807,667, somewhat reduced from the results shown for the "no change scenario".

The next scenario, "Composting Facility Only", makes similar assumptions with respect to the previous recycling scenario, except that SCS estimated the costs for construction and operation of a windrow composting facility. Given the limited availability of public land for the facility, we assumed a conservative purchase price for a private parcel of land ($100,000 for one acre). There are more "high tech" types of composting technologies, which could be sited at existing MOS facilities, such as the wastewater treatment plant or the proposed recycling facility. These will be analyzed further, if the Assembly decides to move forward on this program option. We are of the opinion that construction and operating costs used in the model provide a conservative approximation of the costs for these systems for MOS planning-level decisions. The scenario projects an estimated MOS subsidy of $891,320, somewhat more than the recycling only scenario, primarily because we assumed a conservative assumption that the MOS would not receive revenues from the sale of the compost product, at least not initially, from the public.

The next scenario, "Recycling and Composting Facilities Scenario", assumes that the MOS would implement both proposed facilities. All of the major assumptions for the two previous scenarios were utilized in this scenario such as staffing and construction and operating costs for the two facilities. Most importantly, however, the diversion of recyclables and compostables from the MOS's MSW waste stream was projected to result in an annual 40% reduction in Incinerator burns. As shown, the scenario projects an estimated MOS subsidy of $445,073 over the planning period. Again, this is a significant reduction in the amount of additional MOS subsidy required, nearly $950,000 less than the "no change scenario".

The next scenario, "Recycling and Composting Facilities and Close Incinerator Scenario", makes the same assumptions noted in the previous scenario, except that an assumption was made that the MOS would close the Incinerator and ship the MSW and other special wastes to a landfill south of Seattle. Current MOS costs to pay the debt service for Incinerator through 2019 were included in the scenario.

SCS spoke with officials at Republic and utilized the contract terms that they have negotiated with many communities in southeast Alaska to estimate the cost of waste transport. We also estimated the cost for a small transfer facility to accommodate this process. It is noteworthy to mention that the MOS shipped all of its solid waste and special wastes to Republic during the period when the Incinerator was being repaired. Utilizing these assumptions, the scenario projects a net savings to MOS of $627,230 over the planning period.

Lastly, the "Close Incinerator Scenario", assumes that the MOS would not implement a recycling or composting program, but would close its Incinerator and ship all of its MSW and special wastes out of the Borough. Importantly, the scenario builds upon the transportation and disposal cost information provided by Republic and makes an estimate for development of a somewhat larger transfer station to ship approximately 1,100 tons of MSW and special wastes that are currently being incinerated. Utilizing these assumptions, the scenario projects a net savings to MOS of $850,826 over the planning period.

EVALUATION METHODOLOGY

The pool of solid waste management options is large, and therefore decisions must be made about which ones to include and exclude when developing a preferred waste management strategy. Selection criteria that support the approved goals, policies, and objectives in the MOS's Comprehensive Plan provided guidance and rationale for the Recycling Committee for selecting options that will constitute the overall strategy for the next 20 years. Selection criteria were used to compare and contrast the relative characteristics, advantages/disadvantages, and impacts of the options.

Each option was evaluated against five criteria:

- Promotes waste reduction, recycling, and/or composting.
- Supports a sustainable solid waste management system.
- Complies with and supports State solid waste laws, regulations and goals as well as goals in the Comprehensive Plan.
- Providing cost-effective, efficient services and programs.
- Enhances regional cooperation, education, and communication efforts.

The selection criteria were then used as follows to select the best options for consideration of the Assembly:

- For each option, each Recycling Committee member assigned a rating of 1, 2, 3, 4, or 5 on each of the five criteria. .
- The scores for each option were tabulated and a numeric rating was established for each option, based on average scores (Exhibit 93). The results were presented to the Recycling Committee for further discussion and decision-making.

Exhibit 93. Recycling Committee Scores

Program Scenarios	Average Score	Ranking
No Change	6.0	6
Recycling Facility Only	17.5	3
Composting Facility Only	16.75	4
Recycling and Composting Facilities	22.5	1
Recycling and Composting Facilities, Close Incinerator	21.5	2
Close Incinerator	9.75	5

RECOMMENDED COMMITTEE ACTIONS

The Recycling Committee has developed a set of recommended actions in keeping with the solid waste goals, policies, and objectives outlined in this Plan. These recommendations form a 10-year, integrated program of waste management for the MOS. Roadmaps of the following three program scenarios are shown in Exhibits 94, 95, and 96:

- Recycle and Compost Program and Continue Incinerator Use – This operating scenario assumes that the MOS would develop an enhanced recycling and composting program, but also utilize the Incinerator for MSW not recycled or composted, as well as for disposal of special wastes.

- Recycle and Compost Program and Close the Incinerator – This operating scenario assumes that the MOS would develop an enhanced recycling and composting program, but would close the Incinerator and ship MSW not recycled or composted, as well as special wastes, to a facility outside the MOS.

- Recycle With Continued Incinerator Use – This operating scenario assumes that the MOS would continue following the current goals and actions recommended in the 2020 Comprehensive Plan, which entails continued use of the incinerator and promoting recycling activities, but without implementing an enhanced, comprehensive recycling and composting program.

MUNICIPAL CODE OPTIONS

Briefly, there will be needed revisions and additions to the current Code if the Assembly approves any of the three proposed program scenarios. These Code changes or revisions will assist the MOS in further implementation of the suggested solid waste and recycling programs changes. Typical of most municipal experience in this area these will undoubtedly be completed incrementally in the years ahead.

Definitions

Based on our review of the current Code during the preparation of the SWRMP, we are of the opinion that there are needed new definitions for the Code in relation to solid waste and recycling. SCS proposes the following definitions to be included at a minimum in any rewrite of the Code. These will provide more clarity in the Code and provide more background for those who will have to enforce its mandates. The following are illustrative of suggested definitions, which should be considered for insertion in Chapter 13.20 of the MOS Code:

Cardboard

Corrugated cardboard, cereal boxes, etc.

Co-Mingled Goods

Combined aluminum cans, tin cans, Type 1 and Type 2 plastic containers, and glass goods.

Co-Mingling

The combining of non-putrescible source-separated recyclable materials for the purpose of recycling.

Compostable Materials

Source separated organic materials for the purpose of composting in a municipal facility.

Construction and Demolition Debris

Material and debris that typically results from construction and/or demolition at residential, commercial and/or industrial sites in the municipality, including concrete, brick, tree parts, nonferrous/ferrous metal, asphalt, corrugated cardboard, etc.

Designated Recyclable Materials

Those materials designated by the municipality to be source-separated for the purpose of recycling. This definition shall include co-mingled goods, white goods, cardboard, mixed paper, leaves, grass clippings, construction and demolition debris, electronic waste, and household hazardous waste, all as defined herein.

Electronic Waste

A computer central-processing unit and associated hardware, including keyboards, modems, printers, scanners and fax machines; a cathode ray tube; a cathode ray tube device; a flat panel display or similar video display device with a screen that is greater than four inches measured diagonally and that contains one or more circuit boards, including a television; and cell phones.

Household Hazardous Waste

Paint and other household chemicals that are not safe to dispose of with solid waste collection due to flammability and/or danger posed to solid waste collection workers.

Mixed Paper

Newspaper, magazines, junk mail, high-grade office paper, etc.

Multifamily Dwelling

Any building or structure, or complex of buildings in which three or more dwelling units are owner-occupied or rented or leased, or offered for rental or lease, for residential purposes and shall include hotels, motels, or other guest houses serving transient or seasonal guests.

Municipal Recycling Coordinator

The person or persons appointed by the Mayor and Assembly and who shall be authorized to, among other things, enforce the provisions of this article and any rules and regulations which may be promulgated hereunder.

Municipal Solid Waste Streams

All solid waste generated at residential, commercial and institutional establishments within the boundaries of the municipality of Skagway.

Recyclable Material

Those materials which would otherwise become solid waste, and which may be collected, separated or processed and returned to the economic mainstream in the form of raw materials or products.

Source –Separated Recyclable Materials

Recyclable materials which are separated at the point of generation by the generator thereof from solid waste for the purposes of recycling.

Source Separation

The process by which recyclable materials are separated from solid waste at the point of generation by the generator thereof for the purposes of recycling.

Yard Waste

Yard waste means vegetative matter resulting from landscaping maintenance or land clearing operations and includes materials such as trees and shrub trimmings, grass clippings, trees and tree stumps, and associated rocks and soils.

White Goods

Any metal items, such as refrigerators, ovens, bed frames, etc., other than materials defined herein as co-mingled goods.

Recommended Revisions

Dependent on the program scenario decided by the Assembly, the following clauses may be inserted into the Code.

E-Waste and Household Hazardous Wastes

During the course of conducting the waste composition study, our team noticed small quantities of electronic wastes and household hazardous wastes in the waste stream. It is our understanding that the MOS does participate in annual recycling events for these materials. However, the Code is silent on this issue. Inclusion of the following revisions to the Code are warranted in Code Section 13.20.070:

Recycling of Electronic Equipment

"No person shall place electronic equipment in refuse containers for collection or bury or otherwise dispose of electronic equipment in or on private or public property within the

Municipality. All electronic equipment must either be stored and presented or delivered to a licensed solid waste collector for recycling or delivered directly to a qualified recycling facility for electronic equipment."

Household Hazardous Waste Disposal

"No person shall place household hazardous waste in refuse containers for collection or bury or otherwise dispose of household hazardous waste in or on private or public property within the MOS. All household hazardous waste must either be stored and presented or delivered to a licensed solid waste collector for recycling or delivered directly to a qualified recycling facility for household hazardous waste."

Revise Current Wording On Overflow of Residential and Commercial Collection Cans to Minimize Animal Attraction

There is existing Code provisions and MOS policies that deal with overflows of trash from residential and commercial containers. Based on our discussions with the Committee, the bear and animal attraction issue is more a "people issue" that an animal issue and that increased enforcement is the preferred option at this time. We have reviewed similar ordinances across the country and it appears that many communities address the overall issue solid waste issue in four basic ways:

- Garbage cans may be put out to the curb for collection no sooner than 4 to 6 a.m. on pickup day.
- Prior to the pickup day, the cans must be kept in an animal-resistant container or enclosure.
- The cans must be fitted with lids so as to remain secure if they are tipped over.
- That there is increasing level of fines imposed (and specific records kept by Code Enforcement) for not meeting these requirements That is, a $50 fine for the first offense, $100 for second, $300 for third offense, etc.. Also, this fine can be imposed on an individual homeowner, the business, or to the renter.

Waste Collection

Chapter 13.20 may need to be revised in light of the following issues:

- Only curbside collection; no alley collection. If the MOS decides to move towards automated collection, there will be a need to adjust collection out of the alleys and to curbside.
- MOS-provided cans; customer request and payment for second can. Again, with automated collection, MOS would probably have to provide standardized cans. The wording the Code dealing with 30 gallon containers would have to be revised.
- Customer care of MOS-provided can. Similarly, if the cans were provided by the MOS, there should be a clause ensuring that the homeowner or business would be responsible

for taking of the container and what charges, if any, would be imposed for damage or loss.

Restrictions on Non Compostable Food Service Ware

During discussions, the Committee expressed an interest in developing an ordinance prohibiting non compostable food service ware. This assumes that the MOS would have a comprehensive composting program in place. The following is an example of an ordinance, which has been implemented by one of our clients.

> "For the purposes of this Article, certain words and phrases are defined, and certain provisions shall be construed as herein set out, unless it shall be apparent from their context that a different meaning is intended.
>
> a. ASTM-Standard. ASTM Standard means meeting the standards of the American Society for Testing and Materials (ASTM) International Standards D6400 or D6868 for compostable plastics, as those standards may be amended.
>
> b. Biodegrade/Biodegradable. Biodegrade or Biodegradable means the entire product or package will completely break down and return to nature, i.e., decompose into elements found in nature within a reasonably short period of time after customary disposal.
>
> c. City Facility. City Facility means any building, structure, land or park owned or operated by the City of Hayward, its agents and departments and includes City buildings, structures, parks, recreation facilities or property.
>
> d. City Facility Users. City Facility Users means all persons, societies, associations, organizations or special events promoters who require a permit to reserve or rent a City Facility or a permit or contract to use a plaza, sidewalk, or roadway, as further described in Hayward Municipal Code Chapter 3, Public Safety, Article 5, Section 3-5.10 Temporary Use of Sidewalk or Roadway. City Facility Users also includes concession contracts with the City, City-managed concessions, City-sponsored events and food services provided at City expense.
>
> e. Compostable. Compostable means that all materials in the product or package will Biodegrade or otherwise become part of usable compost (e.g., soil conditioning material, mulch) in an appropriate composting program or facility. Compostable Disposable Food Service Ware includes ASTM-Standard bio-plastics (plastic-like) products that are clearly labeled so that any compost collector and processor can easily distinguish the ASTM-Standard Compostable plastic from non-ASTM Standard Compostable plastic.
>
> f. Disposable Food Service Ware. Disposable Food Service Ware means a product used by a Food Vendor for serving or transporting prepared and ready-to-consume food or beverages which is commonly disposed of after a single use. Disposable Food Service Ware includes, but is not limited to, plates, cups, bowls, trays and hinged or lidded containers. This definition does not include single-use disposable straws, utensils or hot cup lids.

g. Food Vendor. Food Vendor means any establishment located within the MOS of Hayward, or any establishment which provides Prepared Food or beverages for public consumption within the MOS, including but not limited to any store, supermarket, delicatessen, restaurant, retail food vendor, sales outlet, shop, cafeteria, catering truck or vehicle, sidewalk or other outdoor vendor, or caterer.

h. Polystyrene Foam. Polystyrene Foam means a thermoplastic petrochemical material utilizing the styrene monomer, which may be marked with resin symbol #6, processed by any number of techniques including, but not limited to, fusion of polymer spheres (expandable bead polystyrene), injection molding, form molding, and extrusion-blow molding (extruded foam polystyrene), sometimes referred to as Styrofoam™, a Dow Chemical Company trademarked form of polystyrene foam insulation. In food service, Polystyrene Foam is generally used to make cups, bowls, plates, trays, and clamshell containers intended for a single use.

i. Prepared Food. Prepared Food means any food or beverage prepared for consumption using any cooking, packaging, or food preparation technique by Food Vendor. Prepared Food does not include uncooked meat, fish, poultry, or eggs unless provided for consumption without further food preparation, such as sushi. Prepared Food may be eaten either on or off the premises, also known as “take-out food.”

j. Recyclable. Recyclable means any material that is accepted by the MOS recycling program, including, but not limited to, paper, glass, metal, cardboard, and plastic that can be recycled, salvaged, processed, or marketed by any means other than landfilling or burning, whether as fuel or otherwise, so that they are returned to use by society. Recyclable plastics include any plastic which is identified as recyclable by the MOS in the City’s municipal recycling program. For purposes of this Article, recyclable plastic does not include Polystyrene Foam labeled with resin symbol #6.

k. Special Events Promoter. Special Events Promoter means an applicant for any special events permit issued by the City or by any City employee(s) responsible for any organized special event within the MOS.

PROHIBITED USE OF POLYSTYRENE FOAM DISPOSABLE
FOOD SERVICE WARE.

a. Except as provided by Section 5-11.03, all Food Vendors are prohibited from providing Prepared Food in Disposable Food Service Ware made from Polystyrene Foam.

b. Except as provided by Section 5-11.03, all City Facility Users are prohibited from using Disposable Food Service Ware made from Polystyrene Foam.

REQUIRED USE OF RECYCLABLE OR COMPOSTABLE FOOD SERVICE WARE.

a. All Food Vendors using any Disposable Food Service Ware shall use a suitable Recyclable or Compostable product.

b. All City Facility Users shall use a suitable Recyclable or Compostable product for Disposable Food Service Ware.

EXCEPTIONS.

a. Foods prepackaged outside the limits of the City of Hayward are excluded from the provisions of this Article, but the purveyors of foods prepackaged outside of the limits of the City of Hayward are encouraged to follow these provisions as it is the City's policy goal to eliminate the use of Polystyrene Foam Disposable Food Service Ware.

b. Coolers and ice chests that are intended for reuse are excluded from the provisions of this Article.

c. The City Manager may except a Food Vendor or City Facility User from the requirements set forth in Section 5-11.02 for a period of time to be determined by the City Manager on a case-by-case basis for undue hardship. Undue hardship includes, but is not limited to, situations unique to the Food Vendor or City Facility User not generally applicable to other persons in similar circumstances.

d. Food Vendors and City Facility Users seeking an exception from the requirements of this Article shall include all information on the application for exception to allow the City to make its decision, including but not limited to, documentation showing factual support for the claimed exception. The City Manager shall confirm the decision to grant or deny each exception in writing and may approve an exception request in whole or in part. The decision of the City Manager shall be final

.

e. Emergency supplies or services procurement. City Facility Users and Food Vendors shall be exempt from the provisions of this Article, in a situation deemed by the City Manager to be an emergency for the immediate preservation of the public peace, health or safety.

ADMINISTRATIVE RULES AND REGULATIONS.

The City Manager may make such rules and regulations, consistent with the provisions of this Article, as may be necessary or desirable to supplement or clarify such provisions or aid in their enforcement.

ENFORCEMENT AND PENALTIES.

a. The City Manager or his/her designee shall have primary responsibility for enforcement of this Article. If the City Manager or his/her designee determines that a violation of this Article has occurred, he/she shall issue a written warning notice to the Food Vendor that a violation has occurred. Subsequent violations of this Article by a Food Vendor shall be subject to the enforcement and penalties set forth below.

b. Each and every sale or other transfer of Disposable Food Service Ware made from Polystyrene Foam shall constitute a separate violation of this Article.

c. Any violation of this Article that occurs after the issuance of a written warning to a Food Vendor is subject to civil and administrative enforcement, punishable by a civil fine established by resolution of the City Council. Any citation issued for a violation of this Article shall give notice of the right to request an administrative hearing to challenge the validity of the citation and the time for requesting that hearing as provided for in Chapter 1, Article 7 of the Hayward Municipal Code.

d. The City Attorney may seek legal, injunctive or other equitable relief to enforce this Article.

e. The remedies provided herein are cumulative and not exclusive.

CONSTRUCTION AND PREEMPTION.

This Article and any of its provisions shall be null and void upon the adoption of any state or federal law or regulation imposing the same, or essentially the same, limits on the use of prohibited products as set forth in this Article. This Article is intended to be a proper exercise of the MOS's police power, to operate only upon its own officers, agents, employees and facilities and other persons acting within its boundaries, and not to regulate inter-City or interstate commerce. It shall be construed with that intent."

Mandatory Recycling

To maximize recycling rates within the Borough, the Assembly may consider enacting a mandatory recycling clause in the Code (Chapter 13.20) similar to the paragraph below.

Residential Recycling

It shall be mandatory for all persons who are owners, tenants or occupants of residential and nonresidential premises, which shall include but not be limited to retail and other commercial locations, as well as government, schools and other institutional locations within the Borough of Skagway, to separate designated recyclable materials from all solid waste. Designated recyclable materials shall be deposited separate and apart from other solid waste generated by the owners, tenants or occupants of such premises and shall be self-delivered to the Borough facility (placed separately at the curb in a manner) and on such days and times as designated herein or as may be hereinafter established by regulations promulgated by the Skagway Department of Public Works.

Multi-Family and Commercial Recycling

Owners or designated agents of multiple-family dwellings and nonresidential facilities and properties shall do all of the following to recycle the materials specified by the Department of Public Works.

(1) Provide adequate, separate containers for the recyclable materials.

(2) Notify in writing, at least semiannually, all users, tenants and occupants of the properties about the municipal recycling program.

(3) Provide for the collection of the materials separated from the solid waste by the users, tenants and occupants and the delivery of the materials to a recycling facility.

(4) Notify users, tenants and occupants of reasons to reduce and recycle, which materials are collected and how to prepare materials in order to meet the processing requirements, collection methods or sites, locations and hours of the recycling and composting facilities.

Recycling Franchise and Collection

If the MOS does decide to construct and operate recycling and composting facilities, it appears that there should be clauses within the Code to prohibit private collection of these materials. The following paragraphs provide some examples.

No Person Shall Collect Residential Recyclables Without Franchise Or Contract

The recyclables collector operating under exclusive franchise or contract with the MOS is the sole commercial enterprise authorized to collect recyclables from residences within the city. No person may collect, transport, or convey discarded residential recyclables, nor may any person permit such collection, transportation or conveyance, where any fee or other remuneration whatsoever is charged or accepted for the collection, transportation, conveyance, processing or disposal of such residential recyclables, or where such service is otherwise provided or conducted for commercial profit, without first having obtained a contract or franchise from the MOS granting the provider of such service the privilege of engaging in all or some portion of such activities. Nothing in this section shall prohibit any person from selling that person's recyclables, or donating such recyclables to a nonprofit organization, nor shall this section apply to nonprofit organizations engaging in recyclables collection activity as an activity incidental to the main activities of that organization.

No Person May Collect Business Recyclables Without Business License, Compliance With Ordinance.

No person may collect, transport or convey recyclables from businesses within the city, nor may any person permit such collection, transportation, or conveyance of such business recyclables, where any fee or remuneration of any kind whatsoever is or may be charged for the collection, transportation, conveyance, processing and/or disposal of such materials, unless the person providing such services has first obtained any required business license from the city granting such person the privilege of conducting all or some portion of such activities within the MOS,

and complies in all respects with the applicable provisions of this Code. Only such persons shall be considered authorized recyclers. Nothing in this section shall prohibit any person from selling that person's recyclables, or donating such recyclables to a nonprofit organization, nor shall this section apply to nonprofit organizations engaging in recyclables collection activity as an activity incidental to the main activities of the organization. Nothing in this section shall prevent authorized recyclers from charging fees for collection and/or processing of business recyclables.

Collection Of Municipal Solid Waste As Recyclables Prohibited.

No person, other than the collector, engaged in the business of collecting business recyclables shall collect, nor shall any business offer to such person for collection, loads of business recyclables composed of more than ten percent by weight municipal solid waste or other nonrecyclable material.

Landfill Disposal Of Recyclables Prohibited.

No person engaged in the business of recyclables collection within the MOS shall dispose of such materials at a landfill, or otherwise re-combine such materials with municipal solid waste.

Changes With Cost Of Service Study

SCS has recommended the implementation of a Cost of Service Study. Based on the results of this Study, Chapter 13.20.140 of the Code may be revised in light of the following issues:

- New rate schedules for residential and commercial customers.
- Differential rates for those delivering recyclables and compostables for MOS facilities.
- Pay-As-You Throw (PAYT) rates for residential and commercial customers.

Exhibit 94. Implementation Schedule, Recycle and Continued Incinerator Use Scenario

Program Area	Key Steps or Milestones	Fiscal Year									
		13	14	15	16	17	18	19	20	21	22
Legal	1. Ordinance Modifications/Revisions	■			■						
Public Education	2. Develop Educational Materials	■		■		■		■		■	
	3. Conduct Public Outreach Campaign	■	■	■	■	■	■	■	■	■	■
	4. Initiate Business Audit Program to Assist in Waste Reduction	■	■	■	■	■	■	■	■	■	■
Equipment/ Facilities	5. Purchase New Residential Bear-proof Containers		■								
	6. Maintain recycling collection stations	■	■	■	■	■	■	■	■	■	■
	7. Purchase New Collection Trucks				■						
	8. Negotiate Contract for Recyclables Transport and Processing	■					■				
	9. Assembly Sign Agreement With Recyclables Service Provider	■					■				
Disposal	10. Conduct Incineration Life Extension Study		■								
	11. Identify a New Ash Fill Site		■								
Financial	12. Conduct Cost of Service Study		■								
	13. Prepare Grant Applications for Funding	■	■	■	■	■	■	■	■	■	■

Exhibit 95. Implementation Schedule, Recycle and Compost and Continued Incinerator Use

Program Area	Key Steps or Milestones	Fiscal Year									
		13	14	15	16	17	18	19	20	21	22
Legal	1. Ordinance Modifications/Revisions	■			■						
Siting	2. Finalize Site Location	■									
	3. Purchase Property(s) If Municipal Site(s) Unavailable		■								
Staffing	4. Hire Recycling Coordinator	■									
Public Education	5. Develop Educational Materials	■		■		■		■		■	
	6. Conduct Public Outreach Campaign	■	■	■	■	■	■	■	■	■	■
	7. Initiate Business Audit Program to assist in waste reduction	■	■	■	■	■	■	■	■	■	■
	8. Initiate Green Purchasing Program for MOS & Businesses	■	■	■	■	■	■	■	■	■	■
Equipment/ Facilities	9. Purchase Recycling Containers for Downtown and Cruise Dock		■	■							
	10. Select Engineering Firm to Design Facilities	■									
	11. Conduct Composting Feasibility Study	■									
	12. Issue Bid Document(s) for Facility(s)		■								
	13. Select Contractor(s) to Construct Facility(s)		■								
	14. Design and Build Recycling and/or Facility(s)		■								
	15. Purchase New Residential Containers					■					
	16. Purchase New Collection Trucks					■					

Program Area	Key Steps or Milestones	Fiscal Year									
		13	14	15	16	17	18	19	20	21	22
Disposal	17. Negotiate Contract for Recyclables Transport and Processing	■					■				
	18. Assembly Sign Agreement With Recyclables Service Provider	■					■				
	19. Continue Assistance to STC With E Waste Collection Program	■	■	■	■	■	■	■	■	■	■
	20. Merge HHW Collection With Clean Sweep Program	■									
	21. Conduct Incineration Life Extension Study	■									
Financial	22. Conduct Cost of Service Study		■					■			
	23. Prepare Grant Applications for Funding	■	■	■	■	■	■	■	■	■	■

Exhibit 96. Implementation Schedule, Recycle and Compost and Close Incinerator

Program Area	Key Steps or Milestones	Fiscal Year									
		13	14	15	16	17	18	19	20	21	22
Legal	1. Ordinance Modifications/Revisions	■			■						
Siting	2. Finalize Site Location	■									
	3. Purchase Property(s) If Municipal Site(s) Unavailable		■								
Staffing	4. Hire Recycling Coordinator	■									
Public Education	5. Develop Educational Materials	■		■		■		■		■	
	6. Conduct Public Outreach Campaign	■	■	■	■	■	■	■	■	■	■
	7. Initiate Business Audit Program to assist in waste reduction	■	■	■	■	■	■	■	■	■	■
	8. Initiate Green Purchasing Program for MOS & Businesses	■	■	■	■	■	■	■	■	■	■
Equipment / Facilities	9. Purchase Recycling Containers for Downtown and Cruise Dock		■	■							
	10. Select Engineering Firm to Design Facilities	■									
	11. Conduct Composting Feasibility Study	■									
	12. Issue Bid Document(s) for Facility(s)		■								
	13. Select Contractor(s) to Construct Facility(s)		■								
	14. Design and Build Recycling and Transfer Station Facility(s)		■								
	15. Purchase New Residential Containers					■					
	16. Purchase New Collection Trucks					■					
	17. Conduct Incineration Life Extension Study					■					

Program Area	Key Steps or Milestones	Fiscal Year									
		13	14	15	16	17	18	19	20	21	22
Disposal	18. Assembly Sign Agreement With Recyclables and MSW Service Provider										
	19. Continue Assistance to STC With E Waste Collection Program										
	20. Merge HHW Collection With Clean Sweep Program										
	21. Conduct Cost of Service Study										
Financial	22. Prepare Grant Applications for Funding										

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APPENDIX A

WASTE TONNAGE NUMBERS

Date	Pounds	Tons		Date	Pounds	Tons		Date	Pounds	Tons		Date	Pounds	Tons		Date	Pounds
												1/4/2011	14,860	7.4		12/28/2010	2,900
												1/11/2011	13,920	7.0		12/27/2010	9,900
												1/18/2011	11,680	5.8		12/21/2010	10,120
				6/28/2012	12,340	6.2		12/27/2011	15,000	7.5		1/19/2011	11,680	5.8		12/15/2010	17,500
				6/26/2012	16,020	8.0		12/19/2011	3,820	1.9		1/24/2011	9,360	4.7		12/8/2010	9,660
				6/25/2012	11,700	5.9		12/19/2011	9,340	4.7		1/27/2011	6,940	3.5		12/3/2010	12,480
				6/22/2012	17,320	8.7		12/13/2011	10,080	5.0		2/2/2011	11,380	5.7		11/24/2010	11,260
				6/21/2012	7,800	3.9		12/9/2011	9,180	4.6		2/7/2011	8,480	4.2		11/18/2010	12,320
				6/19/2012	8,840	4.4		12/5/2011	9,520	4.8		2/14/2011	8,760	4.4		11/12/2010	11,120
				6/18/2012	19,620	9.8		11/29/2011	13,400	6.7		2/16/2011	11,460	5.7		11/8/2010	9,120
				6/15/2012	9,480	4.7		11/22/2011	6,300	3.2		2/23/2011	8,760	4.4		11/5/2010	14,640
				6/15/2012	10,640	5.3		11/18/2011	7,660	3.8		2/25/2011	11,020	5.5		11/1/2010	16,960
				6/12/2012	7,580	3.8		11/14/2011	4,560	2.3		3/2/2011	10,740	5.4		10/26/2010	10,780
				6/11/2012	18,520	9.3		11/10/2011	8,200	4.1		3/9/2011	16,640	8.3		10/22/2010	13,600
				6/8/2012	17,160	8.6		11/7/2011	12,460	6.2		3/15/2011	12,240	6.1		10/19/2010	16,700
				6/8/2012	6,560	3.3		11/1/2011	16,200	8.1		3/21/2011	15,500	7.8		10/13/2010	12,340
				6/5/2012	8,900	4.5		10/27/2011	6,800	3.4		3/21/2011	2,380	1.2		10/11/2010	16,020
				6/3/2012	18,640	9.3		10/24/2011	16,400	8.2		3/25/2011	12,480	6.2		10/3/2010	16,700
				6/1/2012	5,360	2.7		10/19/2011	1,560	0.8		3/25/2011	4,900	2.5		10/4/2010	15,800
9/12/2012	12,080	6.0		6/1/2012	17,580	8.8		10/19/2011	16,340	8.2		3/29/2011	9,680	4.8		10/1/2010	16,480
9/11/2012	9,000	4.5		5/29/2012	11,120	5.6		10/14/2011	17,400	8.7		4/1/2011	10,080	5.0		9/29/2010	6,400
9/10/2012	15,960	8.0		5/28/2012	16,800	8.4		10/7/2011	17,220	8.6		4/4/2011	2,580	1.3		9/28/2010	7,240
9/7/2012	14,880	7.4		5/25/2012	18,420	9.2		10/4/2011	14,400	7.2		4/6/2011	8,000	4.0		9/27/2010	17,180
9/5/2012	17,380	8.7		5/22/2012	16,120	8.1		10/3/2011	12,800	6.4		4/11/2011	3,700	1.9		9/24/2010	12,800
9/3/2012	18,200	9.1		5/21/2012	13,680	6.8		9/28/2011	16,540	8.3		4/11/2011	7,600	3.8		9/21/2010	9,140
8/31/2012	17,260	8.6		5/19/2012	14,100	7.1		9/26/2011	16,120	8.1		4/13/2011	4,800	2.4		9/21/2010	3,480
8/29/2012	10,160	5.1		5/16/2012	13,500	6.8		9/23/2011	19,480	9.7		4/15/2011	9,760	4.9		9/20/2010	3,420
8/27/2012	17,320	8.7		5/14/2012	15,040	7.5		9/21/2011	17,800	8.9		4/19/2011	11,500	5.8		9/20/2010	13,140
8/24/2012	19,100	9.6		5/11/2012	14,300	7.2		9/19/2011	18,200	9.1		4/22/2011	9,220	4.6		9/17/2010	14,000
8/22/2012	17,160	8.6		5/8/2012	14,300	7.2		9/16/2011	17,520	8.8		4/26/2011	13,780	6.9		9/15/2010	11,400
8/20/2012	20,260	10.1		5/7/2012	15,420	7.7		9/14/2011	18,500	9.3		4/28/2011	12,420	6.2		9/13/2010	17,060
8/17/2012	17,600	8.8		5/4/2012	12,280	6.1		9/12/2011	12,500	6.3		5/2/2011	12,900	6.5		9/10/2010	13,320
8/15/2012	16,600	8.3		5/1/2012	14,040	7.0		9/9/2011	18,000	9.0		5/5/2011	10,920	5.5		9/9/2010	4,460
8/14/2012	17,820	8.9		4/27/2012	9,368	4.7		9/7/2011	17,700	8.9		5/9/2011	16,020	8.0		9/8/2010	17,020
8/13/2012	5,920	3.0		4/25/2012	8,460	4.2		9/5/2011	18,600	9.3		5/16/2011	16,500	8.3		9/7/2010	19,880
8/12/2012	14,480	7.2		4/23/2012	6,840	3.4		9/2/2011	19,800	9.9		5/13/2011	14,120	7.1			
8/10/2012	15,400	7.7		4/20/2012	10,200	5.1		8/31/2011	18,900	9.5		5/16/2011	14,460	7.2			
8/7/2012	9,660	4.8		4/18/2012	10,500	5.3		8/29/2011	19,100	9.6		5/17/2011	14,100	7.1			
8/6/2012	19,220	9.6		4/16/2012	8,420	4.2		8/26/2011	18,360	9.2		5/19/2011	14,100	7.1			
8/3/2012	12,660	6.3		4/11/2012	11,220	5.6		8/24/2011	20,040	10.0		5/24/2011	14,200	7.1			
8/3/2012	17,380	8.7		4/9/2012	11,960	6.0		8/22/2011	19,160	9.6		5/23/2011	16,160	8.1			
7/31/2012	10,000	5.0		4/4/2012	11,100	5.6		8/19/2011	3,760	1.9		5/24/2011	16,080	8.0			
7/30/2012	17,840	8.9		3/30/2012	4,860	2.4		8/19/2011	18,680	9.3		5/27/2011	16,020	8.0			
7/30/2012	2,180	1.1		3/30/2012	14,340	7.2		8/15/2011	18,460	9.2		5/28/2011	15,780	7.9			
7/27/2012	10,940	5.5		3/20/2012	10,920	5.5		8/12/2011	19,520	9.8		5/31/2011	18,420	9.2			
7/27/2012	16,680	8.3		3/19/2012	11,200	5.6		8/10/2011	17,440	8.7		6/3/2011	16,680	8.3			
7/24/2012	13,380	6.7		3/15/2012	9,700	4.9		8/8/2011	15,720	7.9		6/6/2011	15,140	7.6			
7/23/2012	16,540	8.3		3/10/2012	11,780	5.9		8/5/2011	4,920	2.5		6/7/2011	16,500	8.3			
7/20/2012	13,140	6.6		3/2/2012	1,880	0.9		8/5/2011	17,540	8.8		6/10/2011	16,200	8.1			
7/20/2012	18,820	9.4		3/1/2012	7,880	3.9		8/2/2011	19,000	9.5		6/13/2011	16,180	8.1			
7/17/2012	9,540	4.8		2/24/2012	11,800	5.9		8/1/2011	16,860	8.4		6/14/2011	18,120	9.1			
7/16/2012	18,360	9.2		2/17/2012	13,500	6.8		7/29/2011	4,000	2.0		6/17/2011	16,180	8.1			
7/13/2012	11,460	5.7		2/10/2012	14,220	7.1		7/29/2011	17,460	8.7		6/20/2011	15,920	8.0			
7/13/2012	9,180	4.6		2/3/2012	4,560	2.3		7/26/2011	17,520	8.8		6/21/2011	17,320	8.7			
7/11/2012	5,360	2.7		2/2/2012	8,140	4.1		7/25/2011	16,460	8.2		6/24/2011	16,600	8.3			
7/11/2012	17,000	8.5		1/29/2012	2,220	1.1		7/22/2011	9,040	4.5		6/27/2011	17,760	8.9			
7/9/2012	19,100	9.6		1/24/2012	7,960	4.0		7/22/2011	17,260	8.6		6/27/2011	17,760	8.9			
7/6/2012	11,000	5.5		1/21/2012	3,040	1.5		7/18/2011	5,280	2.6		6/28/2011	16,500	8.3			
7/6/2012	17,120	8.6		1/20/2012	5,360	2.7		7/18/2011	17,340	8.7		7/1/2011	18,560	9.3			

Annual MSW Subtotals	**1,282,168**	**641**	
MSW Two Years (September 2010 to September 2012)	**3,366,588**	**1,683**	
Average Annual MSW	**1,683,294**	**842**	
Sludge Delivered to Incinerator	113 cubic yard	**69**	Assume: Sludge has density of 45 pounds/cubic yard
MSW Delivered to Republic When Incinerator Shut Down		**114**	
Total Annual MSW+Sludge		**1,024**	

APPENDIX B

CITIZEN AND BUSINESS SURVEYS

Municipality of Skagway
GATEWAY TO THE KLONDIKE
P.O. BOX 415 SKAGWAY, ALASKA 99840
(PHONE) 907-983-2297 – Fax 907-983-2151
www.skagway.org

RESIDENTIAL RECYCLING SURVEY

The Borough of Skagway invites you to help in the development of a Borough-wide recycling program for residents. Please take a few minutes to complete and return this survey. The **Borough's Recycling Committee and consultant, SCS Engineers**, will use your input to help determine the future expansion of recycling.

Please circle your answers.

1. Does your family currently recycle?
   a. Yes, frequently
   b. Yes, occasionally
   c. No (please skip to question 4)

2. If yes, please tell us what you recycle (please circle all that apply).
   a. Aluminum cans
   b. Cardboard
   c. Mixed paper
   d. Metals
   e. Yard waste
   f. E-waste
   g. Other _____

3. Where do you recycle?
   a. Drop-off at Public Works
   b. Raven Recycling in Whitehorse
   c. Bring to business / work location
   d. Other _____

4. If no, why not?
   a. Unsure of what can be recycled
   b. Drop-boxes unavailable
   c. Incinerator location too far away
   d. Whitehorse too far away
   e. Don't generate enough
   e. Other _____

5. Would a downtown recycling center be more convenient and increase your recycling?
   a. Yes
   b. No

6. List any additional comments that would help develop a residential recycling program.

_____
_____
_____
_____
_____
_____
_____

Your input is valuable in designing and implementing a residential recycling service. To avoid duplication and in-person visits, please fill out the information below. This information will not be incorporated into final survey results.

Name: _____

Physical Address: _____

Phone Number: _____

Email: _____

Please return this by survey October 1, 2012. Thank you!

You may drop off your completed survey at City Hall, by fax at 1-907-983-2151, or mail it to: Municipality of Skagway, P.O. Box 415, Skagway, AK 99840.

Municipality of Skagway
GATEWAY TO THE KLONDIKE
P.O. BOX 415 SKAGWAY, ALASKA 99840
(PHONE) 907-983-2297 – Fax 907-983-2151
www.skagway.org

BUSINESS AND MUNICIPAL DEPARTMENT RECYCLING SURVEY

The Borough of Skagway invites you to help in the development of a Borough-wide recycling program for Municipal departments and businesses. Please take a few minutes to complete and return this survey. The **Borough's Recycling Committee and consultant, SCS Engineers**, will use your input to help determine the future expansion of recycling.

Please circle your answers.

1. What type of business do you operate?
   a. Retail
   b. Food Service
   c. Manufacturing/Warehouse
   d. Professional Service
   e. Hospitality
   f. Medical
   g. Multi-family Complex/Apartments
   h. Other _____

2. Does your agency or business currently recycle?
   a. Yes, frequently
   b. Yes, occasionally
   c. No (please skip to question 4)

3. If yes, please tell us what your business recycles (please circle all that apply).
   Cardboard, Mixed Paper, Plastic, Aluminum/Tin, Other _____

4. If no, why not?
   a. Unsure of what can be recycled
   b. Drop-boxes unavailable
   c. It's too labor intensive for my business
   d. Not enough space in my business
   e. Other _____
   _____

5. What items could you recycle in large quantities? (Please rate from 1-6; 1 being the most)
   a. Cardboard ___
   b. Paper ___
   c. Plastic ___
   d. Aluminum/Tin ___
   e. Organics ___
   f. Other ___

6. Approximately, what percentage does the #1 item from above occupy in your entire waste stream?
   a. 0-20%
   b. 21-40%
   c. 41-60%
   d. 61-80%
   e. 81-100%

7. Does your business generate enough cardboard to justify a separate cardboard only container?
   a. Yes
   b. No

8. What percentage of the entire waste generated by your business could be recycled?
   a. 0-20%
   b. 21-40%
   c. 41-60%
   d. 61-80%
   e. 81-100%

9. List any additional comments that would help develop an agency or business recycling program.

_____
_____
_____
_____
_____
_____
_____

Your input is valuable in designing and implementing a commercial recycling service. To avoid duplication and in-person visits, please fill out the information below. This information will not be incorporated into final survey results.

Agency or Business Name: _____

Agency or Business Address: _____

Name of Contact Person: _____

Phone Number: _____

Email: _____

Please return this by survey October 1, 2012. Thank you!

You may drop off your completed survey at City Hall, by fax at 1-907-983-2151, or mail it to: Municipality of Skagway, P.O. Box 415, Skagway, AK 99840.

APPENDIX C

RECYCLING SURVEYS

Organization	Name/Title	Contact Info	Website
Haines Friends of Recycling , Haines, AK	Melissa Aaronson, HFR Board Chair	(907)766-2185 aronson@aptalaska.net	www.hainesrecycle.org
Community Waste Solutions, Haines, AK	Burl Sheldon, Contractor	(907)736-2468	http://communitywastesolutions.com
Raven Recycling, Whitehorse, YT, Canada	Joy Snyder, Executive Director	(867)667-7269 info@ravenrecycling.org	www.ravenrecycling.org
P&M Recycling, Whitehorse, YT, Canada	Pat McInroy, Owner	(867) 667-4333	n/a
Gustavus Disposal and Recycling Center, Gustavus, AK	Paul Berry, DRC Operator/ Manager	(907) 697-2118 dumpmaster@gustavus-ak.gov	http://cms.gustavus-ak.gov/government/committees/disposal-recycling-center
Southeast Alaska Solid Waste Authority, Petersburg, AK	Karl Hagerman, SEASWA Chairman	(907) 772-4430; ppwdir@ci.petersburg.ak.us	http://www.seconference.org/seaswa
The Juneau Recycle Center, Juneau, AK			www.juneau.org/pubworks/recycling.php

Organization	Contact Information	Materials Accepted																				
		Mode of Transport	Mixed Paper	Charge /Pay	White Office Paper	Charge /Pay	Cardboard (OCC)	Charge /Pay	Alum. Cans	Charge /Pay	Steel, tin and mixed metal cans	Charge/ Pay	Glass	Charge/ Pay	Plastic Bottles/ Containers	Charge/ Pay	Plastic Grocery Bags	Charge/ Pay	Fluorescent Bulbs	Charge/ Pay	Organics	Charge/ Pay	Notes
Whitehorse, YK-Raven	Raven Recycling Joy Snyder, Exec Dir (867)667-7269 info@ravenrecycling.org	Truck/ Alaska Marine Lines	Yes	charge	White Office Paper only	charge	yes	Charge	Yes	pay	yes	Charge	Yes	Charge	Yes #1-#7	Charge	Yes	Charge	Yes	Charge	No		Nonprofit Organization--Self-haul
Whitehorse, YK-P&M	P&M Recycling Pat McInroy, Owner (867)667-4333	Truck/ Alaska Marine Lines	Yes	charge	Yes	charge	yes	Charge	Yes	pay	yes	Charge	Yes	Charge	Yes #1-#7	Charge	Yes	Charge	?		No		Private--Self-haul
Haines, AK--Haines Friends of Recycling	Haines Friends of Recycling Melissa Aaronson, HFR Board Chair (907)766-2185 aronson@aptalaska.jet	Alaska Marine Lines	Yes	no	Yes	no	yes	no	Yes	no	Yes	no	No	n/a	#1 and #2	no	No	n/a	Yes	$1 for 4' tube; $2 for 8'	No	n/a	Nonprofit Organization--Self-haul
Haines, AK-- CWS	Community Waste Solutions Burl Sheldon, Contractor (907)736-2468 www.communitywastesolutions.com	Alaska Marine Lines	Yes	$0.25/lb	Yes	$0.25/lb	Yes	$0.25/lb	Yes	$0.25/lb		$0.25/lb	yes	$0.25/lb	#1-#7	$0.25/lb	No	n/a			Yes	$0.25/lb	Private--Self-haul OR curbside collection
Juneau Recycle Center	juneau.org/pubworks/recycling.php	Alaska Marine Lines	See Notes	See Notes	White Office Paper only	See Notes	yes	See Notes	Yes	See Notes	Yes	See Notes	Yes, all colors	See Notes	#1 and #2	See Notes	Yes	See Notes		See Notes	No	See Notes	Private-- Self-haul. Residents pay $4/month for recycling and HHW through yearly SW assessment fee; Businesses, non-profits, pay flat $100 for recycling for year-long permit
Juneau-- Arrow Refuse	SE Alaska SW Authority Karl Hagerman, SEASWA Chairman (907)772-4430 ppwdir@ci.petersburg.ak.us	Alaska Marine Lines	See Notes	See Notes	White Office Paper only	See Notes	yes	See Notes	Yes	See Notes	Yes	See Notes	Yes, all colors	See Notes	#1 and #2	See Notes	Yes	See Notes		See Notes	No	See Notes	Private Waste Operator--Contract with City for curbside collection. Charges $3.11/month collection fee for recyclables
Gustavus--Disposal and Recycling Center	Gustavus Disposal and Recycling Center Paul Berry, DRC Operator/ Manager (907)697-2118 dumpmaster@gustavus-ak.gov	Alaska Marine Lines	yes	$0.16/lb	Yes	$0.16/lb	yes	$0.16/lb	Yes	no	Yes	$0.16/lb	Yes	$0.16/lb	#1-#7	$0.16/lb	Yes	$0.16/lb	Yes	$1.15 ea	Yes	$0.16/lb	Self-supporting business unit of City--Self-haul

APPENDIX D

HIGH TECHNOLOGY COMPOSTING ALTERNATIVES TO WINDROW COMPOSTING

FOOD WASTE PROCESSING – SUMMARY

Waste Collection

The City will establish a pilot program to include restaurants and possibly some residences. Plastic covered bins, specifically made for holding food wastes, will be provided by the City to the pilot program customers. The City can opt to either provide an instructional brochure with the bins, and/or provide in-person training at a central City location to explain the program and what customers need to do.

Customers will be expected to sort out any non-food waste items before putting the food waste in the bin. The bin would be typically left inside the store near the rear delivery door. Food bins will be picked up at restaurants by a City truck on a daily basis. Residential pilot customers will be collected from the curb once per week. The food containers will be put on pallets in the collection truck and delivered to the City waste water treatment plant building.
Ideally, the collection truck would make several deliveries, staggered throughout the day. The number of trips depends on the size of the truck and the daily amount of waste. A few deliveries in the morning of the prior day's waste is likely to be the most practical.

Waste Pre-Processing

At the treatment plant the pallets will be unloaded from the truck bed with a forklift and moved inside the building to a temporary holding area (Figure 1). A designated worker will manually unload the food containers a few at a time from the pallets and empty the contents onto the screening pad. The screening pad is a stainless steel bin, approximately 8 feet by 8 feet square, with a 4-inch high curb and center drain. The pad is installed over an existing concrete floor that has a 3-inch diameter plumbing line installed. Installing the plumbing line will obviously require cutting the floor.

The food waste is spread out with a rake and inspected on the pad for inappropriate items that would jam the digester or not decompose properly. These items could include; plastic and glass, paper, large bones, metals, or other non-food items. Any inappropriate items are removed by the worker and discarded in the trash. The leftover food will be placed in the digester.
We anticipate that the screening activity will occur a couple of times per hour throughout the day until the day's waste deliveries are processed. A typical digester unit has a food processing capacity of 1,200 pounds over an 8 to 12 hour period. So, theoretically, over a 16 hour period, approximately 1.2 tons of food waste can be processed.

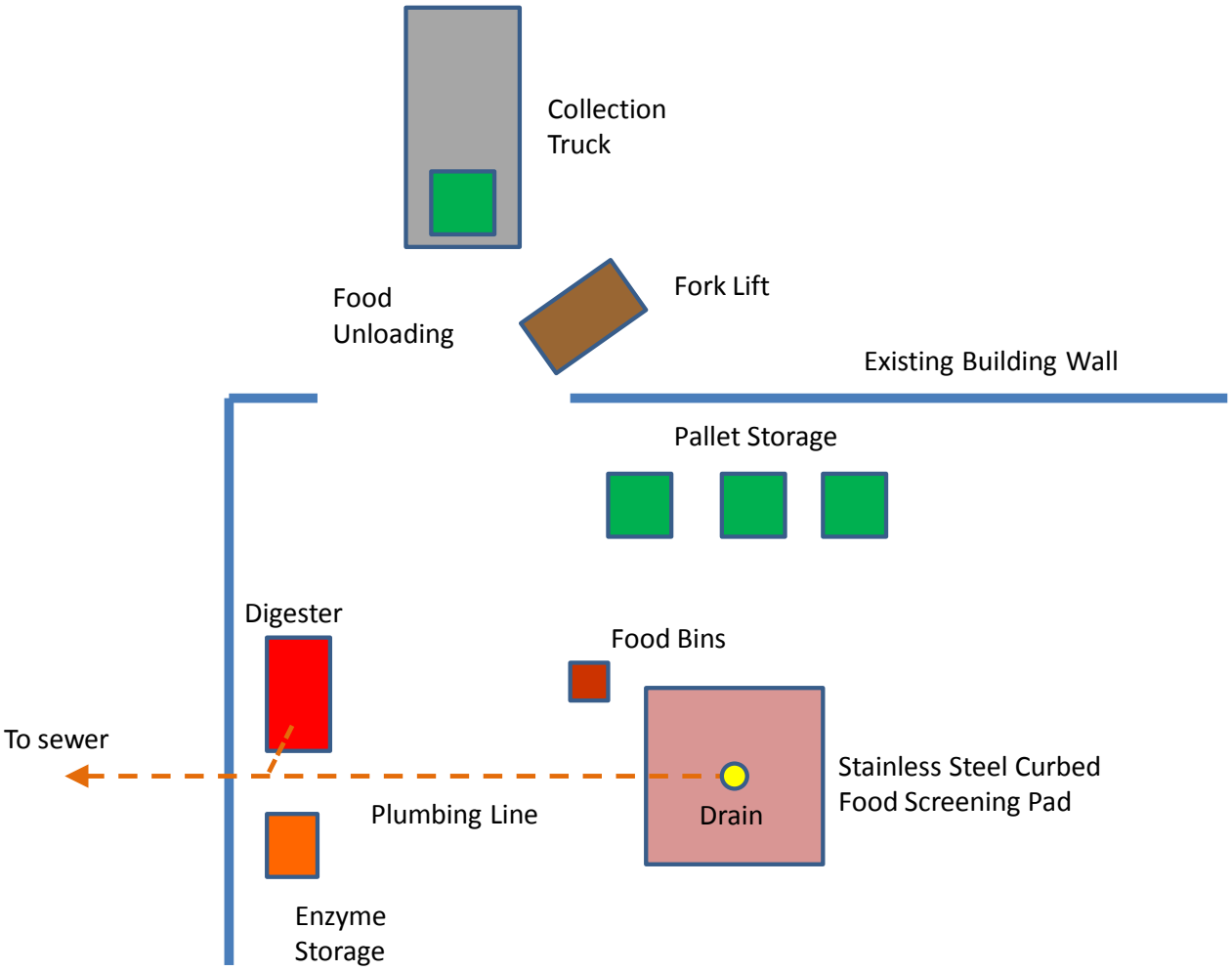


Figure 1. Concept for Food Waste Processing Area

Digester Technology

The digester itself is a self-contained unit that uses tap water, small wood chips, enzymes and natural, non-toxic bacteria in an agitated compartment to rapidly decompose food waste into water. The agitator is a paddle that is slowly turned by an electric motor. The wood chips are typically only replenished about every 6 months, while the enzyme/bacteria mix is typically replenished about every 2 months. The loading and operation of the unit is comparable and no more complicated than a washing machine.

The digester automatically records the amount of waste (in pounds) it processes.

Digester Operation

Prior to placing food in the digester, the worker charges the digester with the prescribed amount of wood chip and enzyme formula. Waste that has been screened is shoveled form the pad into a smaller bin. The bin is sized to make it easy to handle and empty the contents into the digester's top-loading hatch. Then, the food wastes are loaded into the digester. The process of filling the bin and feeding the digester continues until the sorting pad is clear.

The digester has a built-in automatic scale and warning light system, that automatically weights the incoming food waste and by illuminating yellow and then a red light tells the operator when filling is almost complete and when the unit is full.

The digester automatically adds the prescribed amount of potable water and then starts itself. The food wastes are decomposed by the enzymes and turned into a gray liquid. The process usually takes about 8 hours. The gray liquid is automatically flushed from the digester into the plumbing line. The plumbing line shall be connected to drain to a sewer manhole, or directly to a sewage lift station.

At the end of the day the sorting pad is rinsed clean with a hose and any remaining food residue flushed down the drain connection.

Other Technology

An alternate, more robust proven technology that can process food waste, dried biosolids and green waste is an in-vessel aerobic composter. A unit typically consists of a horizontal, frame-mounted cylinder that is slowly rotated on roller bearings by an electric motor. Wastes are ground-up and fed automatically into the front-end of the unit along with continuous air from a small blower fan.

The mixture is turned in the drum for several hours each day, decomposing rapidly into a rough texture compost in about 4 days. Inside the drum the wastes reach a temperature of at least 131 degrees Fahrenheit over the 4 days, adequate for sterilizing the compost and meeting U.S. EPA rules for public distribution and contact. A well-engineered unit will achieve a volume reduction of about 40%.

The mixture is discharged from the drum and onto a small stacking conveyor where it is piled up for final curing. Depending on the customer's end use, the final curing stage, where additional size reduction occurences can last from 1 to 4 weeks.

A composting unit manufactured by Seattle-based DT Environmental is included in Appendix C. SCS spoke with them and they recommend *Model 6-16 Envirodrum*. This company builds a heavy-duty unit that is being used throughout Canada for dairy farm waste composting, and has two units operating in the U.S. composting food wastes (Charlotte International Airport and The National Archives in Washington D.C.).

And, of course, unlike the food digesters, the composting unit produces a useful compost soil conditioner.

Space Requirement

Digesters

We anticipate that the area required for the food digesters temporary storage of several pallets, the food screening pad, bin storage, the digester, enzyme storage, and basic clearances will be at least 400 square feet (i.e, a 20 ft. by 20 ft. area). A concept layout of an operation described herein is provided in Figure 1.

Composter

For the in-vessel composting system, the processing unit can be installed inside or outside. If placed outside it should preferably be under a roof cover. An indoor unit will last longer and require less maintenance when not exposed directly to the elements. For a waste flow of approximately 1 ton per day, SCS estimates the compost curing pile size to be approximately 12 to 14 feet in diameter and up to 9 feet high. The minimum footprint for the in-vessel composter is approximately 1,000 square feet. The pile does not need to be covered. The pile would likely have a musty odor, but not an offensive or putrid smell.

Digester and Composter Comparisons

Table 1 summarizes the requirements and main features of two digester units and a composter unit on the market. Digester units are being produced by Marathon Equipment Company (i.e, the Eco-Safe) and Totally Green (i.e, the ORCA). DT Environmental produces an in-vessel composter.

Table 1. Quick Comparison of Food Aerobic Digester and Composter Units

Requirement / Feature	Manufacturer		
	Marathon (EcoSafe)	**Totally Green (ORCA)**	**DT Environmental (Envirodrum)**
Food Digested Automatically	Yes	Yes	Yes *
Unit Capacity	1,200 lbs. (0.6 tons)	800 (0.4 tons)	3,000 (1.5 tons)
Minimum Cycle Time (per unit capacity)	8 to 12 hours	8 to 12 hours	4 days
Voltage Requirement	208-240 / 3 phase	110 / single phase	240 / single phase
Annual Power Use	4,350 kW-hrs (based on 8 hr. day/7 days per week)	3,500 kW-hrs (based on 8 hr. day/7 days per week)	4,600 kW-hrs (based on 4 hr. day/7 days per week)
Capital Cost (machine only)	$40,000	Waiting on vendor	$130,000
Annual Cost of Operating Supplies	$1,900	Waiting on vendor	None special required
Hot – Cold Water Supplies Required	Yes	Yes	No
Options	Computer Remote monitoring	Waiting on vendor	Computer Remote monitoring
Factory Warranty	1 year	Waiting on vendor	1 year on vessel, 3 yrs. on structural items
Service Facility	Bob's Services - Anchorage	Waiting on vendor	Seattle, WA

*This unit can also process dried biosolids and chipped green waste alone or in combination with food waste.

Both digester units provide an automated food digesting cycle and use push-button controls. The ORCA only requires a 110 volt outlet, while the Eco-Safe requires a 240 volt, 3-phase outlet. The latter usually is available at a waste water treatment facility. The composters are also typically completely automated.

Processing capacities are approximately similar, with the Eco-Safe having a slightly larger capacity. However, if the units are operated over-night, the capacity difference should not be a limiting issue. Both digester units and the composter unit would use less than $1,000 worth of power annually.

Both digester systems use a wood pellet and enzyme mix that is reused over several processing cycles before it has to be replenished. Operating supply costs are similar for both digester machines and would likely be no more than $2,000 annually.

Capital costs for the digester units are similar. Including other construction-related costs necessary to install and operate the units, the total estimated capital cost is approximately $66,000 (Table 2). Capital costs are higher for the composter, however, its capacity is larger and

it can process other organic waste streams (dried biosolids and chipped green waste) that the digesters cannot. The estimated capital costs per ton of waste capacity for the digesters and the composter are similar.

Table 2. Estimated Capital Cost for Food Digester and Composter

Item	Estimated Cost (digesters)	Estimated Cost (composter)
Digester Unit & Ancillary Equipment	$40,000	$130,000
Electrical	$3,000	$3,000
Potable Water Supply	$1,500	$1,500
Plumbing Line cut-in and tie-in to sewer	$5,000	N/A
Food Screening Pad	$3,000	$3,000
Food bins (processing area only) and miscellaneous	$1,000	$1,000
Wood Pallets	$200	$200
Curing Pile concrete bunker	N/A	$20,000
Concrete pad	N/A	$10,000
Digester Delivery	$3,000	$5,000
Installation	$10,000	$20,000
Contingency (15%)	$10,000	$29,000
Total	**$76,700**	**$219,700**
Capital Cost per Design Capacity	**$420/ton**	**$401/ton**

Manufacturer cut-sheets for the respective composter and digester units are provided in Attachment A.

ATTACHMENT A

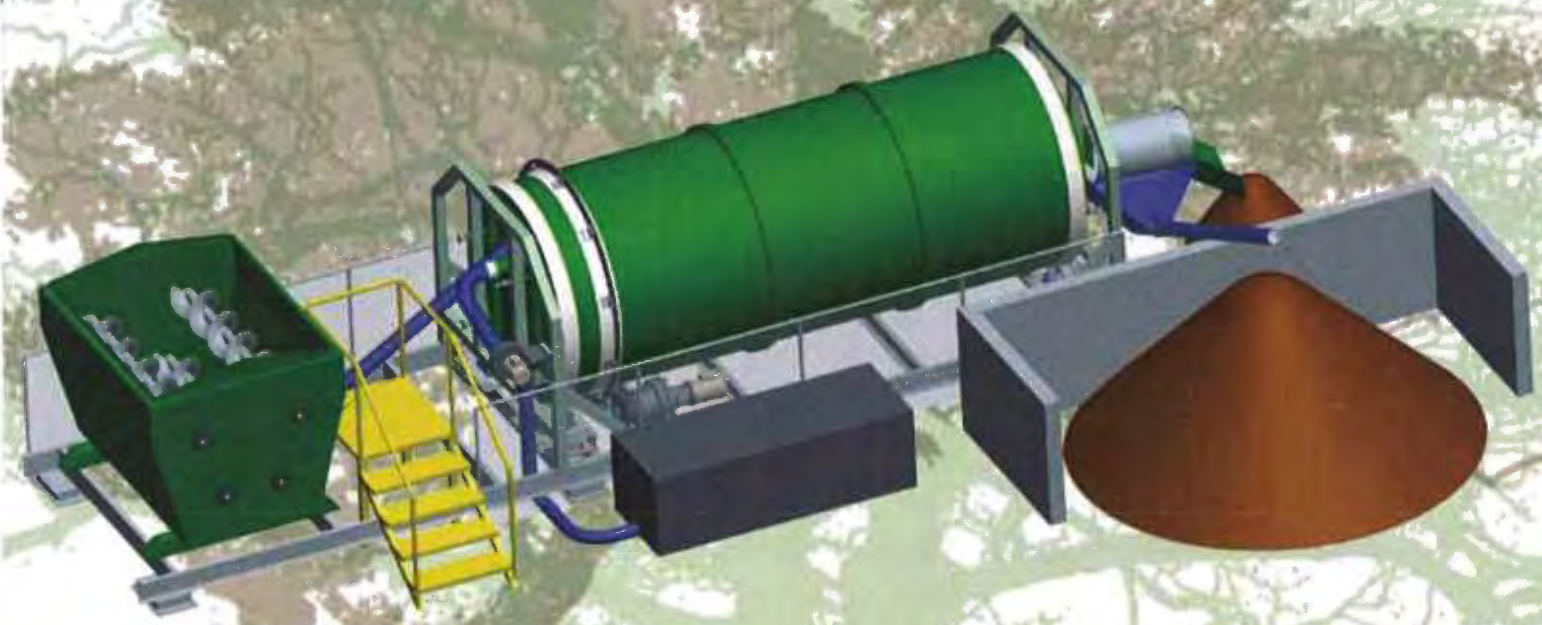
Sample Brochures
Food Composter and Digester

DTEnvironment

DTE ENVIRONMENTAL

ENVIRO-DRUM

In-Vessel Composting By DT-Environmental



Complete the cycle...

Patent Pending

DTE ENVIRONMENTAL

6-20 ENVIRO-DRUM

The *6-20 ENVIRO-DRUM*, up to 17 yards operating capacity

5-14 ENVIRO-DRUM

The *5-14 ENVIRO-DRUM*, up to 8 yards operating capacity

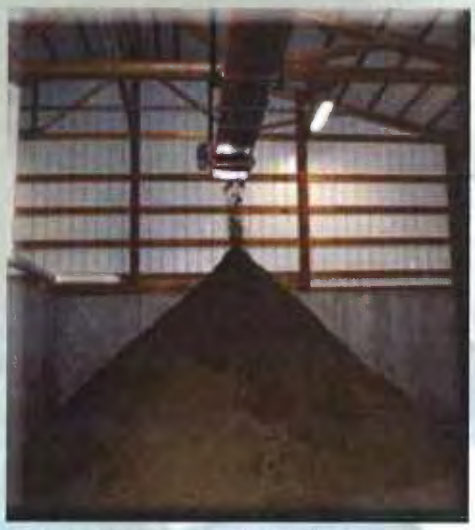
6-32 ENVIRO-DRUM

The *6-32 ENVIRO-DRUM*, up to 27 yards operating capacity

Truck Delivery:
ENVIRO-DRUMS can be delivered anywhere in North America.

8-40 ENVIRO-DRUM

The *8-40 ENVIRO-DRUM*, over 60 yards operating capacity

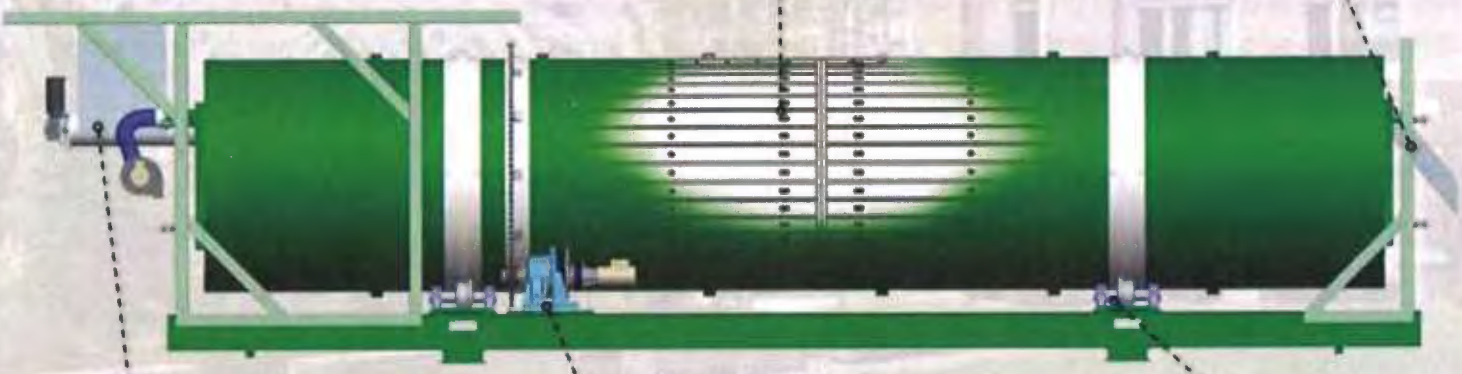


Finished compost stacked and stored.

Control Panel:
Control panel can be installed in a heated enclosure.

Exit Chute:
Continuous operation provides many options for conveyance of finished bedding.

Insulation Boards:
Linear boards on the inside provide insulation, abrasion barrier, and host bacteria in spaces.



Patent Pending

Feed Auger:
Infeed auger supports continuous operation with uninterrupted air supply.

Motor and Wheels:
Heavy duty drive motor and idler wheels ensure longevity and trouble free operation.

ENVIRO-DRUM

"We have been dealing with DTE for years and have always appreciated the effort and thought that goes into their equipment. By bringing the quality and workmanship of large industrial systems to our operation, DTE has given us an affordable means of accomplishing our composting goals."

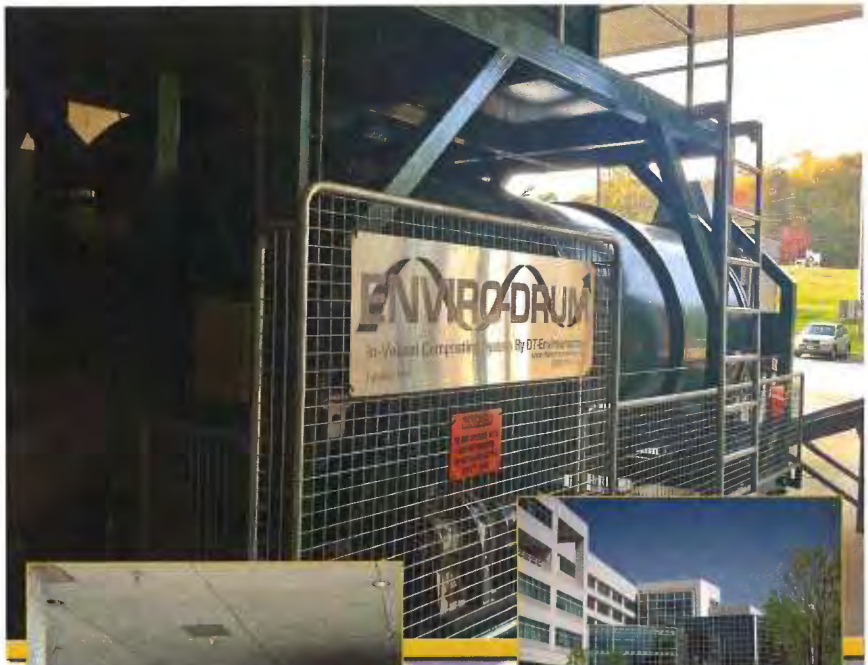
The DTE ENVIRO-DRUM is built with excellent workmanship to ensure great performance and value for years to come. Organic waste handling systems from DT-Environmental help eliminate tipping fees and transport costs by closing the loop and turning your waste into a fertile soil amendment. With the Enviro-Drum as the central system component, DTE can affordably accelerate the composting process, reducing the footprint and making on-site waste management feasible.

Features include:

- **Proven composting technology**
- **Fixed ends provide greater capacity for better value**
- **Heavy rubberized industrial coating**
- **Internal boards protect vessel from heat fluctuations**
- **HDPE boards protect inside of vessel from wear**
- **Heavy duty drive system, idler wheels and bearings for longevity**

DTEnvironmental
Subsidiary of DariTech, Inc.
8540 Benson Rd.
Lynden, WA 98264
(800) 701-3632
(360) 354-6900
www.dtenvironmental.com

Authorized Representative:



National Archives - College Park, Maryland

6-16 EnviroDrum

- Composting of cafeteria and soiled paper waste
- Finished compost to be used on the grounds
- Closing the loop
- Offsetting of disposal costs: Landfill and transport
- Accelerated in-vessel composting allows for small footprint

Sustainability!

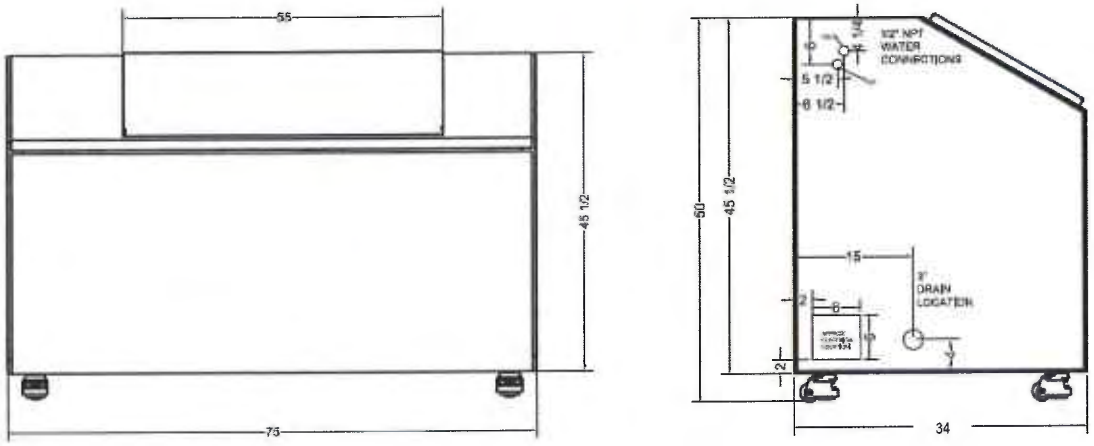
DTE ENVIRONMENTAL
www.dtenvironmental.com

Samples of Operating *Envirodrum* Composting Systems


BeddingMaster

Totally Green
Food Waste Digester

ORCA Green™ Machine - Model OG1200



- Aerobically processes up to 1200 lbs. of food waste per 24-48 hour period
- ½ hp electric motor
- Heavy-duty machine, aluminum paddles on stainless steel shaft
- Simple control panel for user operation
- Door sensor turns off machine when door is opened
- Can add food waste continuously
- ETL certified
- Air-tight machine tank system, generating a silent odor-free operation
- Machine easily movable on heavy-duty casters that lock down
- Utilizes ORCA Bio-Chips to hold high levels of Micro-Organisms that digest organic waste
- Nozzles spray water & Micro-organism solution into machine automatically
- Effluent from machine tested safe to enter water waste system

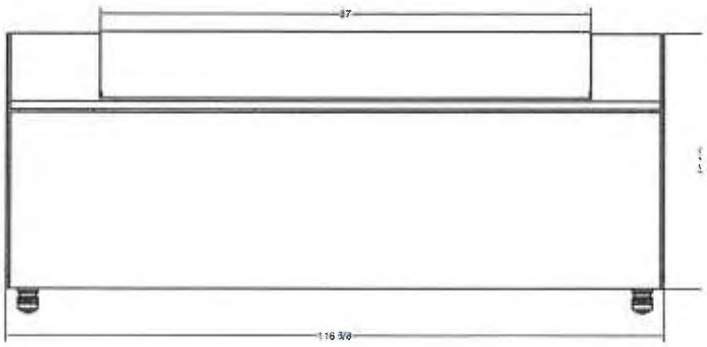
Materials: Cost includes ORCA Chips & ORCA Micro-Organisms
Dimensions (LxWxH): 75"x34"x50"
Weight: 870 lbs.

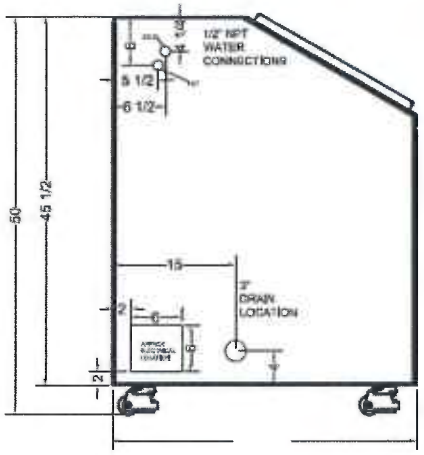
Daily Processing Capacity: 1200 lbs per day
Electrical Consumption: 0.7 kwh
Water Consumption: Usage varies based on utilities & food waste make up
Required supplies: ORCA Chips and ORCA Micro-Organisms available from Totally Green

Installation requirements: Electrical – 110v / 1 phase (15 amp)
Water- hot & cold water connection
to sewer drain

www.totallygreen.com
25 Sheppard Ave. Suite 1600 Toronto, On M2N 6S6

ORCA Green™ Machine - Model OG2400





- Aerobically processes up to 2400 lbs. of food waste per 24-48 hour period
- 1 hp electric motor
- Heavy-duty machine, aluminum paddles on stainless steel shaft
- Simple control panel for user operation
- Door sensor turns off machine when door is opened
- Can add food waste continuously
- ETL certified
- Air-tight machine tank system, generating a silent odor-free operation
- Machine is easily movable on heavy-duty casters that lock down
- Utilizes ORCA Bio-Chips to hold high levels of Micro-Organisms that digest organic waste
- Nozzles spray water & Micro-organism solution into machine automatically
- Effluent from machine tested safe to enter water waste system

Materials: Cost includes ORCA Chips & ORCA Micro-Organisms
Dimensions (LxWxH): 116"x34"x50"
Weight: 1280 lbs.

Daily Processing Capacity: 2400 lbs per day
Electrical Consumption: 1.2 kwh
Water Consumption: Usage varies based on utilities & food waste make up
Required supplies: ORCA Chips and ORCA Micro-Organisms available from Totally Green

Installation requirements: Electrical – 110v / 1 phase (20 amp)
Water- hot & cold water connection
to sewer drain

www.totallygreen.com
25 Sheppard Ave. Suite 1600 Toronto, On M2N 6S6

Marathon Food Waste Digester

ORGANIC WASTE DECOMPOSITION SYSTEM

Eco-Safe Digester™

MARATHON®

Convert food waste to liquid in an environmentally friendly manner

RAMJET®

Stationary and self-contained compactors.

Environmental Solutions Group

A DOVER COMPANY

2011

PRODUCT SHEET

Food Processing Plants

Food Wholesalers

Food Distribution Centers

Supermarkets

Restaurants

Commercial Kitchens

Schools and Universities

Hospitals

Hotels

Resorts

Prisons

Eco-Safe Digester™ for Organic Waste

Marathon's Eco-Safe Digester™

The new Eco-Safe Digester from Marathon is an innovation breakthrough in confronting the growing problem of organic waste processing and disposal. The Eco-Safe Digester is an environmentally friendly method for converting food waste into liquid and was designed in response to some staggering statistics:

- According to a 2008 United Nations study, it's estimated that about 30 percent of the food produced annually in the United States — about $50 billion — is thrown into the garbage.
- Food retailers lose more than of 5.5 billion pounds of food per year — about 2 percent of the edible food supply — with dairy, fruit, and vegetable spoilage accounting for half of those losses, according to a USDA report.
- The Environmental Protection Agency has reported that the United States spends an estimated $1 billion annually on disposing of food waste.
- Less than 800,000 tons of the 31.79 million tons of food waste generated annually in the United States is diverted from landfills.

Benefits

By diverting waste from landfills, the Eco-Safe Digester offers multiple environmental benefits as well as measurable cost savings. For example, using the 1,200-pound capacity unit for one year:

- Reduces 58 MTCE of greenhouse gases
- Is equivalent to taking 40 cars off the road
- Saves 1,700 gallons of diesel fuel (it takes 130 barrels of crude oil to produce 1,200 gallons of diesel fuel)
- Reduces CO_2 by 470,000 pounds
- Preserves valuable landfill space
- Is equivalent to planting approximately 100 trees
- Reduces use of trash bags and rodent control systems
- Returns tens of thousands of gallons of water a year to the ecosystem

Designed to safely convert up to 1,200 pounds of food waste per day into a liquid that can be returned to the ecosystem.

How It Works

The Eco-Safe Digester™ uses a highly refined formula of micro-organisms to break down organic waste into a liquid. This liquid can be safely flushed down the drain, completely eliminating the waste and ultimately enabling the effluent to return to the ecosystem as water.

Within 24 hours, the Eco-Safe Digester will safely and quickly decompose virtually all organic food waste, including:

- Meat
- Poultry
- Fish
- Fruits
- Vegetables
- Rice
- Pasta
- Bread
- Coffee grounds
- Grains
- Eggshells
- Dairy products

4 Easy Steps

STEP 1:
A highly refined formula of microorganisms is added to the unit during setup.

STEP 2:
Food waste is added to the chamber through the hatch.

STEP 3:
Water is added, and the food waste begins breaking down immediately.

STEP 4:
The resulting liquid is flushed down the drain, completing the process.

English Specifications

Model	Capacity (lbs.)	Dimensions (inches)			Power			Weight (lbs.)
		Length	Depth	Height	Voltage	Amperage (amps)	Horsepower (hp)	
Eco-Safe Digester 400	400	43	36	48	208 volt 3-phase	30	0.75	683
Eco-Safe Digester 800	800	57	44	52	208 volt 3-phase	30	1.5	1000
Eco-Safe Digester 1200	1200	67	44	52	208 volt 3-phase	30	2	1350

Metric Specifications

Model	Capacity (kg)	Dimensions (mm)			Power			Weight (kg)
		Length	Depth	Height	Voltage	Amperage (amps)	Horsepower (kW)	
Eco-Safe Digester 400	180	1092	914	1219	208 volt 3-phase	30	0,56	310
Eco-Safe Digester 800	360	1448	1118	1321	208 volt 3-phase	30	1,13	454
Eco-Safe Digester 1200	545	1702	1118	1321	208 volt 3-phase	30	1,50	612

Eco-Safe Digester™ for Organic Waste

Testing and Certification

Safety and Regulatory Standards

The Eco-Safe Digester meets all nationwide Safety and Regulatory standards at all times. Rigorous testing by regulatory agencies nationwide proved the effluent to have no negative impact on sewer treatment facilities.

ETL Listed

When a product bears the ETL Listed Mark, it is proof that the product has passed rigorous product safety testing and has achieved certification. The ETL Listed Mark is issued by the ETL SEMKO division of Intertek, a leading global testing, inspection, and certification organization that serves manufacturers worldwide to help them reach global markets.

NYC DEP Compliant

This product complies with all applicable regulations of the New York City Department of Environmental Protection.

NELAC Compliant

All applicable test results meet the requirements of NELAC, the National Environmental Laboratory Accreditation Conference (NELAC).

Installation Requirements

- Designed for indoor installation
- Sufficient space to provide 2–3 feet of clearance around the unit on all sides
- 208 volt 3-phase electric
- Connection to hot and cold water supply with mixing valve
- Floor drain and drain pipe connection
- Thermometer incorporated into water line to visually monitor water temperature
- Garden hose attachment incorporated into water line with separate shut-off valve for use in cleaning and servicing the unit

Options

- Ethernet port to enable technological maintenance, software updates, and remote monitoring
- Static IP address to enable monitoring and remote access

RAMJET®

Stationary and self-contained compactors.

Authorized Dealer:

Marathon Equipment Company
P.O. Box 1798
Vernon, AL 35592-1798
800.633.8974
www.marathonequipment.com
www.nexgenbalers.com

Environmental Solutions Group
A DOVER COMPANY
www.doveresg.com

Eco-Safe-Digester
Statement on BOD's & Approval letters

MARATHON® A DOVER COMPANY

COLLABORATIVE ENTREPRENEURIAL SPIRIT | WINNING THROUGH CUSTOMERS | HIGH ETHICAL STANDARDS, OPENNESS, AND TRUST | EXPECTATIONS FOR RESULTS | RESPECTS AND VALUES PEOPLE

Inside

- Document of reference discussing BOD's and their effect on waste water treatment plants.
- Approval letters from a number of municipalities from around the US.
- Last a statement on Environmental Sustainability.

The Eco-Safe-Digester has never been refused or not allowed in an application.

DOCUMENT OF REFERENCE

In response to questions regarding BOD's and effluent acceptance of the Eco-Safe Digester, we offer the following facts and information. As you know, the Eco-Safe Digester is currently installed throughout the United States in 16 states and to date has been approved by numerous wastewater treatment jurisdictions. In most cases the Eco-Safe does not require regulatory approval by the end user. However, many of our customers have asked us to obtain approvals from their governing waste water treatment district. Copies of some of the regulatory approvals have been provided in the past.

When analyzing the BOD levels discharged from an Eco-Safe Digester, many things need to be taken into account:

- The point of sampling – BOD levels will be higher at the machine's discharge pipe than at the connection to the main sewer line.

- The time of sampling – BOD levels will be higher during certain cycles of the digestion process. On the average, based on samples taken over a 24-hour period, the expected BOD levels of the consolidated sample should be below most wastewater treatment facility thresholds.

- Volume of discharge – The largest Eco-Safe Digester will discharge approximately 400 gallons of effluent in a 24-hour period. This is a very small amount of liquid being added to a facility's overall wastewater volume. The average hospital discharges between 100 and 200 gallons per bed per day of wastewater. This can be as much as 100,000 gallons of wastewater for a 500-bed facility. As you can imagine, the 400 gallons of additional effluent is not likely to have a material effect on the overall characteristic of the facility's discharge. Similar circumstances apply to hotels, supermarkets and other industrial users.

- Type of food waste introduced immediately prior to testing – as is the case with the human body; the bacteria used in treatment of the food waste will digest different types of food at different rates. If for instance, a vat of soup is introduced immediately prior to testing, the BOD level at that test will be elevated compared to a sample taken immediately after some potatoes and meats were introduced due to the time that the food remains in the digestion chamber and its size and makeup.

We are confident that the Eco-Safe Digester will be widely accepted throughout the United States as our market continues to expand. In response to the questions specifically targeting the health care markets and The Joint Commission I offer the following:

- To date, BioHitech has not been denied approval to install the Eco-Safe Digester by any wastewater treatment jurisdiction when asked to seek said approval by our customer. We have multiple approval letters from various jurisdictions throughout the country supporting the implementation of our product. Once properly educated, we found that regulatory agencies quickly became comfortable with our technology and the means in which it diverts organic waste from our landfills. In fact, many wastewater treatment plants utilize microbial blends similar to ours. Every facet of our process has been specifically selected because of its environmentally friendly nature. There are no chemicals used during the process and all digestive aids used are 100% natural. One can surmise that the addition of our digesters may and can actually improve the efficiency of our customer's drainage systems. In one case we received feedback from a well-known hospitality customer that claimed the overall maintenance and performance of their drainage system improved post installation of our digester.

- Our understanding is that the Joint Commission is a non-profit organization that functions as an "accreditation vehicle" that is widely accepted throughout the US. The Joint Commission currently accredits approximately 82% of US hospitals. The Joint Commission addresses hospital's performance in specific areas to ensure that patient care is provided in a safe manner and in a secure environment. While it is unclear to us whether The Joint Commission would have any opinion about the specific equipment, it would most likely be considered as part of the institution's satisfactory rating as it pertains to food services. That being said, we see no reason The Joint Commission would object to the use of the Eco-Safe Digester as we have numerous installations in food preparatory environments such as Universities, Prisons, and national retail restaurant chains. All of these applications are governed by numerous agencies, most notably local boards of health. To date we have not received any objections or board of health violations associated with the Eco-Safe Digester.

In 2012 The Joint Commission and SGS Group are joining forces to offer hospitals in the US the option of pursuing both accreditation and ISO certifications. It is our belief that use of the Eco-Safe Digester can help certain hospitals achieve ISO and industry best standard status. "The ISO 14000 environmental management standards exist to help organizations (a) minimize how their operations (processes etc.) negatively affect the environment (i.e. cause adverse changes to air, water, or land); (b) comply with applicable laws, regulations, and other environmentally oriented requirements, and (c) continually improve in the above." "The ISO 14000 family includes most notably the ISO 14001 standard, which represents the core set of standards used by organizations for designing and implementing an effective environmental management system."

- Concerning grease and grease traps, there is plenty of evidence to suggest that our technology has favorable impacts on both. Our microbial blend contains strains of microorganisms that focus on the digesting and breaking down of fats, oils, and greases (FOG's). The trace amounts of fat that is typically found on the meat products introduced into our system pose no threat if administered properly. Let it be clearly stated, our system is not intended to process fat renderings. The concern here is more for the well being of our customers than our technology. Adhering to this simple rule will ensure a long and effective use of our technology and preserve the integrity of their drainage systems.

Numerous of our customers have been approved to install our technology without the addition of a peripheral grease trap system. Furthermore, those same customers have yet to experience any negative effects in the absence of a grease trap system.

To address the sale opportunities in Hawaii and specifically within the county of Honolulu, our representative in Hawaii has had conversations with the Regulator Control Branch Chief of the City and County of Honolulu Dept. of Environmental Services. Our understanding is that the installation of Eco-Safe Digesters directly tied in to the sanitary sewer lines would be approved so long as there is an "inspection port" located between the discharge pipe and the sewer connection. The department's concern is not necessarily with BOD's but with FOG's (Fats, Oils, and Greases) since there is an ongoing issue in Hawaii with FOG's due to the excessive amounts of rice in the grease traps.

When used in accordance to our specifications our technology offers a producer of high volumes of organic waste an environmentally responsible means of diverting food waste from customary waste removal methods.

UTILITIES AND SOLID WASTE MANAGEMENT DIVISION
FREDERICK COUNTY, MARYLAND
Department of Regulatory Compliance
4520 Metropolitan Court • Frederick, Maryland 21704
(301) 600-2297 • FAX (301) 600-2349 • TTY: Use Maryland Relay
www.FrederickCountyMD.Gov

January 4, 2011

BioHitech America, LLC
7 Pearl Court Unit B
Allendale, NJ 07401

Attention: Mr. Michael Buonanno

RE: BioHitech Organic Waste Decomposition System

Dear Mr. Buonnano:

Thank you for providing Frederick County Division of Utilities and Solid Waste Management (DUSWM) with information regarding the installation of High-Volume Organic Waste Decomposition Systems at several Giant Food locations throughout Frederick County.

After reviewing the information submitted to our office, it does not appear that installation of this equipment will have a negative impact on the quality of effluent entering the sewer collection system. Any installation will be subject to Frederick County Plumbing Code and its permitting and inspection procedures. Any waste discharged to the sewer from these units will be required to meet the performance standards of the Frederick County Industrial Waste Ordinance. Because this device will increase flow to the sewage collection system, its installation will result in additional fixture unit totals and be subject to additional capacity fees.

As the holder of Industrial Waste Discharge Permits, Giant Foods will need to make contact with the Pretreatment Office prior to installation under the provisions 'change in effluent characteristics' in their discharge permit. Arrangements will have to be made for the proper disposal of the residual solid waste material.

Should you have any additional questions, please contact Mr. Kenneth Carter, Pretreatment Specialist, at (301) 600-2511.

Sincerely,

Mark A. Schweitzer
Department Head

pc: Kenneth Carter, Frederick County DUSWM
Kristina Stefanski, Stop & Shop Supermarkets

October 18, 2010

BioHitech America, LLC.
ATTN: Michael Buonanno
7 Pearl Ct.
Unit B
Allendale, NJ 07401

Re: Gaylord Palms Resort
Organic Waste Decomposition System
Toho Project No. 990058.EM

Dear Mr. Buonanno:

The Tohopekaliga Water Authority (TWA) has reviewed the available information and has approved the requested installation barring deviation from the following stipulations:

1. The product must connect to a drain that feeds into the existing grease trap system on site.
2. The grease traps are monitored on a regular basis, if anything out of the ordinary is noted during an inspection, the product must be removed from service until the problem can be rectified.
3. If the product is shown to increase grease waste into the TWA system, Gaylord Palms Resort will be responsible for upgrading the grease handling capacity of their internal system to adequately treat the increased waste flow.
4. TWA is not the only permitting authority in Osceola County. It is understood by TWA that the Osceola County Government, Florida Department of Environmental Protection, and the Florida Department of Business and Professional Regulation have been contacted and all have given their blessing of this installation. If the parties listed above have not been contacted and will not provide confirmation upon request, the product must be removed from service until such time as the product is in compliance with all regulating agencies.

If you have any questions, feel free to contact this office.

Sincerely,

David W. Thomas
Engineering Assistant

Toho Engineering
Water Authority

951 MLK Boulevard, Kissimmee FL 34741
407.944.5000 Fax 407.343.4264 · www.tohowater.com

CITY OF HOLLYWOOD, FLORIDA

Building Department
2600 Hollywood Blvd. · P. O. Box 229045 · Hollywood, Florida 33022-9045
Phone (954)921-3071 · Fax (954)921-3037 · www.hollywoodfl.org

To Whom it may concern: BioHitech organic waste control system in my opinion has got to be the future for waste control of organic materials from large volume users. The system eliminates over loading our land fills with food waste products that just attracts birds and rodents. The system needs a permit for installation for hook up to a floor drain and backflow device for protection of water supply. The City of Hollywood would have no problem having the BioHitech system installed.

Cary L. Bauer
Chief Plumbing Inspector
City of Hollywood

If you should have any question please call me at: 954-980-2508 (my cell) 954-921-3071 (my office)

ORANGE COUNTY SANITATION DISTRICT

phone:
(714) 962-2411
fax:
(714) 962-0356
www.ocsd.com

mailing address:
P.O. Box 8127
Fountain Valley, CA
92728-8127

street address:
10844 Ellis Avenue
Fountain Valley, CA
92708-7018

July 30, 2007

COPY

Rick Crandall,
Albertsons
1421 South Manhattan Avenue
Fullerton, CA 992831

SUBJECT: Discharge Request

The Orange County Sanitation District (District) has received the letter from Albertsons submitted on June 28, 2007 regarding the potential wastewater discharge from their pilot project at their Fullerton facility.

According to the information submitted, it is the District's understanding that the proposed discharge consists of an additional 200 gallons per day from Albertsons #6119, located at 1930 North Placentia Avenue in Fullerton, which is generated by the reduction of waste foods via a 'Bio-X' unit. The unit will operate using active microbial digestion in an aqueous media to reduce or eliminate the solid food waste disposed of in it. Some unreduceable solid mass will remain, which will not be directed to the sewer system. The additional wastewater discharged to the District's sewer system consists of the concentrated liquid (BOD & TSS) effluent from the unit and contains no significant contamination.

Based upon this information, the District has determined that this wastewater may be discharged to the sewer system without an Industrial Wastewater Discharge Permit at the present time. All discharge of wastewater must be in compliance with the District's *Wastewater Discharge Regulations*, particularly the prohibition on the use of grinders (§206A&B) and the prohibition on the discharge of sludges (§211).

Should the quantities or type of waste significantly change, you are also required to notify the Districts in writing. If you have any questions, please telephone Tom Walker at (714) 593-7440.

Tom Walker
Associate Engineer

TW:mb
G:\wp.cta\ts\640\walker\dr\Sanitor.l

c: insp.

Post-it® Fax Note 7671	Date 8/6/07	# of pages ▶ 1
To RICK CRANDALL	From T. WALKER	
Co./Dept. ALBERTSONS	Co. OCSD	
Phone #	Phone #	
Fax #	Fax #	

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
WASTEWATER ENTERPRISE—COLLECTION SYSTEM DIVISION
3801 THIRD STREET, SUITE 600, SAN FRANCISCO, CA 94124 • TEL. (415) 695-7310 • FAX (415) 695-7388

WATER
HETCH HETCHY WATER & POWER
CLEAN WATER

GAVIN NEWSOM
MAYOR

ANN MOLLEER CAEN
PRESIDENT

F. X. CROWLEY
VICE-PRESIDENT

FRANCESCA VIETOR
COMMISSIONER

JULIET ELLIS
COMMISSIONER

ANSON B. MORAN
COMMISSIONER

ED HARRINGTON
GENERAL MANAGER

October 21, 2009

Jeff Haller
Trash Talker, LLC
P.O. Box 52041
Riverside, CA 92517

SUBJECT: BioHitech Organic Waste Decomposition System.
Wastewater Pretreatment Review

Dear Mr. Haller:

We have reviewed your application (dated Sep. 10, 2009) for a Wastewater Pretreatment Review for the aforementioned organic waste decomposition system, which utilizes a proprietary blend of microorganisms to digest human food scraps, converting them to an aqueous waste stream which is then discharged to the sanitary sewer.

Chemical test results for samples "NY-01" and "NJ-02" (sample date 7/22/08) (EMSL Analytical lab {Westmont, NJ; EMSL Orders 010803560 and 010803537, respectively} and Analytical Laboratory Services, Inc. {Middletown, PA; Report IDs 9747160 and 9746943, respectively}) indicate little or no risk of interference, and no risk of violating the NPDES permits for San Francisco's wastewater treatment plants: Southeast WPCP, Oceanside WPCP, or Treasure Island WPCP.

Based on the average TSS, COD, and O&G values reported for the aforementioned samples (480 mg/L TSS, 480 mg/L COD, 2 mg/L O&G) and current (July 2009) S.F. Sewer Service rates, users of the BioHitech unit [model not specified] (normal loading, normal operation, "few weeks" digestion time) may expect a Sewer Service Charge of $9.86 per water unit (100 cubic feet, 748 gallons) for this discharge ($0.0132 / gallon). This is comparable to the pollutant loadings historically assigned to the S.F. restaurant industry (for untreated wastewater): 303 mg/L TSS, 1153 mg/L COD, 251 mg/L O&G.

Redacted chemical test results for samples "PT-1135", "PT-1136" and "PT-1137" (sample dates 8/25/08, 9/2/08, and 9/15/08, respectively) (Las Vegas [Nevada] Water Pollution Control Facility lab, table titled "Santa Fe Waste Digester Pilot Test" (Santa Fe Station Casino; BioHitech model 1200) [no report date or number]) likewise showed little or no risk of causing interference, and no risk of violating the NPDES permits for San Francisco's aforementioned sewage treatment plants.

Based on the average TSS, COD, and O&G values for the "Santa Fe Waste Digester Pilot Test" (1236 mg/L TSS, 3728 mg/L COD, 290 mg/L O&G) and current (July 2009) S.F. Sewer Service rates, users of the BioHitech model 1200 (food digesting rate: 650 lb/d; H_2O consumption: 153 GPD; 42 days total digestion time) may expect a Sewer Service Charge of $20.37 per water unit (100 cubic feet, 748 gallons) for this discharge ($0.0272 / gallon). This is generally more concentrated than the pollutant loadings historically assigned to the S.F. restaurant industry (for untreated wastewater); values noted above.

The **BioHitech Organic Waste Decomposition System** may thus be used within the City & County of San Francisco without the need for a special wastewater discharge permit from this Division, notwithstanding the right of the SFPUC General Manager to modify or curtail said discharge if compelled by necessity, pursuant to Sections 120, 124, and 125, Chapter X (Public Works Code) of Part II, San Francisco Municipal Code, Article 4.1.

As with all other pretreatment systems or wastewater disposal of any kind, effluent discharged from the BioHitech unit to the San Francisco sewer system shall be in compliance with

- the requirements of Article 4.1 (S.F. Sewer Use Ordinance) and amendments thereto, as well as the City's Department of Public Works' Order No. 158170; and

- the U.S. Environmental Protection Agency regulations (40 CFR Part 403); and applicable pretreatment regulations and standards required under local, state, and federal law.

If you have any questions regarding this Wastewater Pretreatment Review, please contact Dr. John Gregson at JGREGSON@sfwater.org, or (415) 695-7358.

Sincerely,

Bruce Seale, Acting Manager
Pretreatment Program
Wastewater Enterprise / Collection System
Division

By Certified Mail

October 29, 2008

Jeff Tiraada, Chief Engineer – Facilities
Santa Fe Station Hotel & Casino
4949 North Rancho Drive
Las Vegas, Nevada 89130

SUBJECT: TRASHTALKER FOOD WASTE DECOMPOSITION UNIT

Dear Mr. Tiraada,

The City of Las Vegas Industrial Waste Section has completed its assessment of your 60 day pilot test of the TrashTalker Food Waste Decomposition Unit. The City of Las Vegas takes no exception to discharging treated wastewater from the unit into the sanitary sewer, subject to the following provisos:

1. The wastewater must discharge into an approved grease interceptor prior to discharging into the sanitary sewer system.

2. The discharge must remain compliant with the conditions of Santa Fe's Wastewater Contribution Permit and Chapter 14.17 of the Las Vegas Municipal Code.

3. Santa Fe will be assessed an annual fee of $600 to cover treatment and administrative costs for disposal of the wastewater.

As specified in an e-mail to Wally Jensen on 6/26/08, the Santa Fe will also be assessed a one time testing fee of $750 for analyses costs for the pilot testing. An invoice will be mailed under separate cover.

Thank you for your cooperation during the pilot testing. Should you have any questions, feel free to contact John Solvie at 229-6547.

Sincerely,

Daniel C. Fischer
Pretreatment Coordinator
Environmental Division

cc: Dave Gildersleeve (Santa Fe)
David Mendenhall (CLV)
Tom Gugino (CLV)
Jeff Haller (Trashtalker)
Anna Haller (Trashtalker)

CITY OF LAS VEGAS
ENVIRONMENTAL DIVISION
6005 VEGAS VALLEY DRIVE
LAS VEGAS, NEVADA 89142

VOICE 702.229.6200
TTY 702.386.9108
www.lasvegasnevada.gov

APPENDIX E

PRO FORMA MODEL RESULTS

PRO FORMA MODEL - "NO CHANGE SCENARIO", MUNICIPALITY OF SKAGWAY, AK

	BUDGET YEARS									
Cost Element	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Operating Revenues[1]										
Dumpster Leases	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511
Recycling Revenue[2]	6,934	7,073	7,214	7,358	7,506	7,656	7,809	7,965	8,124	8,287
Garbage Service	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Subtotal	440,445	440,584	440,725	440,869	441,017	441,167	441,320	441,476	441,635	441,798
Transfer Sales Tax[3]	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Transfer Excise Tax[4]	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493
Transfer MOS Bond Fund[5]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
Total Operating Revenues	**$903,938**	**$904,077**	**$904,218**	**$904,362**	**$904,510**	**$904,660**	**$904,813**	**$784,969**	**$785,128**	**$785,291**
Operating Expenses[6]										
Administration	9,000	9,180	9,364	9,551	9,742	9,937	10,135	10,338	10,545	10,756
Capital Outlay	14,000	14,280	14,566	14,857	15,154	15,457	15,766	16,082	16,403	16,731
Contracts	45,000	45,900	46,818	47,754	48,709	49,684	50,677	51,691	52,725	53,779
Employee PR Expenses	75,149	76,652	78,185	79,749	81,344	82,971	84,630	86,323	88,049	89,810
Employee Health Insurance	86,478	88,208	89,972	91,771	93,607	95,479	97,388	99,336	101,323	103,349
Solid Waste Salaries	157,586	160,738	163,952	167,232	170,576	173,988	177,467	181,017	184,637	188,330
Recycling Program Salaries and Program[7]	0	0	0	0	0	0	0	0	0	0
Equipment	10,000	10,200	10,404	10,612	10,824	11,041	11,262	11,487	11,717	11,951
Hazardous Waste	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902
Incinerator Repair and Maintenance	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902
Insurance Liability	12,425	12,674	12,927	13,186	13,449	13,718	13,993	14,272	14,558	14,849
Recycling Expenses	110,000	112,200	114,444	116,733	119,068	121,449	123,878	126,355	128,883	131,460
Repairs and Maintenance	19,000	19,380	19,768	20,163	20,566	20,978	21,397	21,825	22,262	22,707
Travel	4,000	4,080	4,162	4,245	4,330	4,416	4,505	4,595	4,687	4,780
Utilities Incinerator	201,300	205,326	209,433	213,621	217,894	222,251	226,696	231,230	235,855	240,572
Major Repair Incinerator[8]	0	0	0	0	0	650,000	0	0	0	0
Recycling Facility Operations[9]	0	0	0	0	0	0	0	0	0	0
Composting Facility Operations[10]	0	0	0	0	0	0	0	0	0	0
Total Operating Expenses	**$783,938**	**$799,617**	**$815,609**	**$831,921**	**$848,560**	**$1,515,531**	**$882,842**	**$900,498**	**$918,508**	**$936,878**
Financing Expenses										
Incinerator Debt/Loan[11]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
New Facilities Debt/Loan[12]	0	0	0	0	0	0	0	0	0	0
Total Financing Expenses	**$120,000**	**$120,000**	**$120,000**	**$120,000**	**$120,000**	**$120,000**	**$120,000**	**$0**	**$0**	**$0**
										10-Year Total
NET REVENUE OR LOSSES[13]	**$0**	**($15,540)**	**($31,391)**	**($47,559)**	**($64,050)**	**($730,871)**	**($98,029)**	**($115,529)**	**($133,380)**	**($151,588)**	**($1,387,937)**

Notes:

[1] Existing MOS solid waste program fees; no CPI adjustment or rate increase assumed.

[2] Revenues received by MOS from recyclables dropped off at PWD or at Incinerator.

[3] Funds from the MOS sales tax fund are used to pay the annual debt service of the Incinerator.

[4] Funds from the Alaska Excise Tax is currently used to supplement the solid waste budget.

[5] MOS Bond Fund used to pay for the Incinerator debt service through 2019.

[6] MOS 2012 budget was used for most operating expenses except those noted in the notes below. These were escalated using a 2% annual inflation factor.

[7] Operating costs to fund an enhanced recycling public education and outreach program.

[8] Estimated costs to fund an Incinerator rehab similar to recent retrofit of refractory and duct work. Estimated cost escalated at 2% annually. Life extension study would establish more refined schedule and cost.

[9] Estimated annual operating costs for proposed recycling facility.

[10] Estimated annual operating costs for proposed composting facility.

[11] Existing debt service through 2019 for Incinerator.

[12] Debt service or loan payments for proposed new recycling facilities.

[13] Estimated or projected new revenues or losses for solid waste and recycling programs.

PRO FORMA MODEL - "RECYCLING FACILITY ONLY SCENARIO", MUNICIPALITY OF SKAGWAY, AK

	BUDGET YEARS									
Cost Element	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Operating Revenues[1]										
Dumpster Leases	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511
Recycling Revenue[2]	6,934	12,744	12,999	13,259	13,524	13,795	14,071	14,352	14,639	14,932
Garbage Service	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Subtotal	440,445	446,255	446,510	446,770	447,035	447,306	447,582	447,863	448,150	448,443
Transfer Sales Tax[3]	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Transfer Excise Tax[4]	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493
Transfer MOS Bond Fund[5]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
Total Operating Revenues	**$903,938**	**$909,748**	**$910,003**	**$910,263**	**$910,528**	**$910,799**	**$911,075**	**$791,356**	**$791,643**	**$791,936**
Operating Expenses[6]										
Administration	9,000	9,180	9,364	9,551	9,742	9,937	10,135	10,338	10,545	10,756
Capital Outlay	14,000	14,280	14,566	14,857	15,154	15,457	15,766	16,082	16,403	16,731
Contracts	45,000	45,900	46,818	47,754	48,709	49,684	50,677	51,691	52,725	53,779
Employee PR Expenses	75,149	76,652	78,185	79,749	81,344	82,971	84,630	86,323	88,049	89,810
Employee Health Insurance	86,478	88,208	89,972	91,771	93,607	95,479	97,388	99,336	101,323	103,349
Solid Waste Salaries	157,586	160,738	163,952	167,232	170,576	173,988	177,467	181,017	184,637	188,330
Recycling Program Salaries and Program[7]	0	40,500	41,310	42,136	42,979	43,839	44,715	45,610	46,522	47,452
Equipment	10,000	10,200	10,404	10,612	10,824	11,041	11,262	11,487	11,717	11,951
Hazardous Waste	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902
Incinerator Repair and Maintenance	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902
Insurance Liability	12,425	12,674	12,927	13,186	13,449	13,718	13,993	14,272	14,558	14,849
Recycling Expenses	110,000	0	0	0	0	0	0	0	0	0
Repairs and Maintenance	19,000	19,380	19,768	20,163	20,566	20,978	21,397	21,825	22,262	22,707
Travel	4,000	4,080	4,162	4,245	4,330	4,416	4,505	4,595	4,687	4,780
Utilities Incinerator[8]	201,300	164,261	167,546	170,897	174,315	177,801	181,357	184,984	188,684	192,458
Major Repair Incinerator[9]	0	0	0	0	0	650,000	0	0	0	0
Recycling Facility Operations[10]	0	25,000	25,500	26,010	26,530	27,061	27,602	28,154	28,717	29,291
Composting Facility Operations[11]	0	0	0	0	0	0	0	0	0	0
Total Operating Expenses	**$783,938**	**$711,852**	**$726,089**	**$740,610**	**$755,423**	**$1,420,531**	**$785,942**	**$801,660**	**$817,694**	**$834,048**
Financing Expenses										
Incinerator Debt/Loan[12]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
New Facilities Debt/Loan[12]	0	36,797	36,797	36,797	36,797	36,797	36,797	36,797	36,797	36,797
Total Financing Expenses	120,000	156,797	156,797	156,797	156,797	156,797	156,797	36,797	36,797	36,797
										10-Year Total
NET REVENUE OR LOSSES[13]	**$0**	**$41,100**	**$27,118**	**$12,856**	**($1,691)**	**($666,529)**	**($31,664)**	**($47,101)**	**($62,847)**	**($78,908)**	**($807,667)**

Notes:

[1] Existing MOS solid waste program fees; no CPI adjustment or rate increase assumed.

[2] Revenues received by MOS from recyclables dropped off at proposed Recycling Facility. Assumes new Republic agreement and minimum 50% recovery of recyclables in MOS waste stream (residential and commercial) as identified in Waste Composition Study.

[3] Funds from the MOS sales tax fund are used to pay the annual debt service of the Incinerator.

[4] Funds from the Alaska Excise Tax is currently used to supplement the solid waste budget.

[5] MOS Bond Fund used to pay for the Incinerator debt service through 2019.

[6] MOS 2012 budget was used for most operating expenses except those noted in the notes below. These were escalated using a 2% annual inflation factor.

[7] Operating costs to fund an enhanced recycling public education and outreach program.

[8] Based on an conservative capture (50%) of recyclables from MSW (residential and commercial), a 20% reduction of Incinerator burns is projected.

[9] Estimated costs to fund an Incinerator rehab similar to recent retrofit of refractory and duct work. Estimated cost escalated at 2% annually. Life extension study would establish more refined schedule and cost.

[10] Estimated annual operating costs for proposed recycling facility.

[11] Estimated annual operating costs for proposed composting facility.

[12] Existing debt service through 2019 for Incinerator.

[13] Debt service or loan payments for proposed new recycling facilities.

[14] Estimated or projected new revenues or losses for solid waste and recycling programs.

PRO FORMA MODEL - "COMPOSTING FACILITY ONLY SCENARIO", MUNICIPALITY OF SKAGWAY, AK

	BUDGET YEARS									
Cost Element	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Operating Revenues[1]										
Dumpster Leases	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511
Recycling Revenue[2]	6,934	7,073	7,214	7,358	7,506	7,656	7,809	7,965	8,124	8,287
Garbage Service	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Subtotal	440,445	440,584	440,725	440,869	441,017	441,167	441,320	441,476	441,635	441,798
Transfer Sales Tax[3]	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Transfer Excise Tax[4]	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493
Transfer MOS Bond Fund[5]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
Total Operating Revenues	**$903,938**	**$904,077**	**$904,218**	**$904,362**	**$904,510**	**$904,660**	**$904,813**	**$784,969**	**$785,128**	**$785,291**
Operating Expenses[6]										
Administration	9,000	9,180	9,364	9,551	9,742	9,937	10,135	10,338	10,545	10,756
Capital Outlay	14,000	14,280	14,566	14,857	15,154	15,457	15,766	16,082	16,403	16,731
Contracts	45,000	45,900	46,818	47,754	48,709	49,684	50,677	51,691	52,725	53,779
Employee PR Expenses	75,149	76,652	78,185	79,749	81,344	82,971	84,630	86,323	88,049	89,810
Employee Health Insurance	86,478	88,208	89,972	91,771	93,607	95,479	97,388	99,336	101,323	103,349
Solid Waste Salaries	157,586	160,738	163,952	167,232	170,576	173,988	177,467	181,017	184,637	188,330
Recycling Program Salaries and Program[7]	0	40,500	41,310	42,136	42,979	43,839	44,715	45,610	46,522	47,452
Equipment	10,000	10,200	10,404	10,612	10,824	11,041	11,262	11,487	11,717	11,951
Hazardous Waste	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902
Incinerator Repair and Maintenance	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902
Insurance Liability	12,425	12,674	12,927	13,186	13,449	13,718	13,993	14,272	14,558	14,849
Recycling Expenses	110,000	0	0	0	0	0	0	0	0	0
Repairs and Maintenance	19,000	19,380	19,768	20,163	20,566	20,978	21,397	21,825	22,262	22,707
Travel	4,000	4,080	4,162	4,245	4,330	4,416	4,505	4,595	4,687	4,780
Utilities Incinerator[8]	201,300	164,261	167,546	170,897	174,315	177,801	181,357	184,984	188,684	192,458
Major Repair Incinerator[9]	0	0	0	0	0	650,000	0	0	0	0
Recycling Facility Operations[10]	0	0	0	0	0	0	0	0	0	0
Composting Facility Operations[11]	0	30,000	30,600	31,212	31,836	32,473	33,122	33,785	34,461	35,150
Total Operating Expenses	**$783,938**	**$716,852**	**$731,189**	**$745,812**	**$760,729**	**$1,425,943**	**$791,462**	**$807,291**	**$823,437**	**$839,906**
Financing Expenses										
Incinerator Debt/Loan[12]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
New Facilities Debt/Loan[12]	0	34,525	34,525	34,525	34,525	34,525	34,525	34,525	34,525	34,525
Total Financing Expenses	120,000	154,525	154,525	154,525	154,525	154,525	154,525	34,525	34,525	34,525
										10-Year Total
NET REVENUE OR LOSSES[14]	**$0**	**$32,700**	**$18,504**	**$4,025**	**($10,744)**	**($675,809)**	**($41,174)**	**($56,847)**	**($72,834)**	**($89,140)**	($891,320)

Notes:

[1] Existing MOS solid waste program fees; no CPI adjustment or rate increase assumed.

[2] Revenues received by MOS from recyclables dropped off at PWD or at Incinerator.

[3] Funds from the MOS sales tax fund are used to pay the annual debt service of the Incinerator.

[4] Funds from the Alaska Excise Tax is currently used to supplement the solid waste budget.

[5] MOS Bond Fund used to pay for the Incinerator debt service through 2019.

[6] MOS 2012 budget was used for most operating expenses except those noted in the notes below. These were escalated using a 2% annual inflation factor.

[7] Operating costs to fund an enhanced recycling public education and outreach program.

[8] Based on an conservative capture (50%) of compostables from MSW (residential and commercial), a 20% reduction of Incinerator burns is projected.

[9] Estimated costs to fund an Incinerator rehab similar to recent retrofit of refractory and duct work. Estimated cost escalated at 2% annually. Life extension study would establish more refined schedule and cost.

[10] Estimated annual operating costs for proposed recycling facility.

[11] Estimated annual operating costs for proposed composting facility.

[12] Existing debt service through 2019 for Incinerator.

[13] Debt service or loan payments for proposed new recycling facilities.

[14] Estimated or projected new revenues or losses for solid waste and recycling programs.

PRO FORMA MODEL - "RECYCLING+COMPOSTING FACILITIES SCENARIO", MUNICIPALITY OF SKAGWAY, AK

	BUDGET YEARS									
Cost Element	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Operating Revenues[1]										
Dumpster Leases	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511
Recycling Revenue[2]	6,934	12,744	12,999	13,259	13,524	13,795	14,071	14,352	14,639	14,932
Garbage Service	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Subtotal	440,445	446,255	446,510	446,770	447,035	447,306	447,582	447,863	448,150	448,443
Transfer Sales Tax[3]	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Transfer Excise Tax[4]	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493
Transfer MOS Bond Fund[5]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000
Total Operating Revenues	**$903,938**	**$909,748**	**$910,003**	**$910,263**	**$910,528**	**$910,799**	**$911,075**	**$911,356**	**$911,643**	**$911,936**
Operating Expenses[6]										
Administration	9,000	9,180	9,364	9,551	9,742	9,937	10,135	10,338	10,545	10,756
Capital Outlay	14,000	14,280	14,566	14,857	15,154	15,457	15,766	16,082	16,403	16,731
Contracts	45,000	45,900	46,818	47,754	48,709	49,684	50,677	51,691	52,725	53,779
Employee PR Expenses	75,149	76,652	78,185	79,749	81,344	82,971	84,630	86,323	88,049	89,810
Employee Health Insurance	86,478	88,208	89,972	91,771	93,607	95,479	97,388	99,336	101,323	103,349
Solid Waste Salaries	157,586	160,738	163,952	167,232	170,576	173,988	177,467	181,017	184,637	188,330
Recycling Program Salaries and Program[7]	0	40,500	41,310	42,136	42,979	43,839	44,715	45,610	46,522	47,452
Equipment	10,000	10,200	10,404	10,612	10,824	11,041	11,262	11,487	11,717	11,951
Hazardous Waste	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902
Incinerator Repair and Maintenance	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902
Insurance Liability	12,425	12,674	12,927	13,186	13,449	13,718	13,993	14,272	14,558	14,849
Recycling Expenses	110,000	0	0	0	0	0	0	0	0	0
Repairs and Maintenance	19,000	19,380	19,768	20,163	20,566	20,978	21,397	21,825	22,262	22,707
Travel	4,000	4,080	4,162	4,245	4,330	4,416	4,505	4,595	4,687	4,780
Utilities Incinerator[8]	201,300	123,196	125,660	128,173	130,736	133,351	136,018	138,738	141,513	144,343
Major Repair Incinerator[9]	0	0	0	0	0	650,000	0	0	0	0
Recycling Facility Operations[10]	0	25,000	25,500	26,010	26,530	27,061	27,602	28,154	28,717	29,291
Composting Facility Operations[11]	0	30,000	30,600	31,212	31,836	32,473	33,122	33,785	34,461	35,150
Total Operating Expenses	**$783,938**	**$700,786**	**$690,873**	**$704,690**	**$718,784**	**$1,383,160**	**$747,823**	**$762,779**	**$778,035**	**$793,596**
Financing Expenses										
Incinerator Debt/Loan[12]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
New Facilities Debt/Loan[13]	0	71,322	71,322	71,322	71,322	71,322	71,322	71,322	71,322	71,322
Total Financing Expenses	120,000	191,322	191,322	191,322	191,322	191,322	191,322	71,322	71,322	71,322
										10-Year Total
NET REVENUE OR LOSSES[14]	**$0**	**$17,640**	**$27,808**	**$14,251**	**$422**	**($663,683)**	**($28,070)**	**$77,255**	**$62,286**	**$47,018**	**($445,073)**

Notes:

[1] Existing MOS solid waste program fees; no CPI adjustment or rate increase assumed.

[2] Revenues received by MOS from recyclables dropped off at PWD or at Incinerator.

[3] Funds from the MOS sales tax fund are used to pay the annual debt service of the Incinerator.

[4] Funds from the Alaska Excise Tax is currently used to supplement the solid waste budget.

[5] MOS Bond Fund used to pay for the Incinerator debt service through 2019.

[6] MOS 2012 budget was used for most operating expenses except those noted in the notes below. These were escalated using a 2% annual inflation factor.

[7] Operating costs to fund an enhanced recycling public education and outreach program.

[8] Based on an conservative capture (50%) of recyclables and compostables from MSW (residential and commercial), a 40% reduction of Incinerator burns is projected.

[9] Estimated costs to fund an Incinerator rehab similar to recent retrofit of refractory and duct work. Estimated cost escalated at 2% annually. Life extension study would establish more refined schedule and cost.

[10] Estimated annual operating costs for proposed recycling facility.

[11] Estimated annual operating costs for proposed composting facility.

[12] Existing debt service through 2019 for Incinerator.

[13] Debt service or loan payments for proposed new recycling facilities.

[14] Estimated or projected new revenues or losses for solid waste and recycling programs.

PRO FORMA MODEL - "RECYCLING+COMPOSTING FACILITIES+CLOSE INCINERATOR SCENARIO", MUNICIPALITY OF SKAGWAY, AK

	BUDGET YEARS									
Cost Element	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Operating Revenues[1]										
Dumpster Leases	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511
Recycling Revenue[2]	6,934	12,744	12,999	13,259	13,524	13,795	14,071	14,352	14,639	14,932
Garbage Service	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Subtotal	440,445	446,255	446,510	446,770	447,035	447,306	447,582	447,863	448,150	448,443
Transfer Sales Tax[3]	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Transfer Excise Tax[4]	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493
Transfer MOS Bond Fund[5]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
Total Operating Revenues	**$903,938**	**$909,748**	**$910,003**	**$910,263**	**$910,528**	**$910,799**	**$911,075**	**$791,356**	**$791,643**	**$791,936**
Operating Expenses[6]										
Administration	9,000	9,180	9,364	9,551	9,742	9,937	10,135	10,338	10,545	10,756
Capital Outlay	14,000	14,280	14,566	14,857	15,154	15,457	15,766	16,082	16,403	16,731
Contracts	45,000	45,900	46,818	47,754	48,709	49,684	50,677	51,691	52,725	53,779
Employee PR Expenses	75,149	76,652	78,185	79,749	81,344	82,971	84,630	86,323	88,049	89,810
Employee Health Insurance	86,478	88,208	89,972	91,771	93,607	95,479	97,388	99,336	101,323	103,349
Solid Waste Salaries	157,586	160,738	163,952	167,232	170,576	173,988	177,467	181,017	184,637	188,330
Recycling Program Salaries and Program[7]	0	40,500	41,310	42,136	42,979	43,839	44,715	45,610	46,522	47,452
Equipment	10,000	10,200	10,404	10,612	10,824	11,041	11,262	11,487	11,717	11,951
Hazardous Waste	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902
Incinerator Repair and Maintenance	20,000	0	0	0	0	0	0	0	0	0
Insurance Liability	12,425	12,674	12,927	13,186	13,449	13,718	13,993	14,272	14,558	14,849
Recycling Expenses	110,000	0	0	0	0	0	0	0	0	0
Repairs and Maintenance	19,000	19,380	19,768	20,163	20,566	20,978	21,397	21,825	22,262	22,707
Travel	4,000	4,080	4,162	4,245	4,330	4,416	4,505	4,595	4,687	4,780
Utilities Incinerator	201,300	0	0	0	0	0	0	0	0	0
Major Repair Incinerator[8]	0	0	0	0	0	0	0	0	0	0
Recycling Facility Operations[9]	0	25,000	25,500	26,010	26,530	27,061	27,602	28,154	28,717	29,291
Composting Facility Operations[10]	0	30,000	30,600	31,212	31,836	32,473	33,122	33,785	34,461	35,150
Transportation of MSW[11]	0	87,217	37,961	38,720	39,495	40,285	41,090	41,912	42,750	43,605
Total Operating Expenses	**$783,938**	**$644,407**	**$606,296**	**$618,421**	**$630,790**	**$643,406**	**$656,274**	**$669,399**	**$682,787**	**$696,443**
Financing Expenses										
Incinerator Debt/Loan[12]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
New Facilities Debt/Loan[13]	0	71,322	71,322	71,322	71,322	71,322	71,322	71,322	71,322	71,322
Total Financing Expenses	120,000	191,322	191,322	191,322	191,322	191,322	191,322	71,322	71,322	71,322
										10-Year Total
NET REVENUE OR LOSSES[14]	**$0**	**$74,019**	**$112,386**	**$100,520**	**$88,416**	**$76,071**	**$63,479**	**$50,635**	**$37,534**	**$24,171**	**$627,230**

Notes:

[1] Existing MOS solid waste program fees; no CPI adjustment or rate increase assumed.

[2] Revenues received by MOS from recyclables dropped off at PWD or at Incinerator.

[3] Funds from the MOS sales tax fund are used to pay the annual debt service of the Incinerator.

[4] Funds from the Alaska Excise Tax is currently used to supplement the solid waste budget.

[5] MOS Bond Fund used to pay for the Incinerator debt service through 2019.

[6] MOS 2012 budget was used for most operating expenses except those noted in the notes below. These were escalated using a 2% annual inflation factor.

[7] Operating costs to fund an enhanced recycling public education and outreach program.

[9] Estimated annual operating costs for proposed recycling facility.

[10] Estimated annual operating costs for proposed composting facility.

[11] Transportation and disposal of MSW, biosolids, and other special wastes per Republic MSA. Would require development of transfer station at Recycling Facility, estimated at $100,000 capital expense.

[12] Existing debt service through 2019 for Incinerator.

[13] Debt service or loan payments for proposed new recycling facilities.

[14] Estimated or projected new revenues or losses for solid waste and recycling programs.

PRO FORMA MODEL - "CLOSE INCINERATOR SCENARIO" , MUNICIPALITY OF SKAGWAY, AK

	BUDGET YEARS									
Cost Element	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Operating Revenues[1]										
Dumpster Leases	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511	33,511
Recycling Revenue[2]	6,934	8,921	9,099	9,281	9,467	9,656	9,849	10,046	10,247	10,452
Garbage Service	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Subtotal	440,445	442,432	442,610	442,792	442,978	443,167	443,360	443,557	443,758	443,963
Transfer Sales Tax[3]	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Transfer Excise Tax[4]	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493	293,493
Transfer MOS Bond Fund[5]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
Total Operating Revenues	**$903,938**	**$905,925**	**$906,103**	**$906,285**	**$906,471**	**$906,660**	**$906,853**	**$787,050**	**$787,251**	**$787,456**
Operating Expenses[6]										
Administration	9,000	9,180	9,364	9,551	9,742	9,937	10,135	10,338	10,545	10,756
Capital Outlay	14,000	14,280	14,566	14,857	15,154	15,457	15,766	16,082	16,403	16,731
Contracts	45,000	45,900	46,818	47,754	48,709	49,684	50,677	51,691	52,725	53,779
Employee PR Expenses	75,149	76,652	78,185	79,749	81,344	82,971	84,630	86,323	88,049	89,810
Employee Health Insurance	86,478	88,208	89,972	91,771	93,607	95,479	97,388	99,336	101,323	103,349
Solid Waste Salaries	157,586	160,738	163,952	167,232	170,576	173,988	177,467	181,017	184,637	188,330
Recycling Program Salaries and Program[7]	0	0	0	0	0	0	0	0	0	0
Equipment	10,000	10,200	10,404	10,612	10,824	11,041	11,262	11,487	11,717	11,951
Hazardous Waste	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902
Incinerator Repair and Maintenance	20,000	0	0	0	0	0	0	0	0	0
Insurance Liability	12,425	12,674	12,927	13,186	13,449	13,718	13,993	14,272	14,558	14,849
Recycling Expenses	110,000	0	0	0	0	0	0	0	0	0
Repairs and Maintenance	19,000	19,380	19,768	20,163	20,566	20,978	21,397	21,825	22,262	22,707
Travel	4,000	4,080	4,162	4,245	4,330	4,416	4,505	4,595	4,687	4,780
Utilities Incinerator	201,300	0	0	0	0	0	0	0	0	0
Major Repair Incinerator	0	0	0	0	0	0	0	0	0	0
Recycling Facility Operations[8]	0	25,000	25,500	26,010	26,530	27,061	27,602	28,154	28,717	29,291
Composting Facility Operations[9]	0	30,000	30,600	31,212	31,836	32,473	33,122	33,785	34,461	35,150
Transportation of MSW[10]	0	211,650	113,883	116,161	118,484	120,854	123,271	125,736	128,251	130,816
Total Operating Expenses	**$783,938**	**$728,341**	**$640,908**	**$653,726**	**$666,800**	**$680,136**	**$693,739**	**$707,614**	**$721,766**	**$736,201**
Financing Expenses										
Incinerator Debt/Loan[11]	120,000	120,000	120,000	120,000	120,000	120,000	120,000	0	0	0
New Facilities Debt/Loan[12]	0	0	0	0	0	0	0	0	0	0
Total Financing Expenses	**$120,000**	**$120,000**	**$120,000**	**$120,000**	**$120,000**	**$120,000**	**$120,000**	**$0**	**$0**	**$0**
										10-Year Total
NET REVENUE OR LOSSES[13]	**$0**	**$57,584**	**$145,196**	**$132,560**	**$119,671**	**$106,524**	**$93,114**	**$79,437**	**$65,485**	**$51,255**	**$850,826**

Notes:

[1] Existing MOS solid waste program fees; no CPI adjustment or rate increase assumed.

[2] Revenues received by MOS from recyclables dropped off at PWD or at Incinerator.

[3] Funds from the MOS sales tax fund are used to pay the annual debt service of the Incinerator.

[4] Funds from the Alaska Excise Tax is currently used to supplement the solid waste budget.

[5] MOS Bond Fund used to pay for the Incinerator debt service through 2019.

[6] MOS 2012 budget was used for most operating expenses except those noted in the notes below. These were escalated using a 2% annual inflation factor.

[7] Operating costs to fund an enhanced recycling public education and outreach program.

[8] Estimated costs to fund an Incinerator rehab similar to recent retrofit of refractory and duct work. Estimated cost escalated at 2% annually. Life extension study would establish more refined schedule and cost.

[9] Estimated annual operating costs for proposed recycling facility.

[10] Estimated annual operating costs for proposed composting facility.

[11] Existing debt service through 2019 for Incinerator.

[12] Debt service or loan payments for proposed new recycling facilities.

[13] Estimated or projected new revenues or losses for solid waste and recycling programs.