Solid Waste Plan

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2013

Section I-Solid Waste Operations Summary

Overview

During fiscal year 2014, the City of Flagstaff Solid Waste Section (Solid Waste) will draft a Solid Waste Management Plan (SWP). The SWP will provide policy and program direction for the next decade. This section provides the community with a general overview of the existing Solid Waste program, with future considerations for development and growth. In addition the report provides suggestions on how to present the SWP to stakeholders within the community.

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10/24/2013

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Executive Summary

Flagstaff City Council (Council) established a priority for fiscal year (FY) 2013 to maintain and deliver quality reliable infrastructure. The City of Flagstaff Solid Waste Section (Solid Waste) responded to the goal by proposing a comprehensive solid waste management plan (SWP) by FY 2015. With an assumed vested interest in municipal solid waste (MSW) for the City and the region, it is only fitting that Solid Waste draft a comprehensive plan that addresses the program for the next ten years. The Operations Summary represents a baseline of the Solid Waste program as it currently exists, with highlights of possible considerations for growth in the future.

The Solid Waste program offers a wide range of residential and commercial trash collection services within the limits of Flagstaff. Some services are also extended into the County. Private solid waste providers both within the City and outside the City limits utilize Cinder Lake Landfill (CLL), as it is the only regional landfill within a 75 mile radius of the City. The facility footprint encompasses 346 acres and will remain open until it reaches capacity in approximately 40 years. Solid waste disposal will occur in cells A, B, and C (110 acres) for 9 to 13 years (depending on growth). Future expansions in cells D and E (136 acres) will require engineering controls such as a leachate collection system and an impervious cap. CLL is conducting research and development for materials that have the potential to act in lieu of the standard landfill cap and liner. In addition landfill staff is exploring the feasibility of excavating cell D to elevations greater than the prescribed design, thereby gaining an additional 5 to 20 years of landfill life.

Although the timeline for CLL is favorable, maintaining a strong diversion rate (above 40%) is a key element to ensuring the life of the landfill. Therefore affordable and realistic methods of diversion will continue to be explored.

The financial outlook for Solid Waste is expected to remain flat. However, management will continue to adjust for fluctuations in growth. Also any new Solid Waste programs will be studied carefully before they are introduced.

Many of the regional stakeholders (other government agencies and private solid waste services) rely on the City for collection, disposal, and recycling services. Since the stakeholders are likely to have an interest in the ten-year outlook of the Solid Waste program, they will be invited to a meeting led by Solid Waste during fall 2013. This will give stakeholders an opportunity to provide insight on how the City's strategy may influence their business decisions in the future. Staff is requesting that the City Manager motivate stakeholders to attend the meeting.

Solid Waste staff prepared a list of goals for the program which are meant to springboard discussion of the most relevant policy drivers thus far. Any changes or considerations by the City Manager and Council are welcome throughout this endeavor.

The SWP is scheduled to be completed and submitted to the City Manager by May 30, 2015. Over the next 8 months, Solid Waste staff will continue to draft sections of the plan while providing guidance for the endorsement, adoption, and implementation of the SWP.

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1 Solid Waste Plan

1.1 Purpose

The key purpose of a Solid Waste Management Plan (SWP) is to provide the community, and perhaps the region, with an outlook on the existing conditions, future challenges, and opportunities that are likely to be faced in the future. No matter what path the City of Flagstaff (City) Solid Waste Section (Solid Waste) takes in the future, the SWP will adjust to the needs of the community by proposing annual edits and additions for the program. As noted by this report, much of the framework for the SWP has already been prepared. Additional insight will be provided for the City Manager and Council to consider when making policy changes. Some of the questions that will require collaboration are the following:

- What are the City's goals in drafting the SWP?
- What initiatives (federal, state, local) affect the successful implementation of the SWP?
- What agencies are likely to have a role in the success of the SWP?
- What types of policy should be realized in drafting the SWP?
- What other agencies will be affected by the change in policy?
- What role do other stakeholders play in the SWP?

1.2 Existing Initiatives

The following section identifies agencies that drafted initiatives or plans for the implementation of solid waste management in the past.

1.2.1 Federal Initiatives

In 1976 congress enacted the Resource Conservation and Recovery Act (RCRA) which amended the Solid Waste Disposal Act of 1965. The law gave states the necessary authority and financial assistance to incorporate new provisions for the development of state planning guidelines (40 CFR Part 256 and 257).

1.2.2 State Initiatives

In response to the regulations, the State of Arizona Department of Health Services (now Arizona Department of Environmental Quality-ADEQ) drafted the Arizona Solid Waste Management Plan. The Arizona Solid Waste Management Plan (Arizona, 1981) designated six Councils of Governments as regional solid waste management planning agencies within the State of Arizona.

1.2.3 Regional Initiatives

In response to the previously mentioned state initiative, the Northern Arizona Council of Governments (NACOG) drafted their Solid Waste Management Plan in 1979. The document is a generic approach to solid waste management for the four counties in Northern Arizona (Apache, Coconino, Navajo, and Yavapai). So many changes have occurred since the adoption of the document, and many of the discussion items are outdated.

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In drafting the County Comprehensive Plan of 2003, the County made it a goal to reduce the amount of solid waste sent to landfills and minimize the impact of its disposal (Coconino County, 2003). The County currently utilizes Waste Management Joseph City Landfill and CLL as its final disposal facilities.

The County has also enacted a subdivision ordinance whereby "subdividers are required to indicate in their development proposal the distance between the new development and an approved sanitary landfill or solid waste transfer station. If this distance exceeds 10 miles, the subdivider must form a sanitation district to construct, operate, and maintain a new facility. This requirement may be waived if the subdivision is served by adequate private collection". It is unknown whether any sanitation districts have been formed within the County.

1.2.4 City Initiatives

The Flagstaff City Code-Chapter 07-04 (City Code) provides regulatory authority for the Solid Waste Section. Portions of the SWP will be guided by the City Code and its policy. The SWP will also help to determine whether changes in policy will occur and whether an ordinance will be required to carry the policy forward.

The City of Flagstaff Regional Plan, which applies to 525 square mile Flagstaff Metropolitan Planning Organization planning area, identifies CLL as the closest landfill within the region. Within the Flagstaff Regional Plan, CLL stated that "it remains a top priority to explore efficient and realistic methods of extending the useful life of this facility."

The City Sustainability and Environmental Management Section (SEMS) have prepared the following mission statement:

> "The Sustainability and Environmental Management Section's mission is to preserve and enhance the community and natural environment by implementing resource conservation and sustainability through projects, leadership and education."

1.3 Goals

In order for the Solid Waste program to remain financially solvent, it is imperative to assure municipal solid waste (MSW) continues to be delivered to CLL from the City and the region. The MSW has historically been perceived by many communities as a problem. Solid Waste strives to change the paradox so the community can realize potential resources that are available in the organic and recyclable fraction of MSW. Therefore, Solid Waste is proposing the following goals as a template of ideas meant to springboard the SWP into action:

- Establish a baseline of existing conditions and milestones within the Solid Waste Program
- Provide a path for optimization of the program
- Gain community endorsement (financial and otherwise) of the SWP
- Maximize diversion of recyclable materials by 2023
- Achieve full diversion and development of monetizable components of waste stream by 2025
- Maximize conservation of landfill airspace and soil resources by 2025

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Solid Waste staff will be requesting guidance from City Manager to decipher what goals work in concert with the City's priorities. Should any new policy changes be realized through the chartering of this project, then Solid Waste will seek direction on the implementation of new programs and how they might affect existing programs within Solid Waste.

1.4 Policy Changes and Stakeholder Input

The first volume of the SWP should not necessitate any policy changes for the City. However the introduction of concepts related to maximization of resource capture (recycling) may require changes in the SWP, and thereby additional ordinances may need to be adopted in City Code.

Appendix A identifies commercial and government solid waste organizations that rely on the Solid Waste program for the proper disposal of MSW and diversion. While each organization's level of support for the SWP varies, the City should take a pro-active role in planning for future solid waste needs within the municipality and the region. Future challenges can be achieved in a much more expedient manner if the program addresses a plan for growth. Existing financial projections and growth projections are discussed in subsequent sections. The financial projections also act as the baseline for determining the viability of additional programs within the Solid Waste. The City is in a unique position because CLL has assumed the role as the regional landfill even though it is ultimately the responsibility of the regional and state authorities to address how MSW is managed. With that said, the facility is a valuable asset, and it is in the best interest of the City to continue managing the baseline of MSW it receives from its citizens, while serving the needs of the region as well.

Over the coming months Solid Waste proposes to form a workgroup with private and public organizations throughout the region. The group will be provided with the necessary framework of existing policy and programs as outlined within the Operations Summary. A meeting is scheduled for the middle of November, 2013. Subsequent to the meeting, the work group will have 30 days to comment on the existing program and how it affects their business. Staff will review the comments and suggestions to determine whether they fit within the SWP ten year plan. Projects valid for future consideration should be analyzed through a feasibility study, and funded by the parties who have a vested interest in the technology or idea (discussed below). During spring, 2014 stakeholders will be invited to subsequent monthly meetings to review updates to the SWP.

It is likely that some stakeholders will have interest in programs that provide social benefit to the community. In the past the City has been approached by various vendors with a new technology that is touted to increase diversion while converting MSW to an alternative end-product (i.e. ash or compost). Staff is proposing that the stakeholders and vendors use the financial model (discussed in subsequent sections) to validate their concept. Staff is suggesting that the stakeholder or vendor contract with a qualified Arizona state licensed professional engineer to validate their concept. This allows staff to have a consistent perspective in evaluating whether a project is worthy of consideration over the next ten years.

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1.5 SWP Schedule

Solid Waste is dedicated to completing the SWP in Fiscal Year 2014 (FY 14). The project schedule shown in Table 1 is rigorous with very little accommodation for scope creep. Project Managers will continue to provide updates to the schedule as the scope of work becomes more refined over the coming months.

Table 1-Forecast of Scheduled Tasks Necessary for Completion of the Solid Waste Plan

Task	Start	Finish
Solid Waste Plan Schedule	**7/3/13**	**6/2/14**
Operations summary		
Project Coordination Meetings	7/3/13	8/1/13
1st Draft Operations Summary	7/8/13	8/14/13
Leadership Meeting and Endorsement	8/2/13	9/3/13
Preparation for Operations presentation to Leadership	8/2/13	9/17/13
Operations Presentation to Leadership	9/17/13	9/17/13
Stakeholder gathering		
Stakeholder Invitation Prepared and mailed by City Manager	9/17/13	9/30/13
Determine outsourcing needs (mediators or professional consultants) and prepare Scope and RFP's	11/14/13	12/13/13
Stakeholder Comments Accepted and Compiled	11/29/13	12/30/13
Stakeholder Comments Prepared in a Memo for Management and Leadership	12/30/13	1/8/14
Present stakeholder comments to Leadership	1/14/14	1/16/14
Prepare SWP		
Draft Sections of SWP	9/23/13	4/16/14
Preparation for Stakeholder Meetings	10/8/13	11/12/13
1st stakeholder meeting	11/12/13	11/14/13
Meeting with mediator-determine goals, objectives, and roles for stakeholder meetings	1/16/14	1/16/14
Monthly community meeting	1/28/14	1/28/14
Monthly community meeting	2/28/14	2/28/14
Monthly community meeting	4/1/14	4/1/14
Monthly community meeting	4/30/14	5/2/14
SWP Submitted to Leadership for review		
Meeting to discuss 1st draft of SWP with Leadership and Management	4/16/14	4/16/14
1st Review of SWP and comments by Leadership	4/18/14	5/2/14
2nd Draft of SWP prepared by staff	5/2/14	5/16/14
2nd Review of SWP and comments by Leadership	5/16/14	5/23/14
Final draft of SWP prepared by staff	5/23/14	6/2/14

Details on the schedule for adoption of the SWP have not been addressed yet. We expect to address that schedule on the first meeting in January, 2014.

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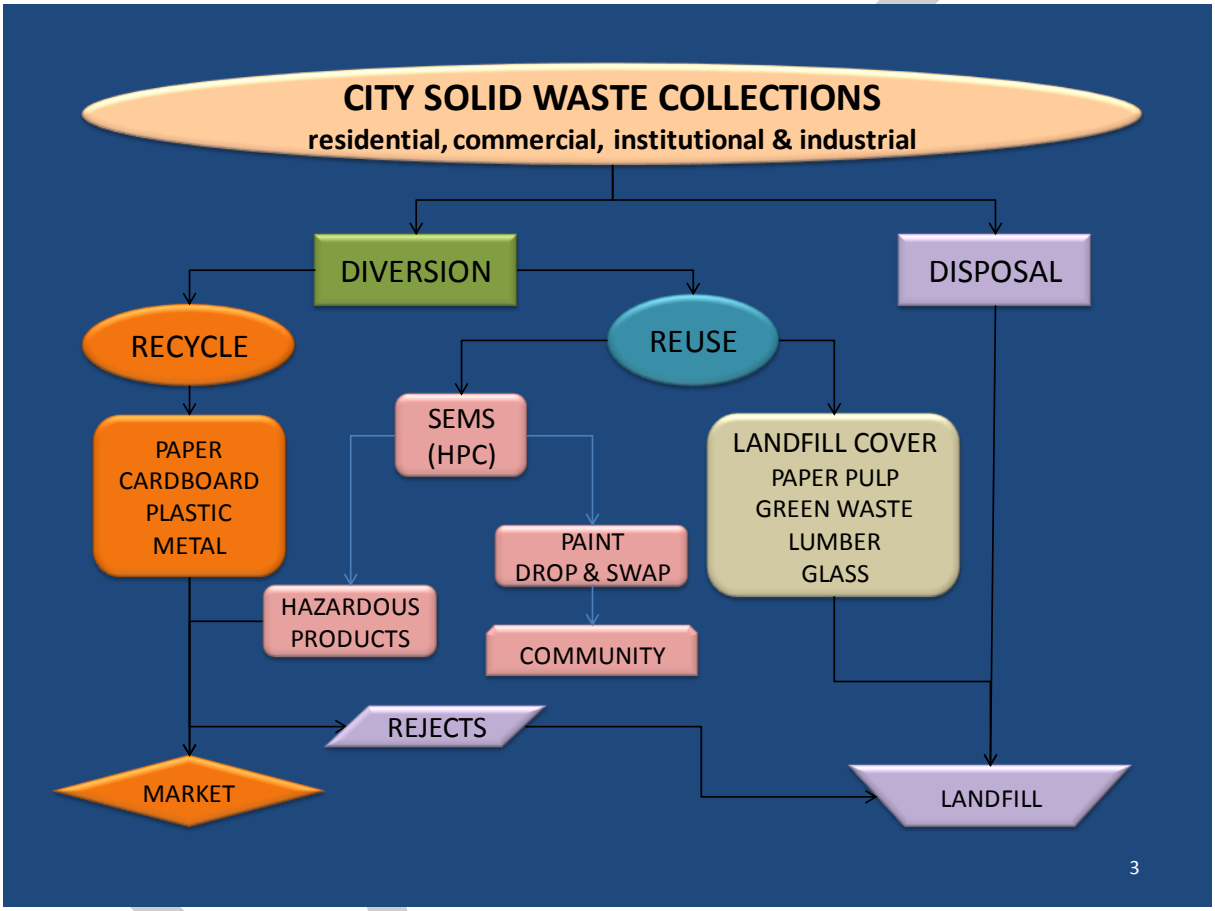
2 Operations Summary

This section provides an overview of current services and the opportunities for growth within Solid Waste Section (Solid Waste).

2.1 Structure of Solid Waste Program

Solid Waste currently maintains the following operations within the program:

Figure 1-Existing Diagram of the Structure of the Solid Waste program



2.2 Services Offered within Solid Waste

Landfill

Cinder Lake Landfill is the only permitted landfill within Coconino County. The facility is open to the public 6 days a week throughout the year. The current rate of trash disposal is 279 tons per day (Appendix A). There is currently not enough soil to cover the entire landfill through its life (approximately 41 years). Therefore the operation uses alternative daily cover (ADC) in the form of paper pulp millings from the SCA Tissue plant in Flagstaff mixed with green waste. Approximately 135 tons of (ADC) was delivered daily to Cinder Lake Landfill in FY 13.

Dry Lake Inert Material Pit
The Dry Lake Inert Materials Pit (Dry Lake Pit) is located on Forest Service Rd. 231 approximately 2 miles south of West Route 66. The facility is sited on Forest Service Land and is open upon request to the public. Yearly maintenance to the site is required. In addition the site is permitted under the Arizona Pollutant Discharge Elimination System. Materials are diverted from the landfill and used to reclaim the old cinder mining operation. The facility is permitted to accept rock, dirt, cinder blocks, and clean concrete.

Residential Trash Collection
The residential trash collection program is responsible for servicing some 17,000 homes weekly. Currently, the City is divided into 4 sections, or routes. Service days are Monday, Tuesday, Thursday, and Friday. The 4.5 operators who collect these areas work 10 hr. shifts.

Bulky Trash/Woodwaste
This program is responsible for the curbside collection of household bulky items as well as tree limbs, yard waste, etc. The work is performed by 2 trucks with 2 operators each. The trucks are loaded with an articulated loader, purchased in FY 09/10. The loader increased productivity and efficiencies, allowing for collaboration with Flagstaff Fire Department to remove slash piles from forest thinning projects. Capture of this green waste reduces carbon emissions due to burning as well as providing valuable Alternative Daily Cover for Cinder Lake Landfill.

Commercial Trash
This program collects trash from commercial businesses, apartments and town homes. The operation runs 7 days a week. The operators work 10 hr shifts with staggered off days in order to provide route coverage and meet customer service expectations.

Residential Bin Maintenance-
This program is responsible for the delivery, pick up, cleaning, and repair of residential curbside containers. Other duties include special events, collection of white goods (weekly), collection of move- in boxes, pre- baled cardboard, pick up and disposal of dead animals from Flagstaff's streets (dogs, cats, skunks, deer, etc.), snow removal when needed, and the operation of any and all solid waste collection vehicles when needed. The position may respond to customer "emergencies" after hours or on weekends.

Commercial Bin Maintenance
This program is responsible for all commercial and roll off container deliveries, repairs, painting and cleaning. Other duties include welding, fabrication, and design, delivery and pick up of temporary bins, repairs and fabrication of gates, enclosures, etc. The position has a high degree of interaction with internal and external customers on a daily basis, and is a large factor in customer satisfaction & retention. Both bin maintenance programs respond to customer requests within 24 hrs. Most times same day service is provided. The position is also required to operate solid waste collection vehicles when needed.

Hoist & Haul (Roll Off)
This program services commercial and residential customers with a variety of needs. Construction materials, clean ups, grocery store and food service compactors(including NAU and Flagstaff Medical Center), recycling, and glass recycling drop off locations are all a part of this program. The program currently has 3 assigned operators who run Mon – Fri., with some

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Sat. & Sun. pulls by request. The operators work a 5 day, 8 hr schedule in the fall and winter months when activity is slower. During the busy season they work 4 -10 hr days.

Residential Recycling
The residential curbside recycling program operates much like the residential trash program, with approximately 17,000 homes to service.

Commercial recycling
This program is similar to the commercial trash program, with the exception of the schedule. Recycling collection is currently Monday- Friday. As volumes increase, Saturday collection may be considered.

Glass Collection
In addition to City provided Glass Collection Drop-Off Location sites, The City of Flagstaff Solid Waste Section offers glass collection to residential customers on a subscription basis ($3.55 / month).

Administration
The administrative staff handles all dispatch and phone calls from the public. In addition they provide support in accounting and book keeping for the program. Administrative assistants are posted at the Public Works Yard and the Scale House at Cinder Lake Landfill.

Program Assistant- Sales
This position is responsible for increasing our market share in all commercial programs, increasing the volume of recyclables collected, and providing excellent customer service. The position helps to provide services to meet customer demands, “right sizes” service levels, and provides information on all services provided.

3 Existing Budget

3.1 General Observations of the Solid Waste Section

The community often seeks to understand whether certain services or solid waste technologies could successfully be introduced into the Solid Waste Section. In the past, decisions of whether to provide certain solid waste services were weighted on the potential social costs and benefits rather than fiscal policy. In addition many diversion technologies (i.e. composting, glass recycling, and biomass recycling) were not vetted against a recognized model that accounted for the Section’s future. However, the financial projections presented in this discussion represent a balance between responsible fiscal policy and environmental stewardship over the next five years.

The Solid Waste Section has historically remained financially solvent. This is due in part to the City’s ability to successfully track and anticipate changes in solid waste disposal rates within the City and the region. Although the existing program is stable, it is important to note that small decreases in revenue have the potential to affect the potential success of the Section. Figures 2 and 3 are meant to provide an example of how variables in revenue can affect the program. Figure 2 shows the five year outlook for the program as it exists today. The projections assume

that all revenue will increase 2% year over year. Figure 3 shows what the affect is by lowering commercial revenues to 1.5% per year and residential revenues to 0.5% per year. If the scenario in Figure 3 were to occur, then management would certainly revise its capital expenditures to accommodate the lack of growth. However, the exercise clearly demonstrates the importance of ensuring the consistent flow of MSW while maintaining competitive disposal rates for the City and the region.

Figure 2-Projection of Existing Program

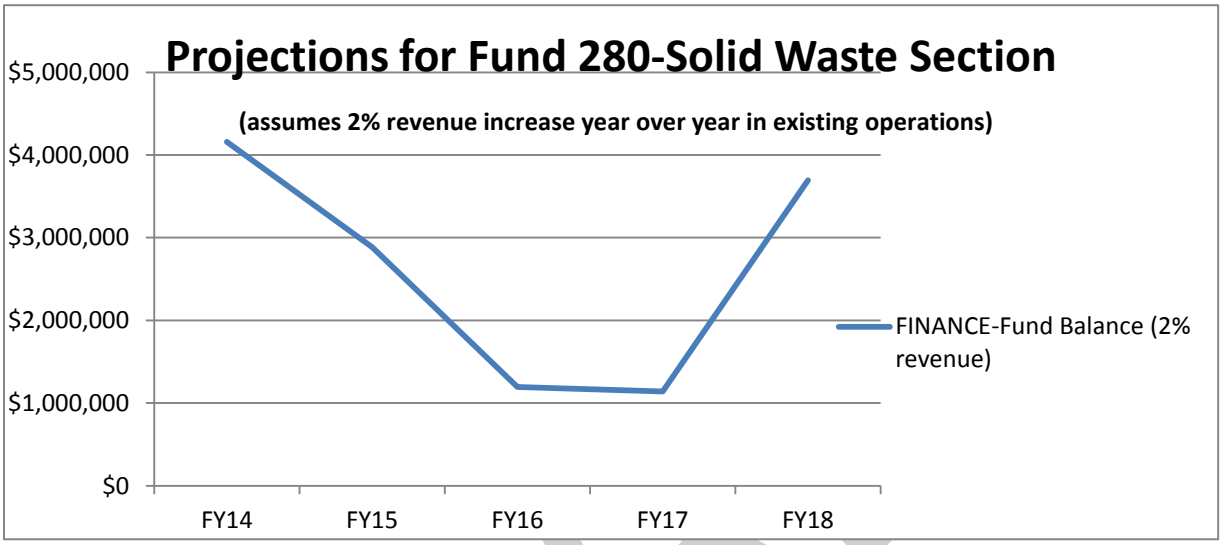
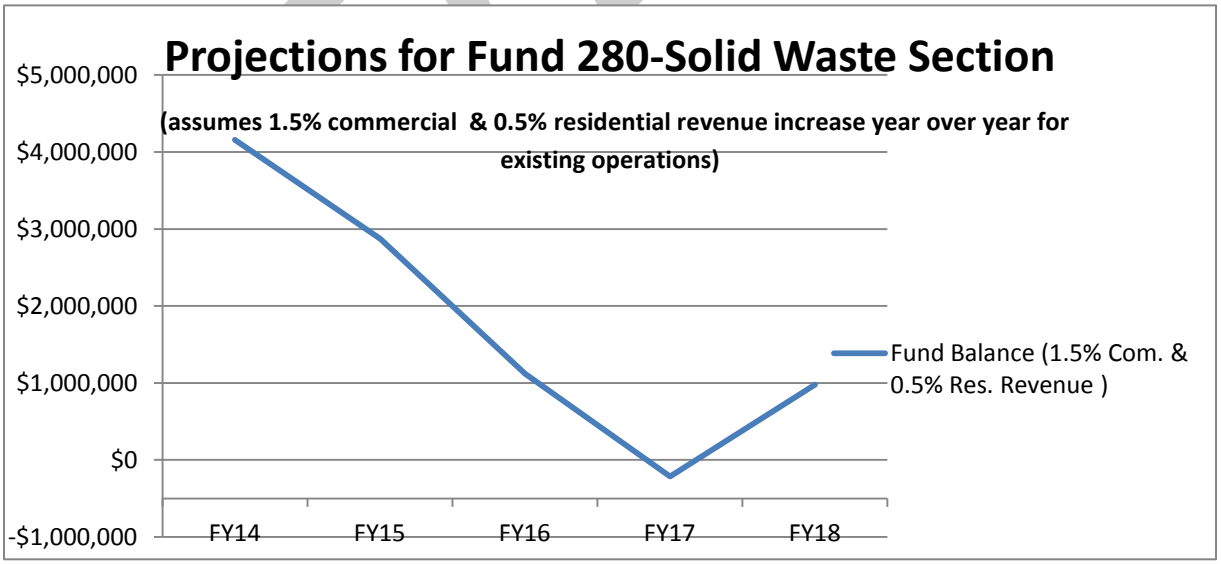


Figure 3-Scenario depicting year over year revenue increases of 1.5% for commercial collections and 0.5% for residential collections



The SWP will act as a reference for the community to better understand the triggers which will allow the program to consider additional services or sustainable technologies. Should the community propose alterations in the path-forward, then it should be up to the interested parties to demonstrate how the service or technology will work within the framework of the existing

projections through a cost benefit analysis. As previously discussed, those interested parties should prepare a feasibility study under contract with an Arizona licensed professional engineer.

Council would also be given the opportunity to direct Solid Waste to perform internal studies during the annual review of the SWP. Staff would use the exiting financial projections to perform a cost benefit analysis that compares the existing program with the proposed changes.

Budget decisions are typically based on the considerations of a program's existing financial conditions. However in order for the Solid Waste program to prepare for future developments, it may be necessary to consider some up-front capital expenditures in order to realize significant savings within a reasonable payback period. The SWP will serve as the mechanism that identifies projects that have been vetted by Solid Waste staff or another qualified professional. These projects are discussed in sections 5 and 6.

3.2 Collections Program

Budget projections- Solid Waste Collections has budgeted flat for FY14, with minor adjustments between line items and overtime projections to account for position vacancies, fuel costs and Fleet Services rate adjustments. Residential collections are expected to increase by approximately 400-600 units over the next 2 years in high density in- fill areas such as the Sawmill project and Presidio in the Pines. No rate increases are projected in the foreseeable future.

3.3 Landfill Program

The Cinder Lake Landfill has experienced a 9% decrease in tonnage since the recession starting in FY 2009. The main reason for the decrease is due to the change in consumer trends, which now shows a conservative spending pattern. Landfill expenditures will continue to be adjusted in concert with consumer trends in anticipation of a new baseline in per capita waste disposal.

With the changes in consumer trends over the past five years, a decrease in solid waste from Flagstaff and municipalities around Northern Arizona has occurred. However landfill disposal volumes from other municipalities have historically contributed less than 10% of the total volume buried in the landfill. Therefore it is anticipated that there will be little chance for a decrease in disposal rates unless another recession were to occur.

4 Regulatory Compliance for CLL and Dry Lake Inert Material Pit

Maintaining regulatory landfill compliance for CLL and Dry Lake Inert Material Pit (Dry Lake Pit) typically comes with a fixed annual cost to the program (unless unforeseen exceedances occur). There are currently no new regulations being discussed at the state or federal level. There are two employees in Solid Waste that manage employee training, environmental monitoring and reporting activities for CLL. A total of 750 hours per year is spent to ensure that CLL is within the federal and state rules and regulations as discussed Appendix C.

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5 Growth and Development of the Solid Waste Section

There are many factors that depend on the successful development of the Solid Waste Section. Decisions are heavily weighted on economic factors and how they will affect the community. The most pertinent discussion pieces are found in the following sections. Additional factors are also rooted in Appendix A, B, and C.

5.1 Collections

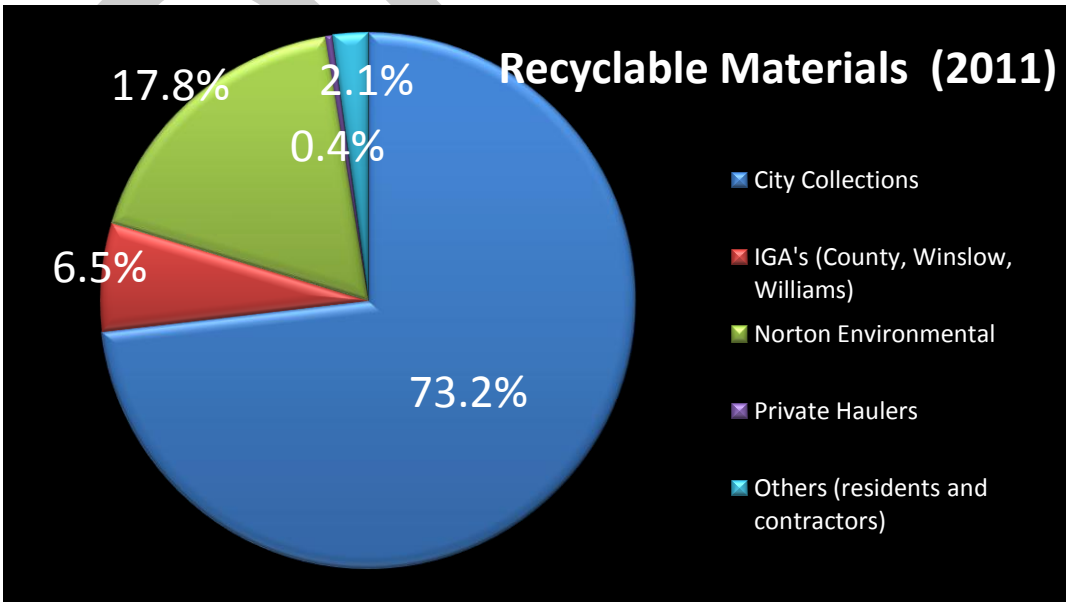
Collections fleet is adequate for the current work load. Commercial equipment ranges from 2008 and newer. While some older equipment remains on-line, aging equipment is scheduled for replacement over the next 2-3 years. The number of trucks to be replaced in the future will be determined by economic factors based on development of subdivisions within the City.

5.2 Municipal Solid Waste Diversion

The City recycling program operates under a format known in the industry as a co-mingled system. Research shows that citizen participation increases in this type of system for the fact that individuals are not required have separate bins for cardboard, paper, metals, and plastic. In addition the level of contamination is decreased in a co-mingled recycling operation. However, even the most stringent recycle programs will experience contamination in some manner. Therefore all rejected recyclables from Norton Environmental are typically delivered to the landfill every other day.

In FY 12 CLL conducted a waste audit to determine characteristics of waste coming from both the rejected recycle waste and trash at the landfill. The majority of trash and recyclables are generated within the City. For purposes of the waste audit, the most reliable sources of trash stem from the city's own collection services (Figure 5).

Figure 4-City Recyclables Versus Others in 2011



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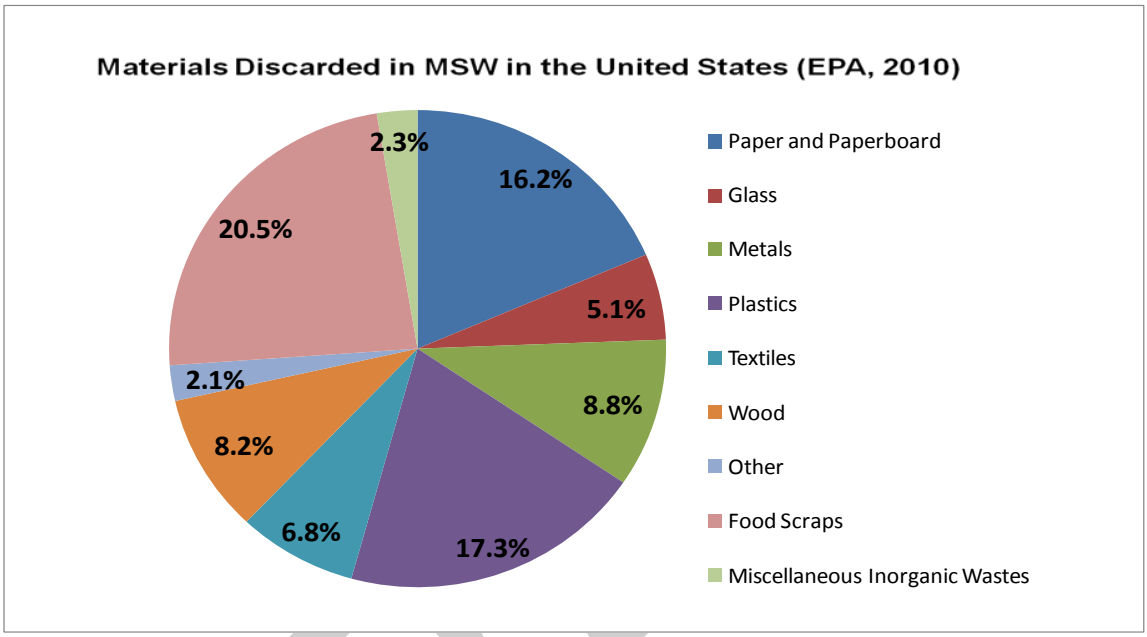
Subsequent to the audit we compared results with the existing disposal rates in the United States (EPA, 2010). Note that disposal of miscellaneous inorganic waste is much higher on the city pie chart. This difference is likely because the EPA data represents waste that was mechanically sorted and hand sorted prior to sampling. Whereas the majority of waste audited for our study was only hand sorted.

Figure 5-Disposal Rates for the United States



It is also worth noting that our approximate disposal rate is much less than that of the country as a whole. City disposal rates are at approximately 2.0 lb per person per day.

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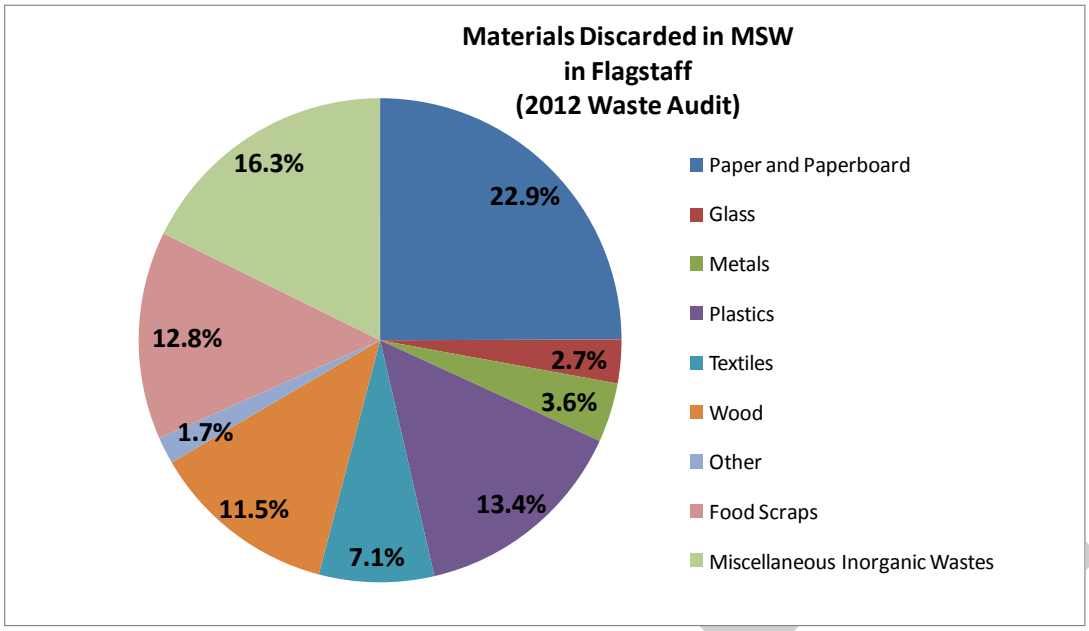
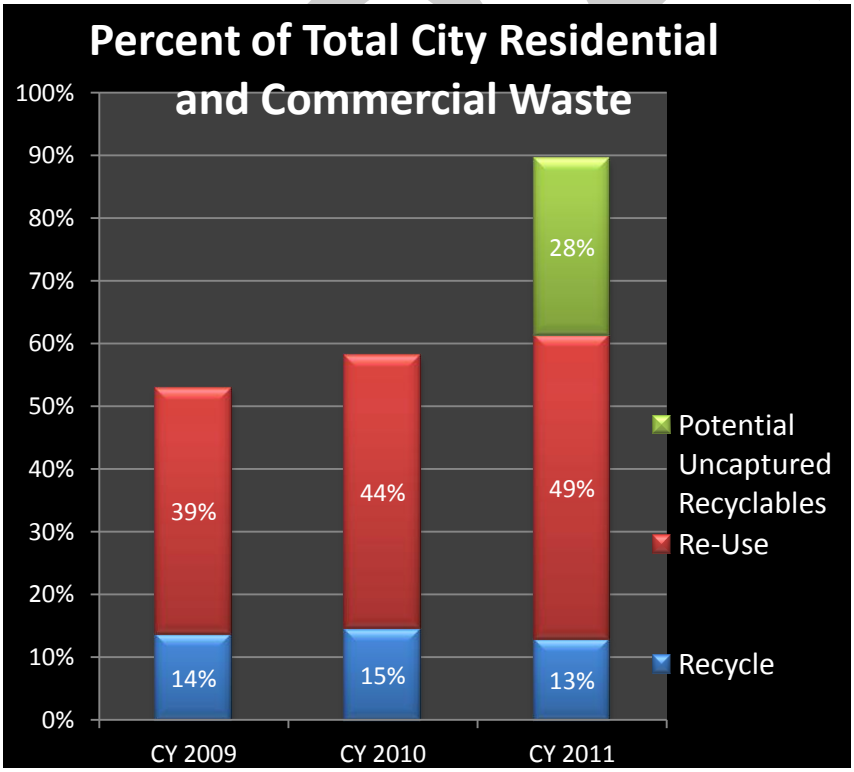
Figure 6-Disposal Rates for the City of Flagstaff



Approximately 28% of the material disposed in the city solid waste bins could have been sent to the Material Recovery Facility (MRF) as recyclable goods, thereby increasing revenue in the profit share program.

Figure 7-Trends for Recycle Rates within the City of Flagstaff



Over the years definitive correlations were noted between economic conditions and the amount of trash people throw away. Since 2009 disposal rates have been relatively flat. Recycle rates have also dipped slightly. However, we have seen increases in the past few years in the overall diversion rate.

Paper pulp millings from SCA Tissue are delivered daily to CLL. The material has been approved by ADEQ as an alternative daily cover. The use of paper pulp millings has undoubtedly decreased the existing soil deficit at the facility.

Exclusive loads of Green waste (tree limbs and stumps) and lumber are delivered to CLL by the public. The product is processed through a grinding operation and used as an amendment to paper pulp millings for alternative daily cover.

5.3 Landfill Growth and Development

Five cells are designated for land disposal activities at CLL. The cells (also known as sequences) are labeled in the existing design as A through E (Figure 4). Sequence A thru C (110 acres) is where MSW has been historically disposed since 1965. Even though the cells are not lined, the landfill was permitted to continue placing MSW within Sequence A thru C. When the sequences are completed, they will have to be finished off with a cap that falls within guidelines. Sequence A thru C will last another 9 to 13 years (depending on growth rates). Expanding the operation to Sequences D and E (136) will require the facility to follow guidelines for design and construction of landfills with an approved liner. The expected closure of Sequence E will occur sometime near the year 2054.

5.4 Phasing and Construction Plans

The existing design shows an overall plan for the development of the landfill. However, it does not specify the manner in which each sequence should be phased over time. Over the next fiscal year MSW will be placed at the maximum design elevations within the northern portions of Sequence B. When constructing the maximum design elevations, it is essential to have a clear strategy for the placement of MSW. Therefore project managers will be working with the landfill manager and supervisor to design the roadways, stormwater controls, and an overall plan for phasing each cell within the sequence. The relevant portions of sequencing and phasing will be noted and diagrammed in the Regional Solid Waste Management Plan.

5.5 Gaining Efficiencies in Future Sequences

Although the closure of Sequences A thru C will not occur for approximately 9 years, it is necessary to start planning for future infrastructure needs. In consideration of the future cell construction, project managers are exploring how the City may be able to incorporate advanced technologies that would not only provide positive financial returns, but would also help subsidize the development of future sequences.

5.6 Excavation of Sequence D

Prior to identifying advanced technologies, it is necessary to determine where the existing design could be improved. The CLL Solid Waste Facility Plan acts as the guiding construction document and prescribes excavation depths within the future expansion area known as Cell D

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as shown in Figure 8 (33 Acres). The depths established by the engineer of record were based on the elevations for marginally rippable (extractable) rock, as determined by drillers' logs and geophysical surveys. The engineer assumed that the desirable method of excavation was through mechanical removal by bulldozers and excavators with minimal blasting. Since that time there have been multiple excavations performed on-site. Project managers determined drilling and blasting will be a more practical method to successfully extracting rock and soil from the site.

In fall 2012, CLL embarked on an extensive drilling and sampling operation. The mission of the project was to determine whether it was feasible to drill and blast below the prescribed elevation within Cell D. Results from the study indicate that excavation below the design elevation is potentially feasible based on the following considerations:

- The *in situ* rock is a potentially valuable resource to consider as aggregate for future applications in roadway construction for the region. The nearest source of aggregate is located approximately 40 miles north of Flagstaff at the CEMEX Gray Mountain Plant.
- The "slag" generated from processing rock would decrease the existing soil deficit, which is approximately 1.2 to 2.6 million cubic yards.

The potential excavation would not conflict with the aquifer, as it lies in excess of 1,600 feet below the landfill footprint. Project managers concluded that the existing design could be exceeded by as much as 20 feet. However, the operation would involve mining portions of buried MSW within Cell C to achieve such elevations (additional discussions in Section 7 pertain to landfill mining). The additional airspace gained over that time is likely to result in another substantial landfill life as shown in Table 2. Although growth rates in the long-range cannot be accurately predicted, the results from this study have already demonstrated that additional investigation is warranted.

Table 2-Comparison of Closure Dates with Potential Expansion in the Cell D

Condition	Approximate Closure Date
Existing Design	2054
Expansion with Disposal rate increase of 3% per year	2059
Expansion with Disposal rate increase of 1% per year	2086

The next stage will be to prepare a phasing and staging diagram for processing aggregate and soil. The study will result in a comprehensive proposal to consider for future development of the site. Although excavation is not required for another decade, the planning, staging, and sale of aggregate could take years to complete.

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Figure 8-Existing Aerial Photo of Cinder Lake Landfill (spring, 2011) Not to Scale

5.7 Alternative Cap and Liner Designs

The volumes of paper sludge delivered every day to CLL are large enough (80 to 120 cubic yards per day) to warrant its use as an alternative liner and cap material since future sequences will require the implementation of landfill liners and caps that meet federal and state standards. The cost for traditional cap is approximately $55,000 per acre (includes all infrastructure).

In 2012 the City collaborated with Northern Arizona University College of Engineering and Natural Sciences to conduct preliminary studies on the use of paper pulp millings as a primary component for an alternative landfill cap (see Section 6). The material was deemed favorable when mixed with binders such as fly ash. The students arrived at the following results:

- Paper pulp millings alone do not create a viable cap or liner
- When mixed with smaller particle size materials (and larger surface area), the mixture can successfully be used as a barrier
- Cost analysis will require further investigation
- Additional research is warranted to determine if the product has any structural limitations.

CLL is also in the process of studying the use of polymers to optimize the performance of paper pulp millings as a liner. Preliminary results demonstrate that certain long-strain polymers are likely to perform successfully. However, additional research will be conducted to qualify the validity of the product.

Both the liner and the cap systems will require additional lab testing under controlled conditions. If either or both of them prove favorable in the lab, Cell D will be used as a pilot study area for the implementation of the products in the field. The pilot study would likely consist of multiple acre-sized plots of MSW to be placed atop the alternative liner. The alternative liner would be constructed on top a conventional liner system. The conventional liner would collect any leakage that occurred through the alternative liner.

It would be most efficient to conduct the study in cells where the final design elevation is achieved. Regardless of whether the City pursues deeper cells as previously discussed, it would be most efficient to excavate to whichever elevation is decided upon when constructing the multiple acre-sized cells.

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6 Waste Utilization and Conversion Technologies

There are many existing and developing waste utilization and conversion technologies in the solid waste industry. Some have been proven in large scale commercial applications and others have yet to be scaled up from a bench model. CLL is apprised of most of these technologies either through industry contacts or scientific literature and they have been reviewed in varying detail to determine which of the technologies would be feasible to deploy. The first and foremost consideration is the potential project's ability to pay for itself. There is no benefit in saddling Solid Waste operations with ongoing additional expenditures. A criterion of factors is as follows:

- The ability and longevity of the technology to continuously produce a sellable commodity
- A buyer willing to enter into contract to purchase and take possession of the commodity over the lifetime of the project
- Complies with all federal, state and local regulations that govern Solid Waste Section operations

6.1 Traditional Landfill Gas Extraction

Over the past three years studies have been conducted to determine the viability of landfill gas extraction at Cinder Lake Landfill. This type of technology has been in use in the United States for over 25 years at over 500 landfills. The process involves drilling and installing landfill gas extraction wells throughout the existing footprint of the landfill. A network of surface piping is used to convey landfill gas collected from wells to an area where the gas can either be processed for conversion to beneficial energy use or can be flared off to the atmosphere. In both processes methane is converted to carbon dioxide and energy, thereby reducing the global warming potential of the gas by a factor of 21. This would reduce the amount of carbon dioxide equivalents that CLL would have to disclose in its annual green house gas emissions report to the Environmental Protection Agency. The energy derived from these conversion processes can be used to offset the use of fossil fuels. The results of the studies indicate the following:

- CLL is not required to place landfill gas extraction and control systems in place because the facility falls below the EPA New Source Performance Standards threshold of 50 megagrams of Non Methane Organic Compounds per 40 CFR 60 Subpart WWW (EPA, 1999)
- There is adequate potential methane gas flow rates and concentrations at CLL to warrant pursuing landfill gas to energy opportunities
- Selling the gas to an industrial end user yielded a very low return on investment with very long payback periods
- Sending the gas to Wildcat Waste Water Treatment Plant would yield significant cost savings as compared to paying for natural gas for a sludge drying operation
- The option with the best return on investment and the shortest payback period was to convert landfill gas into fuel that can be used by the City fleet

Traditional landfill gas extraction has been demonstrated favorably over many years at many landfills in the United States. However, in order for this technology to be successful over the life of the project there has to be a guarantee that the organic fraction of the waste steam will not be

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diverted from the landfill. This means that any new technologies utilizing organics outside of a traditional landfill operation will not be able to be deployed; even if these technologies can make better use of the organic fraction of the waste stream.

6.2 Alternative Technologies

The City has been working with Northern Arizona University College of Engineering and Natural Sciences students during FY 13 to determine the viability of using paper pulp millings as alternative cap for CLL (NAU, 2013).

Various components of the waste stream that enter the landfill have potential economic value. These include but are not limited to:

- Organics
- Plastics
- Precious Metals (i.e. Copper)
- Aluminum
- Steel
- Office Paper
- Cardboard
- Newspaper
- Magazines
- Paper Pulp and Alternative Cover

One way to develop beneficial uses of these resources is to separate the waste stream into individual components. The advantage of this is to create relatively homogonous feedstock which in turn can either be fed into a waste conversion technology process or sent to Norton Environmental for recycling.

Organics can be used to generate natural gas and/or compost. Older, traditional organic waste conversion technologies forced mangers to choose between these two end products. Now a promising technology called Organic Waste Recycling Biomodule purports to do both. Natural gas generated from this process could be sold to an industrial end user. Revenue from the sale of gas would pay for the implementation and life of the organic waste conversion project. In addition compost can be made available to businesses and residents. The compost can also be used as cover material at CLL (see Section 6 regarding soil deficiencies). A cursory investigation of the feasibility of this technology concluded that more investigation is warranted.

Plastics 3-7 can be converted to crude oil by utilizing a process that volatilizes organic compounds found in plastics (Plastics-to-Oil). The vapor generated from this process is then condensed into crude oil which could then be transported to a refinery (i.e. Ciniza Refinery in Gallup, New Mexico) for further processing. This technology is also being investigated for its feasibility.

Waste-to-Energy is a process by which MSW is directly converted to energy. Deployed in its traditional form, this process is accomplished through combustion of MSW to generate electricity. Through investigating traditional landfill gas utilization technologies, the local electric

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utility is not interested in purchasing electricity from small scale power generation projects at this time. Also the net return on investment of waste utilization projects that generate electricity is generally substantially less than deploying a waste conversion technology that generates a solid, liquid or gas fuel. Given these considerations, project managers are reviewing non-traditional forms of Waste-to-Energy conversion processes that can generate a solid, liquid or gas fuel commodity. This is done by limiting oxygen and adding heat to the waste conversion process to avoid combustion. Project managers are in the initial stages of investigating this new technology.

Securing and sometimes separation of feedstock is essential for deploying any of previously mentioned waste conversion technologies. For example, in a Plastics-to-Oil operation, separation of MSW is essential. In an Organic Waste Recycling Biomodule, ensuring a continual input of homogenous feedstock is less essential (but still favorable). Finally, waste segregation is minimal for a Waste-to-Energy facility.

There are many benefits to waste separation. Any precious metals derived from the separation process can be sold within the recycling market. Plastics 1 and 2, aluminum, steel, office paper, cardboard, newspaper, and magazines can be taken to Norton Environmental for recycling. Recovering recyclables from the waste stream would likely help bridge the gap between the guaranteed minimum daily tonnage requirements the City is obligated to provide through 2023 to Norton Environmental. Since waste separation provides a mechanism for diverting more material away from the landfill, additional airspace will be conserved thereby extending the life of the landfill.

Landfill mining can provide feedstock for all the process described above, while substantially increasing the life of the landfill. Although the operation is likely to be financially prohibitive by itself, when paired with other perspective projects it may prove to be more attractive. Therefore the feasibility of landfill mining, in compilation with the expansion of sequence D (see Section 6) is being investigated.

6.3 Future Outlook for Alternative Technologies

More than likely the processes described above will be successful if they are implemented in a suite of technologies over time. Since MSW consist of a multitude of valuable resources, a comprehensive approach must be taken to develop these assets. The outlook of solid waste is paradoxical when compared with traditional public perception. It is in the best interest of the City to view solid waste as a resource that has ever-changing value (financial and environmental) for society over time. There are many commodities that can be extracted and created from MSW. As conversion technologies continue to mature, certain variables may generate financial returns that outweigh the existing model, which supports burying trash in the landfill. It's likely that there will always be some residual material from the conversion processes needing to be disposed in a landfill.

Project Managers have explored reasonable mechanisms that maximize the conversion or reuse of solid waste into valuable materials. Therefore a set of potential goals have been proposed that are in alignment with the Project Manager's role (discussed in Section 1.3).

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7 Conclusion

The key purpose of a SWP is to provide the community, and perhaps the region, with an outlook on the existing conditions, future challenges, and opportunities that are likely to be faced in the future. Many organizations have touted diversion of waste as a main priority for the community. However the strategy for achieving waste diversion were never outlined with significant detail. The only known solid waste plan for the region was drafted in 1979 by NACOG.

Because CLL assumes the role as a regional landfill, it is only fitting that the City paves the way for the future growth by preparing a comprehensive SWP for the municipality and the region.

The framework of the Solid Waste Section demonstrates a multitude of services that are offered within the community and the region. The financial outlook for the program remains optimistic, and continuous adjustments will be made as necessary to accommodate the local and regional economy. Environmental compliance is also essential to assure the program will remain a viable disposal option for the region for years to come. Meanwhile managers will continue to remain committed to balancing fiscal responsibility and environmental stewardship for the City and the region. The SWP is expected to be a mechanism for communication to the public how it intends to achieve this balance over coming years.

Although the waste diversion rate within Flagstaff is favorable, recycling rates could be improved with more state of the art technologies. If the program is to be successful at exploring innovative strategies for the future, then a change in development philosophy will likely need to be considered. For instance, capital expenditures have historically been justified on a “pay as you go” basis. However, many of the innovations proposed in this report may require the community to justify expenditures ahead of time for research and development.

Successful implementation of the SWP will be contingent on the practicality of the plan. In order for the document to be practical, it will be necessary for stakeholders to be given the opportunity to express their role in the program. Stakeholders will likely include community leaders, government agencies, private and public solid waste industry leaders, and other City organizations (SEMS, Planning and Zoning, Utilities). The City Managers’ guidance will be needed for the implementation of the SWP and its policies. In the meantime a form letter has been drafted in anticipation that it would be distributed on behalf of the City Manager. The letter will invite stakeholders to a public meeting in the fall of 2013, where project managers will present a ten year outlook of the City Solid Waste program. Project managers will also examine some of the long-term objectives of the stakeholders. Those issues that are of relevance to the next ten years will be considered in the SWP.

Over the coming months, the SWP the project may require input from other City Sections. In addition, project managers will pro-actively provide correspondence with monthly project updates. A schedule has been established to complete the final draft of the SWP by the end of FY14. It is expected that annual updates will be provided to the City Manager and Council to consider with the budget development cycle in the fall.

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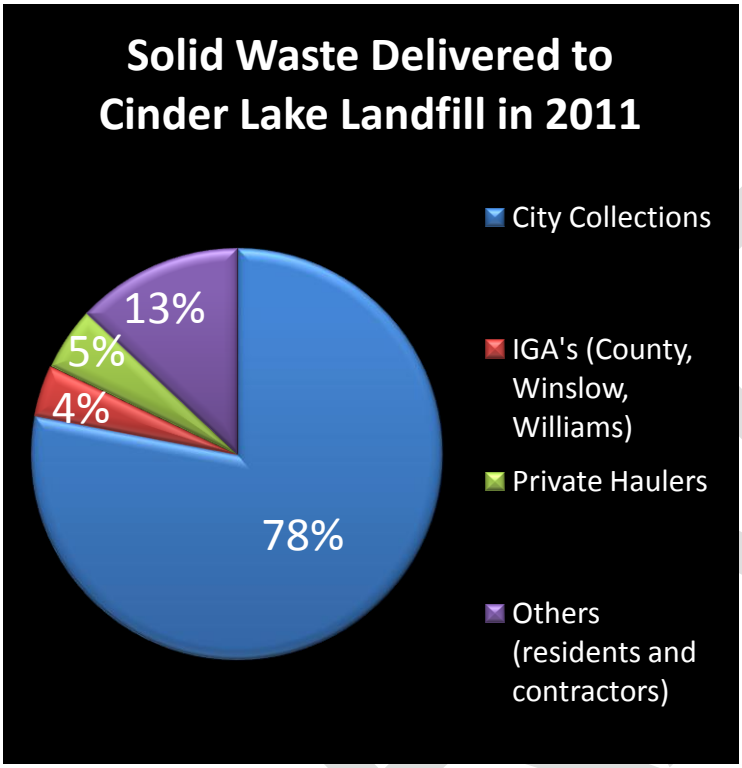
Appendix A

Stakeholders

The figure below is a general representation of what percentages of waste that was disposed of at Cinder Lake Landfill in 2011.

Figure 9-Percentages of Waste Disposed at Cinder Lake Landfill in 2011



The most influential stakeholders lay in our relations with Intergovernmental Agreements (IGA's), contractual obligations, general agreements, and solid waste providers in the County.

IGA's

Although the contribution of solid waste by IGA's is minimal (Figure 8), Solid Waste has provided the necessary resources for the smaller communities within the County with MSW disposal options and recycling options. Ultimately it is the responsibility of the County and municipalities to ensure that adequate solid waste services are offered to the public (ARS 49-741).

Solid Waste also provides financial incentives for other municipalities to participate in the recycle program at the Norton Environmental Material Recovery Facility (MRF) through the profit share program (Table 1).

Table 3-FY 12 IGA-Contributions

IGA	Tonnage	Revenue
City of Flagstaff	12,277	$222,010
City of Williams	314	$7,200
City of Winslow	114	$2,400
Coconino County	231	$5,190
Total	**12,936**	**$236,800**

Recycle rates within the cities and towns outside of the City indicate that there is little motivation to adopt changes in policy for the County. Solid Waste will continue maintaining the agreements as a means of good stewardship to the surrounding communities. However, additional cooperation would be advised with County recycling efforts.

Contracts

Formal contracts that have been established typically guarantee consistent revenue and resources for MSW for Solid Waste. Four contracts that are worth noting include the following:

SCA Tissue

The terms of this contract provide for the City of Flagstaff's Solid Waste Section to provide waste sludge hauling and snow removal services to SCA Tissue for a 10-year term. The paper sludge is hauled to the City of Flagstaff's Cinder Lake Landfill. The paper sludge is mixed with green waste and crushed glass gravel and used as an Alternative Daily Cover (ADC). The Arizona Department of Environmental Quality (ADEQ) has approved of the use of these materials as an ADC. The paper sludge makes up approximately 90% of the ADC used at the Landfill.

Using paper sludge as an ADC saves valuable landfill airspace as well as defers the need for the City to import cover for landfill operations. The use of paper sludge as an ADC helps to keep landfill fees down which is a benefit that is passed onto the citizens and businesses that use our services. Reasonable fees are a factor in maintaining a competitive service in the Northern Arizona market.

Norton Environmental

The City has a contractual obligation to provide Norton Environmental, Inc. (Norton) Materials Recovery Facility (MRF), with an annual minimum of recyclable tonnage. If and when this tonnage is not achieved, the City of Flagstaff is required to pay the MRF a compensation fee that is calculated according to the shortage of material. It is in the benefit of both the City of Flagstaff and the MRF to meet the contractual standards, as 50% of profits generated from the sale of Recovered Materials are paid back to the City from the MRF. Source-separated recycling tonnage has been decreasing slowly since 2008. The profit sharing program should continue to bring positive net financial returns to the City of Flagstaff. However, additional revenue could be realized by meeting the contractual obligation of 15,600 tons per year.

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Educational Institutions

Northern Arizona University and the Flagstaff Unified School District make substantial contributions to the solid waste and the recycle program. Their contracts expire in 2015 and 2016 respectively.

Agreements

Previous agreements were established long ago informally or as understandings. The following agreements are currently in place:

Ralston Purina

Purina's plant creates high volumes of MSW every year. Therefore previous management provided the plant with a volume discount.

City of Flagstaff, Solid Waste Cooperative Management on Flagstaff Ranger District

The City and the Forest Service continue with cooperative efforts to manage illegal dumping, monitor litter at and adjacent to the Cinder Lake Landfill, and enforce litter and dumping regulations within Forest Service Boundaries.

Figure 10-A typical example of wildcat dumping occurring within Forest Service boundaries

Solid Waste Providers within the County

Although private solid waste companies contribute minimal volumes of MSW, the Solid Waste program can experience shifts in financial stability if the resource were to be sent to a facility other than CLL. Table 4 demonstrates the major contribution of heavy haulers providing solid waste services in the region.

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Table 4-Regional Private Solid Waste Providers

Company	Services	CLL Users
Bleaker Boxes	City and County Construction Debris (large trash bins)	Regular
Norton Environmental	City Commercial and County Trash and Recycle Services	Regular
Ash Fork Sanitation	County Solid Waste Services	Regular
Auerbach Waste	City Commercial and County Solid Waste Services	Regular
Navajo Sanitation	City Commercial and County Solid Waste Services	Occasional
Waste Management	City Commercial and County Trash and Recycle Services	Occasional (Wood Waste Only)
Republic Services	City of Page Trash and Recycle Services	Never

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Appendix B

Federal Laws and Regulations that Govern Cinder Lake Landfill

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act — commonly referred to as RCRA — is the nation's primary law governing the disposal of solid and hazardous waste. Congress passed RCRA on October 21, 1976 to address the increasing problems the nation faced from our growing volume of municipal and industrial waste. RCRA, which amended the Solid Waste Disposal Act of 1965, set national goals for:

- Protecting human health and the environment from the potential hazards of waste disposal.
- Conserving energy and natural resources.
- Reducing the amount of waste generated.
- Ensuring that wastes are managed in an environmentally-sound manner.

Regulatory authority for enforcement of regulations promulgated under the RCRA by the Environmental Protection Agency (EPA) comes from 40 CFR Chapter I – EPA, Subchapter I – Solid Waste, Parts 239-282.

Clean Air Act

Landfills are required to sample, monitor, and control airborne contaminants ranging from fugitive dust to landfill gas. CLL gas levels currently fall below the regulatory thresholds which require the installation of a landfill gas collection and control system. Airborne contaminants are regulated through the Clean Air Act.

The Clean Air Act is designed to control air pollution on a national level. It requires the EPA to develop and enforce regulations to protect the public from airborne contaminants known to be hazardous to human health. The 1963 version of the legislation established a research program, expanded in 1967. Major amendments to the law, requiring regulatory controls for air pollution, passed in 1970, 1977 and 1990.

Regulatory authority for enforcement of landfills is promulgated under the Clean Air Act by the EPA comes from 40 CFR Chapter I – EPA, Subchapter C – Air Programs, Parts 50-98.

Clean Water Act

Landfills are typically required to install groundwater monitoring wells with up-gradient and down-gradient wells per 40 CFR § 258.50 to 258.51. However the elevations of the aquifer below Cinder Lake Landfill are unique in that the depth to the aquifer is approximately 1,600 feet below the facility. The City explored more cost-effective alternatives to monitoring the vadose zone (the zone between the bottom of the landfill and the aquifer). The vadose zone monitoring system, which was installed in the fall of 1995, consists of five monitoring stations consisting of a sampling device (lysimeter) and a monitoring device to measure moisture migration (neutron probe access tube). Since the inception of the monitoring program, the facility has remained

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below the Maximum Contaminant Levels as promulgated by the Clean Water Act. In addition there has never been a noticeable migration moisture front moving across the vadose zone. Regulatory authority for enforcement of regulations promulgated under the Clean Water Act by the EPA comes from 40 CFR Chapter I – EPA, Subchapter C – Water Programs, Part 122.

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. CLL and the Dry Lakes Inert Material Pit are monitored quarterly for any illicit discharges from either site.

State Enforcement of Federal Law and Regulations

The Arizona Department of Environmental Quality has been granted authorization by the EPA to enforce certain federal law and regulatory rules, which allows for state oversight of some environmental regulations.

Provisions provided in RCRA, Clean Air Act and the Clean Water Act allow for the delegation of enforcement of regulations promulgated under each of these acts from EPA to the state.

Arizona State Laws that Govern Cinder Lake Landfill

Regulatory Authority for Collection and Disposal of Municipal Solid Waste

Arizona Revise Statutes (ARS) § 49-741 requires that each County, city or town shall:

1. Provide or otherwise ensure proper arrangements are made for public facilities at such intervals and as conveniently as the governing body deems necessary for the safe and sanitary disposal of solid waste generated within its jurisdiction but need not duplicate a service provided by a private enterprise or another political subdivision.
2. Comply with regulations adopted by the director (director of environmental quality) in the administration of solid waste management programs.

Regulatory Requirement for a Solid Waste Facility Plan

ARS Section 49-762 requires that the owner or operator of the following solid waste facilities shall obtain approval of a solid waste facility plan in accordance with sections 49-762.03 and 49-762.04:

1. Solid waste land disposal facilities.
2. Biosolids processing facilities.
3. Medical waste facilities.
4. Special waste facilities.
5. Municipal solid waste landfills.
6. Commercial or government-owned household waste composting facilities.
7. A site at which five hundred or more waste tires are stored on any day and any tire is stored for more than twelve months unless the site is a waste tire collection site owned by a municipality or a county.

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City Laws that Govern Cinder Lake Landfill

Solid waste rules and regulations within the City of Flagstaff are guided by City Code Chapter 07-04. Many of the ordinances within the code are a reflection to the needs of the community to provide improved definitions. There is no change in City Code that is expected to come from the future operations Solid Waste in the next ten years. However the City Manager and Council may want to revisit this annually with revisions to the SWP.

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Appendix C

Cinder Lake Landfill Compliance Requirements

Greenhouse Gas Reporting Rule

CLL is required to estimate its methane emissions to the atmosphere and report them annually to EPA.

Air Quality Class I Permit

Issued by ADEQ, CLL is required to create an estimate of its emissions of air pollutants and submit the estimate annually to ADEQ. Twice a year CLL must submit a report to certify that it is following the requirements of its Air Quality Class I Permit. Every two weeks a Visible Emission Survey must be completed to determine the opacity of air borne dust that is generated by vehicular traffic. Annual inspections are performed by representatives of ADEQ as well.

Solid Waste Facility Plan

Approved by ADEQ, CLL is required to monitor soil moisture beneath the landfill foot print and to monitor subsurface landfill gas migration at the perimeter of the landfill quarterly. The monitoring information is compiled and submitted annually to ADEQ.

NPDES Permit

CLL maintains an Emergency Response Plan, Spill Prevention Countermeasures Control Plan, and Stormwater Pollution Prevention Plan. The permits for all three plans are guided by the Multi-Sector General Permit under the Arizona Pollutant Discharge Elimination System (AZPDES) program. Dry Lake Inert Material Pit is also guided by the Multi Sector Construction permit under AZPDES. The program requires quarterly monitoring, seasonal water sampling, and annual reporting. The reports for both facilities are stored at CLL and do not require submittal to ADEQ until an annual inspection occurs.

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Appendix D

Infrastructure

Cinder Lake Landfill

Power

Currently CLL uses single phase power that is provided by APS. In FY 2012, all operations at CLL used approximately 89,000 kWh of power which cost approximately $14,000. Three phase power would have to be installed at CLL if a landfill gas extraction system or any type of waste conversion technology is deployed. Arizona Public Service has provided an initial cost estimate of approximately $750,000 to connect the landfill to three-phase power. A cost-benefit analysis has been completed within the Landfill Gas Feasibility Study (Geosyntec, 2013).

Water

Currently CLL relies on potable water to be delivered to the facility weekly for its domestic needs. If more aggressive industrial activities are to occur, it will be necessary to have a reliable source of on-demand water on site. This will especially be the case for any landfill gas collection and control systems. The costs to connect to a potable water line to the facility would be approximately $290,000.

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Appendix E

Other Programs Supported by Solid Waste

The Solid Waste program provides ancillary benefits to programs within the City limits and beyond. The following activities or programs are some of the examples of support the Solid Waste program provides to the community:

County Cleanup Day
On one Saturday in May, the County will provide free trash disposal at CLL to its residents. The City provides the necessary manpower for the entire day. The program requires all of the staff at CLL to be present during County Cleanup Day.

Free public mulch
The public is free to pick up wood chips at the City Public Works Yard and CLL. The mulch is provided by various contractors who occasionally dispose of clean wood chips. The wood chip pile is maintained by Solid Waste throughout the year.

Sustainability and Environmental Management Section
Projects that receive (or have received) direct support from Solid Waste include the following:

- Hazardous Product Center
- Promotional mailings for recycling
- Manpower for collection and cleanup wildcat dump sites
- Public service events involving a community cleanup day
- All other SEMS related events involving the need for solid waste and recycle bins

Flagstaff Fire Department Fuels Management Program
CLL has provided multiple levels of service for the fuels reduction program throughout the past. Subsequent to tree thinning, CLL operators have provided heavy equipment for grading, site access, and tree chipping and removal. Equipment provided in the past included:

- Motor Grader
- Front End Loader with grapples
- Tree Chipper/Shredder
- Dump Truck

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Appendix F

Cinder Lake Landfill MSW Disposal Rates

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Table **5**-Breakdown of Municipal Solid Waste Disposed at Cinder Lake Landfill over the Past Two Fiscal Years

FY 13			FY 12				
Product Name	**# Loads**	**Adj Net Wgt**	**Product Name**	**# Loads**	**Adj Net Wgt**	**Variance**	**Percent**
Bulky Residential MSW	498	3,038.76	Bulky Residential MSW	475	3,046.99	(8.23)	-0.27%
Carcass (Animals) Commercial MSW	47	17.72	Carcass (Animals) Commercial MSW			17.72	100.00%
CARCASS RESIDENTIAL HOUSEHOLD	18	7.75	CARCASS RESIDENTIAL HOUSEHOLD			7.75	100.00%
CHRISTMAS TREE'S CITY RESIDENTIAL	7	22.32	CHRISTMAS TREE'S CITY RESIDENTIAL	5	17.47	4.85	21.73%
City of Flagstaff Streets/Clean Sweepings	101	1,236.22	City of Flagstaff Streets/Clean Sweepings	63	869.84	366.38	29.64%
City of Flagstaff Water Distribution	32	401.12	City of Flagstaff Water Distribution	65	822.39	(421.27)	-105.02%
CITY RESIDENTIAL CONSTRUCTION	928	455.50	CITY RESIDENTIAL CONSTRUCTION	556	556.44	(100.94)	-22.16%
CITY RESIDENTIAL WOOD WASTE	109	54.75	CITY RESIDENTIAL WOOD WASTE	107	61.00	(6.25)	-11.42%
CNTY RESIDENTIAL CONSTRUCTION	1,207	626.50	CNTY RESIDENTIAL CONSTRUCTION	638	679.06	(52.56)	-8.39%
CNTY RESIDENTIAL WOOD WASTE	205	104.75	CNTY RESIDENTIAL WOOD WASTE	157	88.50	16.25	15.51%
Commercial MSW	4,587	36,734.63	Commercial MSW	5,571	41,485.38	(4,750.75)	-12.93%
Filter Waste	72	508.94	Filter Waste	144	1,012.05	(503.11)	-98.85%
Green Waste	923	580.01	Green Waste	214	394.73	185.28	31.94%
H&H Construction & Demolition	1,270	6,372.50	H&H Construction & Demolition	1,177	4,895.55	1,476.95	23.18%
H&H COUNTY RES. TRASH	113	594.79	H&H COUNTY RES. TRASH	102	552.09	42.70	7.18%
In Bound Dirt	686	14,264.65	In Bound Dirt			14,264.65	100.00%
Inert Waste (Rock/Concrete/Dirt)	302	3,291.43	Inert Waste (Rock/Concrete/Dirt)			3,291.43	100.00%
Landscaping Debris Commercial MSW	44	76.18	Landscaping Debris Commercial MSW			76.18	100.00%
LANDSCAPING DEBRIS RESIDENTIAL	75	37.50	LANDSCAPING DEBRIS RESIDENTIAL			37.50	100.00%
Metal Only	96	259.52	Metal Only	51	157.37	102.15	39.36%
Norton Enviro Crushed Glass	29	291.05	Norton Enviro Crushed Glass	23	393.60	(102.55)	-35.23%
Paper Filter Waste	2,043	42,251.98	Paper Filter Waste	2,105	44,080.51	(1,828.53)	-4.33%
Pine Needles/Leaves Commercial MSW	342	271.84	Pine Needles/Leaves Commercial MSW			271.84	100.00%
PINE NEEDLES/LEAVES RESIDENTIAL	989	488.40	PINE NEEDLES/LEAVES RESIDENTIAL			488.40	100.00%
Pvt Hauler Construct & Demo	4,167	12,550.43	Pvt Hauler Construct & Demo	4,201	12,760.80	(210.37)	-1.68%
RESIDENTIAL HOUSEHOLD TRASH	9,262	3,978.96	RESIDENTIAL HOUSEHOLD TRASH	5,348	5,210.50	(1,231.54)	-30.95%
Residential MSW	2,503	16,493.55	Residential MSW	2,862	20,026.56	(3,533.01)	-21.42%
Snow Plowing	5	0.00	Snow Plowing	6	0.00	0.00	#DIV/0!
Special Handle Waste	25	240.64	Special Handle Waste	56	302.84	(62.20)	-25.85%
Whitegoods	726	-0.02	Whitegoods	472	-0.01	(0.01)	46.67%
WOOD CHIPS	52	504.61	WOOD CHIPS			504.61	100.00%
Wood Waste	181	296.42	Wood Waste	184	401.57	(105.15)	-35.47%
Grand Total:	**31,644**	**146,053.41**	**Grand Total:**	**24,582**	**137,815.23**	**8,238.18**	**5.64%**
Average Daily	**101.10**	**466.62**		**78.54**	**440.30**	**26.32**	**5.64%**
Minus Paper Sludge and other cover	**28,725**	**87,395**		**22,343**	**92,042**	**-4,648**	**-5.32%**
Average Daily	**91.77**	**279.22**		**71.38**	**294.07**	**-14.85**	**-5.32%**

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Appendix G

Solid Waste Operating Capital and Capital Expenditures-

Ten Year Plan

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Table 6-Existing Budget Projections

		Budget 2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2021-2023	2021-2024
Sources of Funds												
Beginning Fund Balance		4,922,416	4,157,932	2,887,573	1,193,602	1,141,668	3,693,553	2,811,026	4,912,616	7,345,381	9,063,471	11,142,883
Intergovernmental Revenues												
	County	-	-	-	-	-	-	-	-	-	-	-
	Federal Grant	-	-	-	-	-	-	-	-	-	-	-
	Federal Grants	-	-	-	-	-	-	-	-	-	-	-
Revenues:												
	Commercial Refuse	2,430,415	2,479,023	2,528,603	2,579,175	2,630,759	2,683,374	2,737,041	2,791,782	2,847,618	2,904,570	2,962,661
1004+1005+8001	Commercial Recycling	426,145	434,668	443,361	452,228	461,273	470,498	479,908	489,506	499,296	509,282	519,468
	Residential	2,468,307	2,517,673	2,580,615	2,632,227	2,684,872	2,738,569	2,793,340	2,849,207	2,906,191	2,964,315	3,023,601
	Curbside Recycling Revenue	1,057,734	1,078,889	1,100,467	1,122,476	1,144,926	1,167,825	1,191,182	1,215,006	1,239,306	1,264,092	1,289,374
	Revenue Share	239,846	244,643	249,536	254,527	259,618	264,810	270,106	275,508	281,018	286,638	292,371
	IGA Allocation Rev Share	(5,202)	(5,306)	(5,412)	(5,520)	(5,630)	(5,743)	(5,858)	(5,975)	(6,095)	(6,217)	(6,341)
	Hoist & Haul	155,102	158,204	161,368	164,595	167,887	171,245	174,670	178,163	181,726	185,361	189,068
4001+4007+4008	Landfill Fees	4,611,980	4,635,040	4,681,390	5,909,243	5,997,882	6,087,850	6,209,607	6,333,799	6,460,475	6,589,685	6,721,479
	Inert matls Landfill	-	-	-	-	-	-	-	-	-	-	-
	Environmental Service Fee	-	-	-	-	-	-	-	-	-	-	-
5004+5003+6001+4004	Hazardous Waste	-	-	-	-	-	-	-	-	-	-	-
6001 + 4004	Reclamation Chg	-	-	-	-	-	-	-	-	-	-	-
	Miscellaneous	-	-	-	-	-	-	-	-	-	-	-
	Other Financing Sources	3,950,000	250,000	2,000,000	250,000	550,000	3,250,000	1,750,000	1,750,000	250,000	250,000	250,000
	Unrestricted Interest	47,044	47,750	48,705	49,923	51,171	52,450	53,761	55,105	56,483	57,895	59,342
	Restricted Interest	-	-	-	-	-	-	-	-	-	-	-
	Total Revenue	15,381,371	11,840,584	13,788,633	13,408,874	13,942,758	16,880,878	15,653,757	15,932,101	14,716,018	15,005,621	15,301,023
	Total Sources of Funds	20,303,787	15,998,516	16,676,206	14,602,476	15,084,426	20,574,431	18,464,783	20,844,717	22,061,399	24,069,092	26,443,906
Uses of Funds												
Operations:												
1+45	General Administration	555,790	569,351	583,243	597,474	612,052	626,986	642,284	657,956	674,010	690,456	707,303
	Indirect Costs	1,299,173	1,331,652	1,364,943	1,399,067	1,434,044	1,469,895	1,506,642	1,544,308	1,582,916	1,622,489	1,663,051
2&5	Residential	1,671,421	1,712,204	1,753,982	1,796,779	1,840,620	1,885,531	1,931,538	1,978,668	2,026,947	2,076,405	2,127,069
3&6	Commercial Refuse	2,143,362	2,195,660	2,249,234	2,304,115	2,360,335	2,417,927	2,476,924	2,537,361	2,599,273	2,662,695	2,727,665
14	Commercial Recycling											

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			592,424	606,879	621,687	636,856	652,395	668,313	684,620	701,325	718,437	735,967	753,925
7+28		Hoist & Haul	411,141	421,173	431,450	441,977	452,761	463,808	475,125	486,718	498,594	510,760	523,223
4		Landfill	1,362,263	1,395,502	1,429,552	1,464,433	1,500,165	1,536,769	1,574,266	1,612,678	1,652,027	1,692,336	1,733,629
8		Recycling Program (Admin)	-	-	-	-	-	-	-	-	-	-	-
10		Landfill Outside Contracts	267,117	273,635	280,312	287,152	294,159	301,336	308,689	316,221	323,937	331,841	339,938
11		Curbside Recycling	905,492	927,586	950,219	973,404	997,155	1,021,486	1,046,410	1,071,942	1,098,097	1,124,891	1,152,338
	20	Recycling Grants	-	-	-	-	-	-	-	-	-	-	-
21		Conservation Education	-	-	-	-	-	-	-	-	-	-	-
12		Inert Matls Landfill	2,500	2,561	2,623	2,687	2,753	2,820	2,889	2,959	3,031	3,105	3,181
9		Hazardous Matls	-	-	-	-	-	-	-	-	-	-	-
13		Refrigerant Extraction	-	-	-	-	-	-	-	-	-	-	-
60		Brownfield	-	-	-	-	-	-	-	-	-	-	-
22		Sustainability	-	-	-	-	-	-	-	-	-	-	-
23		Environmental Management	-	-	-	-	-	-	-	-	-	-	-
24		Conservation	-	-	-	-	-	-	-	-	-	-	-
25		Commercial Sales	7,960	8,154	8,337	8,525	8,717	8,913	9,114	9,319	9,529	9,743	9,962
27		Energy Management	-	-	-	-	-	-	-	-	-	-	-
63+80 +52+66+68		One-time operating	25,000	-	-	-	-	-	-	-	-	-	-
	80	Debt Service	250,000	250,000	325,000	325,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
		Contingency/Reserve	612,000	-	-	-	-	-	-	-	-	-	-
		Total Operating Budget	10,105,643	9,694,357	10,000,582	10,237,469	10,555,156	10,803,784	11,058,501	11,319,455	11,586,798	11,860,688	12,141,284
Fund Balance - Operations Only			5,275,728	2,146,227	3,788,051	3,171,405	3,387,602	6,077,094	4,595,256	4,612,646	3,129,220	3,144,933	3,159,739
Capital Requirements:													
		Operating Capital	981,996	1,223,060	1,154,112	2,941,564	320,000	3,739,883	699,827	451,859	1,178,841	828,880	175,000
		Capital Improvement Program	108,000	1,922,000	4,060,000	10,000	310,000	3,010,000	1,580,000	1,510,000	10,000	10,000	10,000
		Total Capital Expenditure	1,089,996	3,145,060	5,214,112	2,951,564	630,000	6,749,883	2,279,827	1,961,859	1,188,841	838,880	185,000
Transfers In:													
		Stormwater-Education	-	-	-	-	-	-	-	-	-	-	-
		Beaut-KAB	-	-	-	-	-	-	-	-	-	-	-
		General Fund	-	-	-	-	-	-	-	-	-	-	-
		Beautification	-	-	-	-	-	-	-	-	-	-	-
		Env Svc Capital	-	-	-	-	-	-	-	-	-	-	-
		Total Transfers In:	-	-	-	-	-	-	-	-	-	-	-
Transfers out:													
		General Fund - APSES Loan	14,810	7,405	-	-	-	-	-	-	-	-	-
		Secondary Property Tax	-	-	-	-	-	-	-	-	-	-	-
		Capital Projects Fund	4,675,000	-	-	-	-	-	-	-	-	-	-
		HURF - Fee Holiday 5 yrs											

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	17,000	17,000	17,000	17,000							
Environmental Management	185,728	189,443	193,232	197,097	201,039	205,060	209,161	213,344	217,611	221,963	226,402
General Fund - Brownfield's	-	-	-	-	-	-	-	-	-	-	-
General Fund - Fee Holiday 5 yrs	53,000	53,000	53,000	53,000	-	-	-	-	-	-	-
General Fund	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678
Total Transfers Out:	4,950,216	271,526	267,910	271,775	205,717	209,738	213,839	218,022	222,289	226,641	231,080
Total Uses of Funds	16,145,855	13,110,943	15,482,604	13,460,808	11,390,873	17,763,405	13,552,167	13,499,336	12,997,928	12,926,209	12,557,364
Intra fund transfers less indirect reimb											
Ending Fund Balance - SEMS											
Ending Fund Balance (1)	4,157,932	2,887,573	1,193,602	1,141,668	3,693,553	2,811,026	4,912,616	7,345,381	9,063,471	11,142,883	13,886,542

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Appendix H

Cinder Lake Landfill Closure Projections

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CLOSURE OF CINDER LAKE LANDFILL WITH 1,350 LB/CY

All disposal rates up to 2006 were taken from the documented disposal rates taken from "Estimate of in place MSW.xls"							In-Place Density		ton/cu.yd =	0.68
							Refuse/Soil Ratio		l/total vol =	0.75
		Approximate Closure Year					Refuse Growth Rate		%/year =	3.00%
		Estimated remaining landfill fill capacity (after 12/31/97)						25,256,711	(Cu. Yd)	
		Estimated remaining refuse capacity (after 12/31/97)						18,942,533	(Cu. Yd)	

Year	Disposal Tonnage (Tons)[1]	Compacted Disposal Volume (Cu. Yd)[1]	Paper Sludge[4] Tons	Paper Sludge (Cu.Yd.)	Tonnage after Sludge (Tons)	Volume after Sludge (Cu.Yd.)[2]	Total Remaining Capacity (Tons)[3]	Total Remaining Capacity (Cu. Yd)[3]	Remaining Refuse Capacity (Tons)[2]	Remaining Refuse Capacity (Cu. Yd)[2]
1997							17,048,280	25,256,711	12,786,210	18,942,533
1998	139,477	206,633	6,636	9,831	132,841	196,801	16,871,159	24,994,309	12,653,369	18,745,732
1999	140,502	208,151	29,589	43,836	110,913	164,316	16,723,275	24,775,222	12,542,456	18,581,416
2000	117,597	174,218	26,727	39,596	90,870	134,622	16,602,115	24,595,725	12,451,586	18,446,794
2001	109,835	162,719	28,739	42,576	81,096	120,142	16,493,987	24,435,536	12,370,490	18,326,652
2002	126,650	187,630	28,686	42,498	97,964	145,132	16,363,368	24,242,027	12,272,526	18,181,520
2003	117,880	174,637	28,267	41,877	89,613	132,760	16,243,884	24,065,013	12,182,913	18,048,760
2004	134,367	199,062	32,332	47,899	102,035	151,163	16,107,837	23,863,463	12,080,878	17,897,597
2005	154,389	228,724	35,402	52,447	118,987	176,277	15,949,188	23,628,427	11,961,891	17,721,320
2006	153,120	226,844	34,650	51,333	118,470	175,511	15,791,228	23,394,412	11,843,421	17,545,809
2007	157,408	233,197	39,653	58,745	117,755	174,452	15,634,221	23,161,809	11,725,666	17,371,357
2008	155,470	230,326	39,714	58,836	115,756	171,490	15,479,880	22,933,156	11,609,910	17,199,867
2009	126,990	188,133	28,254	41,858	98,736	146,276	14,920,381	22,104,268	11,190,286	16,578,201
2010	135,162	200,240	32,416	48,024	102,746	152,216	14,783,386	21,901,313	11,087,540	16,425,985
2011	134,743	199,619	43,728	64,782	91,015	134,837	14,662,033	21,721,530	10,996,525	16,291,148
2012	136,947	202,884	32,935	48,793	104,012	154,092	14,523,350	21,516,075	10,892,513	16,137,056
2013	141,055	208,971	32,935	48,793	108,120	160,178	14,379,190	21,302,504	10,784,393	15,976,878
2014	145,287	215,240	32,935	48,793	112,352	166,447	14,229,388	21,080,574	10,672,041	15,810,431
2015	149,646	221,697	32,935	48,793	116,711	172,904	14,073,773	20,850,035	10,555,330	15,637,526
2016	154,135	228,348	32,935	48,793	121,200	179,555	13,912,174	20,610,628	10,434,130	15,457,971
2017	158,759	235,199	32,935	48,793	125,824	186,406	13,744,408	20,362,086	10,308,306	15,271,565
2018	163,522	242,255	32,935	48,793	130,587	193,462	13,570,293	20,104,137	10,177,720	15,078,103
2019	168,428	249,522	32,935	48,793	135,492	200,729	13,389,636	19,836,498	10,042,227	14,877,374
2020	173,480	257,008	32,935	48,793	140,545	208,215	13,202,243	19,558,878	9,901,682	14,669,158
2021	178,685	264,718	32,935	48,793	145,750	215,925	13,007,910	19,270,977	9,755,932	14,453,233
2022	184,045	272,660	32,935	48,793	151,110	223,867	12,806,430	18,972,488	9,604,822	14,229,366
2023	189,567	280,840	32,935	48,793	156,632	232,047	12,597,588	18,663,093	9,448,191	13,997,319
2024	195,254	289,265	32,935	48,793	162,319	240,472	12,381,163	18,342,463	9,285,872	13,756,848
2025	201,111	297,943	32,935	48,793	168,176	249,150	12,156,928	18,010,264	9,117,696	13,507,698
2026	207,145	306,881	32,935	48,793	174,209	258,088	11,924,649	17,666,146	8,943,487	13,249,610
2027	213,359	316,087	32,935	48,793	180,424	267,295	11,684,084	17,309,754	8,763,063	12,982,315
2028	219,760	325,570	32,935	48,793	186,825	276,777	11,434,984	16,940,717	8,576,238	12,705,538
2029	226,353	335,337	32,935	48,793	193,417	286,544	11,177,094	16,558,658	8,382,821	12,418,994
2030	233,143	345,397	32,935	48,793	200,208	296,604	10,910,150	16,163,186	8,182,613	12,122,389
2031	240,137	355,759	32,935	48,793	207,202	306,966	10,633,881	15,753,897	7,975,411	11,815,423
2032	247,342	366,432	32,935	48,793	214,406	317,639	10,348,006	15,330,379	7,761,004	11,497,784
2033	254,762	377,425	32,935	48,793	221,827	328,632	10,052,237	14,892,203	7,539,178	11,169,152
2034	262,405	388,748	32,935	48,793	229,469	339,955	9,746,278	14,438,930	7,309,708	10,829,197
2035	270,277	400,410	32,935	48,793	237,342	351,617	9,429,822	13,970,107	7,072,367	10,477,580
2036	278,385	412,422	32,935	48,793	245,450	363,629	9,102,556	13,485,267	6,826,917	10,113,951
2037	286,737	424,795	32,935	48,793	253,801	376,002	8,764,154	12,983,931	6,573,115	9,737,948
2038	295,339	437,539	32,935	48,793	262,404	388,746	8,414,282	12,465,603	6,310,712	9,349,202
2039	304,199	450,665	32,935	48,793	271,264	401,872	8,052,597	11,929,774	6,039,448	8,947,330
2040	313,325	464,185	32,935	48,793	280,390	415,392	7,678,744	11,375,918	5,759,058	8,531,938
2041	322,725	478,110	32,935	48,793	289,789	429,318	7,292,358	10,803,494	5,469,269	8,102,620
2042	332,406	492,454	32,935	48,793	299,471	443,661	6,893,064	10,211,946	5,169,798	7,658,960
2043	342,379	507,227	32,935	48,793	309,443	458,435	6,480,472	9,600,700	4,860,354	7,200,525
2044	352,650	522,444	32,935	48,793	319,715	473,651	6,054,186	8,969,165	4,540,640	6,726,874
2045	363,229	538,118	32,935	48,793	330,294	489,325	5,613,794	8,316,732	4,210,345	6,237,549
2046	374,126	554,261	32,935	48,793	341,191	505,468	5,158,872	7,642,774	3,869,154	5,732,081
2047	385,350	570,889	32,935	48,793	352,415	522,096	4,688,986	6,946,646	3,516,739	5,209,984
2048	396,911	588,016	32,935	48,793	363,975	539,223	4,203,685	6,227,682	3,152,764	4,670,762
2049	408,818	605,656	32,935	48,793	375,883	556,863	3,702,509	5,485,198	2,776,881	4,113,898
2050	421,082	623,826	32,935	48,793	388,147	575,033	3,184,979	4,718,487	2,388,734	3,538,865
2051	433,715	642,541	32,935	48,793	400,780	593,748	2,650,606	3,926,824	1,987,955	2,945,118
2052	446,726	661,817	32,935	48,793	413,791	613,024	2,098,885	3,109,459	1,574,163	2,332,094
2053	460,128	681,671	32,935	48,793	427,193	632,878	1,529,294	2,265,621	1,146,970	1,699,215
2054	473,932	702,121	32,935	48,793	440,997	653,329	941,298	1,394,516	705,974	1,045,887
2055	488,150	723,185	32,935	48,793	455,215	674,392	334,345	495,326	250,759	371,495
2056	502,794	744,881	32,935	48,793	469,859	696,088	-292,134	-432,791	-219,100	-324,593
2057	517,878	767,227	32,935	48,793	484,943	718,434	-938,724	-1,390,703	-704,043	-1,043,027
2058	533,415	790,244	32,935	48,793	500,479	741,451	-1,606,030	-2,379,304	-1,204,523	-1,784,478
2059	549,417	813,951	32,935	48,793	516,482	765,158	-2,294,673	-3,399,515	-1,721,005	-2,549,636
2060	565,899	838,370	32,935	48,793	532,964	789,577	-3,005,292	-4,452,284	-2,253,969	-3,339,213

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