Seattle Solid Waste Recycling, Waste Reduction, and Facilities Opportunities

VOLUME I

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Seattle Solid Waste Recycling, Waste Reduction, and Facilities Opportunities

Prepared for

Seattle City Council
and
Seattle Public Utilities

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EXECUTIVE SUMMARY

1 Study Background and Purpose

The City of Seattle (City) has long been a national environmental leader. Seattle Public Utilities (SPU) has developed and implemented a variety of programs designed to reduce waste, recycle, and dispose of residuals in an environmentally responsible manner. The City has set a goal for its residents to divert 60% of its waste from landfill disposal.

The 1998 Seattle Solid Waste Comprehensive Plan *On the Path to Sustainability* provided a policy framework of sustainability and stewardship, adopted "zero waste" as a guiding principle, and identified programmatic goals. The 1998 Plan also described various programs designed to achieve the goals in a manner that balanced the values of public and environmental health, cost-effectiveness and system efficiency, and customer and community needs.

The 2004 Plan Amendment (to the 1998 Plan) renewed Seattle's commitment to the policies and goals stated in the 1998 Plan, and subscribed to an "asset management approach" that involves meeting customer and environmental service levels at the lowest life-cycle cost.

In 2003 SPU published its Solid Waste Facilities Master Plan (FMP) that recommended rebuilding both the North and South Recycling and Disposal Stations (NRDS, SRDS) to meet the goals of City Resolution 30431 (Option 11). In addition, Option 11 recommended development of an intermodal facility that would include a new transfer building for collection vehicles; an intermodal yard for placing loaded containers on rail cars; and a rail yard for assembling rail cars into a garbage-only unit train.

During the 2006 review of solid waste rates, the City of Seattle sought to answer the question of whether there were still other methods that Seattle could use to reduce the amount of solid waste and divert it from landfill disposal. In addition, if this further reduction were achieved, how might it affect the need to upgrade NRDS and SRDS and the need for a third facility as recommended by the FMP?

In November 2006, Seattle selected the consultant team of URS Corporation (URS), Herrera Environmental Consultants (Herrera), and Norton-Arnold & Company (NA) to perform a Zero Waste Study. The study addressed three major facets of the solid waste management program: Zero Waste principles and product stewardship; collection of waste and recyclables; and existing/proposed solid waste facilities. Three major goals of the study were to:

- Provide an objective, third-party evaluation of Seattle's work to date: the waste forecasting model; the FMP; and current waste diversion programs.
- Identify potential strategies that could push Seattle beyond its current 60% waste diversion goal.

- Evaluate the effect that implementing such strategies would have on facilities: would they still be needed and if so, what size should they be and what features should they have to improve efficiency, safety, and recycling?

2 Study Methodology

- The study evaluated the potential effect of implementing a variety of waste reduction, recycling, collection, producer responsibility, and policy strategies to reduce the amount of waste generated and eventually sent to the landfill. Feasibility, implementation risks, costs, waste diversion potential, and timing have been analyzed as the basis for future planning, analysis, and implementation by Seattle as part of the Solid Waste Management Plan Update in 2009.
- The study has evaluated the effect of those "Zero Waste" strategies with the most impact on Seattle's solid waste facilities in order to provide the City's decision-makers with appropriate information to guide implementation of the Facilities Master Plan, within the context of a "Zero Waste" future.

3 Existing Program Evaluation

- Our objective, third-party evaluation of Seattle's work to date has largely corroborated the validity of the methodology, analysis, assumptions, and analytic results of the waste forecasting model.
- Our objective, third-party evaluation of Seattle's work to date has identified some areas where the current recovery rates from existing 60% programs may be optimistic. We have suggested new tonnage estimates for recovery rates associated with the 60% program, adjusted downward to model a more conservative estimate.
- Current Seattle programs focus on waste prevention, recycling, composting, producer responsibility, and disposal, but there are opportunities to strengthen the City's emphasis on:
  - Product stewardship
  - Use of regulations and regulatory enforcement
  - Local recycled materials processing
  - Market development for recycled materials use
  - Financial and other incentives for waste diversion, highest and best use of recycled feedstocks, and product stewardship.

4 Potential Strategies

- We identified a group of Zero Waste and collection strategies with the potential to divert significant tonnage away from landfill disposal (the "A" group of strategies).

- Our analysis indicates that existing City programs work well in concert with the potential strategies.

5 Implications for Facilities

- The consultants' third-party evaluation of the City's work to date has confirmed the validity of the methodology, assumptions, analysis, and construction cost estimating models, analyses, and results of the 2003 Facilities Master Plan. The Zero Waste team reviewed the performance requirements, design criteria, and design assumptions for the proposed facilities and, in general, found them to be comprehensive and in accordance with accepted solid waste industry practices and methods.
- The City's Facilities Plan Cost Model was used to evaluate the impact of implementing the "A" strategies for a variety of facility options.
- Successful implementation of "A" strategies can significantly reduce traffic and tonnage going to the transfer stations.
- Purchase of the 20 acre Corgiat site would give the City programmatic and financial flexibility. The site would provide the City with operational redundancy and flexibility to respond to changing regulatory and solid waste conditions. The intermodal and rail yard capabilities of the Corgiat site ensure that the City can continue to load its waste onto trains economically into the future. Owning the site would allow the City to develop its facilities at Corgiat (transfer station, intermodal yard, and/or rail yard) in phases. It would also allow the City to consider other possible uses such as a waste conversion/alternative energy facility or an eco-industrial park.
- The financial implications of the different facility options deserve considerable attention. For example, under Scenario 1 (baseline recycling and Zero Waste programs), the difference between Option 16 (City-owned intermodal facility plus rebuilt NRDS and SRDS) and Option 18 (private intermodal facility plus rebuilt NRDS and SRDS) is about $10 million (net present value [NPV]), on an investment of about $800 million. This difference could be considered the "risk mitigation premium" for increased the facility redundancy and reliability gained by having three transfer stations instead of only two. Similarly, under Scenario 4 (recycling, various Zero Waste programs and all bans), the difference between Options 16 and 18 is about $3 million (NPV), on an investment of about $880 million.

6 Action Menu

- Groups of strategies are organized by policy objectives (e.g. high diversion, targeting toxics, producer responsibility, facility "right-sizing", highest and best use, market development, etc.) so that a balance of options can be chosen to address priorities set by the Council.

- Groups of strategies are organized into near term, mid term and long-term actions based on considerations such as implementation timeline, ramp up time, cost and balance of stakeholder impact.
- The report presents a short list of “A”, “B” and “C” strategies for immediate consideration by the City Council and SPU
- A variety of strategy “packages,” combining different strategies and implementation dates, should be subjected to further detailed analysis to connect 2004 Plan Amendment, 2009 Plan Update and “Zero Waste.”
- The results of our analysis indicate that a 72% recycling rate could be achieved by 2025 with successful implementation of all “A” strategies (and with the use of a commingled sort line for building materials). The City Council and SPU could use this analysis to revise the City’s recycling goals. A Zero Waste ordinance could also be considered.

1 INTRODUCTION TO THE ZERO WASTE STUDY

1.1 Study Background and Purpose

The City of Seattle (City) has long been a national environmental leader. Seattle Public Utilities (SPU) developed and implemented a variety of programs designed to reduce waste, recycle, and dispose of residuals in an environmentally responsible manner. The City set a goal for its residents to divert 60% of its waste from landfill disposal.

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- Provide an objective, third-party evaluation of Seattle’s work to date: the waste forecasting model; the FMP; and current waste diversion programs.

- Identify potential strategies that could push Seattle beyond its current 60% waste diversion goal.
- Evaluate the effect that implementing such strategies would have on facilities: would they still be needed and if so, what features should they have to improve efficiency, safety, and recycling?

Zero Waste is a philosophy and a design principle that goes beyond recycling to take a "whole system" approach to the flow of resources and waste through human society. It attempts to guide people to emulate sustainable natural cycles, where discarded materials become resources for others to use. Zero Waste means designing and managing products and processes to reduce the volume and toxicity of materials used and waste produced; to conserve and recover resources, and not to burn or landfill them. Implementing Zero Waste strategies could reduce discharges to land, water or air that may negatively impact human, animal or plant health. Zero Waste maximizes recycling, minimizes waste, reduces consumption and ensures that products are made to be reused, repaired or recycled back into nature or the marketplace.

Product Stewardship (also known as Extended Producer Responsibility (EPR)) is a related concept that requires those involved in the life cycle of a product (e.g. designers, suppliers, manufacturers, distributors, retailers, consumers, recyclers and disposers) to share responsibility for the environmental effects of the products, and to minimize the impacts of that product on the environment. EPR looks at the entire product system in achieving sustainable development, but focuses leadership and primary responsibility on the producer rather than the consumer or a municipal government.

1.2 The Zero Waste Study Process

The Zero Waste study was carried out through a joint effort of the consultant team (URS, Herrera, and NA), SPU staff, City Council staff, and select members of the City Council. SPU technical and managerial staff provided historical background and insights into existing programs and methodologies. City Council Member Richard Conlin and Council staff provided direction regarding zero waste principles and insights into how the study would be used to develop City policy. The consultant team drew on its previous waste management experience and its research capabilities to identify and evaluate potential strategies.

To ensure that a variety of viewpoints were considered, a Zero Waste Working Group (ZWWG) consisting of consultants, SPU staff, and Council staff, was formed. The ZWWG held biweekly coordination meetings, as well as occasional briefings with Council Member Conlin. The consultants held more frequent technical meetings; various SPU and Council staff attended, depending on the topic.

Identifying and Prioritizing Strategies

The identification of strategies to increase the amount of waste diverted from the transfer stations, and ultimately disposal in a landfill, was a primary focus of this study. The project team drew on its professional experience and conducted literature and Internet searches to learn what other jurisdictions have done and how successful they have been. Approximately 165 potential new strategies were identified, and approximately 124 were identified for further consideration. These were in addition to about 39 existing City programs. (The complete listing of potential strategies is contained in the Appendix to Volume 2.)

The strategies were categorized into four customer **sectors** – single family (SF) residential, multi-family (MF) residential, commercial (i.e. businesses and institutions), and self-haul. Under contract to the City, garbage hauling companies collect wastes from the first three sectors and haul them to the transfer stations in garbage ("packer") trucks, trucks carrying roll-off boxes, or other mechanically unloaded trucks. Self-haul wastes are brought to the transfer stations by the generators themselves, or contractors for hire. Self-haul wastes are typically delivered in smaller vehicles such as cars, minivans, SUVs, pickup trucks, and small trailers, although some arrive in flatbeds and vehicles of larger capacity. Because self-haul vehicles are typically unloaded by hand, they take longer to unload than mechanically unloaded vehicles; as such, they occupy the unloading stalls for longer periods and thus reduce the potential waste-handling capacity of the transfer station.

In identifying and screening the numerous strategies documented in the literature, the ZWWG sought to maximize diversion by highlighting strategies that target organics and construction and demolition (C&D) debris, two of the largest components of the disposed waste stream. Positive environmental benefits (e.g. removal of toxics) and a near-term implementation time frame (e.g. becoming effective in 3-5 years) were important considerations. Other factors included the track record of a strategy, the degree of certainty in achieving results within the desired time frame (implementation risk), regulatory constraints, and contract/contractor constraints.

The 124 new and 39 existing strategies were sorted into four **groups** for evaluation:

- **A** 37 new strategies and 23 existing programs with the potential to divert the largest **tonnage** of waste from the City's transfer stations (and ultimately, landfill disposal), but possibly with fewer environmental benefits than other strategies. A-strategies were evaluated first.
- **B** 61 new strategies and 15 existing programs with the potential to divert smaller amounts of waste, but with significant **environmental** benefits.
- **C** 12 new strategies and 1 existing program that address the portion of the waste stream (e.g. C&D debris) that currently goes to **privately-owned** facilities.

- **D** 14 new strategies that seemed unlikely to divert significant quantities of waste; appeared to be difficult to implement in a timely fashion; or that duplicated existing City programs. However, these were retained for consideration again sometime in the future.

The strategies were further into high (H), medium (M) and low (L) categories to prioritize evaluation of the strategies. The process to rank potential strategies within material categories was based on the potential tonnage and environmental benefits, preliminary estimate of time for implementation and ramp-up; risk of (not) achieving desired results within timeframe; and cost to SPU, ratepayers, and consumers.

At a series of meetings, the ZWWG resorted and regrouped the strategies in several ways:

1. By material type.

- Organics
- Traditional recyclables (newspaper, cardboard, tin, aluminum, etc.)
- C&D wastes
- Electronics/small appliances
- Hazardous (household chemicals, paint, etc.)
- White goods/bulky items/furniture (including reusables)
- Other (miscellaneous and/or multiple material types).

2. By order in which strategies would be implemented. For analysis purposes, it was agreed that strategies would be implemented in the following order:

- First, provide a service that enables a citizen or business to voluntarily act in a manner that increases waste diversion.
- Next, provide a (financial) incentive to act in a manner that increases waste diversion.
- Also, incentivize or require development of a "producer" sponsored infrastructure to handle discarded products.
- Last, institute a ban or other regulation that mandates the particular action to increase diversion.

Because it was acknowledged that education of residents and businesses was an integral part of implementing any of the strategies, **educational programs and advertising were not considered as a separate action or strategy.**

Technical Evaluation

Potential strategies with complementary components were grouped, then placed in order for implementation according to the pattern described above: provide the service that allows voluntary diversion, provide a financial incentive, examine EPR strategies, then institute a ban or other regulation. Other important steps included:

1. Developing the anticipated participation and efficiency rates (and hence recovery rates) for strategies (or groups of strategies).

2. Estimating the cost of a strategy from three perspectives: cost to City, cost to ratepayers, and cost to consumers (as a result of fees or costs outside of City garbage rate structure).

3. Applying environmental costs and benefits were to be applied quantitatively if appropriate, available, or estimable; otherwise applied qualitatively.

4. Estimating risks were to be applied quantitatively if appropriate, available, or estimable; otherwise applied qualitatively.

Analysis of Strategies, Facilities, and Development of Action Menu

Selected high priority strategies were then packaged as scenarios to assess their potential affect on waste reduction, recycling, product stewardship, collection infrastructure, and City facilities.

1. Waste generation and diversion estimates were created based on the implementation of "A" level (high-ranked) Zero Waste and collection strategies.

2. The amount of disposed waste to be received and handled by City facilities, and the amount of waste diverted to recycling (including to EPR programs), were determined.

3. Existing facility design and assumptions used to develop the FMP were compared with facility criteria and methods generally accepted in the solid waste industry

4. Facility configuration, material flow allocations, and facility ownership options were evaluated to determine overall facility needs, as well as estimates of facility construction costs and system-wide costs.

5. Finally, this report, including an Action Menu, was developed to contribute to SPU's and the City Council's future decisions regarding implementation of the FMP, and strategy directives to exceed the 60% goal and effect a shift to a Zero Waste culture.

A more detailed discussion of the technical evaluation methodology is provided in Sections 2, 3, and 4.

Stakeholder Involvement and Surveys

Implementation of any of the waste diversion strategies depends on wide citizen approval and participation. To gain an indication of how receptive citizens would be to some of the high-priority strategies, the consultant team conducted three telephone surveys and one person-to-person "intercept" survey at Seattle's NRDS and SRDS. After the diversion strategies were evaluated and ranked in order of priority, a select few were chosen for inclusion in the surveys. These strategies were related to food waste recycling, an on-demand curbside pickup program for bulky wastes (a.k.a. "call to haul"), a ban of self-haulers from NRDS and SRDS coincident with the on-demand service, pricing of proposed services, and product stewardship.

The first survey, the "intercept" survey, was administered to self-haulers with net-weight loads of 1,500 pounds or less waiting in line at both the NRDS and the SRDS. The second survey was conducted by telephone and polled those self-haulers that hold credit accounts with the City; these are typically businesses or institutions and not individual citizens. The third survey polled residential customers via telephone concerning diverting food from the waste stream, a proposed City-provided service for curbside pickup of materials that would otherwise be self-hauled to a transfer station, and other possible waste diversion strategies. The fourth survey, also conducted by telephone, focused on residential customers' views about options for waste diversion through EPR.

1.3 Existing Program Evaluation

Seattle's 1998 Comprehensive Solid Waste Management Plan was one of the earliest solid waste plans in the United States to adopt the principle of Zero Waste, and the City continues to be a leader in innovative implementation of waste prevention, recycling, and composting programs. Seattle and other local Pacific Northwest governments co-founded the Northwest Product Stewardship Council (NWPSC), which has led efforts regionally and nationally to promote and implement operational models for producer responsibility. The 2004 Plan Amendment provides an overview of the City's plan for diverting 60 percent of Seattle's waste from the landfill by 2010.

The package of programs selected by the City to reach the 60 percent goal is summarized in Table 1.3-1.

Table 1.3-1
Seattle's Package of Programs for Reaching 60% Diversion by 2010

Sector	Strategy	Additional Tons Recycled with 60% Program Strategies, Compared to Programs in Place Prior to 2004	Percent Added to Recycling with 60% Program Strategies, Compared to Programs in Place Prior to 2004
Commercial	Expanded curbside recycling to all businesses	4,900	0.6%
	Paper disposal ban	33,100	4.1%
	Food scraps collection	31,800	3.9%
	Commercial yard debris disposal ban	3,800	0.5%
	Public place recycling citywide (300 high-use pedestrian sites)	80	0.01%
	Waste reduction and reuse	8,250	1.0%
Residential	Curbside materials disposal ban	36,300	4.3%
	Backyard food scraps composting	1,500	0.3%
	Waste reduction and reuse	8,250	1.0%
Self-Haul	Reuse / recycling center	39,000	4.7%
Total		167,000	20.4%

As part of its work to estimate the extent to which additional "Zero Waste" strategies may support or accelerate progress to and beyond the 60% goal, the Zero Waste project team conducted a brief assessment of the City's current package of programs. The first goal was primarily to regenerate a baseline recycling rate from which the effectiveness of additional Zero Waste strategies would be measured. The Zero Waste project team did not attempt to evaluate the effectiveness of the implementation of the 60% program, nor the cost effectiveness. In fact, the Zero Waste team was impressed with the City's level of analysis, implementation plan, and ability to maintain budget and level of service goals while carrying out the components of the plan.

The project team looked primarily at existing data on recycling rates and compared the estimated participation and efficiency rates, and the timelines for increasing both, against real results. The team's evaluation of Seattle's work to date has identified some areas where the current recovery rates from existing 60% programs may be optimistic for 2010. Specifically:

- In the Single Family residential sector, ultimate recovery rates were adjusted downward to better match historical growth rates in recovery rate increases for mixed scrap paper, food waste, beverage and container glass, food cans and aluminum beverage. The adjustments lowered the anticipated overall recovery rate for the sector from 97% to approximately 94% in 2010.

- In the Multi Family residential sector, ultimate recovery rates were adjusted downward to better match historical growth in recovery rate increases in all material categories. The adjustments lowered the anticipated overall recovery rate for the sector from 39% to approximately 37% in 2010.

- In the Commercial sector, ultimate recovery rates were adjusted downward to model a more conservative response to the ban on paper in commercial garbage; and to represent a more modest growth in the Commercial organics recycling program. The adjustments lowered the anticipated overall recovery rate for the sector from 67% to approximately 65% in 2010.

As a result, new tonnage estimates for recovery rates associated with the 60% program were adjusted downward by the Zero Waste team to reflect the change in recovery rates in each sector. Table 1.3-2 provides a comparison of the latest 60% program tonnage estimates and the revisions modeled by the Zero Waste team.

Table 1.3-2
Comparison of 60% Program and revised 60% Program tonnage estimates in 2008, 2020, 2025, and 2038

	60% Program Tonnage Estimates	
	SPU Existing	**Zero Waste Revised**
Total Generated		
2008	822,877	822,877
2020	955,003	955,003
2025	1,016,408	1,016,408
2038	1,198,718	1,198,718
Disposed Waste*		
2008	410,044	426,060
2020	438,593	468,112
2025	470,851	502,153
2038	568,257	604,742
Diverted to Recycling**		
2008	412,833	396,817
2020	516,410	486,891
2025	545,557	514,255
2038	630,460	593,976

* includes amount that would be diverted from reuse/recycle center proposed for the South Recycling and Disposal Station

** does not include amount diverted to reuse/recycle center proposed for the South Recycling and Disposal Station

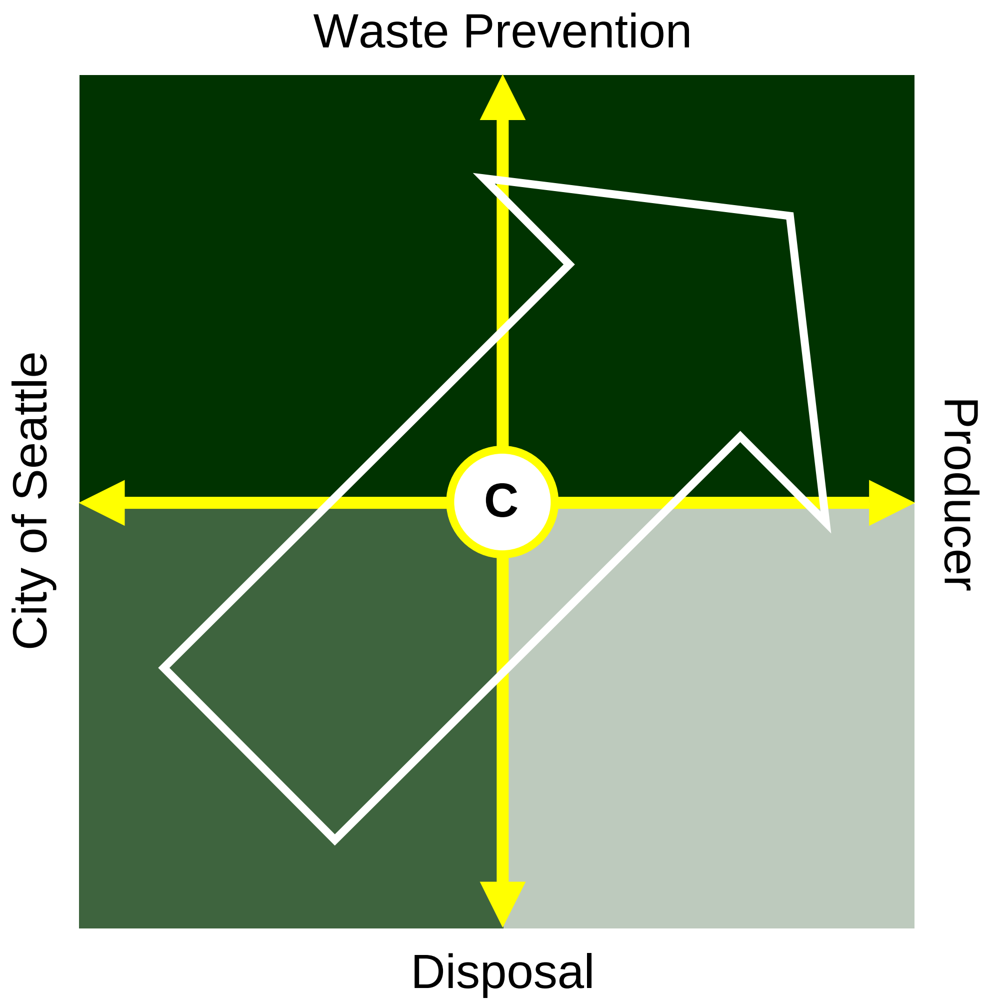
The second component of the Zero Waste project team's assessment looked at the range of sectors targeted (i.e., residential, commercial, self-haul), the range of materials targeted, and the methods for program implementation. These methods can be classified as:

- Regulatory
- Policy based
- Programmatic
- Contractual

Regulatory modifications include actions such as instituting bans on certain classes of materials, or mandating take-back programs. Policy modifications include changing the rate structure for garbage collection, altering purchasing guidelines to emphasize recycled or reused materials in city projects, or adding material classes that may be integrated into the traditional recycling and organics waste collection service. Programmatic modifications include education, market development, or implementing changes in the actual collection of materials including the frequency of collection and the size of containers that are used by residents and business. Contractual modifications include structuring solid waste service contracts to compensate contractors, vendors, and suppliers based on performance objectives that are aligned with the City's waste reduction or product stewardship goals.

The second component of the assessment revealed a wide range of programs employed by the City to promote the vision of shifting toward a "Zero Waste" economy. Figure 1 shows what we call the "waste management context," where the horizontal line shows who is responsible for handling waste, and the vertical line shows the product life cycle starting with the potential to prevent waste through design and manufacturing standards, through disposal. The "C" in the middle of the figure represents the consumer and consumption in general.

Figure 1



Current Seattle programs focus successfully on all quadrants shown in the figure, balancing disposal with waste prevention and recycling. Our assessment also concludes that at present the responsibility is weighted toward those quadrants in the figure where the City and its rate payers take on the bulk of the responsibility for the management of discarded products, packaging, and organic wastes, as well as the associated costs.

The strategies that are described in Section 2 take into account the conclusions reached in our brief assessment of the City's programs, and place emphasis on creating a shift as shown by the arrow. The shift would place greater emphasis on getting producers to be more accountable for the products they produce, and on preventing waste prior to consumption. In general, there is opportunity to strengthen the City's emphasis on the following:

- Product stewardship
- Financial and other incentives for waste diversion, highest and best use of recycled feedstocks, and product stewardship.
- Market development for local recycled materials processing and recycled materials use
- Use of regulations and regulatory enforcement

Overall, it is the Zero Waste team's intent to create the programmatic linkage between the current 60% package of programs and the package of new strategies that will bring the City to the realization of the Zero Waste goal, or closer to it. We anticipate that the City will utilize this Zero Waste study and the strategies it contains as the basis for further analysis and to help draft and adopt the 2009 Solid Waste Management Plan Update.

1.4 Review of the Seattle Discards Model

SPU has developed an econometric model that establishes relationships between various factors and the amount of collected garbage, recycling, and yard debris, as well as self-hauled waste. Factors that influence waste and recycling tonnages include household size and income, precipitation, temperature, snowfall, and the impacts of solid waste program changes such as bans. The Seattle Discards Model (SDM, or "the model ") establishes baseline tonnages against which the impacts of various recycling and waste diversion programs can be measured. It also can be used to predict the tonnages of waste, recyclables, and other materials that SPU's various programs and facilities must handle.

After reviewing the background document *The Seattle Discards Model* and meeting with SPU economics staff members who developed the model, the consultant team came to the following conclusions:

1. The model appears to be comprehensive, well conceived, and well tested. We are unaware of any other waste-forecasting model that considers so many variables (factors that influence waste generation). In contrast, most other models rely primarily on population projections, modified by estimated recycling rates.

2. The independent variables used to predict residential, commercial and self-haul garbage, as well as curbside recyclables and organics, appear to be well chosen. The econometric equations yield tonnage estimates that correlate reasonably well with actual historical tonnages. In most instances where the projections did not closely match the actual tonnages, there were plausible explanations for the differences. For example, due to an oversight in the curbside yard debris section of the SDM, the

impacts of the ‘Clean Drain’ bonus program initiated in 2000 were not included in the projections. However, despite this omission, the overall projections were remarkably accurate.

3. The term R^2 (R-square) is an indicator of how well the model fits the data, or how well the input (independent) variables predict the output (dependent variables). R-square values range from 0.0 to 1.0. An R-square close to 1.0 indicates that we have accounted for almost all of the variability with the independent (input) variables used in the model. A low R-square does not necessarily mean that the model is bad; rather, it means that the equations indicate differences that are not entirely explained by the independent variables used in the model.

   The R^2 (R-square) values for 2006 range from .65 to .98:

Residential garbage	.96
Commercial garbage	.65
Self-haul garbage	.91
Residential recycling	.88
Residential organics	.92
Apartment recycling	.98
Self-haul yard waste	.84

   The R-squares in the range of .84 to .98 indicate the most reliable and closest correlation between projections and actual quantities.

4. The R-square of .65 for the commercial sector falls below the preferred range. This low R-square results from poorer quality input data: limited historical data, commercial recycling data on an annual rather than a monthly basis, and the difficulty of tracking many diverse waste generators. A low R-square does not necessarily mean that the model is bad; rather, it means that the equations indicate differences that are not explained by the variables used in the model. We believe that as more reliable information on the commercial sector becomes available, the R-square will increase from .65 and reach a value similar to the other R-squares.

5. We have confidence that the model is reliable in its prediction of tonnages, as well as its ability to predict the impacts of changes to the solid waste system such as bans, changes in container sizes, and differential can rates. Therefore, we are comfortable with the model as a tool for evaluating tonnages and impacts of proposed programs up to year 2012.

6. To project waste tonnages from 2012 to 2038, the growth rates for the components of the waste stream (i.e., recycling and disposal) in each sector developed by SPU through the year 2012, which are based on an extrapolation of the underlying factors contributing to recycling and waste disposal, were applied and carried forward for each component of the waste stream to the year 2038 at a constant rate by the Zero

Waste team. This is consistent with previous SPU modeling as well as with the work performed for the Puget Sound Regional Council and Seattle City Light.

1.5 Calculating Recycling and Waste Diversion

The consultant team reviewed the ways that three states (California, Oregon and Washington), four cities (Seattle, Portland Metro, New York City and San Francisco) and the federal Environmental Protection Agency (EPA) measure recycling. There is no single, universally accepted method of calculation and it was readily apparent that there are numerous differences between the various methods that make an "apples to apples" comparison between jurisdictions extremely difficult.

One major difference between jurisdictions is the way that similar terms are defined: for example recycling, reuse, recovery, waste avoidance, waste minimization, beneficial use, and diversion. There are overlaps and conflicts between the various definitions and the formulas for what counts as recycling/recovery/diversion and what does not count.

Fortunately, it is relatively easy to gather the data required to measure the recycling of traditional materials such as aluminum and "tin" cans, PET and HDPE containers, various paper products, etc. This allows all the studied jurisdictions to calculate a recycling rate as a percentage of waste generated (which is in itself calculated in several ways).

A major difficulty in measuring recycling is the fact that many materials that are worth recycling (e.g. construction/demolition (C&D) debris, concrete, asphalt, batteries, oil filters, tires, and wood for energy recovery) are not included in the generally accepted definition of municipal solid waste (MSW). As such, they cannot be counted toward "recycling" of solid waste. Our research indicates that the states of California, Oregon, and Washington now include C&D debris (and some of these other materials) in their list of materials that can be counted towards a recovery or diversion rate. This measures the amount of material diverted from landfill disposal and as such, is a useful measurement of progress towards achieving Zero Waste. Table 1.5-1 lists some recent recycling, recovery and diversion rates for the west coast and the entire United States.

Table 1.5-1
Comparison of Recycling, Recovery and Diversion Rates

	Seattle 2005 Combined	Washington 2004 (DOE)	Washington 2005 (DOE)	EPA 2005 Recovery	California 2005	Portland 2004	Oregon 2005
Recycling	-	41.8%	43.6%	32.2%	-	-	46.3%
Recovery	44.1%	-	-	-	-	59%	-
Diversion	-	47.9%	47.7%	-	51.9%	-	-

Observations that can be made about the table above include:

- The California rate appears high because it allows its jurisdictions to include an extensive list of C&D waste materials in their **diversion** calculations. California's 2006 waste composition data (Cascadia 2006) indicates that C&D constituted about 22% of its overall waste stream and that approximately 74% of these materials may be divertible from disposal. A waste stream with 20% C&D and a 50% recovery rate could conceivably contribute about 10% to a jurisdiction's diversion rate.
- Washington's Department of Ecology (DOE) follows the EPA MSW model for **recycling** rate calculations. C&D is not included in recycling, but does count in the **diversion** calculation, along with other materials such as batteries and land-clearing debris. Based on the statewide data for 2004 and 2005, it appears that counting more materials in the **diversion** calculation allows an increase about 4 to 6 percentage points compared to **recycling**.
- Portland Metro had a 59% recovery rate in 2004 (Portland Metro 2006) consisting of 6% prevention (reuse and backyard composting) and 53% recovery (recycling, off-site composting and energy recovery). Metro follows Oregon Department of Environmental Quality guidelines and includes materials such as wood waste, asphalt roofing, gypsum wallboard and scrap metal in calculating its recovery rate.

For additional information regarding recycling, recovery and diversion rates, see Issue Paper regarding Diversion Rate Calculations and the spreadsheet Materials in Diversion Calculations, found in Appendix A.

2 EVALUATION OF NEW STRATEGIES

Central to the Zero Waste project team's tasks were the research, identification and analysis of non-traditional solid waste management options that could supplement the City's 60% Program strategies to help achieve its vision of Zero Waste. Strategies were grouped into three basic types: Zero Waste principles/Product Stewardship; collection; and facilities. The Zero Waste project team was also tasked with identifying the potential for these "Zero Waste" strategies to reduce the size of or eliminate the need for a third transfer station.

This section of the report describes the range of Zero Waste, collection, and facility strategies identified and analyzed by the project team. This section also summarizes the methods of evaluation used to determine recovery rates, implementation costs, and the risks associated with implementation. Volume 2 of this report contains the detailed analysis for most of the strategies listed in this section. Together with the facility evaluation in Section 4, these analyses form the basis for the tonnage projections in Section 3, the effects on the FMP in Section 5, and the action menu for future planning, analysis and implementation described in Section 6.

2.1 Methods of Evaluation

Recovery Rate Calculations

The Zero Waste project team established participation and efficiency ranges for each strategy during preliminary evaluations, and refined them individually, or for groups of strategies, during detailed analysis. Table 2.1-1 shows the initial ranges used.

Table 2.1-1
Participation and Efficiency Ranges

Value	Description	Code
Very Low	Under 5%	VL
Low	5% to 20%	L
Medium	20% to 50%	M
High	50% to 85%	H
Very High	Over 85%	VH

When detailed analysis of the strategies proceeded, the project team estimated participation and efficiency, and recovery rates, based on a combination of:

- Actual results from existing Seattle programs with similar focus or method;
- Actual results from other jurisdictions' programs with similar focus or method;
- Surveys of targeted customers or waste generators from other jurisdictions;

- Diversion rates for the three major stream components: recycling, MSW, organics;
- Professional judgment of the Zero Waste project team.

Participation and efficiency rates for take back programs are difficult to assess/calculate because some products are not disposed of routinely. Consumers often hoard old materials until they are ready to dispose of them. Participation at drop off events can be approximated using the methods described above (typically 1-3 percent of households), however this does not mean that over 97 percent of households are dumping the remaining old materials in the trash.

Since most existing take back programs have been funded pilot studies that were of short duration, there is limited basis for estimating the diversion potential that an ongoing program would achieve. However, as new laws mandate the development of permanent recovery programs and require that these programs be funded by mechanisms other than end-of-life (EOL) recovery fees, it can be reasonably assumed that some portion of the existing waste stream will be diverted. It can similarly be assumed that regulatory prohibitions against dumping of and increased opportunity for recycling compliance will increase participation and efficiency.

Diversion Potential

The Zero Waste project team established diversion ranges for each strategy during preliminary evaluations. During detailed analysis, the diversion range was refined for an individual strategy, or for a group of strategies acting in concert. Table 2.1-2 shows the initial ranges used.

Table 2.1-2
Diversion Ranges

Diversion Value	Diversion Description	Diversion Code
Super Very Low	up to 0.06% (500 tons)	SVL
Very Low	up to 0.3% (2,400 tons)	VL
Low	up to 1.0% (8,000 tons)	L
Medium	up to 2.0% (16,000 tons)	M
High	up to 5.0% (40,000 tons)	H
Very High	over 5.0%	VH
NA	0.0%	NA

Source: Diversion description ranges and description based on work by Skumatz Economic Research Associates, Inc.

During detailed analysis, the team refined the diversion for each strategy, or group of strategies, based on the product of estimated participation rates and estimated efficiency rates and applied to “available” disposed tonnage. A more complete description of the revised and new recycled tonnage estimates and modeling methods used is contained in Section 3

Implementation Costs

The Zero Waste project team went through two phases of cost development. The first, based on available research and current City data, assigned cost ranges to strategies from three perspectives: cost to City; cost to ratepayers, and costs to consumers (as a result of fees or costs outside of the City garbage rate structure). Table 2.1.3 show the initial cost ranges used.

Table 2.1-3
Implementation Cost Ranges

SPU Cost	SPU Cost Description	SPU Cost Code
Very Low	Under $50,000 per year	VL
Low	$50 - $100,000 per year	L
Medium	$100 - 250,000 per year	M
High	$250 - $750,000 per year	H
Very High	Over $750,000 per year	VH
NA	$0	NA
Ratepayer Cost	**Ratepayer Cost Description**	**Ratepayer Cost Code**
Very Low	up to $25 per ton	VL
Low	up to $50 per ton	L
Medium	up to $100 per ton	M
High	up to $150 per ton	H
Very High	over $150 per ton	VH
NA	$0	NA
Consumer Cost	**Consumer Cost Description**	**Consumer Cost Code**
Very Low	up to $10 per Household	VL
Low	up to $20 per Household	L
Medium	up to $50 per Household	M
High	up to $100 per Household	H
Very High	Over $100 per Household	VH
NA	$0	NA

When detailed analysis of the strategies proceeded, the project team built implementation costs from the bottom up, using known unit costs or average unit costs for labor full-time equivalents (FTE), equipment, transportation, processing, advertising and materials production, etc. Actual or estimated costs from contractors were used where applicable and when available. Costs imposed by producers were researched, and with little real data available, averages were estimated for Seattle circumstances.

Environmental Benefits

The Zero Waste project team established qualitative ranges for environmental benefits associated with each strategy during preliminary evaluations. Table 2.1-4 shows the initial ranges used.

Table 2.1-4 Environmental Benefit

Value	Description	Code
Very Low	Very low avoidance	VL
Low	Low avoidance	L
Medium	Moderate avoidance	M
High	High avoidance	H
Very High	Very high avoidance	VH

For the purposes of this study, environmental benefit was defined as the direct avoidance of the release of emissions or effluents harmful to human or environmental health. Direct avoidance refers to the effects associated with use or disposal of a product or material, such as preventing Mercury from entering surface or groundwater through recycle and capture operations. Indirect avoidance, such as those associated with product manufacture were not considered. The Zero Waste team did not attempt to monetize environmental costs and benefits associated with each strategy. Detailed analysis of Zero Waste strategies documented environmental benefits and costs qualitatively in order to provide a relevant starting point for a triple-bottom-line analysis of system costs to be conducted after completion of this study.

Risk of Not Achieving Desired Results

The Zero Waste project team established qualitative ranges for risk associated with each strategy during preliminary evaluations. Table 2.1-5 shows the initial ranges used.

Table 2.1-5 Risk

Value	Description	Code
Very Low	Very low risk of not achieving results	VL
Low	Low risk of not achieving results	L
Medium	Moderate risk of not achieving results	M
High	High risk of not achieving results	H
Very High	Very high risk of not achieving results	VH

For the purposes of this study, risk was defined as the uncertainty that estimated tonnage reductions would be achieved within the predicted time frame. This definition of risk also incorporates the perception of the ease of implementation (lower risk) or difficulty of implementation (higher risk) by SPU; and the perception of whether customers would accept any changes prescribed by a strategy willingly (lower risk) or reluctantly (higher risk). Detailed analysis of Zero Waste strategies in Volume 2 documents risks qualitatively as pros and cons associated with feasibility and implementation steps. Section 1.2 describes the stakeholder involvement process intended to help measure these risks. Results from the stakeholder surveys will be incorporated into this study at a later time.

2.2 Zero Waste Principles/Product Stewardship Strategies

Seattle's 1998 Comprehensive Solid Waste Management Plan was one of the earliest solid waste plans in the United States to adopt the principle of Zero Waste. The principle was reinforced in the City's 2004 Plan Amendment. According to the Zero Waste Alliance, Zero Waste suggests that

> "…the entire concept of waste should be eliminated. Instead, waste should be thought of as a "residual product" or simply a "potential resource" to counter our basic acceptance of waste as a normal course of events. Opportunities such as reduced costs, increased profits, and reduced environmental impacts are found when returning these "residual products" or "resources" as food to either natural or industrial systems. This may involve redesigning both products and processes in order to eliminate hazardous properties that make them unusable and unmanageable in quantities that overburden both industry and the environment."

In a Zero Waste context, organics are generally the responsibility of the overall community. Products, including those considered by the City as traditional recyclables, C&D waste, small appliances and electronics, white goods, furniture, and hazardous chemicals, are the responsibility of the product's producer/manufacturer. With this understanding, wastes can be prevented by all of the economic and environmental stakeholders through product and process designs based on full life-cycle thinking.

Within the Zero Waste context, the City is a major stakeholder and has two distinct roles, both of which are reflected in the City's 2004 Plan Amendment: that of a leader in the effort to transform societal "waste" management into "resource" management; and that of a provider of waste handling and recycling services and facilities to its residential and business customers. Accordingly, research conducted by the Zero Waste project team in this category of strategies focused on activities that address the ways products are made, distributed, consumed and that generally minimize waste and reduce consumption; and those activities that address how products are handled at their end of life, and that generally maximize recycling.

Operationally, these strategies were grouped into four basic areas where the City has exerted influence in the past, and could in the future:

- Product Stewardship (Take Back) Programs
- Education Programs
- Market Development Programs
- Regulatory Programs

The following subsections provide background information for each of the above strategy groups to support the analyses contained in Volume 2. A list of strategies considered follows the background discussions.

Product Stewardship (Take Back) Programs

The notion of having more than just the local government (and its rate payers) take responsibility for managing used products and packages is known by various names, including extended producer responsibility (EPR), manufacturer responsibility, and product stewardship. This report uses the terms interchangeably.

Product stewardship is the approach that manufacturers take responsibility for minimizing the environmental impact of their products throughout their life cycle. Product stewardship creates the opportunity to minimize waste during product design, manufacturing, distribution, and consumption; and provides an infrastructure to handle the recovery of products at the end of their useful life. The dedicated recovery infrastructure allows for the environmentally responsible recycling of product components into the highest value end-use due to the quality and consistency of the resulting materials. While the current waste management system imposes a large financial burden on local governments for managing waste, product stewardship shifts costs to those responsible for creating it.

Product stewardship programs can be mandatory or voluntary, and often take the form of "take-back" programs where a private infrastructure is established (reverse-distribution) to recover end-of-life products. Product stewardship programs are funded in a variety of ways, including advanced disposal fees collected at time of product purchase, end of life disposal fees at time of disposal, or with charges incorporated in the purchase price of the product. According to the Washington Department of Ecology (Ecology), product stewardship can be coupled with positive incentives such as technical assistance, education for consumers, recognition programs, tax reductions; market development plans; grants; and government procurement policies.

Ecology and/or the Northwest Product Stewardship Council (of which the City is a member) are pursuing product stewardship programs for carpet, paint, and other materials.

Take Back Program Models

Special Drop off Events. Special drop off events are one-time (or periodically scheduled) events to allow consumers to bring products to a central location for recovery. Drop off events typically achieve 1-3 percent participation, while participant efficiency can be very high (EcoCycle, Boulder CO). Typical recycle costs vary depending on material targeted. Recovery costs for electronics at drop off events can range as high as $300/ton. Current re-use of electronics recovered from recycling events is approximately 10 percent of disposed materials. (Resource Recycling Journal, Portland OR).

Retail Drop Off. Retailer drop off is generally viewed to be the collection method having the highest participation rates based on pilot study experience and survey results. A 2002 survey in Washington State conducted by the Office of Technology Policy within the U.S. Department of Commerce (OTP, 2006) found that 61 percent of respondents would prefer returning used electronics (e-Waste) to retailers, even if free recycling were offered at local transfer stations or shipping back to producers. Retailer drop off presents several 'level playing field' issues however. Not all retailers have the space or the staff to provide the service, and those who do reap the benefit of extra traffic. For this reason, many take back programs utilize a central, non-retail product recovery center.

Product Recovery Center. Another model for product recovery includes a centralized product recovery center funded by user EOL fees. This model would maintain a level playing field for all retailers (not all retailers have the space or logistical ability to accommodate take back), but could potentially lower participation because it would require users to make a special trip for recycling. For example, Seattle and King County currently accept fluorescent lamps at Household Hazardous Waste Recovery Centers and Wastemobile event locations. This system is less convenient because of limited hours of operation and, in the case of recovery centers, users must schedule an appointment to drop off waste.

Producer Mail Back. Mechanisms for mailing/shipping back waste back to producers are not considered likely to produce high participation because they involve a high consumer cost and convenience burden. Moreover, this approach would not address orphaned products. A 2002 survey found that only 5 percent of respondents would participate in mail back programs where the consumer paid shipping costs. The possibility of free shipping only raised this figure to 20 percent (see OTP 2006). For electronics, typical shipping costs ranged from $20 to $60 per return, not including the effort and cost required to package the materials for return.

Fee Structures

Most manufacturers advocate implementation of advanced recovery fees (ARFs) transitioning to hidden costs in products after sufficient time to recovery legacy products (i.e., those products produced by manufacturers prior to implementation of a take-back program and for which no ARF was collected, but which would be accepted in a take-back program). ARFs provide an immediate and sustainable source of funding for recovery programs, and fund the recovery of orphaned products that might otherwise be hoarded or dumped. However, they admit that ARFs and hidden consumer recycling costs present a disincentive towards increased product stewardship design. They note that government procurement policies favoring products with high levels of product stewardship create a powerful positive incentive when paired with recovery programs funded using ARFs (EMCRR 2005).

Similarly, incentives could be incorporated into the system via a partial refund or other form of reward for producers whose products cost less to recycle or demonstrate one or more other environmental benefits. This would require further administrative mechanisms. California incentivized producers by banning the use of certain materials consistent with the European Restriction on the use of Hazardous Substances directive (RoHS) and requiring manufacturers to submit annual reports on design efforts and their use of hazardous materials.

End of life (EOL) fees are generally viewed to provide less effective incentives for participation. A 2002 King County survey found that 34 percent of respondents would hoard their used electronics and 4 percent admitted they would dispose of them illegally in response to EOL fee implementation. Local governments in Oregon, Maine, and Massachusetts found that EOL fees increased illegal dumping. OTP (2006) points out that EOL recovery fees are inherently regressive, placing a larger percentage of the cost burden on lower income people and charities. These parties represent the bulk of the market for reused materials and are more likely to have ownership of units nearing the end of useful life. For example, Goodwill Industries received approximately 200,000 donated computers in 2004. Of these only 15 percent were usable, and the remainder had to be recycled at high cost to the charity.

A 2002 King County survey found that 71 percent of respondents would prefer that prepaid recycling costs be included in the retail cost of the product (an ARF), as opposed to an EOL fee or mail back program. If a pre-paid recycling fee of $15 were added to the cost of a television, 86 percent of respondents said they would still buy it.

Extended producer responsibility (EPR) places the cost burden for recovery and recycling of used products on the producers. Under the full cost internalization (CI) variant of producer responsibility, producers are responsible for all costs for collecting and managing recovered products. Each manufacturer can decide individually how to absorb the additional costs, including passing part or all of the costs on to the consumer. Partial Cost Internalization (PCI), refers to a system where the producers are responsible for some level of consolidation, and all processing and recycling, and the government is responsible for collection. CI and PCI differ from the ARF in a number of ways. Unlike many ARF varieties, there is no visible and separate fee to the consumer. The retailers do not need to create an infrastructure to collect and remit an ARF at point of sale, thus there is no fee collection bureaucracy. Depending on how the EPR/CI system is established there could be fewer transactions, thus lowering total transaction costs. Individual companies and/or the industry trade organization might have a material tracking and reporting requirement to demonstrate compliance with government producer responsibility mandates. Administratively, EPR/CI supporters claim that the producer responsibility model should be simpler, although critics note the additional requirements associated with orphan determination and responsibility allocation.

Other major arguments made by EPR/CI supporters are that this financing mechanism provides 1) incentives for development of a competitive recycling industry, 2) design for recycling, 3) the least cost for consumers and local governments, and 4) flexibility for creating a variety of collection systems depending upon what works best for industry, retailers, and government in each locale.

Education Programs

Research on several waste reduction and recycling programs revealed that outreach and education plays a major role in the diversion of waste from landfills. Programs containing a significant outreach and education component were reviewed to assess rates of public participation, waste diversion, and efficiency.

For example, staff from the Econservation Institute in Superior, Colorado conducted a study in 2002 (Econservation, 2002) that entailed literature review, phone interviews and analyses of educational campaigns (including radio, TV, newspaper, billboards, brochures, flyers, direct mail and fairs). More than 60 professionals were interviewed and 140 educational campaigns were analyzed across the nation to gather information on recycling and waste diversion program features, program costs, messages, demographics and outreach distribution methods.

Statistical methods were used to measure effects of outreach and education on waste reduction/recycling and diversion. Information from multiple communities and campaigns were utilized to separate out the effects of different education methods, distribution methods and messages. Generally speaking, print media, particularly newspapers, handbooks, billboards and direct mail, were much more effective at changing public awareness and behavior, as compared to electronic media (TV, radio, websites). Also, as one would expect, larger communities are more likely to use electronic media and have higher household budgets than smaller communities relying mostly on printed material. In the study, community size varied from 700 to 200,000 households, and diversion rates ranged from 9% -65% (Econservation, 2002).

In 2003, Ecology Action in Santa Cruz, California lead a program that entailed providing technical assistance to 27 elementary, middle and high schools in Santa Cruz County (Ecology Action, 2007). Ecology Action worked with administrators, staff, students and the greater community to provide education and assist with the implementation of school recycling programs. As a result of this program, 1,200 tons of waste in Santa Cruz County were diverted from landfills and school districts saved $100,000 in garbage hauling costs. In addition, Ecology Action developed their WasteNot© Software to conduct waste audits for businesses in Santa Cruz County and to train businesses to use software for their own waste reduction audits. In 2004, Ecology Action had assisted a total of 624 businesses, and 2,843 tons of business waste was diverted as a result of this program (Ecology Action, 2007). A summary of this and other studies is shown in Table 2.2-1, below.

Table 2.2-1
Effects of Outreach and Education on Waste Reduction and Waste Diversion

Program	Participation Rate	Tons Diverted		Efficiency Rate
Econservation Institute	-	-		9%-65%
Ecology Action	-	Waste Free Schools Program	Business Program	-
		1,200	2,843	
Greater Vancouver Regional Dist. (GVRD) – Educational Program	60%	57,000		-
Ontario Waste Mgmt. - Community Partnership Program	-	-		34%
Washington D.C. – Federal Env. Executive Office (OFEE)	-	85,000		65%
LA County – Business Recycling Technical Assistance Program	13%	51,000 cubic yards		-

For the Zero Waste study, it was assumed that education and outreach would be part of most programs implemented, leading up to the launch of the program and continuing during ramp up of the program. However, the project team did not evaluate any education-only type programs for consideration in the facility analysis. Several education programs are identified as part of added enforcement of existing material bans or proposed regulations. In addition, the Zero Waste team identified several initiatives that call for increased cooperation and coordination with other local governments, Washington State government, and the Municipal and Provincial governments of British Columbia.

Market Development Programs

Most materials that are discarded retain significant resource value, and recycling makes economic and environmental sense. The highest and best use of a recycled material is when it is used as a substitute for virgin material feedstock in the same product application. Market development programs are an important component of a comprehensive recycling strategy to pursue highest and best end-use applications, as well as to ensure that the capacity exists to utilize materials diverted from the waste stream, even in less than best use applications.

Market development often takes the form of low interest loans, grants, technical assistance, tax incentives, marketing promotion, education, etc. The effort can be substantial and costly, and the diversion potential (market pull) may have a long lead time and is subject to a number of other market considerations over which the government has no control (e.g., virgin material pricing, competing product pricing).

The Zero Waste team has identified several potential market development strategies that could help push Seattle beyond its current 60% waste diversion goal, and to help the City address future goals for the recovery of other materials (i.e., C&D waste).

Regulatory Programs

Regulations related to solid waste management are commonplace and widespread. Solid waste is generally regulated under subtitle D of the federal Resource Conservation and Recovery Act (RCRA). The provisions of Subtitle D primarily affect state and regional solid waste management authorities, and include requirements for comprehensive solid waste planning as well as encouraging recycling.

Washington State law assigns primary responsibility for collection, transfer, and disposal of solid waste (including prevention and recycling) to local government (RCW 70.95). The state gives municipalities exclusive authority to provide and set rates for solid waste services by using municipal workers, competitively bidding contracts to private companies, or developing inter-local agreements with a county or city to provide services (RCW 35.21). The Washington State Legislature amended RCW 70.95.305; and reenacted and amended RCW 70.95.020 effective July 24, 2005 to deal with the flow control issue of C&D waste (SB5788 and HB1817 respectively). Seattle has established its authority over solid waste generated within the city and its own solid waste rules in the City's Solid Waste Code (SMC 21.36, 21.40, 21.43, and 21.44)

Regulations related to recycling commonly take the format of material disposal bans and mandatory recycling requirements. Depending on the region or the level of government enacting the legislation, recycling rules are defined and implemented differently. Recycling rules may be aimed at different segments in the life cycle of a product (e.g., producer, retailer, generator, hauler, processor, or transfer or disposal facility); and at different sectors within the generator community (e.g., single-family residences, multi-family residences, commercial businesses, and self-haulers). In addition, programs that address how regulated residents and businesses comply with recycling rules and for dealing with those in violation of them vary greatly. Education, site inspections, load inspections, container tagging (warnings), notices of violation, and fines are all used, often in combination to advance compliance.

A range of materials are targeted by recycling regulations across the United States, and in Europe. In the United States, many disposal ban regulations were initially aimed at potentially hazardous substances such as lead-acid batteries, medical waste, asbestos, and mercury containing products. Many states and municipalities ban other items such as tires, yard waste (including grass), leaves, wood waste, C&D, and white goods. Connecticut, for example, has a mandatory recycling law which requires the recycling of

11 designated items (NERC, 2005). Although not technically a "ban" these items must be recycled and cannot be disposed.

With passage of City of Seattle Ordinance 121372, Seattle prohibits businesses from disposing of paper, cardboard or yard debris in the garbage. Residents (both single-family and multi-family) are prohibited from putting paper, cardboard, glass and plastic bottles, jars, and aluminum and tin cans in their garbage (defined as traditionals for purposes of this study). Yard debris has been banned from residential garbage since 1989. In addition, Seattle prohibits computers and electronics, vehicle batteries, rechargeable batteries, car parts and engines, motor oil and filters, and tires in the garbage.

The Zero Waste team has identified several potential regulatory strategies that could help push Seattle beyond its current 60% waste diversion goal, and to help the City address future goals for the recovery of other materials.

Summary of New Strategies

Table 2.2-2 lists the Zero Waste/Product Stewardship strategies analyzed for inclusion in the facilities scenarios (i.e. the “A” Options, those that have the potential to divert significant tonnage away from disposal). Analyses for all “A” options are contained in Volume 2. The strategies listed in Table 2.2-2 are a subset of all Zero Waste/product stewardship strategies considered and ranked. The full list of strategies (A, B, C and D levels) considered during the study is included in the Appendix to Volume 2 and contained in an Access database accompanying this report

Table 2.2-2
Option “A” Strategies for Zero Waste / Product Stewardship

ID	Strategy	Target Sector	Material Class
152	(Other) Disposal Bans	All	Other
298	Beverage Container Deposit System	All	Traditionals
204	Building Permit C&D Reuse And Recycling Fee Deposit	Commercial	C&D
307	Tiered Commercial Organics Rates	Commercial	Organics
285	Commercial Organic Waste Disposal Ban	Commercial	Organics
349	Disposal Ban For Recyclables In Commercial Waste	Commercial	Traditionals
160 / 330	Expand Inspection & Enforcement Program / Mandatory Commercial/Institutional Waste Audits	Commercial	Traditionals
173	C&D Recyclables Disposal Ban	Commercial & Self-Haul	C&D
265	Take-Back Program For Carpet	Commercial and Self-Haul	Other
182	Residential Food Waste Disposal Ban	Residential	Organics
353	Compostable Plastic Bags	Residential	Traditionals
160	Expand Inspection & Enforcement Program	Residential and Self-Haul	Traditionals and Other

ID	Strategy	Target Sector	Material Class
363	Take-Back Program for Used Building Materials at Home Product Centers	Self-Haul	C&D
192	Pet Waste Composting	SF Residential	Organics
273 / 400	Residential Diaper Composting / Subsidize Reusable Diaper Services from Fee on Disposable Diaper Purchases	SF Residential	Organics

Table 2.2-3 lists the Zero Waste/Product Stewardship strategies analyzed at a lesser level of detail (the “B” Options, those with lower potential diversion but with significant environmental benefits) for inclusion in the Action Menu described in Section 6. Analyses for selected “B” options are contained in Volume 2. The strategies listed in Table 2.2-3 are a subset of all Zero Waste/product stewardship strategies considered and ranked. The full list of strategies considered during the study is included in the Appendix to Volume 2 and contained in an Access database accompanying this report

Table 2.2-3
Option “B” Strategies for Zero Waste / Product Stewardship

ID	Strategy	Target Sector	Material Class
187	Incentive Program to Encourage Biomass/Organics To Energy	All	Organics
202	Packaging Tax	All	Traditionals
228	Product Ban for Styrofoam To-Go Containers and Single-Serve Foodservice	All	Traditionals
340	Create or Adopt Eco-Labeling Requirements for Recycled Content, Recyclability, Product Packaging Ratio, and Toxic Content.	All	Other
355	Chemical Policy and Precautionary Principal	All	Hazardous
329	Create Regional SWAC to Lead, Establish and Implement Cooperation on Zero Waste, Waste Reduction, Recycling, Market Development, "Design For Recycling" Standards, Collection, Facilities, and Disposal Activities	All	Other
374	Meet with the Greater Vancouver Regional District (B.C.) to share strategies on increasing diversion.	All	Traditionals
229	Take-Back Program For EPS Foam Packaging – Negotiate With The Association Of Foam Packaging Recyclers	All	Traditionals
401	Fee on Incandescent Bulbs to Fund Fluorescent Bulb Recycling	All	Hazardous
169	Disposal Ban For Used Oil Bottles	All	Other
399	Ban PVC Plastic Packaging	All	Traditionals
393	Initiate Distinction in Measuring Recycling Rates by 'Closed-Loop Recycling' vs. 'Down-Cycling'	All	Traditionals
394	Emphasize 'Closed-Loop Recycling' in Processing Contracts not 'Down-Cycling'	All	Traditionals
201	Disassembly For Recycling Regulation	Commercial	Traditionals
165	Recycling Market Development Zones	Commercial	Other
289	Reusable Transport Packaging	Commercial	Traditionals

ID	Strategy	Target Sector	Material Class
391	Seattle "Green Dot" Program - Producers Share in the Cost of Curbside Recycling	Residential	Traditionals
364	Product Tagging System in Retail Stores.	Residential	Traditionals
279	Take-Back Program for Household Chemical Waste	Residential	Hazardous
193	Plastic Bag Initiative	Residential	Traditionals
246	Deposit Program for Plastic Grocery Bags and Other Common Items	Residential	Traditionals
396	Grocery Bag Fee	Residential	Traditionals
244	Add Mercury Thermometers to Take-Back Program For Auto Switches, Thermostats, Lamps, Fluorescent Lamps, Dental Waste, Medical Waste	Residential	Hazardous
276	Take-Back Program For Product Packaging By Retail Sellers	Residential	Traditionals
219	Expand Take-Back Program For Fluorescent Lamps to Include Thermostats and to Build Business Participation	Self-Haul	Hazardous

2.3 Collection Strategies

Collection services are one of the most fundamental components of a municipal waste system. The way that collection services are structured can influence both their cost, the diversion rates of materials within the waste stream, customer satisfaction, and the number of trips and total amount of materials delivered to transfer stations in the City. This evaluation was completed to determine the costs and benefits associated with various means of restructuring the City's residential and commercial collection services. Alternatives for restructuring the City's self-haul program are included in this evaluation.

There are four principal implementation methods for modifying collection services in an attempt to minimize waste, and increase diversion and recovery rates of materials. These methods can be classified as:

- Regulatory
- Policy based
- Programmatic
- Contractual

Regulatory modifications include actions such as instituting bans on certain classes of materials. Policy modifications consist of changing the rate structure for garbage collection and altering the material classes that may be integrated into the traditional recycling and organic waste streams. Programmatic modifications include implementing changes in the actual collection of materials including the frequency of collection and the size of containers that are used by residents and businesses. Contractual modifications include structuring solid waste service contracts to compensate waste contractors based on performance objectives that are aligned with the City's waste reduction goals.

The city's 2003 recovery rate and material composition analysis indicates that increasing the collection of food waste and improving the material recovery rates within the self-haul sector offers significant potential benefits for reducing the total amount of MSW that is disposed. Increased diversion of food waste from the waste stream to the organic stream can be accomplished both by increasing the materials that are accepted in the existing food waste collection program and expanding food waste collection to better serve the commercial sector. Evaluation of opportunities for increasing material recovery rates within the self-haul sector also considers the benefits of limiting the number of self-haul trips to NRDS and SRDS. Such trip reduction can be achieved through policy or programmatic methods ranging from offering on-demand pick-ups for self-haul materials to banning self-haul all together.

Background

This section discusses the restructuring of collection services to minimize waste disposal and increase recovery/diversion rates. Twenty-three collection strategies were evaluated based on their potential for influencing diversion/recovery rates and their relative costs as determined through an analysis of collection calculations varying frequency/etc while fixing other standard collection analysis variables.

Evaluations of the following collection-related topics are found below:

- Collection Frequency and Container Size
- Collection Pricing
- Self-Haul Alternatives
- Expansion of residential food waste/organics collection programs
- Adding commercial food waste/organics collection programs

Collection Frequency and Container Size

The common philosophy relied upon by successful recycling programs is customer convenience. When designing a program to achieve a higher diversion rate, a community has a variety of options to influence and encourage their customers' recycling patterns. Two of the most important options are recyclables collection frequency and container size.

Collection Frequency

Typical curbside collection frequencies for traditional recyclables are weekly, every other week (EOW), and monthly. Some communities have used pilot programs to experiment with multiple program changes to establish which programs are the most effective and to determine the cost efficiency of those changes. In the past several years, the trend has been for communities to switch from weekly to EOW collection of traditional recyclables. Generally, communities have paired this decrease in collection frequency with an increase in the types of materials that they collect. This pairing is intended to counteract the potential negative effects of less frequent collection. For instance, a community may reduce their collection frequency but add motor oil to their list of items eligible for pick up. Another technique has been to use the savings from EOW collection to subsidize the cost of yard waste pickup. Table 2.3-1 summarizes jurisdictions that changed their collection frequency.

Table 2.3-1
Changes in Curbside Collection of Traditional Recyclables

Municipality	Original Frequency	New Frequency	Year of Change
Changed to Less Frequent			
Philadelphia, PA	Weekly	EOW	1992
Sacramento, CA	Weekly	EOW	1994
St. Catherines, Ontario	Weekly	EOW	1994
Seattle, WA – north end	**Weekly**	**EOW**	**2000**
Albuquerque, NM	Weekly	EOW	2002
Whitewater, WI	Weekly	EOW	2002
Woodbury, MN	Weekly	EOW	2004
Madison, WI	Weekly	EOW	2005
Oshawa, Canada	Weekly	EOW	2006
Cincinnati, OH	Weekly	EOW	2006
Robbinsdale, MN	Weekly	EOW	2007
Changed to More Frequent			
Naperville, IL	EOW	Weekly	1990
Newark, NJ	EOW	Weekly	1991
Ann Arbor, MI	Monthly	Weekly	1991
NYC, NY	EOW	Weekly	1998
Seattle, WA – south end	**Monthly**	**EOW**	**2000**
St. Paul, MN	EOW	Weekly	2005
Raleigh, NC	EOW	Weekly	2005
Murrysville, PA	Monthly	EOW	2006

Increasing Traditional Recyclables Collection Frequency from EOW to Weekly
Several studies, including one conducted by the EPA, indicate that weekly collection of recyclable materials is the most effective way to increase participation and recovery. A statistical analysis conducted by Lisa Skumatz in 1996 suggests weekly collection could increase the amount diverted by 2 to 4% (EPA, 1999). In 2003 a study conducted by King County estimated an even higher increase of 17% for recycling collection if all EOW programs switched to weekly (Morris, 2003).

Eureka Recycling agency conducted multiple pilot programs in Saint Paul, Minnesota. One of their customer polls showed that “68% of the residents that tested weekly (recyclable collection) felt that it was just the right amount of service and 61% were willing to pay for this additional service" (Eureka Recycling, 2002).

In May 1990, the City of Naperville, Illinois switched from EOW to weekly recyclables collection. Following the collection frequency increase, overall monthly participation increased from 54% to 75%. While servicing the same number of households and collecting the same types of recyclables, the overall tonnage increased by 72% after switching to weekly collection. Naperville also experienced a 152% increase in the number of setouts per collection day, while the weight of each setout decreased by an average of 25% (Ref. 3). The setout rate is the percentage of households eligible for pickup that place materials out for collection on the specified collection day.

In November 1991, the City of Newark, New Jersey switched from EOW to weekly recyclables collection. Newark experienced a 20% increase in the amount of material that was recovered after switching to the weekly program (EPA, 1994).

Decreasing Traditional Recyclables Collection Frequency from Weekly to EOW

In 1995, the Department of Energy conducted a national study that determined that collection costs account for 39 to 62% of recycling system costs (EPA, 1999). Numerous municipalities have found this to be true and have reduced their curbside recyclables collection from weekly to EOW. A study by Lisa Skumatz noted that "some communities may find that EOW collection can lead to a more cost-effective program, and/or may free up budget resources to allow purchase of containers, or upgrade processing capabilities, etc" (EPA, 1999).

In an EPA report, some communities "reported significant reductions in operational costs and only marginal impacts on participation and diversion when collection frequency for recyclables was changed from weekly to biweekly" (EPA, 1999). Communities with significantly high diversion and participation rates generally experience the least change in recycling quantity intake when changing from weekly to EOW recyclables collection. The Northeast Recycling Council stated in one of their studies that "biweekly collection might be more appropriate (than weekly collection)" for communities with previously high diversion and participation rates (Northeast Regional Council, 1999).

In January 1994, City of Sacramento, California decreased the frequency of their recyclables collection from weekly to EOW service. By reducing the frequency of collection, the City was able to decrease the number of routes by 23%, collection cost dropped 38%, and household setouts declined 19% (Powell). The decrease in collection frequency saved $500,000 per year in the recycling program budget. Some of the City reports following the frequency change indicated a 12 to 13% drop in overall recyclables recovered through the curbside program (EPA, 1999).

Virginia Waste Management Authority (CVWMA) conducted a study that indicated that most households participating in their curbside recyclables collection program were setting out recyclables twice per month on average, despite their weekly pickup program.

In response to this study, CVWMA switched from weekly collection to EOW collection of recyclable materials in April 1994. The frequency decrease resulted in a 17% increase in the average number of setouts per route per collection day and a 49% increase in the average pounds collected per setout (EPA, 1999).

In order to dramatically expand their routes, Southeastern Public Service Authority of Virginia (SPSA) decreased their recyclables collection frequency from weekly to EOW. SPSA increased their routing to cover 250,000 households from 150,000 households (weekly program). The decrease in collection frequency also increased setout rate by 1 to 2%, increased pounds per stop by 19%, and increased pounds of recyclables collected per scheduled work hour by 66% (EPA, 1999).

Seattle's Experience

In April 2000, Seattle implemented simultaneous changes in both collection frequency and container size for single-family recyclables. Frequency in the north end of Seattle was reduced from weekly collection of 3 bins to EOW collection of a wheeled cart (96-gallon toter) plus a glass-only bin. Frequency in the south end was increased from monthly to EOW collection of a cart plus glass-only bin (no change in containers). Plastic bags, plastic tubs, polycoated paper, and aseptic packaging were added to the list of acceptable materials. Tonnage collected in the north end decreased; SPU's analysis indicated that about half of the decrease was probably due to the reduction in collection frequency, and about half was due to the decline in the national economy in the 2000-2001 period. Through a waste composition study, SPU learned that the level of contamination (non-recyclable materials mixed in with recyclables) increased in the north end. This is not unexpected when a change is made from smaller, easily-observable open-top bins to toters with lids. South end recyclable tons increased, suggesting a cause-effect relationship with increased collection frequency.

When developing a recycling policy, both the expected program cost and recycling rate benefit must be evaluated to determine the practicality of the policy. SPU's *2006 Solid Waste Residential Customer Survey Research Results* [Seattle Public Utilities, 2006] included feedback from customers on several frequency-of-collection alternatives for waste, recycling, organics, and yard waste pickup. The research included estimates of what customers were willing to pay for frequency changes in their waste, recycling, organics, and yard waste pickup.

Another option presented to customers in the survey was changing **organics** collection from EOW to weekly, while maintaining the current waste and recyclable collection frequency. The report estimates that current organics subscribers are willing to accept a monthly increase of $3.50 per month for weekly collection. The cost of this service change to the City is estimated at $2.75 per customer per month, yielding a difference of $0.75 in favor of the City. The cost to increase organics collection to weekly would only impact organics subscribers and not be carried over to the rates of waste pickup for non-organics subscribers or mandate organics pickup for all for SPU customers. Increasing organics collection to weekly would upgrade collection convenience for organics subscriber customers and create an additional outlet for improving Seattle's waste diversion rate, while maintaining customer satisfaction with SPU's rates.

The SPU survey presented customers with two other scenarios combining increased organics and recyclable collection frequency, and reduced waste collection paired with increase in organics. The results from these two other scenarios indicated large differences between the cost to SPU and the rate increase that customers were willing to accept. Two involving a reduction in waste collection frequency and were negatively received by the surveyed customers, indicating that it may be difficult to gain public acceptance of reduced waste collection. The survey alternatives did not include adjusting the collection frequency of recyclables while maintaining other variables at status quo; therefore the rate increase that customers would be willing to accept for weekly collection was not obtained.

Waste Collection Frequency

Current regulations of Seattle & King County Public Health generally do not allow every-other-week (EOW) collection of garbage; i.e. weekly collection is required. However, a provision in the revised code may allow the City an exception to weekly collection, although the extent and conditions of this exception have not yet been evaluated from a legal and technical standpoint. (Sidles 2007)
Reducing **waste** collection from weekly to every other week (EOW), coupled with a decrease in monthly cost to customers, was presented in the 2006 customer survey (Seattle Public Utilities, 2006). Utilizing the "logit" analysis technique, it was estimated that customers would require a $4.40 savings per month to accept a reduction in their waste collection from weekly to EOW. The reduction in service would save SPU only $1.90 per customer per month, creating a $2.50 deficit but maintaining the same level of customer satisfaction. Reducing waste collection frequency to EOW does not appear to be a viable option without either subsidizing the rate or sacrificing customer satisfaction.

Container Size

Container size is another variable option that recycling programs may attempt to fine tune in order to maximize the diversion rate. Container sizes generally range from 18-gallon bins to 96-gallon wheeled carts. Larger containers are generally used in communities that commingle their recyclables. There are very few pilot programs or implemented container size changes in current recycling programs. Most recycling collection companies are hesitant to change container sizes because they do not expect the outcome to justify the cost of new containers; therefore there is little substantiated data on the effects of container sizes. Most communities continue using their program's original container size unless they expand their list of acceptable materials which generally yields more materials and therefore requires a larger container. In most instances, cities provide bins/carts free of charge to customers (EPA, 1994).

An EPA, *Multifamily Recycling: A National Study* (EPA, 2001), noted that type of container has significant bearing on the diversion rates achieved. Programs with the highest diversion rates were most likely to use 90-gallon carts, rather than smaller containers, such as 18-gallon bins, 20-gallon bins, or 60-gallon carts. The 90-gallon wheeled cart offers several advantages, including easy mobility on site, low square footage required for storage, and compatibility with the semi-automated trucks.

Collection Pricing

A rate structure can be used to support key goals such as waste prevention, greater equity, extending landfill life, and revenue stability. Collection pricing determines the amount that solid waste planners charge a customer for each container of waste collected. Increasing the price difference between waste disposal (garbage rates) and recovery (rates for traditional recyclables, yard waste, and other organics) can be used to encourage customers to separate recyclables themselves at their home or business ("source separate") materials, increase the amount of material recovered, and decrease the amount of material disposed (landfilled).

Rate changes could be used to increase participation in organics collection by raising the variable rates for garbage can sizes through a tiered system, coupled with a lower per-unit rate for higher quantities of organics. This could create the financial incentive for customers to divert waste from the garbage disposal stream into the organics recycling/composting stream. Per unit garbage rates could be flat (i.e. directly proportional to container size) or progressive (e.g. a 90 gallon tote might cost 4 times a 30 gallon can). To encourage organics collections, per unit prices would be lower for organics than garbage. To further encourage organics collection, the organics could be regressive (e.g. a 90 gallon tote could cost only twice a 30 gallon can).

Self-Haul Strategies

Self-haul wastes are typically delivered to NRDS and SRDS in smaller vehicles such as cars, minivans, SUVs, pickup trucks, and small trailers, although some arrive in flatbeds and vehicles of larger capacity. Because self-haul vehicles are typically unloaded by hand, they take longer to unload than mechanically unloaded vehicles; as such, they occupy the unloading stalls for longer periods and thus reduce the potential waste-handling capacity of the transfer station. The self-haul strategies under consideration are intended to minimize self-haul traffic to NRDS and SRDS, minimize delays in tipping activities, increase safety at the transfer stations, and provide additional opportunity to source separate recyclables. If successful, these strategies could result in positive residual effects that include reducing or eliminating the need to resize the transfer station tipping floor, as well as reducing or eliminating the need to add more tipping stalls at NRDS and SRDS, and potentially, eliminating the need for an additional transfer facility.

Residential Organics Collection

Strategies for residential organics collection aimed to expand existing programs to allow collection of commingled yard waste and food waste from the multi-family residential sector and to add all types of organics including meat, dairy products, and fats.

Commercial Organics Collection

These strategies focused on increasing participation in commercial organics collection. Strategies considered aimed at changing commercial customer behavior to increase their waste reduction by source-separation of organics. This would be achieved by structuring the cost of organics collection in a manner to encourage commercial customers to divert waste from the garbage disposal stream into the organics disposal stream. By diverting the organics that were previously in the waste stream into the organics container, the customer can pay for collection and processing at a lower rate. This lower rate equates to a cost savings for the customer and an increase in the production of high quality compost material.

Summary of New Strategies

Table 2.3-2 lists the Collection strategies analyzed for inclusion in the facilities scenarios (the "A" Options). Analyses for all "A" strategies are contained in Volume 2. The strategies listed in Table 2.3-2 are a subset of all collection strategies considered and ranked. The full list of strategies considered during the study is included in the Appendix to Volume 2 and contained in an Access database accompanying this report.

Table 2.3-2
Option "A" Strategies for Collection

ID	Strategy	Target Sector	Material Class
108	Mandatory Commercial Recycling Services	Commercial	Traditionals
118	Rate Structure Review for Commercial Organics Collection	Commercial	Organics
123	Multifamily Residential Organics Program	MF Residential	Organics
124	Commercial Weight-Based Garbage Rates	Commercial	All Comm. Waste
170	On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)	MF Residential	White Goods / Bulky Items / Furniture
170	On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)	SF Residential	White Goods / Bulky Items / Furniture
221	Residential On-Demand Collection Of Waste (C&D) Building Materials	Self-Haul	C&D
240	Performance-Based Contracting For Solid Waste Service Contracts	All	Other
253	Expand Residential Curbside Organics Collection to Include All-Food	Residential	Organics
270	Tiered Commercial Garbage Rates	Commercial	Other
283	Rate Structure Review for Garbage Collection	MF Residential	Traditionals

ID	Strategy	Target Sector	Material Class
		and Self-Haul	
312	Rate Structure Review for Residential Organics Collection	Residential	Organics
323	Ban Self-Haul Disposal at City Owned Transfer Stations	Self-Haul	All Self-Haul Waste
376	On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	All	Small Appliances & Electronics
379	Create Larger Differential Between Disposal Tip Fee and Fee to Dump Recyclables	Commercial and Self-Haul	C&D
273 / 400	Residential Diaper Composting / Subsidize Reusable Diaper Services from Fee on Disposable Diaper Purchases	MF Residential	Organics
283 / 378	Rate Structure Review for Garbage Collection / Maximum Commercial Recycling Container Rate	Commercial	Traditionals
283 / 402	Rate Structure Review for Garbage Collection / Reduce Volume Discounts on Extra Garbage Cans ($/gallon of capacity)	SF Residential	Traditionals
367 / 332	Adjust Rate Structure for Self-Haul Disposal at City Owned Transfer Stations / Raise Self-Haul Tipping Fees and Illegal Dumping Fines	Self-Haul	All Self-Haul Waste

Table 2.3-3 lists the Collection strategies analyzed at a lesser level of detail (the "B" Options) for inclusion in the Action Menu described in Section 6. Analyses for selected "B" strategies are contained in Volume 2. The strategies listed in Table 2.3-3 are a subset of all collection strategies considered and ranked. The full list of strategies considered during the study is included in the Appendix to Volume 2 and contained in an Access database accompanying this report.

Table 2.3-3
Option "B" Strategies for Collection

ID	Strategy	Target Sector	Material Class
153	Add Alkaline Batteries to Existing Curbside Recycling Program	All	Other
369	Pesticide Container Recycling Program	Commercial	Hazardous
155	Source Separated Recycled Material Rate Discount	Commercial	Other
284	Rate Structure Review for Recyclables Collection	All	Traditionals

2.4 Summary of Research Conclusions

Throughout the United States and in many other countries, a variety of recycling strategies have been evaluated, implemented and assessed for their ability to reduce consumption; minimize waste; increase waste reduction, recycling, and composting; internalize a manufacturer's externalized costs of disposal for EOL products; and maximize the efficiency, safety, and waste diverting effects of waste collection. The ability of a particular strategy to accomplish those goals depends on the unique geographic, economic, behavioral, and political contexts in which they are implemented. However, research conducted by the Zero Waste project team provides a number of conclusions that seem to hold universal applicability to any strategies implemented in Seattle. Many of these conclusions may be known to the City, but warrant summation and reinforcement.

Zero Waste / Product Stewardship

- In many cases depending on the model chosen, product stewardship programs are low cost to the City and are effective in transferring costs to producers, and in helping to "incentivize" a cultural shift in how products are produced, bought and discarded. There is a risk that costs can be shifted to consumers with no assurance that waste diversion will also rise, even if take-back programs are mandated.
- Product stewardship may be most effective at the state level, but there are examples of local level success, despite the implementation difficulty.
- Product Stewardship programs tend to require a long lead time for development of a dialogue with affected industries; and/or for the formation of take-back legislation.
- Education is necessary as part of any program package, including product stewardship, and the potential for increased diversion increases significantly if coupled with service strategies or take-back outlets that stress convenience.
- Strong community group and business involvement, in addition to strong liaison/outreach by City staff with these groups, can result in modest waste diversion rates.
- Workshops, television and radio ads, transit ads, mailings, posters, seminars and school programs can be instrumental in facilitating a high degree of participation rate in waste reduction, recycling, composting and producer responsibility programs.
- Infrastructure development programs are an effective means to increase processing capacity and recycling efforts, and end-use capacity. Most local research suggests that private industry is wary of the requirements that may be imposed upon them in order to accept assistance from a government-sponsored market development program (e.g., requirements to share technology, competitive advantage, cost information, and general requirements for reporting). Assistance with permitting, land acquisition and promotion are preferred.
- Required recycling programs have the potential to divert a significant portion of the waste stream from disposal and help Seattle meet and exceed the current 60% recycling goal.
- Material disposal bans are gaining in popularity in many states and municipalities. Seattle has had good results with its recyclables and commercial paper disposal ban.

- Most industries consider material disposal bans as a simple effort that does not create an uneven playing field, as long as viable alternatives exist. This study addresses primarily disposal bans, as opposed to product bans.
- Education and technical assistance are key factors to the implementation of mandatory recycling requirements. A Portland Metro study that profiled required recycling programs reported that all of the surveyed programs provide generators with some level of technical assistance and education (Metro, 2002). Seattle has also stressed this combination of education with requirements, and wisely has had these programs in place prior to the implementation of its recycling requirements. Education and technical assistance programs will most likely require increased staff and budget, and reinforcement. The Portland study also emphasized that using a cooperative approach to mandatory recycling can build program support and increase participation.
- Enforcement is a key part of mandatory recycling requirements and disposal bans. Adequate resources for enforcement of mandatory recycling requirements or disposal bans can increase both the participation and efficiency associated with specified materials.
- Market development and/or the existence of economically feasible commodity markets are necessary for materials that are the subject of recycling requirements.
- Resource conservation is a key tool in economic development, as it may reduce production costs and thereby improve the competitive position of businesses that operate in the City.

Collection

- When recyclables collection frequency is increased from EOW to weekly, the research indicates that more material is collected, ranging from minor increases to significant double-digit percentage increases. Two separate reports prepared by the EPA and the Northeast Recycling Council indicated that communities that already had high participation and diversion rates experienced the <u>lowest</u> increase in material collected when they switched from EOW to weekly collection. On the other hand, the research was clear that all municipalities experienced cost savings when they decreased collection frequency.
- Until additional supportive data can be obtained that demonstrates the cost effectiveness (tons per dollar of additional expenditure) of weekly recyclables collection for communities (such as Seattle) with pre-existing high recycling rates, it is recommended that the City of Seattle maintain its current program of EOW traditional recyclables material collection.
- Based on information gathered during research of other jurisdictions, the City should continue to utilize the 90-gallon carts for its traditional recyclables program.

- Implementation of a restriction in self-haul access to City owned recycling and disposal stations could result in improved safety at NRDS and SRDS.
- Research for various self-haul strategies **yielded no example of a municipality that has banned self-haulers from its transfer stations**. However, municipalities were identified that restrict the hours that self-haulers are allowed access to facilities. Examples are discussed in Strategy #323 Ban Self-Haul at City Owned Transfer Stations included in Volume 2.
- Restricting hours of self-haul access to NRDS and SRDS or banning it entirely, and provision of an "On-Demand" curbside collection service in its place, could result in postponing the need to add a third transfer station to the City-owned system, based only on capacity for waste tonnage and trip generation.

Strategy Analysis Results

The Zero Waste project team evaluated a full range of factors for each of the "A" strategies and selected "B" strategies, including:

- Description of the strategy
- Materials targeted
- Implementation timeframe
- Expected participation and efficiency
- Diversion potential
- Cost
- Action feasibility (pros and cons)
- Risk of not achieving results within timeframe
- Relevant assumptions

A description of the results in each of these categories for each strategy is located in Volume 2 of this study. Table 2.4-1 presents a summary of the research results for each of the "A" strategies, and aggregated "B" strategies, for waste diversion potential, fixed capital and operating and maintenance (O&M) costs, and variable per ton costs to the City

Table 2.4-1
Summary of "A" Strategy Analysis

ID #	Sector	Material	Strategy	Imp. Date	New Tons Recycled (2038)	Percent Added to Recycling (2038)	Fixed Capital (Year 0)	Fixed O&M (Year 1, Annual)	Variable Per Ton (Year 1)
108	Commercial	Traditionals	Mandatory Commercial Recycling Services	2010	20,943	1.75%	$0	$65,150	$0.00
118	Commercial	Organics	Rate Structure Review for Commercial Organics Collection	2011	8,681	0.72%	$0	$246,200	$0.00
123	MF Residential	Organics	Multifamily Residential Organics Program	2008	3,331	0.28%	$191,250	$312,070	$10.00
124	Commercial	All Comm. Waste	Commercial Weight-Based Garbage Rates	2020	2,946	0.25%	$0	$269,350	$0.00
152	All	Other	(Other) Disposal Bans	2015	2,720	0.23%	$0	$287,450	$0.00
160	Residential and Self-Haul	Other	Expand Inspection & Enforcement Program (Other)	2015	2,860	0.2386%	$0	$361,050	$0.00
170	Residential and Self-Haul	White Goods / Bulky Items / Furniture	On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)	2008	914	0.08%	$0	$103,550	$181.82
173	Commercial and Self-Haul	C&D	C&D Recyclables Disposal Ban	2015	8,908	1.07%	$0	$333,888	$0.00
182	Residential	Organics	Residential Food Waste Disposal Ban	2015	15,971	1.33%	$1,390,000	$449,669	$10.00

ID #	Sector	Material	Strategy	Imp. Date	New Tons Recycled (2038)	Percent Added to Recycling (2038)	Fixed Capital (Year 0)	Fixed O&M (Year 1, Annual)	Variable Per Ton (Year 1)
192	SF Residential	Organics	Pet Waste Composting	2011	65	0.01%	$1,400,000	$108,400	$0.00
204	Commercial	C&D	Building Permit C&D Reuse And Recycling Fee Deposit	2008	2,331	0.19%	$0	$239,300	$0.00
209	Commercial and Self-Haul	C&D	Incentivize Development of Private Mixed C&D Debris Recycling Facility	2010	58,121	4.85%	$0	$103,500	$0.00
217	All	Small Appliances & Electronics	Self-Haul Computer Parts	2008	359	0.03%	$0	$77,748	$0.00
221	Self-Haul	C&D	Residential On-Demand Collection Of Waste (C&D) Building Materials	2008	0	0.00%	$250,000	$309,650	$63.12
240	All	Other	Performance-Based Contracting For Solid Waste Service Contracts	2016	2,043	0.17%	$0	$457,000	$0.00
253	Residential	Organics	Expand Residential Curbside Organics Collection to Include All-Food	2011	3,338	0.28%	$208,500	$449,670	$10.00
265	Commercial and Self-Haul	Other	Take-Back Program For Carpet	2010	2,802	0.23%	$0	$77,400	$0.00
270	Commercial	Other	Tiered Commercial Garbage Rates	2008	267	0.02%	$0	$139,200	$0.00

ID #	Sector	Material	Strategy	Imp. Date	New Tons Recycled (2038)	Percent Added to Recycling (2038)	Fixed Capital (Year 0)	Fixed O&M (Year 1, Annual)	Variable Per Ton (Year 1)
283	Self-Haul	Traditionals	Rate Structure Review for Garbage Collection	2010	255	0.02%	$0	$246,200	$0.00
285	Commercial	Organics	Commercial Organic Waste Disposal Ban	2020	21,321	1.78%	$0	$401,050	$0.00
298	All	Traditionals	Beverage Container Deposit System	2020	9,681	0.81%	$0	$51,750	$0.00
307	Commercial	Organics	Tiered Commercial Organics Rates	2011	7,855	0.66%	$0	$139,200	$0.00
312	Residential	Organics	Rate Structure Review for Residential Organics Collection	2008	2,174	0.18%	$0	$246,200	$0.00
323	Self-Haul	All Self-Haul Waste	Ban Self-Haul Disposal at City Owned Transfer Stations	2015	37,670	3.14%	$500,000	$808,300	$86.70
349	Commercial	Traditionals	Disposal Ban For Recyclables In Commercial Waste	2015	5,135	0.43%	$0	$401,050	$0.00
353	Residential	Traditionals	Compostable Plastic Bags	2010	110	0.009%	$0	$287,450	$0.00
363	Self-Haul	C&D	Take-Back Program for Used Building Materials at Home Product Centers	2012	119	0.01%	$0	$77,400	$0.00
376	All	Small Appliances & Electronics	On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	2012	1,809	0.15%	$0	$290,038	$560.00

ID #	Sector	Material	Strategy	Imp. Date	New Tons Recycled (2038)	Percent Added to Recycling (2038)	Fixed Capital (Year 0)	Fixed O&M (Year 1, Annual)	Variable Per Ton (Year 1)
379	Commercial and Self-Haul	C&D	Create Larger Differential Between Disposal Tip Fee and Fee to Dump Recyclables	2010	553	0.05%	$0	$249,100	$0.00
160 / 330	Commercial	Other	Expand Inspection & Enforcement Program / Mandatory Commercial/Institutional Waste Audits (Other)	2015	2,568	0.21%	$0	$361,050	$0.00
273 / 400	Residential	Organics	Residential Diaper Composting / Subsidize Reusable Diaper Services from Fee on Disposable Diaper Purchases	2015	103	0.009%	$0	$250,700	$0.00
283 / 378	Commercial	Traditionals	Rate Structure Review for Garbage Collection / Maximum Commercial Recycling Container Rate	2015	386	0.03%	$0	$246,200	$0.00
283 / 402	Residential	Traditionals	Rate Structure Review for Garbage Collection / Reduce Volume Discounts on Extra Garbage Cans ($/gallon of capacity)	2015	421	0.04%	$868,800	$318,500	$0.00
367 / 332	Self-Haul	All Self-Haul Waste	Adjust Rate Structure for Self-Haul Disposal at City Owned Transfer Stations / Raise Self-Haul Tipping Fees and Illegal Dumping Fines	2015	4,273	0.36%	$0	$139,200	$0.00
- -	All	All	Institute "Group B" Zero Waste Strategies	2020	12,116	1.01%	$417,000	$1,653,440	-
- -	All	All	All	-	**243,144**	**21%**	**$5,225,550**	**$10,557,073**	-

Tonnage estimates listed in Table 2.4-1 assume the implementation of all "A" and "B" strategies and show the results of sequential implementation of the strategies according to estimated implementation dates and Zero Waste strategies in Scenario 4. Percent Added to Recycling in Table 2.4-1 is calculated consistent with the existing City definition of recycling as discussed in Section 1.5; for purposes of this analysis, additional tons recycled in 2038 divided by total tons generated in 2038. Section 3 provides a complete description of the model and scenarios used to estimate tonnages.

3 NEW TONNAGES BASED ON INCREASED DIVERSION USING "A" STRATEGIES

This section of the report includes a summary of the revised recycling tonnages estimated from the implementation of each of four variations of the "A" and "B" strategies analyzed in the study. The purpose of the section is not to describe tonnage and diversion amounts for each strategy analyzed, but to provide:

- Background information on how the tonnage estimates were developed
- A description of each of the four tonnage scenarios produced
- Background information on the queuing model used to inform the facilities analysis
- A comparison of new tonnage estimates with the addition of "Zero Waste" program scenarios with revised 60% program tonnage estimates

Estimates of the additional diversion produced from individual strategies are contained in the detailed analyses for each "A" and "B" strategy in Volume 2 of this study. In addition, detailed recycled tonnage spreadsheets showing implementation dates, ramp-up periods, maximum marginal recycling rates, and annual tonnages recycled due to implementation of each strategy are also found in Appendix C. The spreadsheets in Appendix C also show the effects of "B" strategies aggregated by material class.

3.1 Waste Generation

Waste generation is defined for this study as recycling plus disposal. Base tonnage generation, recycling, and disposal information for the analysis was provided by SPU for each of four sectors: single family residential, multi-family residential, commercial, and self-haul (see the discussion of the Zero Waste team review of Seattle's Discards Model in Section 1.4). The growth rates for the components of the waste stream (i.e., recycling and disposal) in each sector developed by SPU through the year 2012, which are based on an extrapolation of the underlying factors contributing to recycling and waste disposal, were applied and carried forward for each component of the waste stream to the year 2038 at a constant rate by the Zero Waste team. This methodology is consistent with that used by other local public agencies relying on forecasted data (e.g., Puget Sound Regional Council, Seattle City Light, Sound Transit), and is consistent with the modeling done by SPU for the FMP. The Zero Waste team felt that consistency was important in order to produce comparable scenarios for evaluation by decision-makers.

The most recent 60% Program base recycling tonnage estimates for all four sectors provided by SPU were reviewed by the Zero Waste team and adjusted slightly downward to reflect a moderated assumption about the ability to reach the 60% goal by 2010. This was accomplished by adjusting participation or efficiency assumptions based on recent actual data for recycling tonnage and customer sign-ups. The Zero Waste team did not conduct additional detailed evaluation of the assumptions behind the recycling tonnage projections provided by SPU, but rather, based on the review and assessment of the previous modeling and assumptions done by SPU, chose to model a conservative interpretation of that data. The result was the "revised" 60% Program base recycling tonnages shown in table 1.3-2, which formed the basis for all future tonnage modeling.

3.2 Waste Characterization

The disposed waste component for each of the four sectors was subdivided into 20 Recycling Potential Assessment model (RPA) waste categories based on the *2002 Residential Waste Stream Composition Study* (Cascadia, 2002) and the *2004 Commercial and Self Haul Waste Stream Composition Study* (Cascadia 2004). These RPA material categories were further grouped into the seven material classes being addressed and discussed in the Zero Waste Work Group:

- Organics, including yard waste, food waste, a portion of other paper, and other organics
- Traditionals. Traditionals include those material typically collected curbside such as Newspaper, Corrugated-Kraft, Computer-Office Paper, Mixed Scrap Paper, Other Paper, Plastics, Beverage Glass, Container Glass, Other Glass, Food Cans, Other Ferrous, Aluminum Beverage, Other Aluminum, Other Non-Ferrous
- C&D including wood waste and general construction debris
- Hazardous (household chemicals, paint, etc.)
- Small Appliances and Electronics
- White Goods / Bulky Items / Furniture
- Other.

Each of the seven material classes represents a distinct waste stream for which programs could be targeted. This subdivision provides the breakout of the resources available for recovery through implementation of the Zero Waste strategies.

3.3 Waste Diversion Potential

As described in Section 2.1, participation and efficiency, and maximum marginal recovery rates, were estimated for each Zero Waste strategy based on a combination of:

- Actual results from existing Seattle programs with similar focus or method;
- Actual results from other jurisdictions' programs with similar focus or method;
- Surveys of targeted customers or waste generators from other jurisdictions;
- Diversion rates for the three major stream components; recycling, MSW, organics

- Professional judgment of the Zero Waste project team.

In addition, the team assigned a reasonable implementation year to each strategy within each material class based on a sequence of general approaches agreed to by the ZWWG:

- Provide the service
- Modify the incentives associated with the service
- Employ product stewardship
- Employ regulatory approaches.

Following the assignment of the implementation date, the team assigned a reasonable ramp up period, defined as the number of years necessary from the year of implementation to achieve the maximum marginal recycling rate. The assignment of this period was again informed by research and current experience regarding complexity of the strategy; lead time required to minimize risk, engage stakeholders, or pass legislation; available budget; or a combination of all.

Finally, for those strategies that diverted disposed material to private recyclers, a recyclables processing "efficiency" rate was assigned to approximate the recycled yield versus residuals disposed anticipated from the recycler's efforts. The efficiency rate is based on existing data from local recyclers, and professional judgment based on observation. It was assumed that the remaining residual would be brought back to the NRDS and SRDS for disposal as garbage

Appendix C to this report shows the participation and efficiency rates, maximum marginal recovery rates, implementation dates and ramp up period for each of the "A" Strategies analyzed for this study.

3.4 Diversion Model

A spreadsheet model was developed to estimate the waste diversion effects of sequential implementation of Zero Waste strategies for each material class. Sequential implementation, as agreed by the ZWWG, means that each strategy's maximum marginal recycle rate would apply to the tonnage remaining in a given targeted material class, after the tonnage from previously employed 60% program and Zero Waste strategies had been diverted.

The model as developed has the ability to toggle Zero Waste strategies "on" and "off" to simulate various combinations of strategies. In addition, all of the input values described in the previous subsection can be changed to suit various strategy simulations. However, the spreadsheet model is "hard-wired" to perform sequential diversion from the top down, so altering the implementation date will only change the year that the diversion starts, not the order in which programs divert material.

The model output provides the following information in order to determine the anticipated "Zero Waste" recycling rates for each sector and overall; as well as to provide the input necessary for the Queuing model (described below):

- Total tonnage shifted to recycling collection
- Total tonnage shifted to organics collection
- Net tonnage shifted to private recycling facility
- Total tonnage collected by On-Demand vehicle[1] type for recycling at city transfer system
- Total tonnage collected by On-Demand vehicle type for disposal at city transfer system
- Total tonnage prevented from entering the disposal or recycling system (public or private)

Appendix C to this report includes output tables from the Zero Waste diversion model for each of the sectors analyzed in Scenario 4 (see below).

3.5 Tonnage Scenarios

Several waste diversion scenarios were developed that include variations in the "A" Strategies based on levels of service for garbage, recycling, reuse, and organic waste handling for all sectors. Several ZWWG meetings were devoted to develop these strategies:

- **Scenario 1: Baseline.** 60% Program projections (revised) PLUS Zero Waste Program strategies with NO material bans.
- **Scenario 2:** 60% Program projections (revised) PLUS Zero Waste Program strategies with Organics Ban, Commercial Recyclables Ban, C&D Ban, and Other Materials Ban; NO Self-Haul Bans (except C&D)
- **Scenario 3:** 60% Program projections (revised) PLUS Zero Waste Program strategies with Organics Ban, Commercial Recyclables Ban, C&D Ban, and Other Materials Ban; and Voluntary Self-Haul Ban (C&D mandatory)
- **Scenario 4:** 60% Program projections (revised) PLUS Zero Waste Program strategies with Organics Ban, Commercial Recyclables Ban, C&D Ban, and Other Materials Ban; and Mandatory Self-Haul Ban

[1] On-Demand vehicle refers to the vehicles anticipated for use if either a voluntary or mandatory Self-Haul Ban is imposed at City Recycling and Disposal Stations. This strategy is described in more detail in Section 2.2, and also in the detailed analysis provided for Option # 323 in Volume 2 of this study.

These scenarios were developed in order to model the range of anticipated results for material diversion from implementation of Zero Waste strategies and their contribution toward increasing Seattle's overall recycling rate; and to provide a "bracket" around the potential tonnage and vehicle trips anticipated for City facilities through the facility planning horizon of 2038.

Appendix C to this report shows the list of specific Zero Waste strategies included in each of the scenarios described above.

3.6 Queuing Model

A queuing model, developed as part of the FMP process by SPU, was used to estimate incoming traffic flows using the tonnage estimates described above resulting from implementation of Zero Waste "A" strategies. The model reduces annual tonnage estimates to average daily and hourly incoming tonnage flows. Peaking factors developed during the analysis for the FMP were used to convert average incoming tonnage flows into peak day and peak hourly tonnage flows. The number of vehicle trips was calculated using daily estimated tonnages, associated vehicle types, diversion rates, and peaking factors described above. Finally, an hourly queue was developed using the average and peak traffic flows.

The queuing model provides critical input to determine the number of vehicle stalls required for each area of the facility, and the number of vehicle scales necessary to assure levels of service and safety are maintained. The combination of the tonnage anticipated at the City's facilities, the vehicle trips, number of vehicle stalls, and floor area required to handle the material and traffic flow (and desired sorting for recyclables), determine the ultimate size of the facility required.

With the help of the FMP consultant, the Zero Waste team was able to evaluate the impact that the four Zero Waste strategy scenarios could have on the overall need for the facilities, facility size and features. The Zero Waste team analysis is described in more detail in Section 4.

Tonnage Results Comparison

Table 3.6-1 shows the results of the diversion model for each of the four Zero Waste program scenarios described above. As noted, the "Diverted to Recycling" does not include the recyclables to be sorted from material at the recycling/reuse center (commingled sort line for building materials) proposed for the City's Recycling and Disposal Station (North or South depending on Facility strategies discussed in Section 4). Since all Facility strategies discussed in Section 4 employ a commingled sort line for building materials, these tons were excluded in order to highlight the effects of Zero Waste strategies. However, all references to overall recycling rates in this document include the effects of a commingled sort line for building materials at a City facility. All figures are in tons.

Table 3.6-1
Results for Tonnage Scenarios in 2008, 2020, 2025, 2038

Year	Scenarios 1	2	3	4
Total Generated				
2008	822,877	822,877	822,877	822,877
2020	955,003	955,003	955,003	955,003
2025	1,016,408	1,016,408	1,016,408	1,016,408
2038	1,198,718	1,198,718	1,198,718	1,198,718
Disposed Waste*				
2008	424,421	424,421	424,242	424,242
2020	369,442	340,396	338,347	312,605
2025	376,819	333,904	331,707	303,138
2038	451,709	401,953	399,268	361,598
Diverted to Recycling**				
2008	398,456	398,456	398,635	398,635
2020	585,562	614,607	616,657	642,398
2025	639,589	682,504	684,701	713,270
2038	747,009	796,765	799,450	837,120

* includes amount that would be diverted to recycling from reuse/recycling center proposed for a Recycling and Disposal Station

** does not include amount diverted to recycling from reuse/recycling center proposed for a Recycling and Disposal Station

Total Generated includes all MSW generated in Seattle, as defined historically (see section 1.5), including waste not handled by City facilities, organics, and traditional recyclables. Diverted to Recycling includes all tons diverted (except where noted), including those handled by private facilities, EPR programs, and waste reduction/prevention.

4 FACILITIES ANALYSIS

4.1 Introduction

Review of the Facilities Master Plan

In 2003, SPU completed a Solid Waste FMP. Fifteen options for solid waste transfer and rail shipment facilities were considered. The FMP recommended that the City pursue Facility Option 11, which consisted of the following:

- Demolishing and rebuilding the two City-owned Recycling and Disposal Stations as well as the development of a new solid waste intermodal facility (IMF). This option was estimated to cost less than some similar options because only enough additional property would be acquired at each site to accommodate the needed services.
- The majority of garbage trucks would be directed to the IMF, where garbage would be compacted into intermodal shipping containers and then loaded onto railcars for long-haul transport to a landfill for disposal. A new building would be built at the NRDS to receive the self-haul vehicles and about one acre acquired to accommodate additional traffic lanes, and provide space for a new office, employee facilities, plus reuse and recycling facilities.
- A new building would be built at SRDS for the self-haul vehicles, as well as a new building for drop-off of reuse items and a materials recovery facility with sorting line for non-putrescible wastes.

In 2003, capital costs for Option 11 were estimated as $27.5 million for NRDS, $40.0 million for SRDS, and $40.0 million for the IMF.

Review of Underlying Facilities Criteria and Assumptions

Before proceeding with implementation of the 2003 FMP, the City decided to investigate some non-traditional solid waste practices that could potentially result in changes to the need for the facilities recommended by the FMP, or their size and other features. These investigations were an integral part of this Zero Waste Study and involved an evaluation of waste and recycling collection services, Zero Waste and product stewardship strategies, and other methods that could affect the proposed facilities. This Zero Waste Study also included a review of the underlying design criteria and assumptions that were used to develop the FMP.

It would be difficult to envision a solid waste system without transfer stations. Transfer stations serve a critical role as convenient places for generators to take their wastes and recyclable materials, which can then be consolidated for economical transport to recycling and processing facilities or final disposal sites.

Besides the FMP, the Zero Waste project team reviewed background documents such as the 1998 "*Plan for Seattle's' Recycling and Disposal Stations*" and Technical Memorandum No. 2 *Design Criteria and Conceptual Layouts* (TM-2). The Zero Waste project team believes that the facility overview presented in these documents is complete and accurately describes the present facilities and the important design issues. The Zero Waste project team reviewed the performance requirements, design criteria, and design assumptions for the proposed facilities and, in general, found them to be comprehensive and in accordance with accepted solid waste industry practices and methods. This third-party evaluation of Seattle's work to date has confirmed the validity of the methodology, assumptions, analysis, and overall results of the FMP.

4.2 Method of Evaluation

This Study evaluated the six different facility options described below. The level of service to customers, working environment, increase in recycling, environmental improvements, and flexibility of the options were compared. Alternatives for facility ownership and operation were evaluated. Section 5 discusses the effects of waste diversion strategies, grouped into the tonnage scenarios described in Seaction 3, on the amount of waste and the number of vehicles going to the transfer stations. The resulting lower tonnages and fewer vehicle trips were used as inputs to size the facilities, develop construction cost estimates, and calculate overall solid waste system costs, as described in Section 5.

4.3 Facility Development Options

Description of Development Options

The scope of work for this Study identified six major facility options for receiving and handling self-hauled wastes, garbage collection trucks, waste compaction/container loading, and self-haul waste processing.

- **Option 16**

  This option is very similar to Option 11 as recommended by the FMP. Option 16 involves building an IMF at the 20-acre Corgiat site and rebuilding both NRDS and SRDS. Just enough additional property would be acquired adjacent to the sites to accommodate the needed services (1.5 acres east of NRDS and 9 acre bus yard at SRDS..

  The transfer station at NRDS would be demolished and rebuilt within the same alignment as the existing building; however, it would be enlarged to the south. This alignment would preserve the view towards Lake Union along the roads running north of the facility, thereby conforming to the Neighborhood Plan. A rezoning would be required since this alignment would violate the industrial buffer zone.

Garbage collection trucks would be diverted to the new IMF, and the new building would be designed to properly handle the self-haul traffic. In addition, about 1.5 acre would be added for new on-site traffic lanes and to provide space for a new office, staff facilities and recycling facilities.

At SRDS, a new, larger transfer building would be constructed; then the existing transfer building would be demolished. The new building would contain a materials recovery facility (MRF) for dry wastes. In addition, a new building would be constructed for self-haulers to drop off re-use items.

- **Option 17**

  This is the same as Option 16 with respect to rebuilding and additions at NRDS and SRDS. However, the IMF would be designed, built, and operated by a private firm, selected through a competitive procurement process, rather than by the City itself.

- **Option 18**

  Both the North and South Transfer Stations would be rebuilt with additional property to each, but slightly larger than in Option 16 to accommodate collection trucks on a regular basis. The stations will continue to be available to all self-haul and collection trucks. No new transfer station for collection trucks will be provided. The intermodal yard, rail yard, and disposal services would be obtained through a service contract. In addition, a new building would be constructed at SRDS for the installation of a sort line for processing self-hauled building materials.

- **Option 19**

  This option rebuilds SRDS larger than in Option 16. NRDS would have a minor rebuild, a new recycling center. The transfer building at NRDS would be demolished and not rebuilt. There would not be a third station. There would be a ban on residential self-haul.

- **Option 20**

  This option rebuilds NRDS larger than in Option 16. SRDS would have a minor rebuild, a new recycling center. The transfer building at SRDS would be demolished and not rebuilt. There would not be a third station. Residential self-haul.would be banned.

- **Option 21**

  This option rebuilds NRDS and SRDS, both larger than in Option 16. There would not be a third station. There would be a ban on residential self-haul.

Table 4.3-1 summarizes Facility Development Options 16 through 21.

Service Factors for Each Option

The costs of implementing any option are important to the selection process; however, there are many non-monetary factors that are, in many cases, just as important as the costs. Without quantifying the value of each non-monetary factor, the following are factors that should be considered in determining the preferred option:

- How well does the option serve the customers of the City?
- Does the option improve vehicle queuing or waiting times?
- Does the option provide a good working environment for the City's workers?
- Does the option enhance the recovery of materials towards the City's goals?
- Does the option provide environmental improvements to the existing facilities?
- Does the option provide some flexibility to the City as the solid waste industry continues to evolve?

Table 4.3-2 Service Factors summarizes the quality of service for each option. The quality is ranked as excellent, good, fair and poor, and not by a numerical value as was in the 2003 Facility Master Plan. The results are based on the following:

- The service to customers is poor at NRDS and SRDS under present conditions. Queuing can be significant, safety is a concern, and impacts on the environment (both in the station and the neighborhood) are not good. Any improvements would be good.
- The working environment for City employees is not good. Any improvements would be beneficial, especially in safety issues.
- The only way recycling can be improved is if better facilities are installed to receive and manage the recyclables, and if some processing is installed to improve the recovery of certain materials.
- There are significant environmental issues at NRDS and SRDS regarding traffic, odor, and noise. These issues can be improved by rebuilding the stations.

A facility that provides the space to expand or revise existing operations would be very beneficial. This does not exist at NRDS, except for some improved staff facilities, but is possible at SRDS with some good planning.

Table 4.3-1
Facility Development Options

Option	Collection Trucks and Compaction				Self-Haul (1), (2), (3)				Garbage Loaded onto Train	General Comments	Changes to NRDS	Changes to SRDS	Intermodal Yard with Transfer
	Commercial		Residential		MSW		Recycling						
	MSW	Organics	MSW	Organics	Large Trucks	Small Vehicles	Yard Waste	Material Sort Line					
16 (SPU proposal Option 11)	City-owned new site	Private	City-owned new site	City-owned new site	50% to City-owned new site 50% to SRDS	NRDS and SRDS in present ratio	NRDS and SRDS in present ratio	SRDS	City-owned new site	Similar to Option 11 in Master Plan – rebuild NRDS and SRDS with an intermodal/transfer facility. Add limited additional property at stations.	Demolish existing building and rebuild on west side of site to avoid industrial buffer. Add approximately 1.5 acres for recyclables and reuse items. Build a new office and employee facilities.	Demolish existing buildings and rebuild with enhanced recycling. Add a MRF for C&D and a retail reuse facility. Add about 9 acres to the site (bus yard)	Build a new intermodal/yard/ transfer facility on an identified site south of downtown Seattle. Divert all commercial/ packer traffic to this facility.
17 (Public and Private ownership)	Potential private site(s)	Private	Private site(s)	Private site(s)	NRDS and SRDS in present ratio	NRDS and SRDS in present ratio	NRDS and SRDS in present ratio	SRDS	Potential private site(s)	Same as 16 except private ownership of intermodal yard/ transfer facility.	Same as 16	Same as 16	Same as 16, except site, construction and operations by a private company.
18 (SPU proposal Option 0, status quo with rebuilds)	NRDS SRDS	Private	NRDS SRDS	NRDS SRDS	NRDS and SRDS in present ratio	NRDS and SRDS in present ratio	NRDS and SRDS in present ratio	SRDS	Argo Yard	NRDS & SRDS rebuilt – larger than 16 due to commercial. Need additional property at NRDS. Need new property at SRDS (bus yard). No 3rd station.	Same as 16	Same as 16	Continue to export through private IM yard and rail yard.
19	SRDS	Private	SRDS	SRDS	SRDS	SRDS	SRDS	SRDS	Argo Yard	SRDS rebuilt – larger than 16. No 3rd station.	Station rebuilt as enhanced recycling center only.	SRDS is rebuilt. New C&D sorting line & retail reuse facility.	Continue to export through private IM yard and rail yard.
20 (variant on 19)	NRDS	Private	NRDS	NRDS	NRDS	NRDS	NRDS	NRDS	Argo Yard	NRDS rebuilt – larger than 16. No 3rd station.	NRDS is rebuilt. New C&D sorting line & retail reuse facility.	Station rebuilt as enhanced recycling center only.	Continue to export through private IM yard and rail yard.
21 (variant on 18.4)	NRDS SRDS	Private	NRDS SRDS	NRDS SRDS	NRDS	NRDS and SRDS in present ratio	NRDS SRDS	NRDS	Argo Yard	NRDS rebuilt larger than 16. Minor rebuild at SRDS (new recycling center). No 3rd station.	NRDS is rebuilt. New C&D sorting line and retail reuse facility.	Station rebuilt as enhanced recycling center only	Continue to export through private IM yard and rail yard.

Comments: (1) HHW @ Aurora & SRDS (all options); (2) Enhanced recycling and re-use drop-off @ NRDS and SRDS (all options); (3) Re-use retail (all options)

Table 4.3-2
Service Factors

Option	Service to Customers	Working Environment	Increase Recycling	Environmental Improvements	Flexibility	Comments
16	Excellent	Good	Good	Good	Good	• Stations handle self-haul only. • Queuing/waiting will be significantly improved. • City has control over transportation. • New facilities will improve working conditions and improve environmental issues. • Planning is possible to improve flexibility.
17	Excellent	Good	Good	Good	Fair	• Same comments as 16 except private ownership would reduce the flexibility for the City.
18	Improved	Improved	Fair	Good	Poor	• Rebuilds at NRDS and SRDS would improve the working environment, and slightly improve recycling. • Traffic and queuing improved. • Still using private IM yard and rail yard.
19	Fair	Fair at SRDS	Fair	Fair	Poor	• Still using private IM yard and rail yard. • Significant rebuilds to environmental concerns at NRDS. • Increased environmental concerns at SRDS.
20	Fair	Poor at NRDS	Poor	Poor	Poor	• NRDS has several operating issues at present. Increasing the commercial traffic will only make the conditions worse. • Not a viable scenario.
21	Poor	Poor	Poor	Poor	Poor	• Not reasonable to add a MRF at NRDS due to space limitations.

Alternatives for Facility Ownership and Operation

Background

Once garbage has been compacted and loaded into shipping containers at the NRDS and SRDS, the City drays (transports the containers on truck chassis) to the Argo Yard in south Seattle, which is owned and operated by Union Pacific (UP) Railroad. In the context of this Zero Waste Study and the FMP, the Argo Yard functions as both an **intermodal yard (IY)** and a **rail yard (RY)**. In the garbage-hauling context, an IY is a paved area where a specialized mobile piece of equipment (known as a "top-pick") lifts a loaded container off a truck chassis and places it on an (outbound) rail car. Next, the top pick lifts an empty container from an (inbound) rail car and placed on a truck chassis for return to the transfer station. The Argo Yard receives only containerized cargo. As a RY, Argo has sufficient length of track to build a mile-long unit (single cargo) train. (By comparison, Allied/Rabanco's Third and Lander waste and recycling facility is an IY but not an RY. Its track is too short to build a unit train, and train segments are pulled by locomotive from Rabanco up to the Burlington Northern-Santa Fe (BNSF) rail yard at Interbay.) The Argo Yard has some operational and capacity issues that are discussed in the Argo Yard Analysis included as Appendix D.

Ownership Alternatives

The NRDS and SRDS are presently owned and operated by the City and will continue to be publicly owned and operated. However, there are three options for ownership and operation of new intermodal facility (IMF) consisting of a transfer station, intermodal yard, and a rail yard. These are:

- The City constructs, owns and operates the facility.
- The City designs, builds and owns the facility but contracts out operation to a private firm.
- City enters into a contract with a private firm to design, construct, own and operate a new transfer station.

Besides having an **IY** and a **RY**, a City **IMF** would include a **transfer station** to receive and handle all solid waste delivered by City-contracted waste haulers and other large waste collection vehicles. The main reason to develop an IMF is to ensure that the City can ship its waste by rail in a reliable, cost-effective, and environmentally sound manner.

Research Findings

A few general observations can be made:

- The City already has extensive experience in the operating transfer facilities and draying containerized waste to an intermodal yard. The required new skill would be to use a top pick to move containers on and off rail cars.
- If the City selects a private ownership and operations option, the likely competitors will be the large national solid waste firms who already have significant involvement in the local solid waste industry. These firms prefer to achieve vertical integration (collection, transfer and disposal) because it allows them to maximize their profits. Two of these firms presently hold the City's waste collection contracts, and also own large regional landfills in Washington and Oregon. A third firm owns a hauling company and a large regional landfill in Oregon. In any case, the City will continue direct the waste to a particular landfill for disposal based on its long-term contract.
- Experience in other locales (such as Skagit County) and informal discussions with waste hauling companies indicate that the private sector may have little interest in bidding on a contract that focuses just on transfer/intermodal services. This is because the economics of transfer/intermodal alone are likely to be less favorable than if landfill disposal were also part of the package. This would probably hold true regardless of whether the facility is privately or publicly owned.
- In May 2006, SPU completed a study of project delivery methods for designing, building and operating the IMF (RW Beck 2006). Appendix B of the Beck report detailed costs and advantages/disadvantages/risks of the various methods alternatives.
- Strategy #207 included in Appendix D discusses other aspects of private ownership. Its Table 1 lists important pros and cons of <u>private operation</u> excerpted from the 2006 RW Beck report. Its Table 2 lists pros and cons of <u>private ownership and operation</u> excerpted from a study King County's Solid Waste Division Feb. 2006

Table 4.3-3 presents three options for facility ownership and operation, and the impacts on various factors within the solid waste system.

Table 4.3-3
Ownership Alternatives Evaluation

Factors	All-City: City constructs, owns & operates IMF	Combination: City designs, builds & owns IMF; private operates IMF	All Private: Private firm designs, builds, operates & owns IMF
1. Feasibility	Good	Good	Good
2. Disposal Implications	None	None	None
3. Traffic Impacts	Low	Low	Low
4. Cost Impact	Slightly higher	Could reduce overall costs	Highest
5. Flexibility	Good	Reasonable	Fair
6. Risks	Low	Low	High
7. Value to taxpayers	Good	High	Low

The following comments are presented for each factor:

Feasibility

- Either option is very feasible because it has been successfully done in other locations.

Disposal Implications

- A private firm would prefer to dispose of waste at its own landfill to increase its revenue. However, as long as the City continues its present policy and continues to direct waste to the landfill designated in its long-term disposal contract, there should be no difference among the ownership alternatives.

Traffic Impacts

- For each option, the traffic impacts should be low because the new station/intermodal yard would be located where truck traffic can be accommodated, and traffic at NRDS and SRDS would be reduced.

Cost Impacts

- Overall, the cost impacts or differences for the transfer station should not be significant because transfer costs are the lowest of the total collection, transfer and disposal system. Intermodal and rail yard switching costs would be difficult to control without a dedicated City-owned facility.
- Contracting out the facility design, construction and operation introduces an element of competition to the transfer system, which could be beneficial.
- Building a new transfer station could increase the overall costs of transfer because NRDS and SRDS will handle less tonnage, but their costs may not decrease proportionately.

	•	If a private firm owned and operated the facility, it would be difficult for another firm to bid competitively when the contract came up for renewal. The current contractor would have a fully-amortized facility while a new competitor would have to amortize its facility over the life of the contract.
Flexibility	•	The City should be able to make changes or add services more easily than a private firm, as these changes may require a contract modification and possible renegotiation of fees. However, the private operator will probably offer helpful suggestions if it saves them money in the long run.
Risks	•	The City must establish measurable and enforceable long-term performance standards and require guarantees from the private firm that operates the facility.
	•	The risks are higher for the City with private ownership because it could be more difficult for the City to respond to changes in regulations.
Value to Ratepayers	•	The value to the ratepayers should be good with public ownership, but could possibly be improved through competitive bidding for private operations. The cost of transfer and intermodal handling is anticipated to be much higher through a service contract than if the City performed these operations itself.

Other Facility Strategies

Some strategies did not fit neatly into either the Zero Waste or the collection category. These facility strategies do no address facility ownership or allocate waste among the transfer stations. Table 4.3-4 lists those facilities strategies analyzed for inclusion in the facilities scenarios; these "A" strategies had a significant effect on tonnage; for example, #209 on Table 2-4.1 has the potential to divert 58,000 tons per year. Analyses for all "A" strategies are contained in Volume 2. The strategies listed in Table 4.3-4 are a subset of all facilities strategies considered and ranked. The full list of strategies considered during the study is included in the Appendix to Volume 2 and contained in an Access database accompanying this report

Table 4.3-4
"A" Strategies for Facilities

ID	Strategy	Target Sector	Material Class
209	Incentivize Development of Private Mixed C&D Debris Recycling Facility	Commercial	C&D
217	Self-Haul Computer Parts	All	Small Appliances and Electronics

Table 4.3-5 lists the Facilities strategies analyzed at a lesser level of detail (the "B" strategies) for inclusion in the Action Menu described in Section 6. Analyses for selected "B" strategies are contained in Volume 2. The strategies listed in Table 4.3-5 are a subset of all facilities strategies considered and ranked. The full list of strategies considered during the study is included in the Appendix to Volume 2 and contained in an Access database accompanying this report

Table 4.3-5
"B" Strategies for Facilities

ID	Strategy	Target Sector	Material Class
350	Anaerobic Digestion Reactor for Organics Processing and Biofuels Production	All	Organics
177	Salvage And Reuse Swap Sites	Residential	Reusable Items
199	Eco Parks for Resource Sharing and Material Market Development	Commercial	Other
382	Waste Screening at Transfer Stations for Exclusion of Banned Recyclables	Residential	C&D

4.4 Research Conclusions

The consultant team reviewed the City's existing stations and the 2003 Facilities Master Plan. The team conducted a variety of investigations and evaluations to determine the extent to which new solid waste practices could reduce waste quantities, increase recycling, and reduce or eliminate the need for a new intermodal/transfer facility. A summary of these facility-oriented efforts follows:

- If collection practices are revised to reduce the number of self-haul vehicles using NRDS and SRDS, then off-site queuing and traffic congestion around these stations will be reduced. However, it will still be necessary to rebuild the stations to ensure that the City has reliable and safe transfer facilities.

- SPU has the contractual right to utilize the Argo Yard as an intermodal facility until 2028. After that time, the City would have to compete with other shippers and pay the market price for intermodal service, either at the Argo Yard or another privately-owned site, unless the City owned an intermodal facility (as in Option 16).
- Based on its evaluations, the consultant team finds that Option 16 is a viable option that provides:
  - New transfer station buildings with capacity for the next 30+ years.
  - Full City control of intermodal yard and rail yard operations.
  - An increase in the overall recycling rate through implementation of Zero Waste strategies.
  - Flexibility to react to the changes in the solid waste industry.
  - Redundancy in stations and equipment as well as greater station efficiency.
- It is possible to rebuild the stations if adjacent property is acquired next to SRDS so that a new station could be built while the existing station remains in service. Once a new South Station is built, customers from NRDS could be diverted to the new SRDS while the old NRDS is being demolished and replaced. In this way, there would always be two transfer stations available.
- Reinstalling the existing compactors in the rebuilt NRDS and SRDS would provide flexibility and redundancy in waste handling, but would need to be weighed against higher capital costs (for the larger buildings) and operating costs.
- If the City decides to proceed with either Option 16 or 17, it could consider adding a mixed waste processing system at the new intermodal/ transfer facility to recover additional materials from the collected waste stream. Recovery rates would increase, but probably not as much as in other jurisdictions that lack Seattle's comprehensive programs for removing materials "upstream" of the transfer stations. In addition, the benefit of higher recovery rates would need to be balanced against increased capital and operating costs due to the waste processing facility.
- No matter what Facility Option the City selects, some solid waste services should continue to be provided at both NRDS and SRDS. These locations are already permitted to handle solid waste, serve as geographically dispersed facilities, and can continue to be a useful part of the City's overall solid waste management system.
- Construction of a self-haul building materials sorting line at either station is worthwhile. It would provide additional recycling, improve the quality of service, and provide some flexibility in the flow of wastes received on site.

5 EFFECTS OF GROUP “A” STRATEGIES ON FACILITIES

5.1 Zero Waste Strategies and Scenarios

Section 2 of this Zero Waste Study described the evaluation of a series of Zero Waste strategies focusing on the areas of product stewardship and waste collection. Selected **strategies** were combined into a series of **scenarios** (1-4) that prescribe increasingly more stringent methods to reduce self-haul traffic at the transfer stations and increase diversion of materials away from landfill disposal. This Section 5 discusses the effects that reduced tonnage scenarios resulting from the implementation of Zero Waste strategies could have on the facility Options.

Description of Collection/Self-Haul Ban Scenarios

Through meetings with the Zero Waste Work Group, the following scenarios were developed based on Zero Waste strategies and materials bans. The progression from Scenario 1 to 4 attempts to increase diversion by increasing the kinds of materials banned from disposal. The progression also attempts to reduce self-haul traffic to the transfer stations. Further descriptions of the bans are contained in Section 2.

Scenario 1: Baseline. 60% Program projections (revised) PLUS Zero Waste Program strategies with NO material bans.

Scenario 2: 60% Program projections (revised) PLUS Zero Waste Program strategies with Organics Ban, Commercial Recyclables Ban, C&D Ban, and Other Materials Ban; NO Self-Haul Bans (except C&D).

Scenario 3: 60% Program projections (revised) PLUS Zero Waste Program strategies with Organics Ban, Commercial Recyclables Ban, C&D Ban, and Other Materials Ban; and Voluntary Self-Haul Ban (C&D mandatory).

Scenario 4: 60% Program projections (revised) PLUS Zero waste Program strategies with Organics Ban, Commercial Recyclables Ban, C&D Ban, and Other Materials Ban; and Mandatory Self-Haul Ban.

To “bracket” the possible outcomes (lowest tons diverted to highest tons diverted, and most self-haul to fewest self-haul vehicles), it was decided to limit the number of scenarios examined for each option. Scenario 1 (lowest tonnage diverted) was applied only to Options 16 and 18. Scenario 4 (highest tonnage diverted) was applied to all Options 16-21. Scenarios 2 and 3 were applied only to Option 18.

The 2003 FMP evaluated the facilities for the years 2008 (estimated start-up at the time the FMP was written), and 2018, 2028 and 2038 (resulting in a 30-year facility life). For this Zero Waste Study, different years were chosen for estimating tons of waste and trips to the transfer stations. These years were chosen to capture the onset of the Zero Waste strategies and their effect on tonnage, so that we avoided modeling or sizing the facility layouts based on a trough in tonnage. The following tables present the tonnage estimates for the four scenarios for the years 2008, 2020, 2025 and 2038.

Based on these tonnages, the number of vehicle trips going to each station was calculated. Table 5.1-1, Tonnage and Customer Trips Handled at City Facilities, by Facility Option, shows trips generated under the various scenarios for the year 2008 and 2038. Tons and trips in the year 2038 is the standard for which each facility was sized. Actual tonnage and trips for 2006 is also provided as a relative scale.

Facility Sizing

These tonnages and trips served as input to the Facility Sizing computer program developed for the 2003 FMP. The original purpose of this program was to generate a theoretical facility size and conceptual layout that met the required functions and would fit on each building site (NRDS, SRDS, and intermodal site), under varying assumptions about waste tonnages and vehicles trips. It must be emphasized that the program is not intended to present an actual design concept for each site. Rather, its intent was to indicate the size of facility that could be accommodated on each site, present the basic information necessary to develop a preliminary cost estimate, and to allow a consistent comparison between options that assumed different tonnages and vehicle trips.

Table 5.1-2, Facility Size Comparison, summarizes information about the number of vehicle scales, building sizes, and number of tipping bays (unloading stalls) at the NRDS, SRDS, and IMF, as calculated by the Facility Sizing program. The results are based on a vehicle traffic level of 95% of the historically observed peak traffic. The 95% factor is considered a reasonable and practical measurement for sizing a facility, avoiding a facility that is either greatly over- or under-sized. Each facility was sized to handle waste at such a rate that the average queuing time (time spent waiting in line) would exceed 30 minutes no more than 5% of the time, or about 18 days per year. At NRDS, this criterion is met under all Facility Options. It was also intended that vehicle queuing should take place on-site. However, in all option/scenario combinations except 19.4 and 21.4, NRDS fails to meet the criterion of containing the queue on-site 95% of the time. This is because the site is too small to build the additional inbound queuing lanes that would prevent off-site queuing. The highest average off-site queue (about ¼-mile long) could develop under Option 20.4, when NRDS handles the bulk of the waste. Smaller queues of 1/20-2/10 of a mile could develop under other Options. For more information see the Facility Queuing Comparison in Appendix E.

Table 5.1-1
Tonnage and Customer Trips Handled at City Facilities, by Facility Option

	Actual	Option 16.1		Option 16.4		Option 17.4		Option 18.1		Option 18.2		Option 18.3		Option 18.4		Option 19.4		Option 20.4		Option 21.4	
	2006	**2008**	**2038**	**2008**	**2038**	**2008**	**2038**	**2008**	**2038**	**2008**	**2038**	**2008**	**2038**	**2008**	**2038**	**2008**	**2038**	**2008**	**2038**	**2008**	**2038**
NRDS																					
Annual tons	166,507	62,327	88,357	62,125	41,445	62,125	41,445	175,375	201,745	175,367	189,445	175,361	188,482	175,361	181,353			500,275	508,181	175,361	181,353
Annual Trips	221,821	189,355	259,883	188,659	106,617	188,659	106,617	209,058	278,192	208,842	268,663	208,292	267,061	207,767	143,802			419,272	290,910	197,862	133,938
SRDS																					
Annual tons	190,791	67,888	96,806	67,881	87,710	67,881	87,710	299,342	326,012	299,334	296,429	299,296	295,113	299,296	287,984	500,275	508,181			299,296	287,984
Annual Trips	171,590	179,820	248,682	179,224	119,327	179,244	119,327	220,244	286,065	220,029	273,267	219,476	271,696	218,951	149,825	425,386	293,465			226,564	158,663
Intermodal																					
Annual tons		370,120	373,453	370,270	379,026																
Annual Trips		57,951	57,844	57,945	52,792																
System Total																					
Annual tons	357,298	500,335	558,616	500,276	508,181	130,006	129,155	474,717	527,757	474,701	485,874	474,657	483,595	474,657	469,337	500,275	508,181	500,275	508,181	474,657	469,337
Annual Trips	393,411	427,126	566,409	425,828	278,736	367,903	225,944	429,302	564,257	428,871	541,930	427,768	538,757	426,718	293,627	425,386	293,465	419,272	290,910	424,426	292,601

Notes

- System Total excludes tons and trips that are diverted to Private facilities through allocation decisions or private recycling.
- Annual Tons includes Organics
- Inbound Trips only
- Intermodal tons and trips do not include tons transferred to intermodal from Recycle and Disposal Stations, nor the resulting trips
- Trips are for scaled commodities only
- Options 16.1 and 16.4 shows tons and trips in 2008 as if the Intermodal facility were being used, when in actuality, construction would not be complete until after 2008

Table 5.1-2
Facility Size Comparison

Option	Inbound Scales	Outbound Scales	Building Size Width (ft)	Length (ft)	Area (sf)	Total Tipping Bays	Notes
NRDS							
16.1	1	2	232	225	52,200	22	4,5
16.4	1	2	139	255	35,445	13	1,3,5
17.4	1	2	139	255	35,445	13	1,3,5
18.1	2	2	225	360	81,000	40	4,6,7,8
18.2	1	2	225	345	77,625	38	4,6,7,8
18.3	1	2	225	345	77,625	38	4,6,7,8
18.4	1	2	155	270	41,850	14	1,3,5
19.4	-	-	-	-	-	-	11
20.4	2	3	300	315	94,500	30	2,4,6,7,8,9,10
21.4	1	2	300	315	94,500	30	1,4,6,7,8,9,10
SRDS							
16.1	1	2	239	390	93,210	20	3,9
16.4	1	2	239	285	68,115	13	1,3,9,10
17.4	1	2	239	285	68,115	13	1,3,9,10
18.1	2	2	239	435	103,965	23	3,9
18.2	1	2	239	435	103,965	23	3,9
18.3	1	2	239	435	103,965	23	3,9
18.4	1	2	239	315	75,285	15	1,3,9
19.4	2	3	239	510	121,890	28	2,3,9
20.4	-	-	-	-	-	-	11
21.4	1	2	164	300	49,200	16	3
Intermodal Transfer Station							
16.1	1	1	200	285	57,000	15	7,8
16.4	1	1	200	285	51,000	13	7,8
17.4, 18.1-18.4, 19.4, 20.4, 21.4	-	-	-	-	-	-	12

Notes:
1 Second outbound scale is needed only until Zero Waste programs are fully implemented.
2 Third outbound scale is needed only until Zero Waste programs are fully implemented.
3 Tipping bays on one side.
4 Tipping bays on two sides.
5 Fits on existing NRDS site.
6 Requires property to west of NRDS.
7 Building width is limited by site width, resulting in longer and narrower building.
8 Longer building allows more tipping bays than minimum needed.
9 Building width is determined by minimum width of target co-mingled CDL tipping floor.
10 Building length is determined by minimum length of target co-mingled CDL tipping floor.
11 Only new recycling and reuse facilities are included.
12 No intermodal facility included.

The following text refers to three conceptual facility layouts shown on the following pages, as developed by CH2M Hill:

- For illustrative purposes only, Figure 5.1-1 NRDS Option 11 illustrates one possible facility layout for a rebuilt NRDS under FMP Option 11 (similar to Zero Waste Study Option 16), as envisioned in 2003.
- For illustrative purposes only, Figure 5.1-2 Intermodal Facility Corgiat Site Plan Option 16 illustrates one possible facility layout for an intermodal facility at the Corgiat site in Georgetown, as envisioned in 2005.
- For illustrative purposes only, Figure 5.1-3 South Recycling and Disposal Station Site Plan Option 18.1 (One-Sided) illustrates one possible facility layout for a rebuilt SRDS under Zero Waste Study Option 18.1, as envisioned in 2007.

Cost Modeling

SPU has developed a comprehensive capital (construction) cost model to estimate construction costs based on the vehicle trips and tonnage data developed above. This model was utilized for the 2003 estimates. From about 2004 to 2006, there have been significant increases in the cost of construction labor and materials due to high demand from disaster recovery and the rebounding national economy. Unit costs were updated in early 2007 to reflect those rising costs. Construction cost estimates were prepared for Options 16 through 21, as summarized in Table 5.1-3 Planning Level Capital Cost Estimates.

SPU also has developed a comprehensive Facility Plan Cost Model to estimate solid waste system costs. This model facilitates cost comparisons across facility options and various diversion strategies that are implemented in different time, frames. Table 5.1-4 Planning Level Net Present Value Comparison shows how various components of the system cost (e.g. waste compaction, recycling facility construction and operations/ maintenance, changes to upstream costs (Zero Waste strategies), and disposal/processing vary among the Options. Detailed input information used to generate Table 5.1-4 is included in Appendix E.

5.2 Research Conclusions

The potential impacts and results of implementing those strategies are discussed below.

General

- Handling the City's waste requires that two City facilities to be operational at all times. While the City has standard procedures to handle waste if one station is temporarily out-of-service, it is an undesirable condition and poses operational difficulties. Therefore, to rebuild either station requires that an additional station be built first. For example, if adjacent property is acquired next to SRDS, the new station could be built while the existing one remains in service. Once construction is completed, the customers from NRDS could be diverted to the new SRDS while NRDS is being replaced. In this way, there would always be two stations available.

- If collection practices are revised through varying degrees of banning certain materials and vehicle types (Scenarios 1-4), it would reduce self-haul traffic at both NRDS and SRDS, along with congestion on nearby streets
- SPU has the contractual right to utilize the Argo Yard as an intermodal/rail yard until 2028. However, the dependability and regularity of inbound and outbound waste trains is variable. The waste trains do not always have the highest priority in the Argo Yard, and the situation is unlikely to improve as rail traffic through Seattle increases. After 2028, the City would have to compete with other freight and would have to pay the market price for that service.
- No matter what facility development option SPU selects, it is advantageous to continue to provide some level of solid waste or recycling services at both the NRDS and SRDS locations. Their existing land use as permitted solid waste facilities is a valuable asset that would be difficult to obtain elsewhere at a reasonable cost.

Recycling

- All the development Options increase recycling opportunities by providing a larger, more convenient space for customers to drop-off recyclables. Traffic circulation will be improved, making vehicle access safer, more convenient, and more efficient.
- The addition of a self-haul building materials sorting line at either SRDS or NRDS (depending on the development Option) should be considered. It would provide additional recycling, improve the quality of service, and provide some flexibility in the flow of wastes received on site.
- In Option 19 the NRDS becomes a recycling center only. In Option 20, SRDS becomes a recycling center only. In both cases, the reduced traffic volume should minimize the waiting time to drop off recyclables.

Vehicle Processing/Queuing

- Options 16 and 17 remove contract waste collection vehicles from NRDS and SRDS and redirect them to a new City-owned transfer station (Option 16) or a privately owned transfer station (Option 17). This will significantly improve the ability of NRDS and SRDS to handle self-haul vehicles and improve safety. Conditions for collection vehicles at either the new City or private station should also show a significant improvement over the current situation at NRDS and SRDS. Waiting times will be reduced, the length of vehicle queues will be reduced, and the stations should be able to meet the FMP's operational criteria.

Figure 5.1-1 NRDS Option 11 (from FMP)

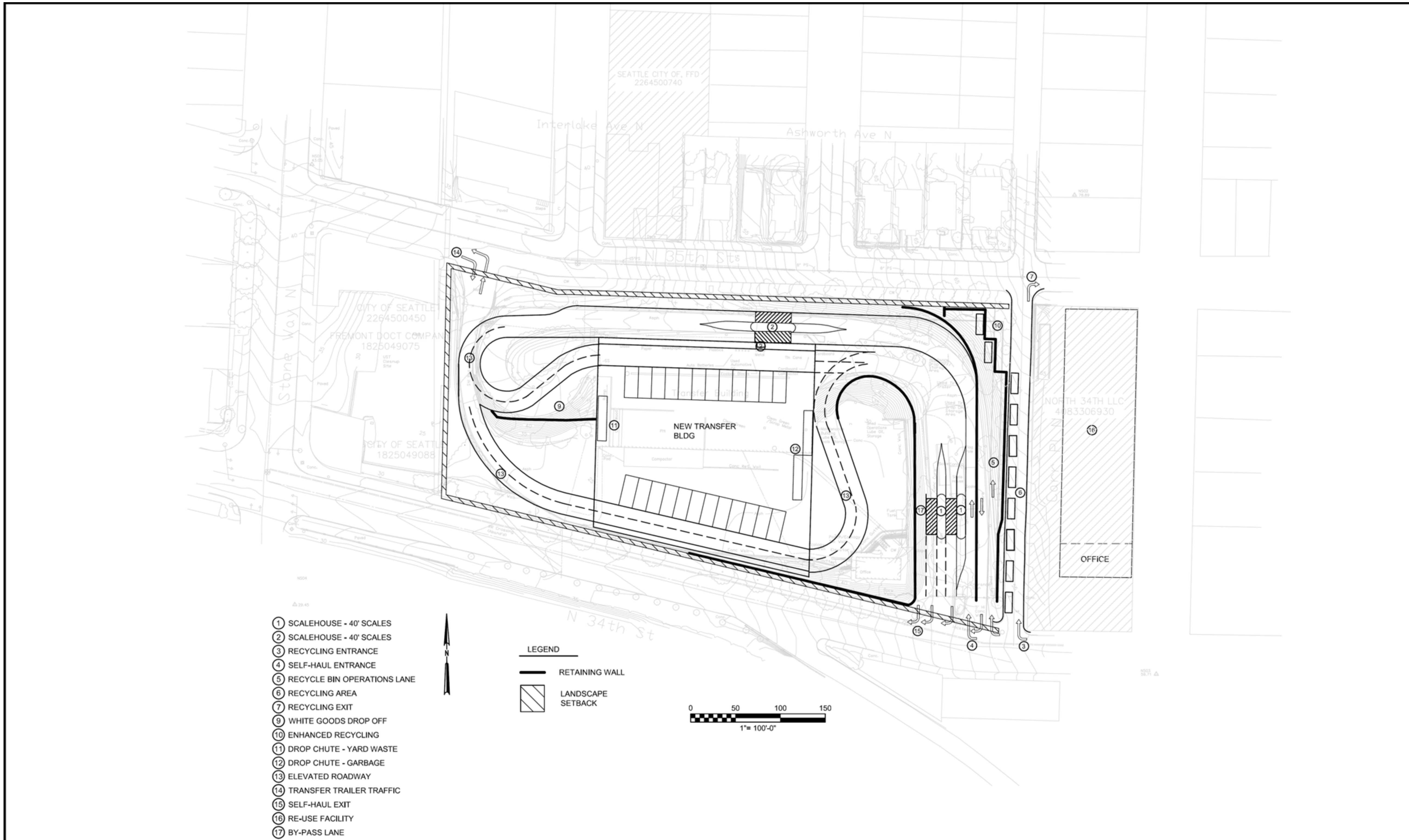


Figure 5.1-2 Intermodal Facility Corgiat Site Plan Option 16

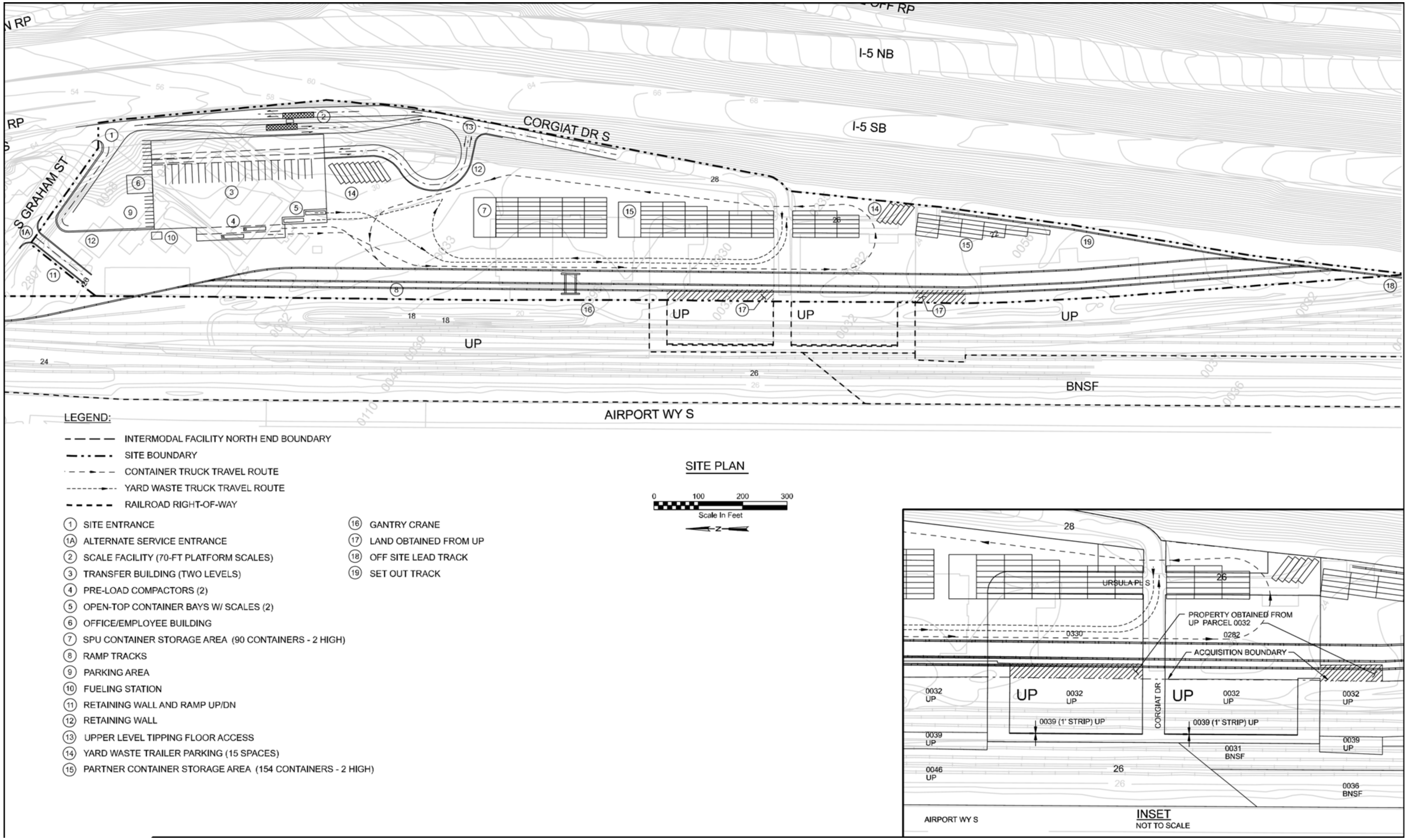


Figure 5.1-3 South Recycling and Disposal Station Site Plan Option 18.1

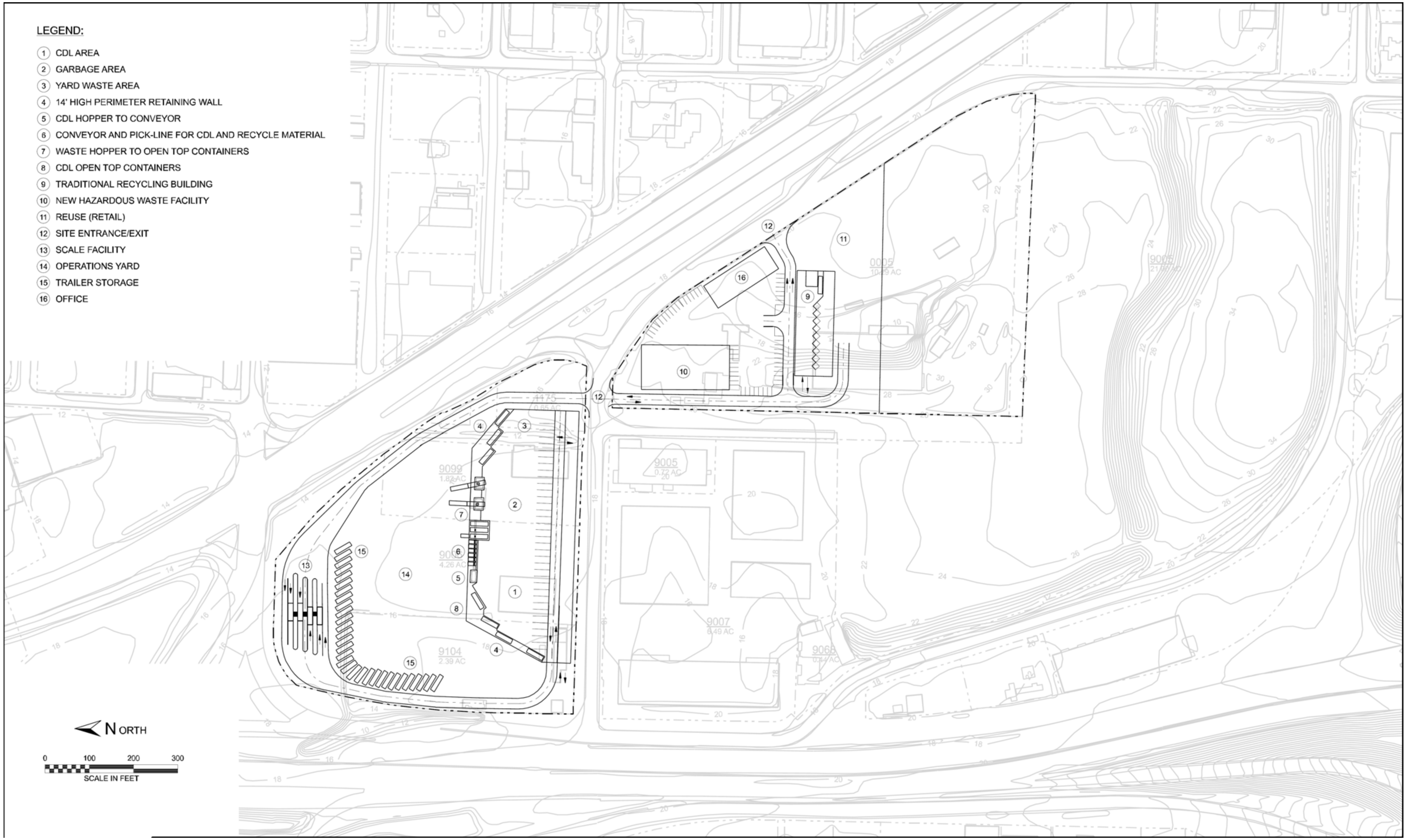


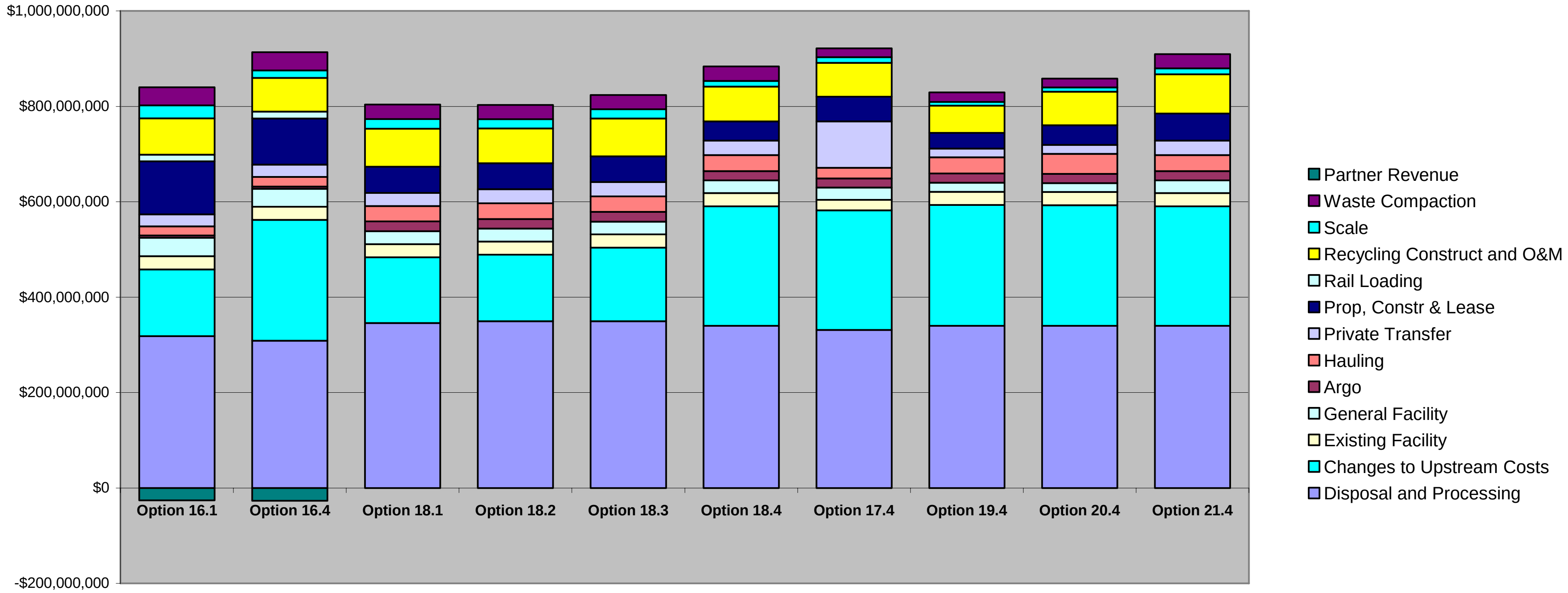
Table 5.1-3
Planning Level Capital Cost Estimates for Facilities Options ($1,000s)

Station	Option 16.1	Option 16.4	Option 17.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 19.4	Option 20.4	Option 21.4
Scale infrastructure	$534	$544	$544	$704	$529	$529	$543	$0	$878	$527
Waste compaction	$24,558	$13,869	$13,869	$33,331	$32,301	$32,301	$15,039	$0	$19,360	$19,363
Hauling (probably $0)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Rail Loading	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
General	$12,411	$12,213	$12,213	$14,287	$14,241	$14,241	$12,237	$4,252	$13,577	$13,561
Subtotal	$37,503	$26,626	$26,626	$48,322	$47,071	$47,071	$27,819	$4,252	$33,815	$33,451
Recycling Construction	$847	$864	$864	$838	$839	$839	$861	$2,158	$20,196	$20,199
Recycling Capital Equipment	$888	$888	$888	$888	$888	$888	$888	$888	$2,653	$2,653
Subtotal	$1,735	$1,752	$1,752	$1,726	$1,727	$1,727	$1,749	$3,046	$22,849	$22,852
Total NRDS	**$39,238**	**$28,378**	**$28,378**	**$50,048**	**$48,798**	**$48,798**	**$29,568**	**$7,298**	**$56,664**	**$56,303**
Scale infrastructure	$410	$410	$410	$585	$409	$409	$410	$760	$0	$413
Waste compaction	$24,211	$23,771	$23,771	$26,189	$26,195	$26,195	$25,093	$29,485	$0	$16,895
Hauling (probably $0)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Rail Loading	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
General	$19,378	$19,348	$19,348	$19,524	$19,520	$19,520	$19,441	$19,769	$11,623	$18,897
Subtotal	$43,999	$43,529	$43,529	$46,298	$46,124	$46,124	$44,944	$50,014	$11,623	$36,205
Recycling Construction	$21,841	$21,550	$21,550	$23,151	$23,156	$23,156	$22,426	$25,336	$6,217	$17,006
Recycling Capital Equipment	$2,789	$2,789	$2,789	$2,789	$2,789	$2,789	$2,789	$2,789	$1,024	$1,024
Subtotal	$24,630	$24,339	$24,339	$25,940	$25,945	$25,945	$25,215	$28,125	$7,241	$18,030
Total SRDS	**$68,629**	**$67,868**	**$67,868**	**$72,238**	**$72,069**	**$72,069**	**$70,159**	**$78,139**	**$18,864**	**$54,235**
Scale infrastructure	$1,169	$1,170	$0	$0	$0	$0	$0	$0	$0	$0
Waste compaction	$22,911	$21,028	$0	$0	$0	$0	$0	$0	$0	$0
Hauling (probably $0)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Rail Loading	$11,703	$11,712	$0	$0	$0	$0	$0	$0	$0	$0
General	$25,847	$25,911	$0	$0	$0	$0	$0	$0	$0	$0
Subtotal	$61,630	$59,821	$0	$0	$0	$0	$0	$0	$0	$0
Recycling Construction	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Recycling Capital Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Subtotal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Intermodal	**$61,630**	**$59,821**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
System Total	**$169,497**	**$156,067**	**$96,246**	**$122,286**	**$120,867**	**$120,867**	**$99,727**	**$85,437**	**$75,528**	**$110,538**
NRDS	$306	$306	$306	$306	$306	$306	$306	$306	$1,817	$1,817
SRDS	$1,219	$1,219	$1,219	$1,219	$1,219	$1,219	$1,219	$1,219	$456	$456
NRDS	$89	$24	$24	$89	$86	$85	$24	$0	$321	$160
SRDS	$276	$158	$158	$276	$270	$268	$158	$317	$0	$23
NRDS	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	24.48	24.48
SRDS	13.85	13.85	13.85	13.85	13.85	13.85	13.85	13.85	4.80	4.80

[a] - Excludes costs for private operation of reuse facilities and material revenues for recyclables.

Note: The above cost opinion is in February 2007 dollars and does not include escalation, financial or O&M costs (except for recycling O&M as noted). The cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final schedule and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

Table 5.1-4
Planning Level Net Present Value Comparison



- Option 18 would improve the ability to handle self-haul and collection vehicles, but not as significantly as Options 16 and 17. In moving from Scenario 1 to Scenario 4 (increasing materials/vehicle bans resulting in reduced tonnages and vehicles), traffic, queuing and vehicle processing should improve as well.
- Options 19–21 would result in some significant improvements in traffic issues, processing times and queuing as the self-haul traffic is significantly reduced.

Flexibility/Redundancy

Flexibility and redundancy are two highly desirable features, both in terms of facilities and in operations. Providing increased flexibility was a primary objective of the FMP. Flexibility is defined as the ability to respond to changing internal and external conditions such as policy objectives, regulations, the economy, energy pricing, rail/shipping market conditions, material flow, and recyclables markets. Redundancy is defined as the ability to maintain level-of-service during temporary and extended facility outages due to equipment failure, transportation system breakdown, road blockages, seismic events, and other conditions beyond the direct control of the City.

- Option 16 offers better flexibility than Option 17: the City can make operational changes in response to changing internal and external conditions without the negotiations and possible contract modifications that are likely with a private facility (Option 17).
- The Zero Waste project team suggests that the City consider reinstalling the existing compactors in the rebuilt NRDS and SRDS. These compactors would provide the redundant capacity to continue compacting waste if the new transfer station were to be temporarily off-line. Furthermore, re-use of the existing compactors would allow the City flexibility to compact certain materials at each station to decrease shipping costs. The value of this flexibility and redundancy would need to be weighed against the costs associated with increasing the size of the building(s) to accommodate the compactors.
- Options 19–21 provide relatively little flexibility or redundancy in future operations. While self-haul vehicle counts may be reduced, there is no added flexibility for collection vehicle operations. With only a single large transfer building at North (Option 20) or at South (Option 19), there is no redundancy or backup transfer capability at a City-owned facility in the event a station becomes incapacitated.

Possible Downsizing or Abandonment of Existing Transfer Stations and Proposed Intermodal Station

After inspecting the City's two stations and reviewing the waste and traffic volumes, the Zero Waste project team confirms that the FMP accurately describes the issues and potential ramifications if no building improvements or operational changes are made in the near future.

Significant landfill space is available in the Pacific Northwest, but it is located 200–400 miles away from Seattle. The amount of waste to be transported out of the greater Seattle area for disposal will grow significantly when King County's Cedar Hills Landfill closes within the next ten years. In addition, the amount of other (non-waste) freight is expected to increase substantially, placing even more demand on the existing intermodal and rail yard infrastructure in Seattle. The logistics and cost of transporting solid waste to a distant landfill are significant issues today, and as competition for limited intermodal/rail yard capacity increases, so will prices.

Based on the above comments, the following is a review of the "possible downsizing or abandonment of existing stations and proposed intermodal station."

Existing NRDS and SRDS Facilities

Abandonment of either NRDS or SRDS is not a recommended solution. These stations have served the City and its ratepayers for the last 40+ years and should continue to be an important part of Seattle's solid waste system. However, for the variety of reasons presented in the FMP, they cannot continue to operate under the present conditions without significant upgrades.

The primary reason for replacing the existing transfer stations is because they are old and at the end of their useful life. It is necessary to replace them before they no longer can provide the services for which they were built. Replacing the stations will ensure that waste and recyclables can continue to be collected and transferred safely and efficiently.

This Zero Waste Study considered Scenarios 1-4 as ways to reduce the total waste going to the stations and possibly eliminate self-haul traffic to the stations. The existing stations would not necessarily be downsized. However, if a self-haul ban were successfully implemented, they would operate more efficiently as only collection (garbage) trucks and other large trucks would unload there. Traffic volumes would decrease significantly and issues such as queuing, traffic impacts, and congestion would be reduced or eliminated.

The only feasible way to eliminate large collection truck traffic from the existing stations would be to divert these vehicles to a third transfer station elsewhere and eliminate their need to go to NRDS or SRDS. This approach would have a significant benefit for both existing stations. The volume of traffic would be reduced slightly, but more importantly, there would be a large reduction in the volume of collected wastes arriving at these stations. Traffic, queuing, odors, noise and overall efficiency would be improved. None of these factors is likely to be a problem at a third facility. The two existing stations would still need to be renovated to more efficiently receive and process self-haul traffic, resulting in more convenient recyclables drop-off and more effective and efficient procedures to handle self-haul vehicles.

The new transfer station should be located in an area that is reasonably accessible for trucks, and in a land use zone where a transfer station has a reasonable likelihood of receiving a permit. After an extensive evaluation of sites involving public and stakeholder input, SPU identified and recommended a site in south Seattle between I-5 and Boeing Field, known as the Corgiat site. This appears to be a viable site with adequate room to support a transfer station, an intermodal yard, and a rail yard. However, it may not be necessary to construct the intermodal and rail yards here at the same time the transfer station is built. The yards could follow at a later date if the Argo Yard is no longer available, or when the Corgiat intermodal and rail yards are more cost-effective than continuing to use the Argo Yard. Alternatively, the City might choose to build the intermodal yard and rail yard first without building the transfer station. This would preserve the flexibility to use the property in a manner most beneficial to the City. The City could evaluate waste conversion or waste-to-energy technologies as they mature; in the future, one of these may become a more advantageous solution for the City's waste management than a transfer station.

Mixed Waste Processing at New Transfer Station

In the past, the City has not considered providing waste processing capability at their stations because it was felt that the private sector was more capable of providing that service and more able to respond quickly to changes in technology.

There is a trend among cities, counties and waste authorities towards installing mixed waste processing capability at their transfer stations. Through mechanical and manual sorting, more material can be recovered from waste destined for disposal. There is concern about the quality of these recovered materials because of contamination by other components of solid waste. Besides the significant capital and operating costs, the amount of potentially recoverable material that is actually present in the waste must be considered, especially in Seattle where numerous "upstream" programs are effective in removing recyclable materials before they become part of the disposed waste stream.

Intermodal and Rail Yards

The City currently ships about 800,000 tons per year (TPY) of compacted and containerized solid waste via the Union Pacific Railroad to Waste Management's Columbia Ridge Landfill in central Oregon. Approximately one million additional TPY of waste are exported by rail through the Seattle area to other regional landfills in eastern Washington and eastern Oregon. In about 2015 when King County's Cedar Hills Landfill is planned to close, the total amount of waste expected to be shipped through Seattle will be approximately 3 million TPY. These wastes will come from the City, King County, and locations north of Seattle including Alaska. All of it must pass over railroad tracks that run through the City of Seattle.

Owning and operating its own intermodal and rail yards would benefit the City in a number of important ways:

- An intermodal yard allows the City to transfer waste containers from truck chassis onto rail cars on its own property. If a transfer station were co-located with the intermodal yard, the trucks would not need to travel on public streets to reach the intermodal yard and would not be subject to restrictive axle weight limits. This would allow each container to have a higher payload, reducing the number of containers required to ship a given amount of waste, and thereby reducing transportation costs.
- A site of sufficient size for a rail yard (about one mile of track) to receive an in-bound train and to "build" an outbound train is a rare commodity in Seattle. The Corgiat site has this capability.
- Having direct access to rail service and control over a portion of its rail cost will allow the City to continue to take advantage of the economical, long-term waste disposal capacity available at regional landfills in the Pacific Northwest. The abundance of landfill capacity will tend to keep prices competitive and stable, a benefit to Seattle's ratepayers.
- Having its own intermodal and rail facility dedicated to solid waste will ensure that the City has the ability to ship its waste out of Seattle in a reliable, cost-effective, and environmentally sound manner.
- By owning and operating its own intermodal yard and rail yards, the City will be negotiating only for transportation on the main rail line and not for rail space within the rail company's yard. Thus, the City should be in a better negotiating position with the rail companies.
- Increasing demand for the railroads to move other kinds of freight through the existing intermodal and rail yard infrastructure is likely to result in more frequent service delays and higher costs, unless the City has its own intermodal and rail yards.
- If a transfer station were to be co-located with the intermodal yard, it would help:
  - Reduce truck traffic on Seattle streets because there would be no need to dray containers from the transfer station to the intermodal facility and deadhead empty containers back to the station.
  - Improve safety of operations at the NRDS and SRDS, as well as the new station, because large garbage collection vehicles would no longer use NRDS and SRDS.
  - Increase the flexibility and redundancy of the overall station system.
  - Increase efficiency, since the new station would be more efficient at receiving and unloading of collection vehicles compared to NRDS and SRDS.
  - Reduce environmental impacts such as noise and odor at NRDS and SRDS, as well as provide a high level of environmental control at the new station.

5.3 Other Considerations

- Rebuilding NRDS and SRDS will improve site conditions and reduce/eliminate many of the current operational problems such as queuing and limited recyclables drop-off.

- Perhaps even more importantly, rebuilding NRDS and SRDS would help avoid problems such as the potentially catastrophic effect that a seismic event could have on these 40-year old facilities. A seismic event could potentially injure or kill staff and/or customers, as well cause structural damage to the facilities. Significant economic loss could be incurred, not only through the need to reconstruct a damaged facility, but through the interruption of waste services to the City's customers.

- Option 16, which is similar to Option 11 as recommended by the FMP, has some particularly desirable aspects. Specifically, the Corgiat site itself has some significant advantages.

  - The Corgiat site has sufficient land area and rail access to accommodate all three desired facilities: a transfer station, an intermodal yard, and a rail yard.
  - The Corgiat site has access to a sufficient length of railroad track to both receive an inbound train (of empty containers) and to depart (assemble and load with containers) an outbound unit train. Without this capability, after 2028 when the Argo Yard contract expires, the City could be faced with paying spot-market prices for space at either the UP or BNSF rail yard to assemble its unit train. Spot prices reflect the level of containerized traffic at any given time. With the prospects for continued growth in the Seattle area and the trend towards more international trade, it seems likely that container traffic, and demands on the rail yards, will increase. Prices would be expected to react accordingly.
  - The Corgiat property is expected to become more expensive in the future. As in-filling and urban renewal continues to occur in Seattle, the cost of land will continue to rise. As sites convert from warehouses, parking lots, and storage yards to higher-end uses such mixed use retail/residential buildings, it will become less and less economically feasible to purchase property with the intent of demolishing the existing structures and rebuilding.
  - The Corgiat property affords the City the equivalent of an "insurance policy" against rising land prices and decreasing availability of property with suitable rail access (both intermodal and rail yard).
  - Other available sites may be able to serve as an intermodal yard, but are not likely to not have sufficient space for a transfer station and rail yard as well.

- Numerous, extensive search efforts for a suitable site to build an intermodal facility (transfer station, intermodal yard and rail yard) have been conducted on behalf of public and private sector entities. The Corgiat site could represent a "one-time" opportunity for the City of Seattle.

5.4 Summary

Table 5.4-1 summarizes the facility options, their descriptions, recycling rates, net present value costs, levelized annual costs, and other factors. This table should help facilitate the comparison of alternatives. For example, Options 16.1 (City intermodal facility plus NRDS and SRDS) and 18.1 (just NRDS and SRDS) achieve the same 65% recycling rate and have about the same $39 million levelized annual cost. The net present value (NPV) of Option 16.1 is about $10 million more than 18.1; this difference essentially buys the City a three transfer station system (Option 16.1) instead of a two transfer station system (Option 18.1). Option 16.1 provides greater flexibility and redundancy; as such, the $10 million difference could be considered a "risk mitigation premium."

Similarly, the higher diversion scenario Options 16.4 and 18.4 both achieve a 72% recycling rate for about the same $43 million levelized annual cost. Their difference in NPVs is even smaller, on the order of $3 million.

Further details comparing the options can be found in Total NPV Costs by Component in Appendix E.

Table 5.1-4
Facility Options Summary

Option	NRDS	SRDS	Third Facility	Organics / C&D Waste Bans	Self-Haul Ban[1]	Net Present Value (000)	Annual Levelized Cost (000)	Recycle Rate[5]	Other Factors
16.1[2] SPU previous Option 11	• Add 1.5 acres for recyclables and reuse • Demolish existing building and rebuild • Build a new office and employee facilities	• Add 9 acres to the site • Material sort line for C&D; retail reuse store • Demolish existing buildings and rebuild	• Build City intermodal yard/ transfer facility on an identified site south of downtown Seattle • Receives commercial and residential MSW • Receives commercial organics[3] • MSW loaded onto train	No	No	$813,898	$39,918	65%	• Maximum redundancy (backup capability) • Maximum flexibility Control over intermodal & rail yard costs • Can arrive/ depart a train • Safety: separated vehicles[6] • Misses NRDS queuing goals[7]
16.4	• Same as above • Building smaller than 16.1	• Same as above • Building smaller than 16.1	• Same as above • Building smaller than 16.1	Yes	Mandatory	$886,512	$43,480	72%	• Maximum redundancy • Maximum flexibility • Control over intermodal & rail yard costs • Can arrive/ depart a train • Safety: separated vehicles[6] • Misses NRDS queuing goals[7]

Option	NRDS	SRDS	Third Facility	Organics / C&D Waste Bans	Self-Haul Ban[1]	Net Present Value (000)	Annual Levelized Cost (000)	Recycle Rate[5]	Other Factors
17.4 Public and Private owner-ship	Same as 16.1 Building smaller than 16.1	Same as 16.1 Building smaller than 16.1	Same as 16.1 except that third facility is privately owned, constructed and operated	Yes	Mandatory	$921,592	$45,200	72%	• Maximum redundancy • Some flexibility • Safety: separated vehicles[6] • Misses NRDS queuing goals[7]
18.1 SPU previous Option 0	• Receives present percentage of small and large self-haul small vehicles • Add more than 1.5 acres • Add recyclables and reuse items and commercial • Demolish existing building and rebuild larger than 16.1 • Receives 40% of commercial and residential MSW and residential organics	• Receives present percentage of small and large self-haul vehicles and organics • Add 9 acres to the site • Add material sort line for C&D and a retail reuse • Demolish existing building and rebuild larger than 16.1 • Receives 60% of commercial and residential MSW and residential organics	No	No	No	$803,672	$39,417	65%	• MSW exported through private intermodal facility and rail yard. • Less control over intermodal and rail yard costs • Safety: vehicles not separated • Misses NRDS queuing goals[7]
18.2	Same as 18.1	Same as 18.1	No	Yes	No	$803,000	$39,384	69%	• MSW export same as 18.1. • Less control over intermodal & rail yard costs • Safety: vehicles not separated • Misses NRDS queuing goals[7]

Option	NRDS	SRDS	Third Facility	Organics / C&D Waste Bans	Self-Haul Ban[1]	Net Present Value (000)	Annual Levelized Cost (000)	Recycle Rate[5]	Other Factors
18.3	Same as 18.1	Same as 18.1	No	Yes	Voluntary	$823,849	$40,407	70%	• MSW export same as 18.1. • Less control over intermodal & rail yard costs • Safety: vehicles not separated • Misses NRDS queuing goals[7]
18.4	Same as 18.1 Building smaller than 16.1	Same as 18.1 Building smaller than 16.1	No	Yes	Mandatory	$883,375	$43,326	72%	• MSW export same as 18.1. • Less control over intermodal & rail yard costs • Misses NRDS queuing goals[7]
19.4	• Station rebuilt only as an enhanced recycling center	• Add 9 acres to the site • Add material sort line for C&D and a retail reuse facility • Demolish existing building and rebuild larger than 16.1 • Receives all commercial and residential MSW and residential organics	No	Yes	Mandatory	$823,849	$40,407	72%	• MSW export same as 18.1. • Less control over intermodal & rail yard costs

Option	NRDS	SRDS	Third Facility	Organics / C&D Waste Bans	Self-Haul Ban[1]	Net Present Value (000)	Annual Levelized Cost (000)	Recycle Rate[5]	Other Factors
20.4 Variant of 19.4	• Add 1.5 acres for recyclables and reuse items • Add material sort line for C&D and a retail reuse facility • Demolish existing; new building almost twice the size of 16.1 • Receives all commercial and residential MSW and residential organics	• Station rebuilt only as an enhanced recycling center	No	Yes	Mandatory	$858,387	$42,100	72%	• MSW export same as 18.1. • Less control over intermodal & rail yard costs
21.4 Variant of 18.4	• Add material sort line for C&D and a retail reuse facility • Demolish existing buildings and rebuild larger than 16.1	• Demolish existing buildings and rebuild smaller than 16.1	No	Yes	Mandatory	$920,982	$46,675	72%	• MSW export same as 18.1. • Less control over intermodal & rail yard costs • Misses NRDS queuing goals[7]

Notes:

[1] Mandatory: This option is not a complete ban on self-haulers, instead it is a ban on self-haulers who do not meet at least one of the following criteria: self-haul vehicle has a semi-automatic or automatic mechanism for unloading waste loads; self-haul vehicle has a 1-ton or greater load capacity; or self-hauler's load comprises of only organics.
Voluntary: On-Demand curbside collection service is offered as an alternative to traditional self-haul.

[2] Option numbers after the decimal refer to Zero Waste strategies as follows. Though not modeled for the study, all facility scenarios could be paired with one of these Zero Waste package options.
1 - Baseline. 60% Program projections (revised) PLUS Zero Waste Program strategies with NO material bans.
2 - 60% Program projections (revised) PLUS Zero Waste Program strategies with Organics Ban, Commercial Recyclables Ban, C&D Ban, and Other Materials Ban; NO Self Haul Bans (except C&D)

3 - 60% Program projections (revised) PLUS Zero Waste Program strategies with Organics Ban, Commercial Recyclables Ban, C&D Ban, and Other Materials Ban; and voluntary Self-Haul Ban (C&D mandatory)

4 - 60% Program projections (revised) PLUS Zero Waste Program strategies with Organics Ban, Commercial Recyclables Ban, C&D Ban, and Other Materials Ban; and Mandatory Self-Haul Ban

[3] For all options commercial organics are received at a private facility.

[4] None of the options require the property north of 35th street for NRDS.

[5] In 2038; includes material diverted at reuse / recycling center at RDS

[6] Self-haul & collection vehicles separated for safety.

[7] Even with west property, site is too small for queue length required to keep waiting time below 30 minutes both inbound and outbound.

6 ACTION MENU

This section of the report builds upon the analyses described in earlier sections to present a wide ranging menu of possible strategies to drive additional diversion and the shift in the City's culture to one of Zero Waste. This section of the report also provides a short list of Zero Waste strategies for immediate consideration; and lists other considerations to address facility-related policy questions. The analyses contained in the previous sections of this report included:

- Sections 2 and 3 summarized the analysis of waste reduction, recycling, and EPR strategies (detailed in Volume 2), and the potential tonnage diversion from four Zero Waste scenarios.
- Section 4 evaluated six major facility configuration and ownership options.
- Section 5 evaluated the potential impacts on each of the facility options that could result from implementation of the four Zero Waste scenarios.

In general, the Zero Waste project team believes that a combination of the strategies and considerations described in this Study can noticeably enhance the City's momentum to:

- Increase its recycling rate to and beyond the current 60% goal.
- Build partnerships between waste generators, product and packaging manufacturers, and re-manufacturers to develop recovery channels and incentives that emphasize waste prevention, resource recovery and reuse.
- Use the full range of incentives, regulations, and other policy actions to address the fundamental need to change public attitudes and values regarding consumption of resources.
- Initiate or enhance plans that promote sustainable economic development.
- Allocate responsibility among all stakeholders and sectors, particularly in these early stages of transformation to a Zero Waste culture, so that political and institutional opposition is muted and in fact, changed into broad-based support.

6.1 Policy Objectives

The Zero Waste project team has developed the Action menu to be consistent with a number of policy objectives expressed by the City Council. The policy objective, and a description of the intent and focus of each, includes:

- Facility "Right-Sizing." Facility "Right-Sizing" refers to optimizing the system-wide configuration of City-owned facilities, including the types of facilities (e.g., transfer station, combination transfer/IMF, combination transfer station/recycling facility (enhanced or with target sort line), the number of total facilities necessary to handle the tonnage of waste and recyclables, and number of customer trips anticipated to pass through the system; the size of individual facilities required to handle the tonnage of waste and recyclables, and number of customer trips anticipated to pass through the facility; and the size of individual facilities necessary to process mixed waste materials for recoverable recyclables.

- Producer Responsibility. Producer responsibility refers to the goal of transferring the primary cost and responsibility for handling recovery of products from the City of Seattle to those responsible for producing the products.

- Highest and Best Use. Highest and best use refers to the actions that promote reuse of products or items after initial discard in their original application; use of recycled material in "closed loop" applications rather than "open loop" applications; the use of recycled materials in higher (dollar) value end-use applications; or the use of recycled materials in applications that can be repeatedly recycled at the end of their life, instead of use in disposable applications.

- Targeting Toxics. Targeting toxics refers to the removal of toxic materials from the waste stream, regardless of the tonnage of total solid waste removed, when doing so will provide human and environmental health benefits, or prevent human and environmental health impacts.

- Market Development. Market development refers to the actions that create a market "pull" for recycled materials out of the waste stream, thereby increasing the incentive to remove them from the waste stream by both consumers and recycling processors. Market "pull" tends to reduce the need for prescriptive regulatory regimes aimed at recycling, and also acts as a form of "sustainable" economic development.

Many of the strategies discussed in this report may apply to more than one of the policy objectives described above. For example, the strategy for a Take Back Program for Carpet (#265) could be described as both an effort at "Facility Right Sizing" or "Producer Responsibility." For the purposes of this study, strategies were categorized once under the policy objective that the Zero Waste project team felt best described its intent. Strategy #265 has the potential to divert tonnage that would affect the sizing or configuration of facilities and so was grouped under "Facility Right Sizing."

By grouping strategies under policy objectives, the ZWWG believes a balance of Zero Waste strategies can be selected to address priorities set by the Council, within the context of other independent considerations such as City budgets, other City priorities, resident and business response, and the overall needs of the community.

6.2 Implementation Timeline

Accomplishing Zero Waste is a long term endeavor. As such, the Zero Waste team has also grouped strategies in the near term, mid term and long term according to considerations for implementation effort, ramp up time, cost and balance. Implementation years were chosen based on several factors, including:

- The experiences of other jurisdictions, the City of Seattle, and professional judgment in implementing similar programs
- Professional judgment on essential sequencing of strategies (e.g., market development for select C&D waste materials should precede a ban on disposal of C&D materials)
- The ability to model diversion estimates by giving time for the following sequence of general approaches agreed to by the ZWWG to take effect:
  - Providing the service
  - Modifying the incentives associated with the service
  - Employing product stewardship
  - Employing regulatory approaches

However, it is important to note that the implementation years listed for all strategies in this report should be considered nominal implementation years, in that the year could be significantly accelerated or changed based on priorities set by the City Council, by modifying the strategy, by combining an individual strategy with other strategies, or by taking all these actions.

Table 6.2-1 shows the range of Zero Waste strategies organized according to the discussions in 6.1 and 6.2, above. Detailed descriptions of all strategies listed under “facility right-sizing”, and many of the other strategies, are contained in Volume 2 of this report. Additional analysis is required of those strategies that have not been detailed in Volume 2, in order to provide estimates of cost and diversion. Table 6.2-1 also shows total cost and the potential increase in recycling/diversion for each policy objective. Several notes are relevant to the following table:

- Cost figures were calculated for the each strategy implemented individually. Consideration was given to efficiencies that might arise from existing SPU programs. However, given the range of future strategy combinations possible, the ZWWG determined that cost estimates should avoid estimating efficiencies that could result from strategy combinations that have yet to be determined. Total costs under each policy objective reflect this approach.
- All strategies listed under “Facility Right Sizing” are “A” strategies. Diversion figures for these strategies were taken from the estimates derived from the modeling effort described in Section 3, utilizing the sequential implementation of Scenario 4.

This approach eliminates any potential double-counting of diversion between strategies that address similar materials.

- All strategies listed under the remaining policy objectives are “B” or “C” strategies. For the modeling effort described in Section 3, diversion estimates for “B” strategies were not estimated for each strategy, but rather aggregated by material type for integration into the sequential implementation approach. Double counting of diversion was thus eliminated for “B” strategies in determining overall diversion tonnages. However, For Table 6.2-1, diversion figures for each “B” and “C” strategy was estimated as if implemented individually. This approach does not eliminate all potential double-counting of diversion between strategies that address similar materials. Total diversion figures under these policy objectives reflect this later approach.
- Cost and diversion figures for each policy objective do not include estimates for all strategies shown.
- Cost and diversion figures for each policy objective are for the year 2038.

Table 6.2-1
Action Menu by Policy Objective

ID #	Title	Imp. Date	ID #	Title	Imp. Date	ID #	Title	Imp. Date
Facility "Right Sizing"			**Total Diversion (2038): 243,144 Tons**			**Total Cost (2038): $13,186,187**		
	Near Term			**Mid Term**			**Long Term**	
123	Multifamily Residential Organics Program	2008	152	(Other) Disposal Bans	2015	124	Commercial Weight-Based Garbage Rates	2020
170	On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)	2008	160	Expand Inspection & Enforcement Program (Other)	2015	285	Commercial Organic Waste Disposal Ban	2020
204	Building Permit C&D Reuse And Recycling Fee Deposit	2008	173	C&D Recyclables Disposal Ban	2015	298	Beverage Container Deposit System	2020
217	Self-Haul Computer Parts	2008	182	Residential Food Waste Disposal Ban	2015			
221	Residential On-Demand Collection Of Waste (C&D) Building Materials	2008	323	Ban Self Haul Disposal at City Owned Transfer Stations	2015			
270	Tiered Commercial Garbage Rates	2008	349	Disposal Ban For Recyclables In Commercial Waste	2015			
312	Rate Structure Review for Residential Organics Collection	2008	160 / 330	Expand Inspection & Enforcement Program / Mandatory Commercial/Institutional Waste Audits (Other)	2012			

ID #	Title	Imp. Date	ID #	Title	Imp. Date	ID #	Title	Imp. Date
108	Mandatory Commercial Recycling Services	2010	273 / 400	Residential Diaper Composting / Subsidize Reuseable Diaper Services from Fee on Disposable Diaper Purchases	2015			
209	Incentivize Development of Private Mixed C&D Debris Recycling Facility	2010	283 / 378	Rate Structure Review for Garbage Collection / Maximum Commercial Recycling Container Rate	2015			
265	Take-Back Program For Carpet	2010	283 / 402	Rate Structure Review for Garbage Collection / Reduce Volume Discounts on Extra Garbage Cans ($/gallon of capacity)	2015			
283	Rate Structure Review for Garbage Collection	2010	367 / 332	Adjust Rate Structure for Self Haul Disposal at City Owned Transfer Stations / Raise Self Haul Tipping Fees and Illegal Dumping Fines	2015			
353	Compostable Plastic Bags	2010	240	Performance-Based Contracting For Solid Waste Service Contracts	2016			
379	Create Larger Differential Between Disposal Tip Fee and Fee to Dump Recycleables	2010						
118	Rate Structure Review for Commercial Organics Collection	2011						
192	Pet Waste Composting	2011						
253	Expand Residential Curbside Organics Collection to Include All-Food	2011						

ID #	Title	Imp. Date	ID #	Title	Imp. Date	ID #	Title	Imp. Date
	Collection to Include All-Food							
307	Tiered Commercial Organics Rates	2011						
363	Take-Back Program for Used Building Materials at Home Product Centers	2012						
376	On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	2012						
Zero Waste / Producer Responsibility		**Total Diversion (2038): 3,608 Tons**				**Total Cost (2038): $499,820**		
Near Term			**Mid Term**			**Long Term**		
219 / 244 / 297	Expand Take-Back Program For Fluorescent Lamps to Include Thermostats and to Build Business Participation / Add Mercury Thermometers to Take-Back Program For Auto Switches, Thermostats, Lamps, Flourescent Lamps, Dental Waste, Medical Waste / Take-Back Program for Fluorescent Tubes	2010	193	Plastic Bag Initiative	2015	391	Seattle "Green Dot" Program - Producers Share in the Cost of Curbside Recycling	2020
117	Backyard Food Waste Vermiculture Program	2008	246	Deposit Program for Plastic Grocery Bags and Other Common Items	2015	201	Disassembly For Recycling Regulation	2020

ID #	Title	Imp. Date	ID #	Title	Imp. Date	ID #	Title	Imp. Date
329	Create Regional SWAC to Lead, Establish and Implement Cooperation on Zero Waste, Waste Reduction, Recycling, Market Development, "Design For Recycling" Standards, Collection, Facilities, and Disposal Activities	2010	396	Grocery Bag Fee	2015	340	Create or Adopt Eco-Labeling Requirements for Recycled Content, Recyclability, Product Packaging Ratio, and Toxic Content.	2020
291	Take-Back Program For Cell Phones	2010	218	Take-Back Program For Household Sharps	2015	364	Product Tagging System in Retail Stores.	2020
196	Take-Back Program fo Used Motor Oil	2010	322	Conduct a Waste Sort to Collect Data on the Quantities, Types and Brands of Products Being Disposed and Allocate Costs to Respective Manufacturers	2015	276	Take-Back Program For Product Packaging By Retail Sellers	2020
216	Take-Back Program For Ink Jet Cartridges	2010	229	Take-Back Program For EPS Foam Packaging – Negotiate With The Association Of Foam Packaging Recyclers	2015	284	Rate Structure Review for Recyclables Collection	2020
315	Take-Back Program For Printer Toner Cartridges	2010	289	Reuseable Transport Packaging	2015			
202	Packaging Tax	2012	195	Take Back Program for Used Tires	2015			
			279	Take-Back Program for Household Chemical Waste	2017			
Highest and Best Use		**Total Diversion (2038): 10,163 Tons**			**Total Cost (2038): $664,806**			

ID #	Title	Imp. Date	ID #	Title	Imp. Date	ID #	Title	Imp. Date
Near Term			**Mid Term**			**Long Term**		
245	Large Venue/Event Waste Reduction Ordinance	2008	386	Health Department Permit Requirement that Restaurants Must Have Food Waste Collection Space and Material Handling Facilities	2015	350	Anaerobic Digestion Reactor for Organics Processing and Biofuels Production	2020
393	Initiate Distinction in Measuring Recycling Rates by 'Closed-Loop Recycling' vs. 'Down-Cycling'	2008				187	Incentive Program to Encourage Biomass/Organics To Energy	2020
177	Salvage And Reuse Swap Sites	2010						
104	Expand Public Space Recycling	2010						
189	School Campus Recycling	2010						
155	Source Separated Recycled Material Rate Discount	2010						
394	Emphasize 'Closed-Loop Recycling' in Processing Contracts not 'Down-Cycling'	2010						
382	Waste Screening at Transfer Stations for Exclusion of Banned Recyclables	2010						
226	Wood Waste Drop Off Center	2010						
197	Wood Salvage Program	2012						

ID #	Title	Imp. Date	ID #	Title	Imp. Date	ID #	Title	Imp. Date
Targeting Toxics		**Total Diversion (2038): 1,362 Tons**			**Total Cost (2038): $1,261,087**			
	Near Term			**Mid Term**			**Long Term**	
398	Ban PBDE in Products	2008	401	Fee on Incandescent Bulbs to Fund Fluorescent Bulb Recycling	2015	320	Universal Waste Disposal Ban	2017
153	Add Alakaline Batteries to Existing Curbside Recycling Program	2008	399	Ban PVC Plastic Packaging	2015	355	Chemical Policy and Precautionary Principal	2017
369	Pesticide Container Recycling Program	2008				316	Residential Curbside Collection of Electronics Waste	2020
339	Computer Waste Disposal Ban	2010						
311	Disposal Ban For Vehicle Batteries	2010						
169	Disposal Ban For Used Oil Bottles	2010						
228	Product Ban for Styrofoam To-Go Containers and Single-Serve Foodservice	2012						
Market Development		**Total Diversion (2038): 3,561 Tons**			**Total Cost (2038): $147,820**			
	Near Term			**Mid Term**			**Long Term**	
243	Expand City of Seattle Sustainable Purchasing /Buy Recycled Program	2008	199	Eco Parks for Resource Sharing and Material Market Development	2015			

ID #	Title	Imp. Date	ID #	Title	Imp. Date	ID #	Title	Imp. Date
374	Meet with the Greater Vancouver Regional District (B.C.) to share strategies on increasing diversion.	2008	165	Recycling Market Development Zones	2015			
186	Market Development For Gypsum, Asphalt Roofing, Wood Waste To Non-Fuel Markets, Except ADC	2008						
174	Development Incentives For Green Building Practices	2008						
190	Recovered Materials Certification & Reporting	2012						

6.3 Strategies for Immediate Consideration

The results listed in sections 2 though 5, and in Volume 2 of this report, provide the basis for the Zero Waste project team to present a "short list" of strategies from Table 6.2-1 for immediate consideration by the City Council and SPU.

Table 6.3-1 shows the Zero Waste strategies for immediate consideration organized by the policy objectives discussed earlier. The strategies listed in Table 6.3-1 are not necessarily appropriate for action in 2007, but rather those strategies that present the best mix of feasibility, tonnage diversion, environmental benefits, and balance among stakeholders such that they should be considered first. As stated previously, actual implementation dates can and should be set according to stated priorities, the complexity of the strategy, lead time required to minimize risk, programs already in place, anticipated costs, or a combination of all. The process used by the Zero Waste project team to select this short list of strategies included an effort to balance the following:

- Strategies from all policy objectives
- Strategies targeting materials with large tonnages remaining in the waste stream
- Strategies with a high likelihood of diverting significant tonnage as estimated by the model described in Section 3
- Strategies that build upon other existing City or private programs, and thus that lower the risk of achieving results cost effectively
- Strategies that enhance the process of making producers responsible for disposal and recycling of their products, by targeting products where some success has already been achieved in other jurisdictions by public or private action
- Strategies that may have a long lead to take affect, but which would help shift societal thinking toward waste.

Impacts on system costs were not considered. As in Table 6.2-1, strategies listed under "Facility Right Sizing" in Table 6.3-1 are "A" strategies. Diversion figures for these strategies were taken from the estimates derived from the modeling effort described in Section 3, utilizing the sequential implementation of Scenario 4. This approach eliminates any potential double-counting of diversion between strategies that address similar materials.

Also for Table 6.3-1, all strategies listed under the remaining policy objectives are "B" or "C" strategies. Summary cost (to the City) and diversion figures for each policy objectives were estimated as if each underlying strategy was implemented individually. Cost and diversion figures shown for each of these policy objectives do not include estimates for all strategies shown.

In summary, the Zero Waste project team feels that in order to maximize effectiveness and overall participation, any package of strategies should affect a variety of actors, including residential, multifamily, commercial, and self haul generators, haulers, the City, and manufacturers, distributors and retailers. These strategies increase recycling diversion for all sectors; address residential and commercial organic waste, wastes that pose a threat to environmental and human health, and C&D waste.

Table 6.3-1
Strategies for Immediate Consideration

ID #	Title	Imp. Year	Diversion Tonnage (2038)	Other Factors
Facility "Right Sizing"				
123	Multifamily Residential Organics Program	2008	3,331	• Low Risk • Medium - High Cost • Low Env. Benefits
204	Building Permit C&D Reuse And Recycling Fee Deposit	2008	2,331	• Low Risk • Medium Cost • Medium Env. Benefits
209	Incentivize Development of Private Mixed C&D Debris Recycling Facility	2010	58,121	• Medium Risk • Low Cost • Medium Env. Benefits
265	Take-Back Program For Carpet	2010	2,802	• Medium Risk • Low Cost • Medium Env. Benefits
379	Create Larger Differential Between Disposal Tip Fee and Fee to Dump Recyclables	2010	553	• Low Risk • Medium Cost • Low Env. Benefits
118	Rate Structure Review for Commercial Organics Collection	2011	8,681	• Medium Risk • Low Cost • Low Env. Benefits
253	Expand Residential Curbside Organics Collection to Include All-Food	2011	3,338	• Low Risk • Medium - High Cost • Low Env. Benefits
307	Tiered Commercial Organics Rates	2011	7,855	• Medium Risk • Low Cost • Low Env. Benefits
160 / 330	Expand Inspection & Enforcement Program	2015	5,427	• Low - Moderate Risk • High Cost • Low Env. Benefits
173	C&D Recyclables Disposal Ban	2015	12,847	• Low Risk • Medium Cost • Medium Env. Benefits

ID #	Title	Imp. Year	Diversion Tonnage (2038)	Other Factors
367 / 332	Adjust Rate Structure for Self-Haul Disposal at City Owned Transfer Stations / Raise Self Haul Tipping Fees and Illegal Dumping Fines	2015	4,273	• Low Risk • Low Cost • Medium Env. Benefits
182	Residential Food Waste Disposal Ban (SF Only)	2015	10,538	• Low Risk • High Cost • Low Env. Benefits
285	Commercial Organic Waste Disposal Ban	2020	21,321	• Low - Medium Risk • Medium - High Cost • Low Env. Benefits
	TOTAL		**141,418**	**COST (2038): $3.2 MM**
Zero Waste / Producer Responsibility				
219 / 244 / 297	Expand Take-Back Program For Fluorescent Lamps to Include Thermostats and to Build Business Participation / Add Mercury Thermometers to Take-Back Program For Auto Switches, Thermostats, Lamps, Flourescent Lamps, Dental Waste, Medical Waste / Take-Back Program for Fluorescent Tubes	2010		• Low Risk • Low Cost • High Env. Benefits
329	Create Regional SWAC to Lead, Establish and Implement Cooperation on Zero Waste, Waste Reduction, Recycling, Market Development, "Design For Recycling" Standards, Collection, Facilities, and Disposal Activities	2010		• High Risk • Low Cost • Medium Env. Benefits
291	Take-Back Program For Cell Phones	2010		• Low Risk • Very Low Cost • High Env. Benefits
196	Take-Back Program for Used Motor Oil	2010		• Low Risk • Very Low Cost • High Env. Benefits
216	Take-Back Program For Ink Jet Cartridges	2010		• Low Risk • Very Low Cost • High Env. Benefits
315	Take-Back Program For Printer Toner Cartridges	2010		• Low Risk • Very Low Cost • High Env. Benefits
289	Reusable Transport Packaging	2015		• Medium Risk • Very Low Cost • Medium Env. Benefits
279	Take-Back Program for Household Chemical Waste	2017		• Low - Medium Risk • Very Low Cost

ID #	Title	Imp. Year	Diversion Tonnage (2038)	Other Factors
	Waste			• High Env. Benefits
229	Take-Back Program For EPS Foam Packaging – Negotiate With The Association Of Foam Packaging Recyclers	2015		• Low - Medium Risk • Very Low Cost • High Env. Benefits
276	Take-Back Program For Product Packaging By Retail Sellers	2020		• High Risk • Very Low Cost • Medium Env. Benefits
	TOTAL		**600**	**COST (2038): $259,000**
Highest and Best Use				
245	Large Venue/Event Waste Reduction Ordinance	2008		• Low Risk • Medium Cost • Low Env. Benefits
393	Initiate Distinction in Measuring Recycling Rates by 'Closed-Loop Recycling' vs. 'Down-Cycling'	2008		• Low Risk • Medium Cost • Medium Env. Benefits
177	Salvage And Reuse Swap Sites	2010		• Low Risk • Medium Cost • Medium Env. Benefits
155	Source Separated Recycled Material Rate Discount	2010		• Low Risk • Very Low Cost • Medium Env. Benefits
394	Emphasize 'Closed-Loop Recycling' in Processing Contracts not 'Down-Cycling'	2010		• Medium Risk • Medium - High Cost • Medium Env. Benefits
197	Wood Salvage Program	2012		• Low Risk • Low Cost • Low Env. Benefits
386	Health Department Permit Requirement that Restaurants Must Have Food Waste Collection Space and Material Handling Facilities	2015		• Medium Risk • Medium Cost • Low Env. Benefits
350	Anaerobic Digestion Reactor for Organics Processing and Biofuels Production	2020		• Medium Risk • Very High Cost • Low Env. Benefits
	TOTAL		**8,400**	**COST (2038): $471,000**
Targeting Toxics				
153	Add Alakaline Batteries to Existing Curbside Recycling Program	2008		• Low Risk • High Cost • High Env. Benefits

ID #	Title	Imp. Year	Diversion Tonnage (2038)	Other Factors
369	Pesticide Container Recycling Program	2008		• Low Risk • Low Cost • High Env. Benefits
169	Disposal Ban For Used Oil Bottles	2010		• Low Risk • Medium Cost • High Env. Benefits
228	Product Ban for Styrofoam To-Go Containers and Single-Serve Foodservice	2012		• Medium Risk • Low Cost • Medium Env. Benefits
	TOTAL		**800**	**COST (2038): $348,000**
Market Development				
186	Market Development For Gypsum, Asphalt Roofing, Wood Waste To Non-Fuel Markets, Except ADC	2008		• Medium Risk • Medium Cost • Medium Env. Benefits
174	Development Incentives For Green Building Practices	2008		• Low Risk • Medium Cost • Medium Env. Benefits
199	Eco Parks for Resource Sharing and Material Market Development	2015		• Medium Risk • Medium Cost • Medium Env. Benefits
165	Recycling Market Development Zones	2015		• Medium Risk • Medium Cost • Medium Env. Benefits
	TOTAL		**3,600**	**COST (2038): $156,000**
GRAND TOTAL			**154,818**	**$4,434,000**

6.4 Other Strategic Considerations

The Zero Waste project team has modeled and estimated a range of waste generation, participation and effectiveness in waste reduction, recycling, EPR, and collection programs. Section 6.3 presents diversion strategies that the team believes, when fully implemented, will divert a substantial amount of waste out of the production cycle, or into recycling and composting. Other important considerations for moving forward include the following:

- Surveys designed to assess public attitudes toward many of the strategies evaluated in this report are not yet complete. A separate report will follow presenting the results.

- Additional analysis of those strategies not detailed in Volume 2, and modeling of a variety of strategy combinations and implementation years should be completed in the future to create a template to connect the 2004 Plan Amendment, the full Solid Waste Comprehensive Plan revision planned for 2008, and the principle of Zero Waste.
- Implementing a series of self-haul related bans (Scenarios 1-4) has potential benefits, but in the near term could have a negative impact on level-of-service (at least perceived, if not actually quantifiable). Successful implementation of Scenario 4 would require significant customer and citizen support and participation (the extent of which will be informed by the above bullet).
- Other jurisdictions have avoided a full, mandatory ban of self-haul vehicles and accomplished some of its goal by taking other measures such as extending the hours when the station is open only to collection vehicles, or severely limiting the times when the station is open to self-haulers (e.g. less than 1,500 lb payloads). At the same time, the City could increase publicity about currently available call-to-haul services already provided by private companies and encouraging the private sector to enhance the infrastructure for C&D waste and on-demand pick. This combination could reduce self-haul traffic and queuing at the stations at a relatively low cost to the City.
- Private industry can and should be a cost-effective partner to enhance efficient resource use and recovery, but may need help to overcome economic obstacles through financial incentives, educational programs, and site development assistance.

The Zero Waste project team has modeled and estimated a range of facility configuration and ownership options to address facility-related policy questions. Cost, engineering, operations, tonnage and trips, and economic considerations are presented in Sections 4 and 5. However, significant outstanding considerations that are independent of those modeled for this study could sway decision makers toward a specific facility solution. These factors include neighborhood attitudes, the amount of risk mitigation premium the City is willing to use to mitigate price or economic risk, and the degree to which the population of Seattle reacts to the 60% program and additional Zero Waste strategies that are implemented.

The following bullet points provide other important considerations as the City Council and SPU move forward toward resolving the outstanding facility question:

- If a transfer station is constructed at Corgiat in the near term, it should be designed with a high degree of flexibility to accommodate other future uses such as materials processing, waste conversion technologies, or subleases for eco-industrial park tenants or general industrial tenants.
- If the City chose not to build a third transfer station immediately, purchase of the Corgiat site could allow the City to make relatively minor improvements to the site (e.g. some demolition and paving) to make it suitable for use as both an intermodal

yard and a rail yard. This would depend on contract considerations with respect to the use of the Argo Yard.

- As 60% program and Zero Waste strategies are phased-in over various time frames, the City will be able to monitor their progress in limiting the amount of waste shipped for disposal. If the City later decides to build a transfer station, this new data will allow the City to more accurately "right-size" the facility.

- As 60% program and Zero Waste strategies are phased-in over various time frames, the City can also monitor the success of alternative waste conversion technologies being tried in other parts of the U.S. and abroad. These waste conversion technologies have the potential to create energy products (e.g. electricity or synthetic equivalents to natural gas) and to have lower environmental impact than conventional technologies such as incineration/waste-to-energy. However, the track record for U.S. facilities of an appropriate size for Seattle is limited.

6.5 Recommended Diversion Goals

The Zero Waste project team believes that the recommended strategies can add to the existing momentum created by Seattle's existing programs to help the City meet and go beyond its 60% recycling goal by 2013. With successful implementation of planned 60% program strategies, and those Zero Waste strategies that are anticipated to divert the most waste, a 72% recycling rate could be expected by 2025, or perhaps sooner based on other program developments or enhancements provided by the City Staff. The City Council and SPU can use this analysis to help set new recycling goals for the City.

In addition, the City could also consider achieving Zero Waste as a long term goal by drafting and passing a resolution to do so. The Council resolution could occur with the Council's decision regarding implementation of a Facilities Plan in 2009. This visible City leadership could help to create and sustain the shift in our culture away from unneeded consumption, toward one of a sustainable, Zero Waste future.

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Appendix A

Diversion Rate Calculations

Materials in Diversion Calculations

Calculating Diversion Rates

By: URS Corporation (URS) and Herrera Environmental Consultants (Hererra)

For: The Seattle City Council and Seattle Public Utilities (SPU)

CONTEXT

In late 2006, the Seattle City Council and SPU retained a consultant team headed by URS to perform a comprehensive evaluation of current and proposed City of Seattle (City) solid waste management programs, with the objective of assisting Seattle to achieve zero waste goals. Also known as the Zero Waste Study, this evaluation focused on:

- Promoting zero waste principles and product stewardship; identifying policy and regulatory options that would encourage businesses to reduce waste through their manufacturing, packaging, and take-back practices.
- Identifying ways to restructure collection (residential, commercial, and self-haul) practices to decrease the tonnage of waste brought to City or private facilities and to increase recycling.
- Identifying ways to downsize or possible abandon the existing transfer stations and/or the proposed intermodal facility.

This issue paper compares SPU's **method of calculating diversion rates with that of other jurisdictions**, in the context of the Zero Waste Study.

Seattle's Zero Waste Strategy is explicit in its pursuit of waste stream reduction and recycling ideas essential to reaching its intermediate and long-term goals. An important component of the Zero Waste Strategy is the design and development of facilities and contracts that support the full recycling of construction and demolition (C&D) waste.

This issue paper compares, through a brief analysis, how a sample of state and local governments consider construction and demolition waste in their respective research and recovery rates.

Research Samples

The consultant team (URS and Herrera) reviewed three states (California, Oregon and Washington) and three cities (Portland Metro, New York City and San Francisco). The team also reviewed the federal Environmental Protection Agency (EPA) recovery rate research.

Recovery Rate Philosophy

The states and their respective cities follow one of two philosophies about including C&D waste in recovery rates. California includes C&D waste, so its cities do as well. Oregon also counts it, as does Portland Metro. Washington does not include C&D, and neither does Seattle. Local Law 19 prohibits New York City from including C&D in its recovery rate.

These differences make it difficult to accurately compare overall recovery rates. As does the approach that each state and local jurisdiction uses to measure C&D recovery. The list of materials considered as C&D by California will differ from Oregon's categories. Washington, which doesn't recognize C&D for its recycling rate calculations, does acknowledge it as a diverted material with a separate diversion rate.

State Research

California

The state's Integrated Waste Management Board (CIWMB) supports a Zero Waste California campaign. It's described as a partnership with local governments, industries and citizens. The CIWMB is a disposal-based agency. It has the most comprehensive disposal reporting system in the west. This reporting and research provides thorough information on every aspect of the solid waste disposal system.

This disposal-based approach requires local jurisdictions to only measure and report on their disposed waste. Their recovery rate calculation is based on the difference between the waste generation forecast and disposal measurements. The cities are not required to report on the composition of diverted materials but just their comprehensive rate, which may include C&D to help them reach the 50% minimum recovery requirement.

The recent research on the C&D waste stream is noteworthy. It's a benchmark of information, including a June 2006 report by the Cascadia Consulting Group that characterizes C&D waste. The research includes an overview of subsectors by percentage, a top ten disposed materials list, and an estimate that 74% of the C&D waste stream may be divertible.

Oregon

The Oregon Department of Environmental Quality (ODEQ) produces an annual material recovery and waste generation survey. The 2005 report was published in November 2006 includes a material recovery rate based on post-consumer materials collected for recycling, compost or energy recovery. However unlike California, it does not include inert materials such as brick or concrete, which is an example of why it is difficult to compare state recovery rates.

Oregon does not have an explicit zero waste strategy. The state's 2009 recovery goal is 50%. The 2005 recovery rate was 49.1%.

Washington

The Washington Department of Ecology (WDOE) follows the federal EPA rationale on C&D waste for recycling calculations. The state considers C&D as a separate, diverted category from the municipal solid waste (MSW) stream and has not included it in the state's recycling rate for twenty years.

WDOE has diversion data from 1999 through 2005. The diverted materials are considered part of emerging recovery markets that were formerly disposed of at landfills or incinerators. The 2005 C&D diversion data reported over 521,000 tons of material, which was 15% of the total volume.

Local Government Research

Portland Metro

The Portland metropolitan area, which includes three counties, had a 2005 recovery rate of 59%. This wasteshed, which follows the recovery reporting guidelines of ODEQ, includes C&D materials such as wood waste, asphalt roofing, gypsum wallboard and scrap metal. The 2005 recovery target for Portland was 62%.

New York City

New York City (NYC) has completed comparative research on municipal recycling for large United States cities and one of the worst recycling rates amongst those cities. The city's Department of Sanitation published a report in May 2004 titled Processing and Marketing Recyclables in NYC. The report compared Chicago, Los Angeles, NYC, San Francisco and Seattle.

NYC, like Seattle, doesn't report C&D waste in its recycling rates. The difference is that the city's Local Law 19, precludes NYC from including C&D, fill and other inert materials in its recovery calculations.

One month after NYC released its comprehensive report, the Consumer Policy Institute/Consumers Union published a reported titled Reaching for Zero: A Citizens Plan for Zero Waste in NYC in June 2004. Reaching for Zero recommends that NYC could reduce its waste exports almost to zero by 2024.

San Francisco

San Francisco has an ambitious goal of 75% diversion by 2010. The city's 2006 recycling rate is 67%, and follows the CIWMB C&D material categories for inclusion in its calculations. These materials include concrete, asphalt paving, asphalt roofing, lumber, gypsum wallboard, rock, soil, fines and composites.

Summary Analysis

1. California achieves the highest recycling rates because it allows jurisdictions to include an extensive list of C&D waste materials in their calculations.
2. The California information provides two important factors about C&D waste. First, that it is generally 22% of the overall MSW stream. Second, that approximately 74% of these materials may be divertible from the waste stream.
3. As a basic assumption, an MSW stream with 20% of C&D that had a 50% recovery rate for that material would add 10% to a jurisdiction's calculation of overall recovery. Seattle, for example, would move to from 44.1% to 54.1%.
4. Portland Metro has a 59% recycling rate because it follows ODEQ C&D calculation guidelines.
5. Washington follows the EPA MSW model for recycling rate calculations. It does not include C&D, but does recognize it as a diverted material. The state's total 2005 diversion rate was over 47.7%. It's 2005 MSW recycling rate was 43.6%

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Items Included In Recycling/Diversion

Waste Category	Waste Type	Seattle	WDOE	EPA	California	OR	NYC
Paper	Corrugated Paper	X	X	X			X
	Uncoated Corrugated Cardboard	X			X		X
	Paper Bags/Kraft	X			X	X	X
	Computer Paper	X			X		
	Mixed Paper	X	X	X	X	X	X
	Newspaper	X	X	X	X	X	X
	High grade ledger paper		X	X	X	X	X
	Other Paper	X		X	X		X
Plastics	HDPE		X		X		X
	PET		X		X		X
	LDPE Plastics		X				
	Rigid Plastic Container		X			X	
	Photographic Films		X				
	Film Plastics				X	X	
	Composite Plastic					X	
	Other Plastics	X	X		X	X	X
Glass	Refillable Glass Beverage	X		X	X		X
	Container Glass	X	X		X	X	X
	Green Glass Bottles & Containers				X		
	Brown Glass Bottles & Containers				X		
	Flat Glass				X		
	Other recyclable Glass	X		X	X	X	X
	Other Non-recyclable Glass			X			
Metals	Aluminum Cans	X	X	X	X	X	X
	Bi-Metal Containers			X	X		
	Refillable Beer Bottles	X	X				X
	Ferrous Metal	X	X	X	X		X
	Tin Cans	X	X			X	X
	Non-Ferrous Metals/Al Scrap	X	X	X	X	X	X
	Steel						
	White Goods		X	X	X		
	Other Metals			X	X		
Yard Waste	Leaves and Grass	X	X	X	X	X	X
	Prunings and Trimmings	X	X	X	X	X	X
	Branches and Stumps	X	X	X	X	X	X
Other Organics	Food Waste		X	X	X	X	
	Tires and Rubber Products			X	X	X	
	Wood wastes	X	X	X	X	X	
	Agricultural Crop Residues				X		
	Manure				X	X	
	Textiles		X		X	X	
	Rubber & Leather			X			

Items Included In Recycling/Diversion

Waste Category	Waste Type	Seattle	WDOE	EPA	California	OR	NYC
	Carpet				X		
	Other Miscellaneous				X		
Electronics	Brown Goods				X		
	Computer-Related Electronics				X		
	Other Small Consumer Electronics				X		
	Telivision & Other Items with CRTs				X		
Other Wastes	Mixed Residues				X		
	Inert Solids						
	Milk Cartons & Boxes		X				
	Computers & Parts		X				
	Porcelain toilets		X			X	
	Fluorescent light bulbs		X			X	
	Milk Cartons/Drink Boxes-Tetra						
	Gypsum		X				
	HHW				X		
Special Wastes	Ash				X		
	Animal Waste/Greese					X	
	Vehicle Batteries		X				
	Tires		X		X		
	Used Oil		X			X	
	Sewage Sludge						
	Industrial Sludge				X		
	Asbestos				X		
	Auto Shredder Waste				X		
	Auto Bodies				X		
	Bulky Items						
	Other Special Wastes				X	X	
Non MSW Materials							
Diverted Materials	Anti-freeze		X				
	Roofing Material		X			X	
	Asphalt/Concrete		X				
	Carpet Pad		X			X	
	Composting Furnish		X				
	Construction & Demolition Debris		X				
	Concrete				X		
	Asphalt Paving				X		
	Asphalt Roofing				X		
	Lumber				X		
	Treated Wood Waste				X		
	Gypsum Board				X		
	Rock, Soil, Fines				X		
	Other C&D				X		
	Donated Food & Merchandise		X				

Items Included In Recycling/Diversion

Waste Category	Waste Type	Seattle	WDOE	EPA	California	OR	NYC
	Food Processing Wastes		X				
	Household Batteries		X				
	Ash, Sand & Dust used in Asphalt Production		X				
	Industrial Batteries		X				
	Land clearing debris		X				
	Matresses		X				
	Oil Filters		X				
	Other Fuels(Reuse&Energy Rec.)		X				
	Miscellaneous		X				
	Paint		X			X	
	Post-Industrial & Flat Glass		X				
	Post-Industrial Plastics		X				
	Railroad Ties		X				
	Reuse-Clothing&Household items		X				
	Reuse - C&D Items		X				
	Reuse - Miscellaneous		X				
	Tires (Retreads)		X				
	Tires (Burned for Energy)		X				
	Topsoil		X				
	Used Oil for Energy Recovery		X			X	
	Wood Fiber/Industrial Paper		X				
	Wood for Energy Recovery		X				
	Yard Waste for Energy Recovery		X				

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Copy of Revised, 60% Projections
Single Family Recycling Rate

DOE http://www.ecy.wa.gov/programs/swfa/solidwastedata/recyclin.asp
Washington doesn't count C&D towards Recycling

EPA http://www.epa.gov/recycle.measure/docs/scope.pdf
EPA doesn't count C&D towards Recycling

NYC http://www.nrdc.org/cities/recycling/gnyc.asp#metal

California http://www.ciwmb.ca.gov/Publications/Disposal/34106005.pdf
CA includes C&D in Recycling

Oregon http://www.clark.wa.gov/recycle/documents/6%20Waste%20Recycling.pdf
Oregon counts C&D towards Recycling

Appendix C

“A” Strategies Diversion Model Information

Appendix C. Participation and Efficiency Rates, Maximum Marginal Recovery Rates, Implementation Dates and Ramp Up Period For "A" Strategies Analyzed

Material	Type	ID #	Strategy	Imp. Date	Ramp	Part.	Eff	Max. Marg. Rec. Rate
SF Residential								
Other	ZW	152	(Other) Disposal Bans	2015	5	90%	100%	90.0%
Other	ZW	160	Expand Inspection & Enforcement Program (Other)	2015	5	50%	10%	5.0%
Traditionals	ZW	160	Expand Inspection & Enforcement Program (Traditionals)	2010	5	50%	10%	5.0%
White Goods / Bulky Items / Furniture	Collection	170	On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)	2008	3	20%	50%	10.0%
Organics	ZW	182	Residential Food Waste Disposal Ban	2015	5	80%	63%	50.0%
Organics	ZW	192	Pet Waste Composting	2011	3	4%	50%	2.0%
Small Appliances & Electronics	Facilities	217	Self-Haul Computer Parts	2008	3	10%	100%	10.0%
Other	Collection	240	Performance-Based Contracting For Solid Waste Service Contracts	2016	3	8%	50%	4.0%

Material	Type	ID #	Strategy	Imp. Date	Ramp	Part.	Eff	Max. Marg. Rec. Rate
Organics	Collection	253	Expand Residential Curbside Organics Collection to Include All-Food	2011	5	13%	80%	10.0%
Traditionals	ZW	298	Beverage Container Deposit System	2020	5	95%	95%	90.3%
Organics	Collection	312	Rate Structure Review for Residential Organics Collection	2008	3	6%	80%	4.8%
Traditionals	ZW	353	Compostable Plastic Bags	2010	10	20%	50%	10.0%
Small Appliances & Electronics	Collection	376	On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	2012	5	20%	100%	20.0%
Organics	ZW	273 / 400	Residential Diaper Composting / Subsidize Reuseable Diaper Services from Fee on Disposable Diaper Purchases	2015	5	5%	50%	2.5%
Traditionals	Collection	283 / 402	Rate Structure Review for Garbage Collection / Reduce Volume Discounts on Extra Garbage Cans ($/gallon of capacity)	2015	3	4%	50%	2.0%
All	ZW	- -	Institute "Group B" Zero Waste Strategies	2020	5	na	na	2.4%

MF Residential

Material	Type	ID #	Strategy	Imp. Date	Ramp	Part.	Eff	Max. Marg. Rec. Rate
Organics	Collection	123	Multifamily Residential Organics Program	2008	5	20%	50%	10.0%
Other	ZW	152	(Other) Disposal Bans	2015	5	90%	89%	80.1%
Traditionals	ZW	160	Expand Inspection & Enforcement Program (Traditionals)	2010	5	50%	10%	5.0%
Other	ZW	160	Expand Inspection & Enforcement Program (Other)	2015	5	30%	10%	3.0%
White Goods / Bulky Items / Furniture	Collection	170	On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)	2008	3	20%	50%	10.0%
Organics	ZW	182	Residential Food Waste Disposal Ban	2015	5	75%	33%	25.0%
Small Appliances & Electronics	Facilities	217	Self-Haul Computer Parts	2008	3	5%	100%	5.0%
Other	Collection	240	Performance-Based Contracting For Solid Waste Service Contracts	2016	3	4%	50%	2.0%
Organics	Collection	253	Expand Residential Curbside Organics Collection to Include All-Food	2011	5	10%	50%	5.0%
Traditionals	ZW	298	Beverage Container Deposit System	2020	5	95%	95%	90.3%

Material	Type	ID #	Strategy	Imp. Date	Ramp	Part.	Eff	Max. Marg. Rec. Rate
Organics	Collection	312	Rate Structure Review for Residential Organics Collection	2008	3	2%	50%	1.0%
Traditionals	ZW	353	Compostable Plastic Bags	2010	10	10%	50%	5.0%
Small Appliances & Electronics	Collection	376	On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	2012	5	40%	100%	40.0%
Organics	Collection	273 / 400	Residential Diaper Composting / Subsidize Reuseable Diaper Services from Fee on Disposable Diaper Purchases	2015	5	5%	50%	2.5%
Traditionals	Collection	283 / 402	Rate Structure Review for Garbage Collection / Reduce Volume Discounts on Extra Garbage Cans ($/gallon of capacity)	2015	3	2%	50%	1.0%
All	ZW	- -	Institute "Group B" Zero Waste Strategies	2020	5	na	na	6.4%
Commercial								
Traditionals	Collection	108	Mandatory Commercial Recycling Services	2010	5	90%	33%	30.0%
Organics	Collection	118	Rate Structure Review for Commercial Organics Collection	2011	10	20%	50%	10.0%
All Comm. Waste	Collection	124	Commercial Weight-Based Garbage Rates	2020	5	4%	50%	2.0%

Material	Type	ID #	Strategy	Imp. Date	Ramp	Part.	Eff	Max. Marg. Rec. Rate
Other	ZW	152	(Other) Disposal Bans	2012	5	50%	100%	50.0%
CDL	ZW	173	C&D Recyclables Disposal Ban	2015	5	50%	100%	50.0%
CDL	ZW	204	Building Permit C&D Reuse And Recycling Fee Deposit	2008	5	100%	10%	10.0%
CDL	Facilities	209	Incentivize Development of Private Mixed C&D Debris Recycling Facility	2010	5	50%	100%	50.0%
Small Appliances & Electronics	Facilities	217	Self-Haul Computer Parts	2008	3	5%	100%	5.0%
Other	Collection	240	Performance-Based Contracting For Solid Waste Service Contracts	2016	3	4%	50%	2.0%
Other	ZW	265	Take-Back Program For Carpet	2010	10	50%	80%	40.0%
Other	Collection	270	Tiered Commercial Garbage Rates	2008	5	10%	50%	5.0%
Organics	ZW	285	Commercial Organic Waste Disposal Ban	2020	5	90%	33%	30.0%
Traditionals	ZW	298	Beverage Container Deposit System	2020	5	95%	95%	90.3%
Organics	ZW	307	Tiered Commercial Organics Rates	2011	10	20%	50%	10.0%

Material	Type	ID #	Strategy	Imp. Date	Ramp	Part.	Eff	Max. Marg. Rec. Rate
Traditionals	ZW	349	Disposal Ban For Recyclables In Commercial Waste	2015	5	50%	20%	10.0%
Small Appliances & Electronics	Collection	376	On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	2012	5	10%	100%	20.0%
CDL	Collection	379	Create Larger Differential Between Disposal Tip Fee and Fee to Dump Recycleables	2010	3	50%	20%	10.0%
Other	ZW	160 / 330	Expand Inspection & Enforcement Program / Mandatory Commercial/Institutional Waste Audits (Other)	2012	3	10%	50%	5.0%
Traditionals	ZW	160 / 330	Expand Inspection & Enforcement Program / Mandatory Commercial/Institutional Waste Audits (Traditionals)	2010	5	10%	50%	5.0%
Traditionals	Collection	283 / 378	Rate Structure Review for Garbage Collection / Maximum Commercial Recycling Container Rate	2015	3	2%	50%	1.0%
All	ZW	- -	Institute "Group B" Zero Waste Strategies	2020	5	na	na	0.8%
Self Haul								
Other	ZW	152	(Other) Disposal Bans	2015	5	50%	100%	50.0%
Other	ZW	160	Expand Inspection & Enforcement Program (Other)	2015	3	10%	50%	5.0%

Material	Type	ID #	Strategy	Imp. Date	Ramp	Part.	Eff	Max. Marg. Rec. Rate
Traditionals	ZW	160	Expand Inspection & Enforcement Program (Traditionals)	2010	5	10%	50%	5.0%
White Goods / Bulky Items / Furniture	Collection	170	On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)	2008	3	20%	50%	10.0%
CDL	ZW	173	C&D Recyclables Disposal Ban	2015	5	50%	100%	50.0%
Small Appliances & Electronics	Facilities	217	Self-Haul Computer Parts	2008	3	5%	100%	5.0%
Other	Collection	240	Performance-Based Contracting For Solid Waste Service Contracts	2016	3	4%	50%	2.0%
Traditionals	Collection	283	Rate Structure Review for Garbage Collection	2010	3	2%	50%	1.0%
Traditionals	ZW	298	Beverage Container Deposit System	2020	5	95%	95%	90.3%
Small Appliances & Electronics	Collection	376	On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	2012	5	20%	100%	20.0%
CDL	Collection	379	Create Larger Differential Between Disposal Tip Fee and Fee to Dump Recycleables	2010	3	50%	20%	10.0%
CDL	Facilities	209	Incentivize Development of Private Mixed C&D Debris Recycling Facility	2010	5	80%	95%	75.0%

Material	Type	ID #	Strategy	Imp. Date	Ramp	Part.	Eff	Max. Marg. Rec. Rate
CDL	Collection	221	Residential On-Demand Collection Of Waste (C&D) Building Materials	2008	5	6%	66%	4.0%
Other	ZW	265	Take-Back Program For Carpet	2015	7	25%	80%	20.0%
All Self Haul Waste	Collection	323	Ban Self Haul Disposal at City Owned Transfer Stations	2015	5	90%	100%	90.0%
CDL	ZW	363	Take-Back Program for Used Building Materials at Home Product Centers	2012	7	20%	25%	5.0%
All Self Haul Waste	Collection	367 / 332	Adjust Rate Structure for Self Haul Disposal at City Owned Transfer Stations / Raise Self Haul Tipping Fees and Illegal Dumping Fines	2015	3	20%	50%	10.0%
All	ZW	- -	Institute "Group B" Zero Waste Strategies	2020	5	na	na	1.7%

Appendix C. List of Zero Waste Strategies Included In Each of the Tonnage Scenarios

ID #	Sector	Material	Title
Scenario 1			
108	Commercial	Traditionals	Mandatory Commercial Recycling Services
118	Commercial	Organics	Rate Structure Review for Commercial Organics Collection
123	MF Residential	Organics	Multifamily Residential Organics Program
124	Commercial	All Comm. Waste	Commercial Weight-Based Garbage Rates
160	Residential and Self Haul	Other	Expand Inspection & Enforcement Program (Other)
192	SF Residential	Organics	Pet Waste Composting
204	Commercial	CDL	Building Permit C&D Reuse And Recycling Fee Deposit
209	Commercial and Self-Haul	CDL	Incentivize Development of Private Mixed C&D Debris Recycling Facility
217	All	Small Appliances & Electronics	Self-Haul Computer Parts
240	All	Other	Performance-Based Contracting For Solid Waste Service Contracts

ID #	Sector	Material	Title
253	Residential	Organics	Expand Residential Curbside Organics Collection to Include All-Food
265	Commercial and Self Haul	Other	Take-Back Program For Carpet
270	Commercial	Other	Tiered Commercial Garbage Rates
283	Self Haul	Traditionals	Rate Structure Review for Garbage Collection
298	All	Traditionals	Beverage Container Deposit System
307	Commercial	Organics	Tiered Commercial Organics Rates
312	Residential	Organics	Rate Structure Review for Residential Organics Collection
353	Residential	Traditionals	Compostable Plastic Bags
363	Self-Haul	CDL	Take-Back Program for Used Building Materials at Home Product Centers
379	Commercial and Self Haul	CDL	Create Larger Differential Between Disposal Tip Fee and Fee to Dump Recyclables
160 / 330	Commercial	Other	Expand Inspection & Enforcement Program / Mandatory Commercial/Institutional Waste Audits (Other)

ID #	Sector	Material	Title
273 / 400	Residential	Organics	Residential Diaper Composting / Subsidize Reuseable Diaper Services from Fee on Disposable Diaper Purchases
283 / 378	Commercial	Traditionals	Rate Structure Review for Garbage Collection / Maximum Commercial Recycling Container Rate
283 / 402	Residential	Traditionals	Rate Structure Review for Garbage Collection / Reduce Volume Discounts on Extra Garbage Cans ($/gallon of capacity)
367 / 332	Self-Haul	All Self Haul Waste	Adjust Rate Structure for Self Haul Disposal at City Owned Transfer Stations / Raise Self Haul Tipping Fees and Illegal Dumping Fines
Scenario 2. All of the Above, Plus:			
349	Commercial	Traditionals	Disposal Ban For Recyclables In Commercial Waste
285	Commercial	Organics	Commercial Organic Waste Disposal Ban
182	Residential	Organics	Residential Food Waste Disposal Ban
173	Commercial and Self Haul	CDL	C&D Recyclables Disposal Ban
152	All	Other	(Other) Disposal Bans
Scenario 3. All of the Above, Plus:			

ID #	Sector	Material	Title
376	All	Small Appliances & Electronics	On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards
221	Self-Haul	CDL	Residential On-Demand Collection Of Waste (C&D) Building Materials
170	Residential and Self Haul	White Goods / Bulky Items / Furniture	On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)

Scenario 4. All of the Above, Plus:

ID #	Sector	Material	Title
323	Self-Haul	All Self Haul Waste	Ban Self Haul Disposal at City Owned Transfer Stations

Appendix C
Diversion Model Output - Scenario 4 All Sectors

Tonnage Projections for New 60% plus New Zero Waste Strategies - All Sectors

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Residential SF Sector															
Total Generated	212,249	213,522	214,804	216,092	217,389	218,693	220,005	221,325	222,653	223,989	225,333	226,685	228,045	229,414	230,790
Total Disposed - All Sectors (Net of 60% Program	**70,526**	**68,597**	**66,606**	**67,020**	**67,434**	**67,839**	**68,246**	**68,655**	**69,067**	**69,482**	**69,898**	**70,318**	**70,740**	**71,164**	**71,591**
60% Program Recycle Rate	67%	68%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%
Total Shifted to Contracted Recycling Collection	-	-	144	290	437	587	738	837	1,127	1,417	1,615	1,625	1,620	1,616	1,611
Total Shifted to Organics Collection	557	1,084	1,588	1,983	2,384	2,788	3,197	5,448	7,336	9,247	11,181	13,138	13,215	13,293	13,372
Net Shifted to Private Recycling Facility	29	56	82	82	104	126	149	208	268	306	346	385	1,010	1,636	2,262
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sy	11	20	30	30	30	30	31	46	61	74	85	95	96	96	97
Total Eliminated from Disposal	-	-	-	26	51	76	76	72	68	65	61	58	58	59	59
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**69,929**	**67,436**	**64,763**	**64,609**	**64,428**	**64,231**	**64,056**	**62,044**	**60,207**	**58,372**	**56,609**	**55,017**	**54,740**	**54,464**	**54,190**
Additional Recycling (Net of 60% Program PLUS Zero Waste Program,	*597*	*1,161*	*1,843*	*2,411*	*3,006*	*3,607*	*4,190*	*6,611*	*8,860*	*11,110*	*13,289*	*15,301*	*16,000*	*16,700*	*17,401*
60% Program PLUS Zero Waste Program Recycle Rate	67%	68%	70%	70%	70%	71%	71%	72%	73%	74%	75%	76%	76%	76%	77%
Residential MF Sector															
Total Generated	79,329	80,837	82,373	83,938	85,532	86,388	87,252	88,124	89,005	89,895	90,794	91,702	92,619	93,546	94,481
Total Disposed - All Sectors (Net of 60% Program	**54,524**	**53,800**	**53,029**	**54,050**	**55,092**	**55,643**	**56,199**	**56,761**	**57,329**	**57,902**	**58,481**	**59,066**	**59,656**	**60,253**	**60,855**
60% Program Recycle Rate	31%	33%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%
Total Shifted to Contracted Recycling Collection	-	-	100	203	311	418	528	567	676	786	863	871	876	880	885
Total Shifted to Organics Collection	592	1,167	1,726	2,431	3,154	3,368	3,580	4,660	5,581	6,521	7,478	8,454	8,539	8,624	8,710
Net Shifted to Private Recycling Facility	17	34	51	52	116	180	246	322	400	413	426	439	1,381	2,330	3,287
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sy	9	18	27	28	28	29	29	29	29	30	30	30	31	31	31
Total Eliminated from Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**53,906**	**52,580**	**51,124**	**51,336**	**51,484**	**51,648**	**51,817**	**51,182**	**50,642**	**50,153**	**49,684**	**49,271**	**48,831**	**48,388**	**47,943**
Additional Recycling (Net of 60% Program PLUS Zero Waste Program,	*619*	*1,220*	*1,904*	*2,714*	*3,608*	*3,994*	*4,382*	*5,578*	*6,686*	*7,749*	*8,797*	*9,795*	*10,826*	*11,865*	*12,912*
60% Program PLUS Zero Waste Program Recycle Rate	32%	35%	38%	39%	40%	40%	41%	42%	43%	44%	45%	46%	47%	48%	49%
Commercial Sector															
Total Generated	395,079	400,144	405,274	410,470	415,732	421,053	426,443	431,901	437,429	443,028	448,699	454,443	460,259	466,151	472,117
Total Disposed - All Sectors (Net of 60% Program	**189,365**	**180,508**	**171,075**	**173,291**	**175,537**	**177,784**	**180,059**	**182,364**	**184,698**	**187,062**	**189,457**	**191,882**	**194,338**	**196,825**	**199,345**
60% Program Recycle Rate	52%	55%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%
Total Shifted to Contracted Recycling Collection	-	-	3,396	6,827	10,294	13,793	17,326	18,400	19,732	21,081	22,330	23,367	23,637	23,910	24,186
Total Shifted to Organics Collection	-	-	-	1,225	2,471	3,736	5,020	6,325	7,650	8,994	10,360	11,745	16,544	20,190	23,928
Net Shifted to Private Recycling Facility	403	768	2,961	5,132	7,774	9,959	12,191	13,670	15,180	16,223	17,290	18,381	20,571	22,731	24,861
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sy	53	100	143	144	146	148	150	152	154	156	158	160	162	164	166
Total Eliminated from Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**188,910**	**179,640**	**164,575**	**159,962**	**154,852**	**150,148**	**145,372**	**143,817**	**141,983**	**140,608**	**139,319**	**138,228**	**133,425**	**129,830**	**126,204**
Additional Recycling (Net of 60% Program PLUS Zero Waste Program,	*455*	*868*	*6,500*	*13,329*	*20,685*	*27,636*	*34,687*	*38,547*	*42,716*	*46,454*	*50,138*	*53,654*	*60,913*	*66,995*	*73,140*
60% Program PLUS Zero Waste Program Recycle Rate	52%	55%	59%	61%	63%	64%	66%	67%	68%	68%	69%	70%	71%	72%	73%
Self Haul Sector															
Total Generated	136,220	138,874	141,561	144,216	146,839	149,996	153,220	156,515	159,880	163,317	166,828	170,415	174,079	177,822	181,645
Total Disposed - All Sectors (Net of 60% Program	**111,645**	**113,996**	**116,350**	**118,665**	**120,942**	**123,542**	**126,198**	**128,911**	**131,683**	**134,514**	**137,406**	**140,360**	**143,378**	**146,461**	**149,609**
60% Program Recycle Rate	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Total Shifted to Recycling Collection	-	-	195	397	605	773	947	1,541	2,261	3,006	3,172	3,241	3,297	3,355	3,413
Total Shifted to Organics Collection	-	-	-	-	-	-	-	1,260	2,574	3,944	5,371	6,858	7,006	7,156	7,310
Net Shifted to Private Recycling Facility	-	-	5,066	10,091	15,138	20,661	26,403	31,018	32,777	34,462	35,763	37,095	41,388	43,071	44,653
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sy	147	300	2,148	2,952	3,780	3,861	3,944	3,948	7,697	11,307	14,920	18,451	16,077	16,366	16,718
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer Syst	450	918	1,688	2,483	3,302	3,373	3,445	77,365	72,441	67,697	63,702	59,815	60,910	62,024	63,265
Total Eliminated from Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**111,498**	**113,695**	**108,940**	**105,225**	**101,419**	**98,248**	**94,904**	**91,145**	**86,375**	**81,795**	**78,180**	**74,715**	**75,610**	**76,513**	**77,516**
Sorted for Recycling at SRDS			24,315	23,486	25,152	24,365	23,536	22,604	21,421	20,285	19,389	18,529	18,751	18,975	19,224
Additional Recycling (Net of 60% Program PLUS Zero Waste Program,	*147*	*300*	*7,409*	*13,440*	*19,523*	*25,294*	*31,293*	*37,767*	*45,308*	*52,718*	*59,226*	*65,645*	*67,768*	*69,948*	*72,094*
60% Program PLUS Zero Waste Program Recycle Rate	18%	18%	40%	43%	48%	51%	53%	56%	59%	62%	65%	67%	67%	68%	68%
All Sectors															
Total Generated	822,877	833,378	844,011	854,716	865,492	876,130	886,920	897,865	908,968	920,230	931,655	943,245	955,003	966,932	979,034
Total Disposed - All Sectors (Net of 60% Program	**426,060**	**416,901**	**407,059**	**413,027**	**419,004**	**424,807**	**430,702**	**436,691**	**442,777**	**448,960**	**455,242**	**461,626**	**468,112**	**474,703**	**481,401**
60% Program Recycle Rate	48%	50%	52%	52%	52%	52%	51%	51%	51%	51%	51%	51%	51%	51%	51%
Total Shifted to Recycling Collection	-	-	3,834	7,717	11,647	15,571	19,539	21,347	23,796	26,290	27,981	29,104	29,430	29,760	30,094
Total Shifted to Organics Collection	1,149	2,252	3,314	5,640	8,008	9,891	11,797	17,692	23,141	28,706	34,390	40,196	45,303	49,264	53,319
Net Shifted to Private Recycling Facility	449	858	8,161	15,358	23,132	30,926	38,988	45,218	48,624	51,404	53,824	56,300	64,350	69,768	75,063
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sy	219	439	2,348	3,154	3,985	4,068	4,153	4,175	7,941	11,567	15,193	18,736	16,365	16,657	17,012
Total Eliminated from Disposal	-	-	-	26	51	76	76	72	68	65	61	58	58	59	59
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**424,242**	**413,352**	**389,403**	**381,133**	**372,182**	**364,275**	**356,149**	**348,188**	**339,207**	**330,929**	**323,792**	**317,231**	**312,605**	**309,195**	**305,853**
Additional Recycling (Net of 60% Program PLUS Zero Waste Program,	*1,818*	*3,549*	*17,657*	*31,894*	*46,822*	*60,532*	*74,553*	*88,503*	*103,570*	*118,031*	*131,450*	*144,394*	*155,507*	*165,508*	*175,548*
Additional Recycling From Sort Line	-	-	*24,315*	*23,486*	*25,152*	*24,365*	*23,536*	*22,604*	*21,421*	*20,285*	*19,389*	*18,529*	*18,751*	*18,975*	*19,224*
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program and	**424,242**	**413,352**	**365,087**	**357,647**	**347,030**	**339,909**	**332,613**	**325,584**	**317,786**	**310,643**	**304,404**	**298,702**	**293,854**	**290,220**	**286,629**
60% Program PLUS Zero Waste and Sort Line Program Recycle Rate	48%	50%	57%	58%	60%	61%	62%	64%	65%	66%	67%	68%	69%	70%	71%
Recycled 60% (Revised)	396,817												486,891		
Recycled 60% (Revised) plus sort	396,817	416,477	412,637	418,202	421,336	426,958	432,682	438,570	444,770	450,985	457,025	463,090	468,140	473,254	478,409
Recycled 60% PLUS ZW	**398,635**												**642,398**		
Recycled 60% PLUS ZW PLUS Sort	398,635												661,149		

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Residential SF Sector																
Total Generated	232,175	233,568	234,969	236,379	237,797	239,224	240,660	242,103	243,556	245,017	246,488	247,966	249,454	250,951	252,457	253,971
Total Disposed - All Sectors (Net of 60% Program	**72,021**	**72,453**	**72,888**	**73,325**	**73,765**	**74,207**	**74,653**	**75,101**	**75,551**	**76,004**	**76,460**	**76,919**	**77,381**	**77,845**	**78,312**	**78,782**
60% Program Recycle Rate	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%
Total Shifted to Contracted Recycling Collection	1,606	1,601	1,611	1,621	1,630	1,640	1,650	1,660	1,670	1,680	1,690	1,700	1,710	1,721	1,731	1,741
Total Shifted to Organics Collection	13,450	13,530	13,611	13,693	13,775	13,857	13,940	14,024	14,108	14,193	14,278	14,364	14,450	14,537	14,624	14,712
Net Shifted to Private Recycling Facility	2,890	3,518	3,539	3,560	3,581	3,603	3,624	3,646	3,668	3,690	3,712	3,734	3,757	3,779	3,802	3,825
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sy	98	98	99	99	100	101	101	102	102	103	104	104	105	106	106	107
Total Eliminated from Disposal	59	60	60	60	61	61	62	62	62	63	63	63	64	64	65	65
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**53,917**	**53,646**	**53,968**	**54,292**	**54,618**	**54,945**	**55,275**	**55,607**	**55,940**	**56,276**	**56,614**	**56,953**	**57,295**	**57,639**	**57,985**	**58,332**
Additional Recycling (Net of 60% Program PLUS Zero Waste Program,	*18,103*	*18,807*	*18,920*	*19,033*	*19,147*	*19,262*	*19,378*	*19,494*	*19,611*	*19,729*	*19,847*	*19,966*	*20,086*	*20,206*	*20,328*	*20,450*
60% Program PLUS Zero Waste Program Recycle Rate	77%	77%	77%	77%	77%	77%	77%	77%	77%	77%	77%	77%	77%	77%	77%	77%
Residential MF Sector																
Total Generated	95,426	96,380	97,344	98,317	99,301	100,294	101,296	102,309	103,333	104,366	105,409	106,464	107,528	108,604	109,690	110,786
Total Disposed - All Sectors (Net of 60% Program	**61,464**	**62,079**	**62,699**	**63,326**	**63,960**	**64,599**	**65,245**	**65,898**	**66,557**	**67,222**	**67,895**	**68,573**	**69,259**	**69,952**	**70,651**	**71,358**
60% Program Recycle Rate	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%
Total Shifted to Contracted Recycling Collection	889	893	902	911	920	930	939	948	958	967	977	987	997	1,007	1,017	1,027
Total Shifted to Organics Collection	8,796	8,884	8,973	9,063	9,153	9,245	9,337	9,431	9,525	9,620	9,716	9,814	9,912	10,011	10,111	10,212
Net Shifted to Private Recycling Facility	4,251	5,222	5,274	5,327	5,380	5,434	5,489	5,543	5,599	5,655	5,711	5,769	5,826	5,885	5,943	6,003
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sy	32	32	32	33	33	33	34	34	34	35	35	35	36	36	36	37
Total Eliminated from Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**47,496**	**47,047**	**47,518**	**47,993**	**48,473**	**48,957**	**49,447**	**49,941**	**50,441**	**50,945**	**51,455**	**51,969**	**52,489**	**53,014**	**53,544**	**54,079**
Additional Recycling (Net of 60% Program PLUS Zero Waste Program,	*13,968*	*15,032*	*15,182*	*15,334*	*15,487*	*15,642*	*15,798*	*15,956*	*16,116*	*16,277*	*16,440*	*16,604*	*16,770*	*16,938*	*17,107*	*17,278*
60% Program PLUS Zero Waste Program Recycle Rate	50%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%	51%
Commercial Sector																
Total Generated	478,161	484,281	490,480	496,758	503,116	509,556	516,079	522,684	529,375	536,151	543,014	549,964	557,004	564,133	571,354	578,668
Total Disposed - All Sectors (Net of 60% Program	**201,896**	**204,481**	**207,098**	**209,749**	**212,434**	**215,153**	**217,907**	**220,696**	**223,521**	**226,382**	**229,280**	**232,214**	**235,187**	**238,197**	**241,246**	**244,334**
60% Program Recycle Rate	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%
Total Shifted to Contracted Recycling Collection	24,465	24,747	25,064	25,385	25,710	26,039	26,372	26,710	27,052	27,398	27,749	28,104	28,464	28,828	29,197	29,571
Total Shifted to Organics Collection	27,758	31,682	32,087	32,498	32,914	33,335	33,762	34,194	34,632	35,075	35,524	35,979	36,439	36,906	37,378	37,857
Net Shifted to Private Recycling Facility	26,957	29,017	29,388	29,765	30,145	30,531	30,922	31,318	31,719	32,125	32,536	32,952	33,374	33,801	34,234	34,672
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sy	168	170	173	175	177	179	182	184	186	189	191	193	196	198	201	204
Total Eliminated from Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**122,549**	**118,864**	**120,386**	**121,926**	**123,487**	**125,068**	**126,669**	**128,290**	**129,932**	**131,595**	**133,280**	**134,986**	**136,713**	**138,463**	**140,236**	**142,031**
Additional Recycling (Net of 60% Program PLUS Zero Waste Program,	*79,348*	*85,617*	*86,712*	*87,822*	*88,947*	*90,085*	*91,238*	*92,406*	*93,589*	*94,787*	*96,000*	*97,229*	*98,473*	*99,734*	*101,010*	*102,303*
60% Program PLUS Zero Waste Program Recycle Rate	74%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
Self Haul Sector																
Total Generated	185,550	189,540	193,615	197,778	202,030	206,374	210,811	215,343	219,973	224,702	229,533	234,468	239,509	244,659	249,919	255,292
Total Disposed - All Sectors (Net of 60% Program	**152,826**	**156,112**	**159,468**	**162,897**	**166,399**	**169,977**	**173,631**	**177,364**	**181,178**	**185,073**	**189,052**	**193,117**	**197,269**	**201,510**	**205,842**	**210,268**
60% Program Recycle Rate	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Total Shifted to Recycling Collection	3,472	3,533	3,609	3,686	3,765	3,846	3,929	4,014	4,100	4,188	4,278	4,370	4,464	4,560	4,658	4,758
Total Shifted to Organics Collection	7,467	7,628	7,792	7,959	8,131	8,305	8,484	8,666	8,853	9,043	9,237	9,436	9,639	9,846	10,058	10,274
Net Shifted to Private Recycling Facility	46,279	47,950	48,981	50,034	51,110	52,209	53,331	54,478	55,649	56,846	58,068	59,316	60,591	61,894	63,225	64,584
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sy	17,077	17,445	17,820	18,203	18,594	18,994	19,402	19,819	20,245	20,681	21,125	21,580	22,044	22,517	23,002	23,496
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer Syst	64,531	65,822	67,238	68,683	70,160	71,668	73,209	74,783	76,391	78,033	79,711	81,425	83,176	84,964	86,791	88,657
Total Eliminated from Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**78,530**	**79,557**	**81,267**	**83,014**	**84,799**	**86,622**	**88,485**	**90,387**	**92,330**	**94,316**	**96,343**	**98,415**	**100,531**	**102,692**	**104,900**	**107,155**
Sorted for Recycling at SRDS	19,475	19,730	20,154	20,588	21,030	21,482	21,944	22,416	22,898	23,390	23,893	24,407	24,932	25,468	26,015	26,575
Additional Recycling (Net of 60% Program PLUS Zero Waste Program,	*74,296*	*76,555*	*78,201*	*79,882*	*81,600*	*83,354*	*85,146*	*86,977*	*88,847*	*90,757*	*92,709*	*94,702*	*96,738*	*98,818*	*100,942*	*103,113*
60% Program PLUS Zero Waste Program Recycle Rate	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%
All Sectors																
Total Generated	991,312	1,003,769	1,016,408	1,029,232	1,042,244	1,055,448	1,068,845	1,082,440	1,096,236	1,110,236	1,124,444	1,138,862	1,153,496	1,168,347	1,183,419	1,198,718
Total Disposed - All Sectors (Net of 60% Program	**488,207**	**495,124**	**502,153**	**509,297**	**516,557**	**523,936**	**531,436**	**539,059**	**546,806**	**554,682**	**562,687**	**570,824**	**579,095**	**587,504**	**596,052**	**604,742**
60% Program Recycle Rate	51%	51%	51%	51%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Total Shifted to Recycling Collection	30,433	30,775	31,186	31,603	32,026	32,455	32,890	33,332	33,779	34,233	34,694	35,161	35,635	36,115	36,603	37,097
Total Shifted to Organics Collection	57,472	61,724	62,463	63,213	63,973	64,743	65,524	66,315	67,118	67,931	68,756	69,592	70,440	71,299	72,171	73,054
Net Shifted to Private Recycling Facility	80,376	85,707	87,183	88,686	90,217	91,777	93,366	94,985	96,635	98,315	100,027	101,772	103,549	105,360	107,204	109,084
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sy	17,375	17,745	18,123	18,509	18,904	19,307	19,718	20,139	20,568	21,007	21,455	21,913	22,380	22,857	23,345	23,843
Total Eliminated from Disposal	59	60	60	60	61	61	62	62	62	63	63	63	64	64	65	65
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**302,492**	**299,114**	**303,138**	**307,225**	**311,376**	**315,593**	**319,875**	**324,225**	**328,644**	**333,132**	**337,691**	**342,323**	**347,028**	**351,808**	**356,664**	**361,598**
Additional Recycling (Net of 60% Program PLUS Zero Waste Program,	*185,715*	*196,010*	*199,015*	*202,072*	*205,181*	*208,343*	*211,561*	*214,833*	*218,163*	*221,550*	*224,995*	*228,501*	*232,067*	*235,696*	*239,388*	*243,144*
Additional Recycling From Sort Line	*19,475*	*19,730*	*20,154*	*20,588*	*21,030*	*21,482*	*21,944*	*22,416*	*22,898*	*23,390*	*23,893*	*24,407*	*24,932*	*25,468*	*26,015*	*26,575*
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program and	**283,017**	**279,384**	**282,984**	**286,638**	**290,346**	**294,110**	**297,931**	**301,809**	**305,746**	**309,742**	**313,798**	**317,916**	**322,096**	**326,340**	**330,649**	**335,023**
60% Program PLUS Zero Waste and Sort Line Program Recycle Rate	71%	72%	72%	72%	72%	72%	72%	72%	72%	72%	72%	72%	72%	72%	72%	72%
Recycled 60% (Revised)			514,255													593,976
Recycled 60% (Revised) plus sort	483,629	488,915	494,100	499,347	504,657	510,029	515,465	520,966	526,532	532,164	537,864	543,632	549,469	555,375	561,352	567,401
Recycled 60% PLUS ZW			**713,270**													**837,120**
Recycled 60% PLUS ZW PLUS Sort			733,424													863,694
																72%

Tonnage Projections for New 60% plus New Zero Waste Strategies - Residential SF

	Residential SF Sector	Updated	2004	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
	Total Residential SF Generated			212,249	213,522	214,804	216,092	217,389	218,693	220,005	221,325	222,653	223,989	225,333	226,685	228,045	229,414	230,790	232,175	233,568	234,969	236,379	237,797	239,224	240,660	242,103	243,556	245,017	246,488	247,966	249,454	250,951	252,457	253,971
	Total Residential SF Recycled (Revised)	Growth Rate:	0.60%	141,723	144,925	148,197	149,072	149,955	150,855	151,760	152,670	153,586	154,508	155,435	156,367	157,306	158,249	159,199	160,154	161,115	162,082	163,054	164,033	165,017	166,007	167,003	168,005	169,013	170,027	171,047	172,073	173,106	174,145	175,189
	Total Residential SF Disposed	Updated	2004																															
C	Wood Waste	2.6%	1.9%	1,807	1,758	1,706	1,717	1,728	1,738	1,748	1,759	1,770	1,780	1,791	1,802	1,812	1,823	1,834	1,845	1,856	1,867	1,879	1,890	1,901	1,913	1,924	1,936	1,947	1,959	1,971	1,983	1,994	2,006	2,018
C	Construction Debris	2.1%	1.6%	1,481	1,440	1,398	1,407	1,416	1,424	1,433	1,441	1,450	1,459	1,468	1,476	1,485	1,494	1,503	1,512	1,521	1,530	1,540	1,549	1,558	1,567	1,577	1,586	1,596	1,605	1,615	1,625	1,634	1,644	1,654
	All C&D	*5%*	*3%*	*3,288*	*3,198*	*3,105*	*3,124*	*3,144*	*3,162*	*3,181*	*3,200*	*3,220*	*3,239*	*3,258*	*3,278*	*3,298*	*3,317*	*3,337*	*3,357*	*3,378*	*3,398*	*3,418*	*3,439*	*3,459*	*3,480*	*3,501*	*3,522*	*3,543*	*3,564*	*3,586*	*3,607*	*3,629*	*3,651*	*3,673*
O	Yard Waste	2.7%	2.2%	1,901	1,849	1,795	1,806	1,818	1,828	1,839	1,850	1,862	1,873	1,884	1,895	1,907	1,918	1,930	1,941	1,953	1,965	1,976	1,988	2,000	2,012	2,024	2,036	2,049	2,061	2,073	2,086	2,098	2,111	2,123
O	Other Paper	6.7%	6.7%	4,739	4,609	4,475	4,503	4,531	4,558	4,585	4,613	4,641	4,668	4,696	4,725	4,753	4,781	4,810	4,839	4,868	4,897	4,927	4,956	4,986	5,016	5,046	5,076	5,107	5,137	5,168	5,199	5,230	5,262	5,293
O	Food Waste	29.3%	35.8%	20,683	20,117	19,533	19,655	19,776	19,895	20,014	20,134	20,255	20,376	20,499	20,622	20,745	20,870	20,995	21,121	21,248	21,375	21,504	21,633	21,762	21,893	22,024	22,156	22,289	22,423	22,558	22,693	22,829	22,966	23,104
O	Other Organics	20.4%	15.1%	14,352	13,960	13,555	13,639	13,723	13,805	13,888	13,972	14,055	14,140	14,225	14,310	14,396	14,482	14,569	14,656	14,744	14,833	14,922	15,011	15,101	15,192	15,283	15,375	15,467	15,560	15,653	15,747	15,842	15,937	16,032
	All Organics	*59%*	*60%*	*41,674*	*40,535*	*39,358*	*39,603*	*39,847*	*40,086*	*40,327*	*40,569*	*40,812*	*41,057*	*41,304*	*41,551*	*41,801*	*42,052*	*42,304*	*42,558*	*42,813*	*43,070*	*43,328*	*43,588*	*43,850*	*44,113*	*44,378*	*44,644*	*44,912*	*45,181*	*45,452*	*45,725*	*45,999*	*46,275*	*46,553*
T	Newspaper	0.9%	2.2%	668	650	631	635	639	643	647	651	654	658	662	666	670	674	678	682	687	691	695	699	703	707	712	716	720	725	729	733	738	742	747
T	Corrugated-Karft	1.2%	2.5%	820	798	775	780	785	789	794	799	804	808	813	818	823	828	833	838	843	848	853	858	863	869	874	879	884	890	895	900	906	911	917
T	Computer-Office Paper	0.1%	1.4%	63	62	60	60	61	61	61	62	62	62	63	63	64	64	64	65	65	66	66	66	67	67	67	68	68	69	69	70	70	70	71
T	Mixed Scrap Paper	4.9%	5.4%	3,468	3,373	3,275	3,296	3,316	3,336	3,356	3,376	3,396	3,417	3,437	3,458	3,479	3,499	3,520	3,542	3,563	3,584	3,606	3,627	3,649	3,671	3,693	3,715	3,737	3,760	3,782	3,805	3,828	3,851	3,874
T	Other Paper	2.9%	2.9%	2,031	1,975	1,918	1,930	1,942	1,953	1,965	1,977	1,989	2,001	2,013	2,025	2,037	2,049	2,061	2,074	2,086	2,099	2,111	2,124	2,137	2,150	2,163	2,175	2,189	2,202	2,215	2,228	2,242	2,255	2,269
T	Plastics	12.2%	10.2%	8,604	8,369	8,126	8,177	8,227	8,277	8,326	8,376	8,426	8,477	8,528	8,579	8,631	8,682	8,734	8,787	8,840	8,893	8,946	9,000	9,054	9,108	9,163	9,218	9,273	9,329	9,384	9,441	9,497	9,554	9,612
T	Beverage Glass	2.0%	2.1%	1,404	1,365	1,326	1,334	1,342	1,350	1,358	1,366	1,375	1,383	1,391	1,400	1,408	1,416	1,425	1,433	1,442	1,451	1,459	1,468	1,477	1,486	1,495	1,504	1,513	1,522	1,531	1,540	1,549	1,559	1,568
T	Container Glass	0.8%	0.8%	560	544	529	532	535	538	542	545	548	551	555	558	561	565	568	572	575	578	582	585	589	592	596	600	603	607	610	614	618	622	625
T	Other Glass	0.7%	0.5%	491	478	464	467	470	473	476	478	481	484	487	490	493	496	499	502	505	508	511	514	517	520	523	527	530	533	536	539	542	546	549
T	Food Cans	0.6%	1.0%	439	427	415	417	420	422	425	428	430	433	435	438	440	443	446	448	451	454	457	459	462	465	468	470	473	476	479	482	485	488	491
T	Other Ferrous	0.4%	0.7%	277	269	262	263	265	266	268	270	271	273	274	276	278	279	281	283	285	286	288	290	291	293	295	297	298	300	302	304	306	308	309
T	Aluminum Beverage	0.3%	0.3%	184	179	174	175	176	177	178	179	180	181	182	183	184	185	186	188	189	190	191	192	193	194	196	197	198	199	200	202	203	204	205
T	Other Aluminum	0.4%	0.3%	290	282	274	276	277	279	281	282	284	286	287	289	291	293	294	296	298	300	301	303	305	307	309	311	312	314	316	318	320	322	324
T	Other Non-Ferrous	0.1%	0.1%	52	51	49	50	50	50	51	51	51	51	52	52	52	53	53	53	54	54	54	55	55	55	56	56	56	57	57	57	58	58	58
	All Traditionals	*27%*	*30%*	*19,352*	*18,823*	*18,277*	*18,390*	*18,504*	*18,615*	*18,727*	*18,839*	*18,952*	*19,066*	*19,180*	*19,295*	*19,411*	*19,528*	*19,645*	*19,763*	*19,881*	*20,000*	*20,120*	*20,241*	*20,363*	*20,485*	*20,608*	*20,731*	*20,856*	*20,981*	*21,107*	*21,233*	*21,361*	*21,489*	*21,618*
Z	Miscellaneous	8.8%	6.5%	6,211	6,042	5,866	5,903	5,939	5,975	6,011	6,047	6,083	6,120	6,156	6,193	6,230	6,268	6,305	6,343	6,381	6,419	6,458	6,497	6,536	6,575	6,614	6,654	6,694	6,734	6,775	6,815	6,856	6,897	6,939
	Total Residential SF Disposed			**70,526**	**68,597**	**66,606**	**67,020**	**67,434**	**67,839**	**68,246**	**68,655**	**69,067**	**69,482**	**69,898**	**70,318**	**70,740**	**71,164**	**71,591**	**72,021**	**72,453**	**72,888**	**73,325**	**73,765**	**74,207**	**74,653**	**75,101**	**75,551**	**76,004**	**76,460**	**76,919**	**77,381**	**77,845**	**78,312**	**78,782**
	Revised 60% Program Recycle Rate			*67%*	*68%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*	*69%*

TRADITIONALS

		Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
☑	160 Expand Inspection & Enforcement Program	2010	5																																
24%	*All Traditionals*			5%	0.0%	0.0%	1.0%	2.0%	3.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
	Subtotal				-	-	144	290	437	587	738	742	747	751	756	760	765	769	774	779	783	788	793	798	802	807	812	817	822	827	832	837	842	847	852
☑	298 Beverage Container Deposit System	2020	5																																
0.3%	*Aluminum Beverage*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
	Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	32	64	97	130	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177
2.0%	*Beverage Glass*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
	Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	243	490	739	991	1,247	1,254	1,262	1,269	1,277	1,285	1,292	1,300	1,308	1,316	1,324	1,331	1,339	1,347	1,356
0.26%	*Plastics*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
	Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	29	59	89	119	150	151	152	153	153	154	155	156	157	158	159	160	161	162	163
	Subtotal Recycled			90%	-	-	-	-	-	-	-	-	-	-	-	-	274	551	832	1,116	1,404	1,412	1,421	1,429	1,438	1,446	1,455	1,464	1,473	1,481	1,490	1,499	1,508	1,517	1,526
☑	283 / 402 Rate Structure Review for Garbage Collection / Reduce Volume Discounts on Extra Garbage Cans ($/gallon of capacity)	2015	3																																
24%	*All Traditionals*			2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.3%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Subtotal				-	-	-	-	-	-	-	95	191	289	290	292	289	286	283	280	276	278	280	281	283	285	287	288	290	292	293	295	297	299	301
☑	353 Compostable Plastic Bags	2010	10																																
1.4%	*Plastics*			10%	0.0%	0.0%	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				-	-	8	17	25	34	42	51	59	67	76	85	84	84	83	82	81	81	82	82	83	83	84	84	85	85	86	86	87	87	88
☑	240 Performance-Based Contracting For Solid Waste Service Contracts	2016	3																																
24%	*All Traditionals*			4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	2.7%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Subtotal				-	-	-	-	-	-	-	-	189	377	569	572	566	560	554	548	542	545	548	551	555	558	561	565	568	572	575	578	582	585	589
	Total Shifted to Contracted Recycling Collection				**-**	**-**	**144**	**290**	**437**	**587**	**738**	**837**	**1,127**	**1,417**	**1,615**	**1,625**	**1,620**	**1,616**	**1,611**	**1,606**	**1,601**	**1,611**	**1,621**	**1,630**	**1,640**	**1,650**	**1,660**	**1,670**	**1,680**	**1,690**	**1,700**	**1,710**	**1,721**	**1,731**	**1,741**
	Total Shifted to Organics Collection				**-**	**-**	**8**	**17**	**25**	**34**	**42**	**51**	**59**	**67**	**76**	**85**	**84**	**84**	**83**	**82**	**81**	**81**	**82**	**82**	**83**	**83**	**84**	**84**	**85**	**85**	**86**	**86**	**87**	**87**	**88**
	Net Shifted to Private Recycling Facility				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**274**	**551**	**832**	**1,116**	**1,404**	**1,412**	**1,421**	**1,429**	**1,438**	**1,446**	**1,455**	**1,464**	**1,473**	**1,481**	**1,490**	**1,499**	**1,508**	**1,517**	**1,526**
	Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
	Total Eliminated from Disposal																																		

ORGANICS

		Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
☑	312 Rate Structure Review for Residential Organics Collection	2008	3																																
48%	*All Organics*			5%	1.7%	3.3%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
	Subtotal				557	1,084	1,579	1,589	1,599	1,608	1,618	1,628	1,638	1,647	1,657	1,667	1,677	1,687	1,697	1,708	1,718	1,728	1,739	1,749	1,759	1,770	1,781	1,791	1,802	1,813	1,824	1,835	1,846	1,857	1,868
☑	253 Expand Residential Curbside Organics Collection to Include All-Food	2011	5																																
29%	*Food Waste*			10%	0.0%	0.0%	0.0%	2.0%	4.0%	6.0%	8.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				-	-	-	377	759	1,146	1,537	1,933	1,944	1,956	1,968	1,979	1,991	2,003	2,015	2,027	2,040	2,052	2,064	2,076	2,089	2,101	2,114	2,127	2,140	2,152	2,165	2,178	2,191	2,204	2,218
☑	182 Residential Food Waste Disposal Ban	2015	5																																
29%	*Food Waste*			50%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	20.0%	30.0%	40.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
	Subtotal				-	-	-	-	-	-	-	1,837	3,695	5,576	7,480	9,406	9,462	9,519	9,576	9,634	9,692	9,750	9,808	9,867	9,926	9,986	10,046	10,106	10,167	10,228	10,289	10,351	10,413	10,475	10,538
☑	192 Pet Waste Composting	2011	3																																
6%	*Other Organics*			2%	0.0%	0.0%	0.0%	0.7%	1.3%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Subtotal				-	-	-	26	51	76	76	72	68	65	61	58	58	59	59	59	60	60	60	61	61	62	62	62	63	63	63	64	64	65	65
☑	273 / 400 Residential Diaper Composting / Subsidize Reuseable Diaper Services from Fee on Disposable Diaper Purchases	2015	5																																
5%	*Other Organics*			3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	1.0%	1.5%	2.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
	Subtotal				-	-	-	-	-	-	-	16	30	43	54	64	64	65	65	65	66	66	67	67	67	68	68	69	69	69	70	70	71	71	72
	Total Shifted to Contracted Recycling Collection																																		
	Total Shifted to Organics Collection				**557**	**1,084**	**1,579**	**1,966**	**2,358**	**2,754**	**3,155**	**5,397**	**7,277**	**9,180**	**11,105**	**13,053**	**13,131**	**13,210**	**13,289**	**13,369**	**13,449**	**13,530**	**13,611**	**13,692**	**13,775**	**13,857**	**13,940**	**14,024**	**14,108**	**14,193**	**14,278**	**14,364**	**14,450**	**14,537**	**14,624**
	Total Shifted to Private Recycling Facility																																		
	Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer S				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**16**	**30**	**43**	**54**	**64**	**64**	**65**	**65**	**65**	**66**	**66**	**67**	**67**	**67**	**68**	**68**	**69**	**69**	**69**	**70**	**70**	**71**	**71**	**72**
	Total Eliminated from Disposal				**-**	**-**	**-**	**26**	**51**	**76**	**76**	**72**	**68**	**65**	**61**	**58**	**58**	**59**	**59**	**59**	**60**	**60**	**60**	**61**	**61**	**62**	**62**	**62**	**63**	**63**	**63**	**64**	**64**	**65**	**65**

OTHER

		Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
☑	152 (Other) Disposal Bans	2015	5																																
0.23%	*Miscellaneous*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
	Subtotal				-	-	-	-	-	-	-	39	78	117	157	198	199	200	201	203	204	205	206	208	209	210	211	213	214	215	216	218	219	220	222
	Subtotal Recycled			90%	-	-	-	-	-	-	-	35	70	106	142	178	179	180	181	182	183	185	186	187	188	189	190	191	192	194	195	196	197	198	199
☑	160 Expand Inspection & Enforcement Program	2015	5																																
0.23%	*Miscellaneous*			5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	2.0%	3.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
	Subtotal				-	-	-	-	-	-	-	2	4	6	9	11	11	11	11	11	11	11	11	11	11	11	11	11	11	12	12	12	12	12	12
	Subtotal Recycled			90%	-	-	-	-	-	-	-	2	4	6	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	11	11	11	11
	Total Shifted to Contracted Recycling Collection																																		
	Total Shifted to Organics Collection																																		
	Net Shifted to Private Recycling Facility				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**37**	**74**	**111**	**149**	**188**	**189**	**190**	**191**	**192**	**193**	**194**	**196**	**197**	**198**	**199**	**200**	**202**	**203**	**204**	**205**	**206**	**208**	**209**	**210**
	Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
	Total Eliminated from Disposal																																		

SMALL APPLIANCES AND ELECTRONICS

		Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
☑	217 Self-Haul Computer Parts	2008	3																																
0.3%	*Miscellaneous*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				11	20	30	30	30	30	31	31	31	31	31	31	32	32	32	32	32	33	33	33	33	33	34	34	34	34	34	35	35	35	35
☑	376 On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	2012	5																																
0.7%	*Miscellaneous*			20%	0.0%	0.0%	0.0%	0.0%	4.0%	8.0%	12.0%	16.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
	Subtotal				-	-	-	-	24	48	72	96	121	122	123	123	124	125	126	126	127	128	129	129	130	131	132	133	133	134	135	136	137	137	138
	Subtotal Recycled			90%	-	-	-	-	21	43	65	87	109	110	110	111	112	112	113	114	114	115	116	117	117	118	119	119	120	121	121	122	123	124	124
	Total Shifted to Contracted Recycling Collection																																		
	Total Shifted to Organics Collection																																		
	Total Shifted to Private Recycling Facility				**-**	**-**	**-**	**-**	**21**	**43**	**65**	**87**	**109**	**110**	**110**	**111**	**112**	**112**	**113**	**114**	**114**	**115**	**116**	**117**	**117**	**118**	**119**	**119**	**120**	**121**	**121**	**122**	**123**	**124**	**124**
	Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer S				**11**	**20**	**30**	**30**	**30**	**30**	**31**	**31**	**31**	**31**	**31**	**31**	**32**	**32**	**32**	**32**	**32**	**33**	**33**	**33**	**33**	**33**	**34**	**34**	**34**	**34**	**34**	**35**	**35**	**35**	**35**
	Total Eliminated from Disposal																																		

WHITE GOODS / BULKY ITEMS / FURNITURE

		Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
☑	170 On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)	2008	3																																
1.0%	*Miscellaneous*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				32	62	90	90	91	91	92	92	93	93	94	95	95	96	96	97	97	98	99	99	100	100	101	102	102	103	103	104	105	105	106
	Subtotal Recycled			60%	19	37	54	54	54	55	55	55	56	56	56	57	57	57	58	58	58	59	59	60	60	60	61	61	61	62	62	62	63	63	64
0.4%	*Other Ferrous*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				9	18	26	26	26	27	27	27	27	27	27	28	28	28	28	28	28	29	29	29	29	29	29	30	30	30	30	30	31	31	31
	Subtotal Recycled			90%	8	16	24	24	24	24	24	24	24	25	25	25	25	25	25	25	26	26	26	26	26	26	27	27	27	27	27	27	28	28	28
0.1%	*Other Non Ferrous*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				2	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6
	Subtotal Recycled			80%	1	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5
0.01%	*Other Aluminum*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Subtotal Recycled			80%	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Total Shifted to Contracted Recycling Collection																																		
	Total Shifted to Organics Collection																																		
	Total Shifted to Private Recycling Facility				**29**	**56**	**82**	**82**	**83**	**83**	**84**	**84**	**85**	**85**	**86**	**86**	**87**	**87**	**88**	**89**	**89**	**90**	**90**	**91**	**91**	**92**	**92**	**93**	**93**	**94**	**95**	**95**	**96**	**96**	**97**
	Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
	Total Eliminated from Disposal																																		

Tonnage Projections for New 60% plus New Zero Waste Strategies - Residential SF

Residential SF Sector	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Residential SF Generated				**212,249**	**213,522**	**214,804**	**216,092**	**217,389**	**218,693**	**220,005**	**221,325**	**222,653**	**223,989**
Total Residential SF Recycled (Revised)			Growth Rate: 0.60%	**141,723**	**144,925**	**148,197**	**149,072**	**149,955**	**150,855**	**151,760**	**152,670**	**153,586**	**154,508**
SELECT ZERO WASTE AND PRODUCT STEWARDSHIP													
☑ -- Institute "Group B" Zero Waste Strategies	2020	5											
0.3% *Misc. Hazardous*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-
23.8% *Misc. Traditionals*			7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-
59.8% *All Organics*			2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-
0.2% *Misc. Other*			2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-
0.7% *Misc. Small Appliances and Electronics*			1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-
2.5% *Misc. White Goods/Bulky Items/Furniture*			0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-
4.7% *All Construction and Demolition*			3.75%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-
Total Shifted to Contracted Recycling Collection													
Total Shifted to Organics Collection													
Total Shifted to Private Recycling Facility				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System													
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System													
Total Eliminated from Disposal													
Total Generated				**212,249**	**213,522**	**214,804**	**216,092**	**217,389**	**218,693**	**220,005**	**221,325**	**222,653**	**223,989**
Total Disposed - All Sectors (Net of 60% Program)				**70,526**	**68,597**	**66,606**	**67,020**	**67,434**	**67,839**	**68,246**	**68,655**	**69,067**	**69,482**
60% Program Recycle Rate				67%	68%	69%	69%	69%	69%	69%	69%	69%	69%
Total Shifted to Contracted Recycling Collection				**-**	**-**	**144**	**290**	**437**	**587**	**738**	**837**	**1,127**	**1,417**
Total Shifted to Organics Collection				**557**	**1,084**	**1,588**	**1,983**	**2,384**	**2,788**	**3,197**	**5,448**	**7,336**	**9,247**
Net Shifted to Private Recycling Facility				**29**	**56**	**82**	**82**	**104**	**126**	**149**	**208**	**268**	**306**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer S				**11**	**20**	**30**	**30**	**30**	**30**	**31**	**46**	**61**	**74**
Total Eliminated from Disposal				**-**	**-**	**-**	**26**	**51**	**76**	**76**	**72**	**68**	**65**
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program)				**69,929**	**67,436**	**64,763**	**64,609**	**64,428**	**64,231**	**64,056**	**62,044**	**60,207**	**58,372**
60% Program PLUS Zero Waste Program Recycle Rate				67%	68%	70%	70%	70%	71%	71%	72%	73%	74%

Residential SF Sector	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Total Residential SF Generated	**225,333**	**226,685**	**228,045**	**229,414**	**230,790**	**232,175**	**233,568**	**234,969**	**236,379**	**237,797**
Total Residential SF Recycled (Revised)	**155,435**	**156,367**	**157,306**	**158,249**	**159,199**	**160,154**	**161,115**	**162,082**	**163,054**	**164,033**
SELECT ZERO WASTE AND PRODUCT STEWARDSHIP										
☑ -- Institute "Group B" Zero Waste Strategies										
0.3% *Misc. Hazardous*	0.0%	0.0%	2.0%	4.0%	6.0%	8.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	-	-	6	12	19	25	31	32	32	32
23.8% *Misc. Traditionals*	0.0%	0.0%	1.4%	2.8%	4.2%	5.6%	7.0%	7.0%	7.0%	7.0%
Subtotal	-	-	198	392	582	767	948	953	959	965
59.8% *All Organics*	0.0%	0.0%	0.4%	0.8%	1.2%	1.6%	2.0%	2.0%	2.0%	2.0%
Subtotal	-	-	116	232	351	470	592	595	599	602
0.2% *Misc. Other*	0.0%	0.0%	0.4%	0.8%	1.2%	1.6%	2.0%	2.0%	2.0%	2.0%
Subtotal	-	-	1	1	2	3	4	4	4	4
0.7% *Misc. Small Appliances and Electronics*	0.0%	0.0%	0.2%	0.4%	0.6%	0.8%	1.0%	1.0%	1.0%	1.0%
Subtotal	-	-	1	2	4	5	6	6	6	6
2.5% *Misc. White Goods/Bulky Items/Furniture*	0.0%	0.0%	0.1%	0.2%	0.2%	0.3%	0.4%	0.4%	0.4%	0.4%
Subtotal	-	-	2	4	6	8	10	10	10	10
4.7% *All Construction and Demolition*	0.0%	0.0%	0.8%	1.5%	2.3%	3.0%	3.8%	3.8%	3.8%	3.8%
Subtotal	-	-	25	50	75	101	127	127	128	129
Total Shifted to Contracted Recycling Collection										
Total Shifted to Organics Collection										
Total Shifted to Private Recycling Facility	**-**	**-**	**348**	**694**	**1,038**	**1,379**	**1,717**	**1,727**	**1,738**	**1,748**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System										
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System										
Total Eliminated from Disposal										
Total Generated	**225,333**	**226,685**	**228,045**	**229,414**	**230,790**	**232,175**	**233,568**	**234,969**	**236,379**	**237,797**
Total Disposed - All Sectors (Net of 60% Program)	**69,898**	**70,318**	**70,740**	**71,164**	**71,591**	**72,021**	**72,453**	**72,888**	**73,325**	**73,765**
60% Program Recycle Rate	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%
Total Shifted to Contracted Recycling Collection	**1,615**	**1,625**	**1,620**	**1,616**	**1,611**	**1,606**	**1,601**	**1,611**	**1,621**	**1,630**
Total Shifted to Organics Collection	**11,181**	**13,138**	**13,215**	**13,293**	**13,372**	**13,450**	**13,530**	**13,611**	**13,693**	**13,775**
Net Shifted to Private Recycling Facility	**346**	**385**	**1,010**	**1,636**	**2,262**	**2,890**	**3,518**	**3,539**	**3,560**	**3,581**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer S	**85**	**95**	**96**	**96**	**97**	**98**	**98**	**99**	**99**	**100**
Total Eliminated from Disposal	**61**	**58**	**58**	**59**	**59**	**59**	**60**	**60**	**60**	**61**
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program)	**56,609**	**55,017**	**54,740**	**54,464**	**54,190**	**53,917**	**53,646**	**53,968**	**54,292**	**54,618**
60% Program PLUS Zero Waste Program Recycle Rate	75%	76%	76%	76%	77%	77%	77%	77%	77%	77%

Residential SF Sector	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Total Residential SF Generated	**239,224**	**240,660**	**242,103**	**243,556**	**245,017**	**246,488**	**247,966**	**249,454**	**250,951**	**252,457**	**253,971**
Total Residential SF Recycled (Revised)	**165,017**	**166,007**	**167,003**	**168,005**	**169,013**	**170,027**	**171,047**	**172,073**	**173,106**	**174,145**	**175,189**
SELECT ZERO WASTE AND PRODUCT STEWARDSHIP											
☑ -- Institute "Group B" Zero Waste Strategies											
0.3% *Misc. Hazardous*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	32	32	32	33	33	33	33	33	34	34	34
23.8% *Misc. Traditionals*	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
Subtotal	971	977	982	988	994	1,000	1,006	1,012	1,018	1,024	1,031
59.8% *All Organics*	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Subtotal	606	609	613	617	620	624	628	632	636	639	643
0.2% *Misc. Other*	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Subtotal	4	4	4	4	4	4	4	4	4	4	4
0.7% *Misc. Small Appliances and Electronics*	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Subtotal	6	6	6	6	7	7	7	7	7	7	7
2.5% *Misc. White Goods/Bulky Items/Furniture*	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
Subtotal	10	10	10	10	10	10	10	11	11	11	11
4.7% *All Construction and Demolition*	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%
Subtotal	130	131	131	132	133	134	134	135	136	137	138
Total Shifted to Contracted Recycling Collection											
Total Shifted to Organics Collection											
Total Shifted to Private Recycling Facility	**1,759**	**1,769**	**1,780**	**1,791**	**1,801**	**1,812**	**1,823**	**1,834**	**1,845**	**1,856**	**1,867**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System											
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System											
Total Eliminated from Disposal											
											2.37%
Total Generated	**239,224**	**240,660**	**242,103**	**243,556**	**245,017**	**246,488**	**247,966**	**249,454**	**250,951**	**252,457**	**253,971**
Total Disposed - All Sectors (Net of 60% Program)	**74,207**	**74,653**	**75,101**	**75,551**	**76,004**	**76,460**	**76,919**	**77,381**	**77,845**	**78,312**	**78,782**
60% Program Recycle Rate	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%
Total Shifted to Contracted Recycling Collection	**1,640**	**1,650**	**1,660**	**1,670**	**1,680**	**1,690**	**1,700**	**1,710**	**1,721**	**1,731**	**1,741**
Total Shifted to Organics Collection	**13,857**	**13,940**	**14,024**	**14,108**	**14,193**	**14,278**	**14,364**	**14,450**	**14,537**	**14,624**	**14,712**
Net Shifted to Private Recycling Facility	**3,603**	**3,624**	**3,646**	**3,668**	**3,690**	**3,712**	**3,734**	**3,757**	**3,779**	**3,802**	**3,825**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer S	**101**	**101**	**102**	**102**	**103**	**104**	**104**	**105**	**106**	**106**	**107**
Total Eliminated from Disposal	**61**	**62**	**62**	**62**	**63**	**63**	**63**	**64**	**64**	**65**	**65**
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program)	**54,945**	**55,275**	**55,607**	**55,940**	**56,276**	**56,614**	**56,953**	**57,295**	**57,639**	**57,985**	**58,332**
60% Program PLUS Zero Waste Program Recycle Rate	77%	77%	77%	77%	77%	77%	77%	77%	77%	77%	77%

Tonnage Projections for New 60% plus New Zero Waste Strategies - Residential MF

	Residential MF Sector			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2030	2030	2030	2030	2030	2030	2030	2030
	Total Residential MF Generated			79,329	80,837	82,373	83,938	85,532	86,388	87,252	88,124	89,005	89,895	90,794	91,702	92,619	93,546	94,481	95,426	96,380	97,344	98,317	99,301	100,294	101,296	102,309	103,333	104,366	105,409	106,464	107,528	108,604	109,690	110,786
	Total Residential MF Recycled (Revised	Growth Rate:	1.00%	24,805	27,036	29,344	29,887	30,441	30,745	31,053	31,363	31,677	31,994	32,314	32,637	32,963	33,293	33,626	33,962	34,301	34,644	34,991	35,341	35,694	36,051	36,412	36,776	37,144	37,515	37,890	38,269	38,652	39,038	39,429
	Total Residential MF Disposed	Updated	2004																															
C	Wood Waste	4.3%	3.5%	2,342	2,311	2,278	2,322	2,367	2,390	2,414	2,438	2,463	2,487	2,512	2,537	2,563	2,588	2,614	2,640	2,667	2,693	2,720	2,748	2,775	2,803	2,831	2,859	2,888	2,917	2,946	2,975	3,005	3,035	3,065
C	Construction Debris	3.0%	2.5%	1,643	1,621	1,598	1,629	1,660	1,677	1,693	1,710	1,728	1,745	1,762	1,780	1,798	1,816	1,834	1,852	1,871	1,889	1,908	1,927	1,947	1,966	1,986	2,006	2,026	2,046	2,066	2,087	2,108	2,129	2,150
	All C&D	7%	6%	3,985	3,932	3,876	3,951	4,027	4,067	4,108	4,149	4,190	4,232	4,274	4,317	4,360	4,404	4,448	4,493	4,537	4,583	4,629	4,675	4,722	4,769	4,817	4,865	4,913	4,963	5,012	5,062	5,113	5,164	5,216
O	Yard Waste	3.8%	3.1%	2,072	2,045	2,016	2,054	2,094	2,115	2,136	2,157	2,179	2,201	2,223	2,245	2,268	2,290	2,313	2,336	2,360	2,383	2,407	2,431	2,455	2,480	2,505	2,530	2,555	2,581	2,606	2,633	2,659	2,685	2,712
O	Food Waste	34.4%	28.1%	18,777	18,528	18,262	18,614	18,973	19,162	19,354	19,547	19,743	19,940	20,140	20,341	20,545	20,750	20,957	21,167	21,379	21,593	21,808	22,027	22,247	22,469	22,694	22,921	23,150	23,382	23,615	23,852	24,090	24,331	24,574
O	Other Paper	6.2%	5.0%	3,341	3,341	3,341	3,341	3,341	3,435	3,469	3,504	3,539	3,574	3,610	3,646	3,682	3,719	3,757	3,794	3,832	3,870	3,909	3,948	3,988	4,027	4,068	4,108	4,150	4,191	4,233	4,275	4,318	4,361	4,405
O	Other Organics	13.2%	10.8%	7,206	7,110	7,008	7,143	7,281	7,354	7,427	7,502	7,577	7,652	7,729	7,806	7,884	7,963	8,043	8,123	8,204	8,286	8,369	8,453	8,537	8,623	8,709	8,796	8,884	8,973	9,063	9,153	9,245	9,337	9,431
	All Organics	58%	47%	31,397	31,024	30,627	31,153	31,689	32,066	32,386	32,710	33,037	33,368	33,701	34,038	34,379	34,723	35,070	35,420	35,775	36,132	36,494	36,859	37,227	37,600	37,976	38,355	38,739	39,126	39,517	39,913	40,312	40,715	41,122
T	Newspaper	1.6%	4.2%	889	877	865	881	898	907	916	926	935	944	954	963	973	983	992	1,002	1,012	1,022	1,033	1,043	1,053	1,064	1,075	1,085	1,096	1,107	1,118	1,129	1,141	1,152	1,164
T	Corrugated-Karft	2.5%	4.2%	1,340	1,322	1,303	1,328	1,353	1,367	1,381	1,394	1,408	1,422	1,437	1,451	1,466	1,480	1,495	1,510	1,525	1,540	1,556	1,571	1,587	1,603	1,619	1,635	1,651	1,668	1,685	1,702	1,719	1,736	1,753
T	Computer-Office Paper	0.3%	2.0%	188	186	183	187	190	192	194	196	198	200	202	204	206	208	210	212	214	216	219	221	223	225	227	230	232	234	237	239	241	244	246
T	Mixed Scrap Paper	2.7%	7.5%	1,468	1,448	1,427	1,455	1,483	1,498	1,513	1,528	1,543	1,558	1,574	1,590	1,606	1,622	1,638	1,654	1,671	1,688	1,704	1,722	1,739	1,756	1,774	1,791	1,809	1,827	1,846	1,864	1,883	1,902	1,921
T	Other Paper	2.6%	2.2%	1,442	1,423	1,403	1,430	1,457	1,472	1,487	1,502	1,517	1,532	1,547	1,563	1,578	1,594	1,610	1,626	1,642	1,659	1,675	1,692	1,709	1,726	1,743	1,761	1,778	1,796	1,814	1,832	1,851	1,869	1,888
T	Plastics	8.7%	8.5%	4,741	4,678	4,611	4,700	4,791	4,839	4,887	4,936	4,985	5,035	5,085	5,136	5,188	5,240	5,292	5,345	5,398	5,452	5,507	5,562	5,617	5,674	5,730	5,788	5,846	5,904	5,963	6,023	6,083	6,144	6,205
T	Beverage Glass	1.1%	3.5%	621	612	604	615	627	633	640	646	653	659	666	672	679	686	693	700	707	714	721	728	735	743	750	758	765	773	781	788	796	804	812
T	Container Glass	0.2%	0.7%	121	120	118	120	123	124	125	126	128	129	130	132	133	134	136	137	138	140	141	143	144	145	147	148	150	151	153	154	156	157	159
T	Other Glass	0.6%	0.5%	301	297	293	298	304	307	310	313	317	320	323	326	329	333	336	339	343	346	350	353	357	360	364	368	371	375	379	382	386	390	394
T	Food Cans	0.4%	1.0%	201	198	195	199	203	205	207	209	211	213	215	218	220	222	224	226	229	231	233	236	238	240	243	245	248	250	253	255	258	260	263
T	Other Ferrous	0.3%	1.1%	181	179	176	180	183	185	187	189	190	192	194	196	198	200	202	204	206	208	210	212	215	217	219	221	223	226	228	230	232	235	237
T	Aluminum Beverage	0.2%	0.5%	103	102	100	102	104	105	106	107	108	109	110	111	113	114	115	116	117	118	120	121	122	123	124	126	127	128	129	131	132	133	135
T	Other Aluminum	0.2%	0.2%	131	129	127	130	132	133	135	136	137	139	140	142	143	144	146	147	149	150	152	153	155	156	158	160	161	163	164	166	168	169	171
T	Other Non-Ferrous	0.1%	0.1%	58	58	57	58	59	60	60	61	61	62	63	63	64	65	65	66	67	67	68	69	69	70	71	71	72	73	74	74	75	76	76
	All Traditionals	22%	36%	11,785	11,629	11,462	11,683	11,908	12,027	12,147	12,269	12,392	12,515	12,641	12,767	12,895	13,024	13,154	13,285	13,418	13,552	13,688	13,825	13,963	14,103	14,244	14,386	14,530	14,675	14,822	14,970	15,120	15,271	15,424
Z	Miscellaneous	13.4%	11.0%	7,332	7,235	7,131	7,269	7,409	7,483	7,558	7,633	7,709	7,787	7,864	7,943	8,023	8,103	8,184	8,266	8,348	8,432	8,516	8,601	8,687	8,774	8,862	8,950	9,040	9,130	9,222	9,314	9,407	9,501	9,596
	Total Residential MF Disposed			54,524	53,800	53,029	54,050	55,092	55,643	56,199	56,761	57,329	57,902	58,481	59,066	59,656	60,253	60,855	61,464	62,079	62,699	63,326	63,960	64,599	65,245	65,898	66,557	67,222	67,895	68,573	69,259	69,952	70,651	71,358
	Revised 60% Program Recycle Rate			31%	33%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%

TRADITIONALS

Program	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2030	2030	2030	2030	2030	2030	2030	2030
☑ 160 Expand Inspection & Enforcement Program	2010	5																																
31% *All Traditionals*			5%	0.0%	0.0%	1.0%	2.0%	3.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Subtotal				-	-	100	203	311	418	528	533	539	544	550	555	561	566	572	578	583	589	595	601	607	613	619	625	632	638	644	651	657	664	671
☑ 298 Beverage Container Deposit System	2020	5																																
0.2% *Aluminum Beverage*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	19	39	59	80	101	102	103	104	105	106	107	108	109	110	111	113	114	115	116
1.1% *Beverage Glass*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	117	236	358	482	608	614	621	627	633	639	646	652	659	665	672	679	685	692	699
0.50% *Plastics*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	31	62	94	127	160	162	163	165	166	168	170	171	173	175	177	178	180	182	184
Subtotal Recycled			90%	-	-	-	-	-	-	-	-	-	-	-	-	150	304	460	620	782	790	798	806	814	822	830	839	847	855	864	873	881	890	899
☑ 283 / 402 Rate Structure Review for Garbage Collection / Reduce Volume Discounts on Extra Garbage Cans ($/gallon of capacity)	2015	3																																
31% *All Traditionals*			1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.7%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Subtotal				-	-	-	-	-	-	-	34	69	104	105	106	106	105	105	105	104	105	106	107	108	109	110	112	113	114	115	116	117	118	120
☑ 353 Compostable Plastic Bags	2010	10																																
1.2% *Plastics*			5%	0.0%	0.0%	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Subtotal				-	-	2	4	6	8	9	11	13	15	17	20	20	19	19	19	19	19	20	20	20	20	20	21	21	21	21	21	22	22	22
☑ 240 Performance-Based Contracting For Solid Waste Service Contracts	2016	3																																
31% *All Traditionals*			2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.3%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Subtotal				-	-	-	-	-	-	-	-	68	137	208	210	209	209	208	207	206	208	210	212	214	216	219	221	223	225	227	230	232	234	237
Total Shifted to Contracted Recycling Collection				-	-	100	203	311	418	528	567	676	786	863	871	876	880	885	889	893	902	911	920	930	939	948	958	967	977	987	997	1,007	1,017	1,027
Total Shifted to Organics Collection				-	-	2	4	6	8	9	11	13	15	17	20	20	19	19	19	19	19	20	20	20	20	20	21	21	21	21	21	22	22	22
Net Shifted to Private Recycling Facility				-	-	-	-	-	-	-	-	-	-	-	-	150	304	460	620	782	790	798	806	814	822	830	839	847	855	864	873	881	890	899
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
Total Eliminated from Disposal																																		

ORGANICS

Program	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2030	2030	2030	2030	2030	2030	2030	2030
☑ 123 Multifamily Residential Organics Program	2008	5																																
38% *All Organics*			10%	2.0%	4.0%	6.0%	8.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				509	1,005	1,489	2,019	2,567	2,597	2,623	2,650	2,676	2,703	2,730	2,757	2,785	2,813	2,841	2,869	2,898	2,927	2,956	2,986	3,016	3,046	3,076	3,107	3,138	3,169	3,201	3,233	3,265	3,298	3,331
☑ 312 Rate Structure Review for Residential Organics Collection	2008	3																																
38% *All Organics*			1%	0.3%	0.7%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Subtotal				83	162	236	236	236	239	241	243	246	248	251	253	256	258	261	264	266	269	272	274	277	280	283	286	288	291	294	297	300	303	306
☑ 253 Expand Residential Curbside Organics Collection to Include All-Food	2011	5																																
34% *Food Waste*			5%	0.0%	0.0%	0.0%	1.0%	2.0%	3.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Subtotal				-	-	-	173	345	524	706	891	900	909	918	927	936	946	955	965	974	984	994	1,004	1,014	1,024	1,034	1,045	1,055	1,066	1,076	1,087	1,098	1,109	1,120
☑ 182 Residential Food Waste Disposal Ban	2015	5																																
34% *Food Waste*			25%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	10.0%	15.0%	20.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Subtotal				-	-	-	-	-	-	-	864	1,746	2,645	3,562	4,497	4,542	4,587	4,633	4,680	4,726	4,774	4,821	4,870	4,918	4,967	5,017	5,067	5,118	5,169	5,221	5,273	5,326	5,379	5,433
☑ 273 / 400 Residential Diaper Composting / Subsidize Reuseable Diaper Services from Fee on Disposable Diaper Purchases	2015	5																																
2% *Other Organics*			3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	1.0%	1.5%	2.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Subtotal				-	-	-	-	-	-	-	7	14	21	28	34	34	34	35	35	35	36	36	36	37	37	38	38	38	39	39	39	40	40	41
Subtotal Recycled			75%	-	-	-	-	-	-	-	5	11	16	21	25	25	26	26	26	27	27	27	27	28	28	28	28	29	29	29	30	30	30	31
Total Shifted to Contracted Recycling Collection																																		
Total Shifted to Organics Collection				592	1,167	1,725	2,427	3,148	3,360	3,570	4,648	5,568	6,505	7,461	8,435	8,519	8,604	8,690	8,777	8,865	8,954	9,043	9,134	9,225	9,317	9,410	9,504	9,599	9,695	9,792	9,890	9,989	10,089	10,190
Net Shifted to Private Recycling Facility				-	-	-	-	-	-	-	6	11	16	21	25	25	26	26	26	27	27	27	27	28	28	28	28	29	29	29	30	30	30	31
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
Total Eliminated from Disposal																																		

OTHER

Program	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2030	2030	2030	2030	2030	2030	2030	2030
☑ 152 (Other) Disposal Bans	2015	5																																
0.04% *Miscellaneous*			80%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.0%	32.0%	48.0%	64.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Subtotal				-	-	-	-	-	-	-	4	9	13	18	23	23	23	23	24	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27
Subtotal Recycled			90%	-	-	-	-	-	-	-	4	8	12	16	20	21	21	21	21	21	22	22	22	22	22	23	23	23	23	24	24	24	24	25
☑ 160 Expand Inspection & Enforcement Program	2015	5																																
0.04% *Miscellaneous*			3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	1.2%	1.8%	2.4%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Subtotal				-	-	-	-	-	-	-	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Subtotal Recycled			90%	-	-	-	-	-	-	-	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Shifted to Contracted Recycling Collection																																		
Total Shifted to Organics Collection																																		
Net Shifted to Private Recycling Facility				-	-	-	-	-	-	-	4	8	12	17	21	21	22	22	22	22	22	23	23	23	23	24	24	24	24	24	25	25	25	25
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
Total Eliminated from Disposal																																		

SMALL APPLIANCES AND ELECTRONICS

Program	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2030	2030	2030	2030	2030	2030	2030	2030
☑ 217 Self-Haul Computer Parts	2008	3																																
1% *Miscellaneous*			5%	1.7%	3.3%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Subtotal				9	18	27	28	28	29	29	29	29	30	30	30	31	31	31	32	32	32	33	33	33	34	34	34	35	35	35	36	36	36	37
☑ 376 On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	2012	5																																
1% *Miscellaneous*			40%	0.0%	0.0%	0.0%	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Subtotal				-	-	-	-	70	141	213	287	362	366	369	373	377	381	384	388	392	396	400	404	408	412	416	420	425	429	433	437	442	446	451
Subtotal Recycled			90%	-	-	-	-	63	127	192	258	326	329	332	336	339	342	346	349	353	356	360	364	367	371	375	378	382	386	390	394	398	402	406
Total Shifted to Contracted Recycling Collection																																		
Total Shifted to Organics Collection																																		
Total Shifted to Private Recycling Facility				-	-	-	-	63	127	192	258	326	329	332	336	339	342	346	349	353	356	360	364	367	371	375	378	382	386	390	394	398	402	406
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer				9	18	27	28	28	29	29	29	29	30	30	30	31	31	31	32	32	32	33	33	33	34	34	34	35	35	35	36	36	36	37
Total Eliminated from Disposal																																		

Tonnage Projections for New 60% plus New Zero Waste Strategies - Residential MF

Residential MF Sector	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Residential MF Generated				**79,329**	**80,837**	**82,373**	**83,938**	**85,532**	**86,388**	**87,252**	**88,124**	**89,005**	**89,895**	**90,794**
Total Residential MF Recycled (Revised		Growth Rate:	1.00%	**24,805**	**27,036**	**29,344**	**29,887**	**30,441**	**30,745**	**31,053**	**31,363**	**31,677**	**31,994**	**32,314**
WHITE GOODS / BULKY ITEMS / FURNITURE	Imp	Ramp	Marg. Recycle Rate											
☑ 170 On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)	2008	3												
0.8% *Miscellaneous*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				17	34	50	51	52	53	53	54	54	55	55
Subtotal Recycled			60%	10	20	30	31	31	32	32	32	33	33	33
0.3% *Other Ferrous*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				6	12	18	18	18	18	19	19	19	19	19
Subtotal Recycled			90%	5	11	16	16	16	17	17	17	17	17	17
0.1% *Other Non Ferrous*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				2	4	6	6	6	6	6	6	6	6	6
Subtotal Recycled			80%	2	3	5	5	5	5	5	5	5	5	5
0.02% *Other Aluminum*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				0	0	1	1	1	1	1	1	1	1	1
Subtotal Recycled			80%	0	0	0	0	0	0	0	0	0	0	0
Total Shifted to Contracted Recycling Collection														
Total Shifted to Organics Collection														
Total Shifted to Private Recycling Facility				**17**	**34**	**51**	**52**	**53**	**53**	**54**	**55**	**55**	**56**	**56**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System														
Total Eliminated from Disposal														
SELECT ZERO WASTE AND PRODUCT STEWARDSHIP	Imp	Ramp	Marg. Recycle Rate											
☑ -- Institute "Group B" Zero Waste Strategies	2020	5												
0.3% *Misc. Hazardous*			30%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-
31.3% *Misc. Traditionals*			20%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-
47.0% *All Organics*			6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-
0.2% *Misc. Other*			6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-
1.3% *Misc. Small Appliances and Electronics*			4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-
4.1% *Misc. White Goods/Bulky Items/Furniture*			1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-
7.3% *All Construction and Demolition*			11%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-
Total Shifted to Contracted Recycling Collection														
Total Shifted to Organics Collection														
Total Shifted to Private Recycling Facility				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System														
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System														
Total Eliminated from Disposal														
Total Generated				**79,329**	**80,837**	**82,373**	**83,938**	**85,532**	**86,388**	**87,252**	**88,124**	**89,005**	**89,895**	**90,794**
Total Disposed - All Sectors (Net of 60% Program				**54,524**	**53,800**	**53,029**	**54,050**	**55,092**	**55,643**	**56,199**	**56,761**	**57,329**	**57,902**	**58,481**
60% Program Recycle Rate				31%	33%	36%	36%	36%	36%	36%	36%	36%	36%	36%
Total Shifted to Contracted Recycling Collection				**-**	**-**	**100**	**203**	**311**	**418**	**528**	**567**	**676**	**786**	**863**
Total Shifted to Organics Collection				**592**	**1,167**	**1,726**	**2,431**	**3,154**	**3,368**	**3,580**	**4,660**	**5,581**	**6,521**	**7,478**
Net Shifted to Private Recycling Facility				**17**	**34**	**51**	**52**	**116**	**180**	**246**	**322**	**400**	**413**	**426**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer				**9**	**18**	**27**	**28**	**28**	**29**	**29**	**29**	**29**	**30**	**30**
Total Eliminated from Disposal				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program				**53,906**	**52,580**	**51,124**	**51,336**	**51,484**	**51,648**	**51,817**	**51,182**	**50,642**	**50,153**	**49,684**
60% Program PLUS Zero Waste Program Recycle Rate				32%	35%	38%	39%	40%	40%	41%	42%	43%	44%	45%

Residential MF Sector	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Total Residential MF Generated	**91,702**	**92,619**	**93,546**	**94,481**	**95,426**	**96,380**	**97,344**	**98,317**	**99,301**	**100,294**	**101,296**
Total Residential MF Recycled (Revised	**32,637**	**32,963**	**33,293**	**33,626**	**33,962**	**34,301**	**34,644**	**34,991**	**35,341**	**35,694**	**36,051**
WHITE GOODS / BULKY ITEMS / FURNITURE											
☑ 170 On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)											
0.8% *Miscellaneous*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	56	56	57	58	58	59	59	60	60	61	62
Subtotal Recycled	34	34	34	35	35	35	36	36	36	37	37
0.3% *Other Ferrous*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	20	20	20	20	20	21	21	21	21	21	22
Subtotal Recycled	18	18	18	18	18	19	19	19	19	19	20
0.1% *Other Non Ferrous*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	6	6	6	7	7	7	7	7	7	7	7
Subtotal Recycled	5	5	5	5	5	5	5	5	5	6	6
0.02% *Other Aluminum*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	1	1	1	1	1	1	1	1	1	1	1
Subtotal Recycled	0	0	0	1	1	1	1	1	1	1	1
Total Shifted to Contracted Recycling Collection											
Total Shifted to Organics Collection											
Total Shifted to Private Recycling Facility	**57**	**57**	**58**	**58**	**59**	**60**	**60**	**61**	**61**	**62**	**63**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System											
Total Eliminated from Disposal											
SELECT ZERO WASTE AND PRODUCT STEWARDSHIP											
☑ -- Institute "Group B" Zero Waste Strategies											
0.3% *Misc. Hazardous*	0.0%	6.0%	12.0%	18.0%	24.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Subtotal	-	13	26	40	54	68	69	69	70	71	71
31.3% *Misc. Traditionals*	0.0%	4.0%	8.0%	12.0%	16.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Subtotal	-	412	820	1,225	1,626	2,024	2,044	2,064	2,085	2,106	2,127
47.0% *All Organics*	0.0%	1.2%	2.4%	3.6%	4.8%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Subtotal	-	253	511	774	1,042	1,316	1,329	1,343	1,356	1,370	1,383
0.2% *Misc. Other*	0.0%	1.2%	2.4%	3.6%	4.8%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Subtotal	-	2	3	5	7	8	8	9	9	9	9
1.3% *Misc. Small Appliances and Electronics*	0.0%	0.7%	1.4%	2.1%	2.8%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Subtotal	-	6	13	19	26	33	33	33	34	34	34
4.1% *Misc. White Goods/Bulky Items/Furniture*	0.0%	0.2%	0.4%	0.6%	0.8%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Subtotal	-	6	12	18	25	31	31	32	32	32	33
7.3% *All Construction and Demolition*	0.0%	2.2%	4.4%	6.6%	8.8%	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%
Subtotal	-	96	194	294	395	499	504	509	514	519	525
Total Shifted to Contracted Recycling Collection											
Total Shifted to Organics Collection											
Total Shifted to Private Recycling Facility	**-**	**787**	**1,579**	**2,375**	**3,175**	**3,979**	**4,019**	**4,059**	**4,099**	**4,140**	**4,182**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System											
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System											
Total Eliminated from Disposal											
Total Generated	**91,702**	**92,619**	**93,546**	**94,481**	**95,426**	**96,380**	**97,344**	**98,317**	**99,301**	**100,294**	**101,296**
Total Disposed - All Sectors (Net of 60% Program	**59,066**	**59,656**	**60,253**	**60,855**	**61,464**	**62,079**	**62,699**	**63,326**	**63,960**	**64,599**	**65,245**
60% Program Recycle Rate	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%
Total Shifted to Contracted Recycling Collection	**871**	**876**	**880**	**885**	**889**	**893**	**902**	**911**	**920**	**930**	**939**
Total Shifted to Organics Collection	**8,454**	**8,539**	**8,624**	**8,710**	**8,796**	**8,884**	**8,973**	**9,063**	**9,153**	**9,245**	**9,337**
Net Shifted to Private Recycling Facility	**439**	**1,381**	**2,330**	**3,287**	**4,251**	**5,222**	**5,274**	**5,327**	**5,380**	**5,434**	**5,489**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer	**30**	**31**	**31**	**31**	**32**	**32**	**32**	**33**	**33**	**33**	**34**
Total Eliminated from Disposal	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**49,271**	**48,831**	**48,388**	**47,943**	**47,496**	**47,047**	**47,518**	**47,993**	**48,473**	**48,957**	**49,447**
60% Program PLUS Zero Waste Program Recycle Rate	46%	47%	48%	49%	50%	51%	51%	51%	51%	51%	51%

Residential MF Sector	2030	2030	2030	2030	2030	2030	2030	2030	2030
Total Residential MF Generated	**102,309**	**103,333**	**104,366**	**105,409**	**106,464**	**107,528**	**108,604**	**109,690**	**110,786**
Total Residential MF Recycled (Revised	**36,412**	**36,776**	**37,144**	**37,515**	**37,890**	**38,269**	**38,652**	**39,038**	**39,429**
WHITE GOODS / BULKY ITEMS / FURNITURE									
☑ 170 On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)									
0.8% *Miscellaneous*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	62	63	64	64	65	66	66	67	67
Subtotal Recycled	37	38	38	39	39	39	40	40	40
0.3% *Other Ferrous*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	22	22	22	23	23	23	23	23	24
Subtotal Recycled	20	20	20	20	20	21	21	21	21
0.1% *Other Non Ferrous*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	7	7	7	7	7	7	7	8	8
Subtotal Recycled	6	6	6	6	6	6	6	6	6
0.02% *Other Aluminum*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	1	1	1	1	1	1	1	1	1
Subtotal Recycled	1	1	1	1	1	1	1	1	1
Total Shifted to Contracted Recycling Collection									
Total Shifted to Organics Collection									
Total Shifted to Private Recycling Facility	**63**	**64**	**65**	**65**	**66**	**67**	**67**	**68**	**69**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System									
Total Eliminated from Disposal									
SELECT ZERO WASTE AND PRODUCT STEWARDSHIP									
☑ -- Institute "Group B" Zero Waste Strategies									
0.3% *Misc. Hazardous*	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Subtotal	72	73	74	74	75	76	76	77	78
31.3% *Misc. Traditionals*	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Subtotal	2,148	2,170	2,191	2,213	2,235	2,258	2,280	2,303	2,326
47.0% *All Organics*	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Subtotal	1,397	1,411	1,425	1,439	1,454	1,468	1,483	1,498	1,513
0.2% *Misc. Other*	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Subtotal	9	9	9	9	9	9	9	10	10
1.3% *Misc. Small Appliances and Electronics*	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Subtotal	35	35	35	36	36	36	37	37	38
4.1% *Misc. White Goods/Bulky Items/Furniture*	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Subtotal	33	33	34	34	34	35	35	35	36
7.3% *All Construction and Demolition*	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%
Subtotal	530	535	540	546	551	557	562	568	574
Total Shifted to Contracted Recycling Collection									
Total Shifted to Organics Collection									
Total Shifted to Private Recycling Facility	**4,224**	**4,266**	**4,309**	**4,352**	**4,395**	**4,439**	**4,483**	**4,528**	**4,574**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System									
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System									
Total Eliminated from Disposal									
									6.41%
Total Generated	**102,309**	**103,333**	**104,366**	**105,409**	**106,464**	**107,528**	**108,604**	**109,690**	**110,786**
Total Disposed - All Sectors (Net of 60% Program	**65,898**	**66,557**	**67,222**	**67,895**	**68,573**	**69,259**	**69,952**	**70,651**	**71,358**
60% Program Recycle Rate	36%	36%	36%	36%	36%	36%	36%	36%	36%
Total Shifted to Contracted Recycling Collection	**948**	**958**	**967**	**977**	**987**	**997**	**1,007**	**1,017**	**1,027**
Total Shifted to Organics Collection	**9,431**	**9,525**	**9,620**	**9,716**	**9,814**	**9,912**	**10,011**	**10,111**	**10,212**
Net Shifted to Private Recycling Facility	**5,543**	**5,599**	**5,655**	**5,711**	**5,769**	**5,826**	**5,885**	**5,943**	**6,003**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer	**34**	**34**	**35**	**35**	**35**	**36**	**36**	**36**	**37**
Total Eliminated from Disposal	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**49,941**	**50,441**	**50,945**	**51,455**	**51,969**	**52,489**	**53,014**	**53,544**	**54,079**
60% Program PLUS Zero Waste Program Recycle Rate	51%	51%	51%	51%	51%	51%	51%	51%	51%

Tonnage Projections for New 60% plus New Zero Waste Strategies - Commercial

	Commercial Sector	Updated	2004	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
	Total Commercial Generated			395,079	400,144	405,274	410,470	415,732	421,053	426,443	431,901	437,429	443,028	448,699	454,443	460,259	466,151	472,117	478,161	484,281	490,480	496,758	503,116	509,556	516,079	522,684	529,375	536,151	543,014	549,964	557,004	564,133	571,354	578,668
	Total Commercial Recycled (Revised)	Growth Rate:	1.28%	205,714	219,636	234,199	237,178	240,195	243,269	246,383	249,537	252,731	255,966	259,242	262,561	265,921	269,325	272,773	276,264	279,800	283,382	287,009	290,683	294,404	298,172	301,988	305,854	309,769	313,734	317,750	321,817	325,936	330,108	334,334
	Total Commercial Disposed	Updated	2004																															
C	Wood Waste	10.8%	6.7%	20,543	19,582	18,559	18,799	19,043	19,287	19,533	19,784	20,037	20,293	20,553	20,816	21,083	21,352	21,626	21,902	22,183	22,467	22,754	23,046	23,341	23,639	23,942	24,248	24,559	24,873	25,191	25,514	25,841	26,171	26,506
C	Construction Debris	5.0%	3.1%	9,562	9,115	8,639	8,751	8,864	8,977	9,092	9,209	9,327	9,446	9,567	9,689	9,813	9,939	10,066	10,195	10,326	10,458	10,592	10,727	10,864	11,003	11,144	11,287	11,431	11,578	11,726	11,876	12,028	12,182	12,338
	All C&D	16%	10%	*30,105*	*28,697*	*27,197*	*27,550*	*27,907*	*28,264*	*28,626*	*28,992*	*29,363*	*29,739*	*30,120*	*30,505*	*30,896*	*31,291*	*31,692*	*32,098*	*32,508*	*32,924*	*33,346*	*33,773*	*34,205*	*34,643*	*35,086*	*35,535*	*35,990*	*36,451*	*36,917*	*37,390*	*37,869*	*38,353*	*38,844*
O	Yard Waste	2.5%	2.9%	4,667	4,449	4,216	4,271	4,326	4,382	4,438	4,494	4,552	4,610	4,669	4,729	4,790	4,851	4,913	4,976	5,040	5,104	5,169	5,236	5,303	5,370	5,439	5,509	5,579	5,651	5,723	5,796	5,871	5,946	6,022
O	Food Waste	22.9%	29.9%	43,445	41,413	39,249	39,757	40,273	40,788	41,310	41,839	42,374	42,917	43,466	44,023	44,586	45,157	45,735	46,320	46,913	47,514	48,122	48,738	49,362	49,993	50,633	51,281	51,938	52,603	53,276	53,958	54,648	55,348	56,056
O	Other Paper	7.4%	6.7%	14,101	13,442	12,739	12,904	13,072	13,239	13,408	13,580	13,754	13,930	14,108	14,289	14,472	14,657	14,845	15,035	15,227	15,422	15,619	15,819	16,022	16,227	16,435	16,645	16,858	17,074	17,292	17,514	17,738	17,965	18,195
O	Other Organics	4.5%	2.8%	8,482	8,085	7,663	7,762	7,863	7,963	8,065	8,168	8,273	8,379	8,486	8,595	8,705	8,816	8,929	9,043	9,159	9,276	9,395	9,515	9,637	9,761	9,885	10,012	10,140	10,270	10,401	10,535	10,669	10,806	10,944
	All Organics	37%	42%	*70,696*	*67,389*	*63,867*	*64,695*	*65,533*	*66,372*	*67,222*	*68,082*	*68,953*	*69,836*	*70,730*	*71,635*	*72,552*	*73,481*	*74,421*	*75,374*	*76,339*	*77,316*	*78,306*	*79,308*	*80,323*	*81,351*	*82,392*	*83,447*	*84,515*	*85,597*	*86,693*	*87,802*	*88,926*	*90,064*	*91,217*
T	Newspaper	2.9%	2.2%	5,479	5,222	4,950	5,014	5,079	5,144	5,209	5,276	5,344	5,412	5,481	5,552	5,623	5,695	5,767	5,841	5,916	5,992	6,068	6,146	6,225	6,304	6,385	6,467	6,550	6,634	6,718	6,804	6,892	6,980	7,069
T	Corrugated-Karft	8.1%	7.0%	15,252	14,539	13,779	13,957	14,138	14,319	14,503	14,688	14,876	15,067	15,259	15,455	15,653	15,853	16,056	16,261	16,470	16,680	16,894	17,110	17,329	17,551	17,776	18,003	18,234	18,467	18,703	18,943	19,185	19,431	19,679
T	Computer-Office Paper	2.2%	2.1%	4,171	3,976	3,768	3,817	3,867	3,916	3,966	4,017	4,069	4,121	4,173	4,227	4,281	4,336	4,391	4,447	4,504	4,562	4,620	4,680	4,739	4,800	4,862	4,924	4,987	5,051	5,115	5,181	5,247	5,314	5,382
T	Mixed Scrap Paper	3.7%	5.8%	6,965	6,639	6,292	6,374	6,457	6,539	6,623	6,708	6,793	6,880	6,969	7,058	7,148	7,240	7,332	7,426	7,521	7,617	7,715	7,814	7,914	8,015	8,118	8,221	8,327	8,433	8,541	8,651	8,761	8,873	8,987
T	Other Paper	3.2%	2.9%	6,043	5,761	5,460	5,530	5,602	5,674	5,746	5,820	5,895	5,970	6,046	6,124	6,202	6,282	6,362	6,443	6,526	6,609	6,694	6,780	6,866	6,954	7,043	7,134	7,225	7,317	7,411	7,506	7,602	7,699	7,798
T	Plastics	2.2%	12.5%	4,246	4,047	3,836	3,886	3,936	3,986	4,037	4,089	4,141	4,194	4,248	4,302	4,357	4,413	4,470	4,527	4,585	4,644	4,703	4,763	4,824	4,886	4,949	5,012	5,076	5,141	5,207	5,273	5,341	5,409	5,479
T	Beverage Glass	3.6%	2.2%	6,786	6,469	6,131	6,210	6,291	6,371	6,453	6,535	6,619	6,704	6,790	6,877	6,965	7,054	7,144	7,235	7,328	7,422	7,517	7,613	7,711	7,809	7,909	8,010	8,113	8,217	8,322	8,429	8,536	8,646	8,756
T	Container Glass	0.2%	0.1%	285	272	257	261	264	268	271	274	278	282	285	289	292	296	300	304	308	312	316	320	324	328	332	336	341	345	349	354	358	363	368
T	Other Glass	2.4%	1.5%	4,622	4,406	4,176	4,230	4,285	4,339	4,395	4,451	4,508	4,566	4,624	4,683	4,743	4,804	4,866	4,928	4,991	5,055	5,120	5,185	5,251	5,319	5,387	5,456	5,526	5,596	5,668	5,740	5,814	5,888	5,964
T	Food Cans	1.2%	0.7%	2,261	2,155	2,043	2,069	2,096	2,123	2,150	2,178	2,205	2,234	2,262	2,291	2,320	2,350	2,380	2,411	2,442	2,473	2,504	2,537	2,569	2,602	2,635	2,669	2,703	2,738	2,773	2,808	2,844	2,881	2,917
T	Other Ferrous	1.9%	1.2%	3,540	3,374	3,198	3,239	3,281	3,323	3,366	3,409	3,453	3,497	3,541	3,587	3,633	3,679	3,726	3,774	3,822	3,871	3,921	3,971	4,022	4,073	4,125	4,178	4,232	4,286	4,341	4,396	4,453	4,510	4,567
T	Aluminum Beverage	0.4%	0.3%	834	795	753	763	773	783	793	803	813	824	834	845	856	866	878	889	900	912	923	935	947	959	972	984	997	1,009	1,022	1,035	1,049	1,062	1,076
T	Other Aluminum	0.4%	0.3%	830	791	750	760	770	780	790	800	810	820	831	841	852	863	874	885	897	908	920	931	943	955	968	980	993	1,005	1,018	1,031	1,044	1,058	1,071
T	Other Non-Ferrous	0.0%	0.0%	72	69	65	66	67	68	69	70	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	89	90	91	92	93
	All Traditionals	32%	39%	*61,387*	*58,516*	*55,458*	*56,177*	*56,904*	*57,633*	*58,370*	*59,118*	*59,874*	*60,641*	*61,417*	*62,203*	*62,999*	*63,806*	*64,622*	*65,450*	*66,287*	*67,136*	*67,995*	*68,865*	*69,747*	*70,640*	*71,544*	*72,460*	*73,387*	*74,326*	*75,278*	*76,241*	*77,217*	*78,206*	*79,207*
Z	Miscellaneous	14.4%	9.1%	27,177	25,906	24,552	24,870	25,192	25,515	25,841	26,172	26,507	26,846	27,190	27,538	27,891	28,248	28,609	28,975	29,346	29,722	30,102	30,488	30,878	31,273	31,673	32,079	32,489	32,905	33,326	33,753	34,185	34,623	35,066
	Total Commercial Disposed			189,365	180,508	171,075	173,291	175,537	177,784	180,059	182,364	184,698	187,062	189,457	191,882	194,338	196,825	199,345	201,896	204,481	207,098	209,749	212,434	215,153	217,907	220,696	223,521	226,382	229,280	232,214	235,187	238,197	241,246	244,334
	Revised 60% Program Recycle Rate			*52%*	*55%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*	*58%*

TRADITIONALS	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
☑ 108 Mandatory Commercial Recycling Services	2010	5																																
34% *All Traditionals*			30%	0.0%	0.0%	6.0%	12.0%	18.0%	24.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Subtotal				-	-	2,933	5,941	9,028	12,191	15,434	15,631	15,831	16,034	16,239	16,447	16,658	16,871	17,087	17,305	17,527	17,751	17,979	18,209	18,442	18,678	18,917	19,159	19,404	19,653	19,904	20,159	20,417	20,678	20,943
☑ 349 Disposal Ban For Recyclables In Commercial Waste	2015	5																																
34% *All Traditionals*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	4.0%	6.0%	8.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				-	-	-	-	-	-	-	767	1,553	2,359	3,185	4,033	4,084	4,137	4,190	4,243	4,298	4,353	4,408	4,465	4,522	4,580	4,638	4,698	4,758	4,819	4,880	4,943	5,006	5,070	5,135
☑ 160 / 330 Expand Inspection & Enforcement Program / Mandatory Commercial/Institutional Waste Audits	2010	5																																
34% *All Traditionals*			5%	0.0%	0.0%	1.0%	2.0%	3.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Subtotal				-	-	463	886	1,266	1,602	1,892	1,883	1,872	1,862	1,851	1,839	1,862	1,886	1,910	1,935	1,959	1,984	2,010	2,036	2,062	2,088	2,115	2,142	2,169	2,197	2,225	2,254	2,282	2,312	2,341
☑ 298 Beverage Container Deposit System	2020	5																																
0.4% *Aluminum Beverage*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	99	200	304	410	519	526	533	540	547	554	561	568	575	582	590	597	605	613	621
3.6% *Beverage Glass*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	804	1,628	2,474	3,340	4,229	4,283	4,338	4,393	4,450	4,507	4,564	4,623	4,682	4,742	4,802	4,864	4,926	4,989	5,053
1.11% *Plastics*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	209	423	643	868	1,099	1,113	1,127	1,142	1,156	1,171	1,186	1,201	1,217	1,232	1,248	1,264	1,280	1,297	1,313
Subtotal Recycled			90%	-	-	-	-	-	-	-	-	-	-	-	-	1,000	2,026	3,078	4,157	5,263	5,330	5,398	5,467	5,537	5,608	5,680	5,753	5,826	5,901	5,976	6,053	6,130	6,209	6,288
☑ 283 / 378 Rate Structure Review for Garbage Collection / Maximum Commercial Recycling Container Rate	2015	3																																
34% *All Traditionals*			1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.7%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Subtotal				-	-	-	-	-	-	-	120	239	356	354	352	346	341	335	329	323	327	331	336	340	344	349	353	358	362	367	372	376	381	386
☑ 240 Performance-Based Contracting For Solid Waste Service Contracts	2016	3																																
34% *All Traditionals*			2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.3%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Subtotal				-	-	-	-	-	-	-	-	237	470	701	697	686	675	664	653	640	649	657	665	674	683	691	700	709	718	727	737	746	756	765
Total Shifted to Recycling Collection				-	-	3,396	6,827	10,294	13,793	17,326	18,400	19,732	21,081	22,330	23,367	23,637	23,910	24,186	24,465	24,747	25,064	25,385	25,710	26,039	26,372	26,710	27,052	27,398	27,749	28,104	28,464	28,828	29,197	29,571
Total Shifted to Organics Collection																																		
Net Shifted to Private Recycling Facility				-	-	-	-	-	-	-	-	-	-	-	-	1,000	2,026	3,078	4,157	5,263	5,330	5,398	5,467	5,537	5,608	5,680	5,753	5,826	5,901	5,976	6,053	6,130	6,209	6,288
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
Total Eliminated from Disposal																																		

ORGANICS	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
☑ 118 Rate Structure Review for Commercial Organics Collection	2011	10																																
40% *All Organics*			10%	0.0%	0.0%	0.0%	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				-	-	-	616	1,247	1,895	2,559	3,240	3,937	4,652	5,385	6,135	6,904	6,993	7,082	7,173	7,265	7,358	7,452	7,547	7,644	7,742	7,841	7,941	8,043	8,146	8,250	8,356	8,463	8,571	8,681
☑ 307 Tiered Commercial Organics Rates	2011	10																																
40% *All Organics*			10%	0.0%	0.0%	0.0%	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				-	-	-	610	1,224	1,841	2,461	3,085	3,712	4,342	4,975	5,610	6,247	6,327	6,408	6,490	6,573	6,658	6,743	6,829	6,917	7,005	7,095	7,186	7,277	7,371	7,465	7,561	7,657	7,755	7,855
☑ 285 Commercial Organic Waste Disposal Ban	2020	5																																
40% *All Organics*			30%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.0%	12.0%	18.0%	24.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	3,392	6,870	10,437	14,094	17,844	18,072	18,303	18,538	18,775	19,015	19,259	19,505	19,755	20,008	20,264	20,523	20,786	21,052	21,321
Total Shifted to Recycling Collection																																		
Total Shifted to Organics Collection				-	-	-	1,225	2,471	3,736	5,020	6,325	7,650	8,994	10,360	11,745	16,544	20,190	23,928	27,758	31,682	32,087	32,498	32,914	33,335	33,762	34,194	34,632	35,075	35,524	35,979	36,439	36,906	37,378	37,857
Total Shifted to Private Recycling Facility																																		
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
Total Eliminated from Disposal																																		

OTHER	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
☑ 270 Tiered Commercial Garbage Rates	2008	5																																
1.54% *Miscellaneous*			5%	1.0%	2.0%	3.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Subtotal				46	88	125	168	213	216	219	221	224	227	230	233	236	239	242	245	248	251	255	258	261	264	268	271	275	278	282	285	289	293	297
Subtotal Recycled			90%	41	79	112	151	192	194	197	199	202	204	207	210	212	215	218	221	223	226	229	232	235	238	241	244	247	250	254	257	260	264	267
☑ 265 Take-Back Program For Carpet	2010	10																																
1.45% *Miscellaneous*			40%	0.0%	0.0%	4.0%	8.0%	12.0%	16.0%	20.0%	24.0%	28.0%	32.0%	36.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Subtotal				-	-	156	316	479	647	818	995	1,175	1,361	1,550	1,744	1,767	1,789	1,812	1,836	1,859	1,883	1,907	1,931	1,956	1,981	2,006	2,032	2,058	2,084	2,111	2,138	2,166	2,193	2,221
Subtotal Recycled			60%	-	-	94	189	287	388	491	597	705	816	930	1,047	1,060	1,074	1,087	1,101	1,115	1,130	1,144	1,159	1,174	1,189	1,204	1,219	1,235	1,251	1,267	1,283	1,299	1,316	1,333
☑ 152 (Other) Disposal Bans	2012	5																																
1.54% *Miscellaneous*			50%	0.0%	0.0%	0.0%	0.0%	10.0%	20.0%	30.0%	40.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Subtotal				-	-	-	-	414	834	1,259	1,688	2,123	2,136	2,149	2,162	2,189	2,217	2,246	2,274	2,303	2,333	2,363	2,393	2,424	2,455	2,486	2,518	2,550	2,583	2,616	2,649	2,683	2,718	2,752
Subtotal Recycled			90%	-	-	-	-	373	750	1,133	1,519	1,911	1,922	1,934	1,945	1,970	1,995	2,021	2,047	2,073	2,100	2,127	2,154	2,181	2,209	2,237	2,266	2,295	2,325	2,354	2,384	2,415	2,446	2,477
☑ 160 / 330 Expand Inspection & Enforcement Program / Mandatory Commercial/Institutional Waste Audits	2012	3																																
1.54% *Miscellaneous*			5%	0.0%	0.0%	0.0%	0.0%	1.7%	3.3%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Subtotal				-	-	-	-	68	134	199	197	194	196	197	198	200	203	206	208	211	214	216	219	222	225	228	230	233	236	239	243	246	249	252
Subtotal Recycled			90%	-	-	-	-	61	121	179	177	175	176	177	178	180	183	185	187	190	192	195	197	200	202	205	207	210	213	216	218	221	224	227
Total Shifted to Recycling Collection																																		
Total Shifted to Organics Collection																																		
Total Shifted to Private Recycling Facility				41	79	206	341	913	1,453	2,000	2,493	2,993	3,119	3,248	3,380	3,423	3,467	3,511	3,556	3,602	3,648	3,694	3,742	3,790	3,838	3,887	3,937	3,987	4,038	4,090	4,142	4,195	4,249	4,304
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
Total Eliminated from Disposal																																		

SMALL APPLIANCES AND ELECTRONICS	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
☑ 217 Self-Haul Computer Parts	2008	3																																
1.1% *Miscellaneous*			5%	1.7%	3.3%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Subtotal				53	100	143	144	146	148	150	152	154	156	158	160	162	164	166	168	170	173	175	177	179	182	184	186	189	191	193	196	198	201	204
☑ 376 On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	2012	5																																
1.1% *Miscellaneous*			20%	0.0%	0.0%	0.0%	0.0%	4.0%	8.0%	12.0%	16.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Subtotal				-	-	-	-	122	247	375	507	641	649	658	666	675	683	692	701	710	719	728	738	747	757	766	776	786	796	806	817	827	838	848
Subtotal Recycled			90%	-	-	-	-	110	222	338	456	577	585	592	600	607	615	623	631	639	647	655	664	672	681	690	698	707	716	726	735	744	754	763
Total Shifted to Recycling Collection																																		
Total Shifted to Organics Collection																																		
Total Shifted to Private Recycling Facility				-	-	-	-	110	222	338	456	577	585	592	600	607	615	623	631	639	647	655	664	672	681	690	698	707	716	726	735	744	754	763
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer				53	100	143	144	146	148	150	152	154	156	158	160	162	164	166	168	170	173	175	177	179	182	184	186	189	191	193	196	198	201	204
Total Eliminated from Disposal																																		

Appendix C
Diversion Model Output - Scenario 4 Commercial Sector

Tonnage Projections for New 60% plus New Zero Waste Strategies - Commercial

Commercial Sector	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total Commercial Generated				395,079	400,144	405,274	410,470	415,732	421,053	426,443	431,901	437,429	443,028	448,699	454,443	460,259
Total Commercial Recycled (Revised)		Growth Rate:	1.28%	205,714	219,636	234,199	237,178	240,195	243,269	246,383	249,537	252,731	255,966	259,242	262,561	265,921
CONSTRUCTION & DEMOLITION	Imp	Ramp	Marg. Recycle Rate													
☑ 204 Building Permit C&D Reuse And Recycling Fee Deposit	2008	5														
15.9% *All C&D*			10%	2.0%	4.0%	6.0%	8.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				602	1,148	1,632	2,204	2,791	2,826	2,863	2,899	2,936	2,974	3,012	3,051	3,090
Subtotal Recycled			60%	361	689	979	1,322	1,674	1,696	1,718	1,740	1,762	1,784	1,807	1,830	1,854
☑ 209 Develop Private Mixed C&D Debris Recycling Facility	2010	5														
15.9% *All C&D*			50%	0.0%	0.0%	10.0%	20.0%	30.0%	40.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Subtotal				-	-	2,557	5,069	7,535	10,175	12,882	13,047	13,214	13,383	13,554	13,727	13,903
Subtotal Recycled			60%	-	-	1,534	3,042	4,521	6,105	7,729	7,828	7,928	8,030	8,132	8,236	8,342
☑ 379 Create Larger Differential Between Disposal Tip Fee and Fee to Dump Recycleables	2010	3														
5.2% *All C&D*			10%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				-	-	404	713	927	804	679	688	696	705	714	724	733
Subtotal Recycled			60%	-	-	243	428	556	483	407	413	418	423	429	434	440
☑ 173 C&D Recyclables Disposal Ban	2015	5														
15.9% *All C&D*			50%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	20.0%	30.0%	40.0%	50.0%	50.0%
Subtotal				-	-	-	-	-	-	-	1,236	2,503	3,803	5,136	6,502	6,585
Subtotal Recycled			60%	-	-	-	-	-	-	-	742	1,502	2,282	3,081	3,901	3,951
Total Shifted to Recycling Collection																
Total Shifted to Organics Collection																
Net Shifted to Private Recycling Facility				**361**	**689**	**2,756**	**4,791**	**6,751**	**8,284**	**9,854**	**10,722**	**11,610**	**12,519**	**13,450**	**14,402**	**14,586**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																
Total Eliminated from Disposal																
ALL COMMERCIAL WASTE	Imp	Ramp	Marg. Recycle Rate													
☑ 124 Commercial Weight-Based Garbage Rates	2020	5														
79% *All Materials*			2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	898
Subtotal Recycled			60%	-	-	-	-	-	-	-	-	-	-	-	-	539
Total Shifted to Recycling Collection																
Total Shifted to Organics Collection																
Net Shifted to Private Recycling Facility				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**539**
Total Collected by Other Vehicle Type to City Transfer System																
Total Eliminated from Disposal																
SELECT ZERO WASTE AND PRODUCT STEWARDSHIP	Imp	Ramp	Marg. Recycle Rate													
☑ -- Institute "Group B" Zero Waste Strategies	2020	5														
0.8% *Misc. Hazardous*			5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	23
34.2% *Misc. Traditionals*			4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	270
42.3% *All Organics*			1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	89
0.0% *Misc. Other*			1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	0
1.1% *Misc. Small Appliances and Electronics*			1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	4
2.0% *Misc. White Goods/Bulky Items/Furniture*			0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	2
15.9% *All Construction and Demolition*			2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	26
Total Shifted to Recycling Collection																
Total Shifted to Organics Collection																
Total Shifted to Private Recycling Facility				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**415**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System																
Total Eliminated from Disposal																
Total Generated				**395,079**	**400,144**	**405,274**	**410,470**	**415,732**	**421,053**	**426,443**	**431,901**	**437,429**	**443,028**	**448,699**	**454,443**	**460,259**
Total Disposed - All Sectors (Net of 60% Program				**189,365**	**180,508**	**171,075**	**173,291**	**175,537**	**177,784**	**180,059**	**182,364**	**184,698**	**187,062**	**189,457**	**191,882**	**194,338**
60% Program Recycle Rate				52%	55%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%
Total Shifted to Recycling Collection				**-**	**-**	**3,396**	**6,827**	**10,294**	**13,793**	**17,326**	**18,400**	**19,732**	**21,081**	**22,330**	**23,367**	**23,637**
Total Shifted to Organics Collection				**-**	**-**	**-**	**1,225**	**2,471**	**3,736**	**5,020**	**6,325**	**7,650**	**8,994**	**10,360**	**11,745**	**16,544**
Net Shifted to Private Recycling Facility				**403**	**768**	**2,961**	**5,132**	**7,774**	**9,959**	**12,191**	**13,670**	**15,180**	**16,223**	**17,290**	**18,381**	**20,571**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer				**53**	**100**	**143**	**144**	**146**	**148**	**150**	**152**	**154**	**156**	**158**	**160**	**162**
Total Eliminated from Disposal				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program				**188,910**	**179,640**	**164,575**	**159,962**	**154,852**	**150,148**	**145,372**	**143,817**	**141,983**	**140,608**	**139,319**	**138,228**	**133,425**
60% Program PLUS Zero Waste Program Recycle Rate				52%	55%	59%	61%	63%	64%	66%	67%	68%	68%	69%	70%	71%

Commercial Sector	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Total Commercial Generated	466,151	472,117	478,161	484,281	490,480	496,758	503,116	509,556	516,079	522,684	529,375	536,151	543,014	549,964	557,004	564,133	571,354	578,668
Total Commercial Recycled (Revised)	269,325	272,773	276,264	279,800	283,382	287,009	290,683	294,404	298,172	301,988	305,854	309,769	313,734	317,750	321,817	325,936	330,108	334,334
CONSTRUCTION & DEMOLITION																		
☑ 204 Building Permit C&D Reuse And Recycling Fee Deposit																		
15.9% *All C&D*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	3,129	3,169	3,210	3,251	3,292	3,335	3,377	3,421	3,464	3,509	3,554	3,599	3,645	3,692	3,739	3,787	3,835	3,884
Subtotal Recycled	1,877	1,902	1,926	1,951	1,975	2,001	2,026	2,052	2,079	2,105	2,132	2,159	2,187	2,215	2,243	2,272	2,301	2,331
☑ 209 Develop Private Mixed C&D Debris Recycling Facility																		
15.9% *All C&D*	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Subtotal	14,081	14,261	14,444	14,629	14,816	15,006	15,198	15,392	15,589	15,789	15,991	16,196	16,403	16,613	16,826	17,041	17,259	17,480
Subtotal Recycled	8,449	8,557	8,666	8,777	8,890	9,003	9,119	9,235	9,354	9,473	9,595	9,717	9,842	9,968	10,095	10,225	10,355	10,488
☑ 379 Create Larger Differential Between Disposal Tip Fee and Fee to Dump Recycleables																		
5.2% *All C&D*	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal	742	752	761	771	781	791	801	811	822	832	843	854	865	876	887	898	910	921
Subtotal Recycled	445	451	457	463	469	475	481	487	493	499	506	512	519	525	532	539	546	553
☑ 173 C&D Recyclables Disposal Ban																		
15.9% *All C&D*	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Subtotal	6,669	6,755	6,841	6,929	7,018	7,107	7,198	7,290	7,384	7,478	7,574	7,671	7,769	7,869	7,969	8,071	8,175	8,279
Subtotal Recycled	4,002	4,053	4,105	4,157	4,211	4,264	4,319	4,374	4,430	4,487	4,544	4,603	4,661	4,721	4,782	4,843	4,905	4,968
Total Shifted to Recycling Collection																		
Total Shifted to Organics Collection																		
Net Shifted to Private Recycling Facility	**14,773**	**14,962**	**15,154**	**15,348**	**15,544**	**15,743**	**15,945**	**16,149**	**16,355**	**16,565**	**16,777**	**16,992**	**17,209**	**17,429**	**17,652**	**17,878**	**18,107**	**18,339**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																		
Total Eliminated from Disposal																		
ALL COMMERCIAL WASTE																		
☑ 124 Commercial Weight-Based Garbage Rates																		
79% *All Materials*	0.8%	1.2%	1.6%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Subtotal	1,759	2,583	3,367	4,110	4,162	4,215	4,269	4,324	4,379	4,435	4,492	4,550	4,608	4,667	4,727	4,787	4,848	4,911
Subtotal Recycled	1,056	1,550	2,020	2,466	2,497	2,529	2,562	2,594	2,628	2,661	2,695	2,730	2,765	2,800	2,836	2,872	2,909	2,946
Total Shifted to Recycling Collection																		
Total Shifted to Organics Collection																		
Net Shifted to Private Recycling Facility	**1,056**	**1,550**	**2,020**	**2,466**	**2,497**	**2,529**	**2,562**	**2,594**	**2,628**	**2,661**	**2,695**	**2,730**	**2,765**	**2,800**	**2,836**	**2,872**	**2,909**	**2,946**
Total Collected by Other Vehicle Type to City Transfer System																		
Total Eliminated from Disposal																		
SELECT ZERO WASTE AND PRODUCT STEWARDSHIP																		
☑ -- Institute "Group B" Zero Waste Strategies																		
0.8% *Misc. Hazardous*	2.0%	3.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Subtotal	47	72	97	123	124	126	128	129	131	132	134	136	138	139	141	143	145	147
34.2% *Misc. Traditionals*	1.6%	2.4%	3.2%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Subtotal	531	783	1,026	1,258	1,274	1,291	1,307	1,324	1,341	1,358	1,375	1,393	1,411	1,429	1,447	1,466	1,485	1,504
42.3% *All Organics*	0.4%	0.6%	0.8%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Subtotal	150	181	180	147	149	151	153	155	157	159	161	163	165	167	169	171	173	176
0.0% *Misc. Other*	0.4%	0.6%	0.8%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Subtotal	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1.1% *Misc. Small Appliances and Electronics*	0.2%	0.4%	0.5%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
Subtotal	8	12	16	20	21	21	21	22	22	22	22	23	23	23	24	24	24	24
2.0% *Misc. White Goods/Bulky Items/Furniture*	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Subtotal	5	7	10	12	12	13	13	13	13	13	13	14	14	14	14	14	14	15
15.9% *All Construction and Demolition*	0.8%	1.2%	1.6%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Subtotal	53	81	109	139	140	142	144	146	148	150	151	153	155	157	159	161	163	166
Total Shifted to Recycling Collection																		
Total Shifted to Organics Collection																		
Total Shifted to Private Recycling Facility	**794**	**1,136**	**1,439**	**1,700**	**1,722**	**1,744**	**1,766**	**1,789**	**1,812**	**1,835**	**1,859**	**1,882**	**1,907**	**1,931**	**1,956**	**1,981**	**2,006**	**2,032**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																		
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System																		
Total Eliminated from Disposal																		
																		0.83%
Total Generated	**466,151**	**472,117**	**478,161**	**484,281**	**490,480**	**496,758**	**503,116**	**509,556**	**516,079**	**522,684**	**529,375**	**536,151**	**543,014**	**549,964**	**557,004**	**564,133**	**571,354**	**578,668**
Total Disposed - All Sectors (Net of 60% Program	**196,825**	**199,345**	**201,896**	**204,481**	**207,098**	**209,749**	**212,434**	**215,153**	**217,907**	**220,696**	**223,521**	**226,382**	**229,280**	**232,214**	**235,187**	**238,197**	**241,246**	**244,334**
60% Program Recycle Rate	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%	58%
Total Shifted to Recycling Collection	**23,910**	**24,186**	**24,465**	**24,747**	**25,064**	**25,385**	**25,710**	**26,039**	**26,372**	**26,710**	**27,052**	**27,398**	**27,749**	**28,104**	**28,464**	**28,828**	**29,197**	**29,571**
Total Shifted to Organics Collection	**20,190**	**23,928**	**27,758**	**31,682**	**32,087**	**32,498**	**32,914**	**33,335**	**33,762**	**34,194**	**34,632**	**35,075**	**35,524**	**35,979**	**36,439**	**36,906**	**37,378**	**37,857**
Net Shifted to Private Recycling Facility	**22,731**	**24,861**	**26,957**	**29,017**	**29,388**	**29,765**	**30,145**	**30,531**	**30,922**	**31,318**	**31,719**	**32,125**	**32,536**	**32,952**	**33,374**	**33,801**	**34,234**	**34,672**
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer	**164**	**166**	**168**	**170**	**173**	**175**	**177**	**179**	**182**	**184**	**186**	**189**	**191**	**193**	**196**	**198**	**201**	**204**
Total Eliminated from Disposal	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program	**129,830**	**126,204**	**122,549**	**118,864**	**120,386**	**121,926**	**123,487**	**125,068**	**126,669**	**128,290**	**129,932**	**131,595**	**133,280**	**134,986**	**136,713**	**138,463**	**140,236**	**142,031**
60% Program PLUS Zero Waste Program Recycle Rate	72%	73%	74%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%

Tonnage Projections for New 60% plus New Zero Waste Strategies - Self-Haul

	Self-Haul Sector				2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
	Total Self-Haul Generated				**136,220**	**138,874**	**141,561**	**144,216**	**146,839**	**149,996**	**153,220**	**156,515**	**159,880**	**163,317**	**166,828**	**170,415**	**174,079**	**177,822**	**181,645**	**185,550**	**189,540**	**193,615**	**197,778**	**202,030**	**206,374**	**210,811**	**215,343**	**219,973**	**224,702**	**229,533**	**234,468**	**239,509**	**244,659**	**249,919**	**255,292**
	Total Self-Haul Recycled (Revised)	Growth Rate:		2.15%	**24,575**	**24,879**	**25,212**	**25,551**	**25,897**	**26,454**	**27,023**	**27,604**	**28,197**	**28,803**	**29,423**	**30,055**	**30,701**	**31,361**	**32,036**	**32,724**	**33,428**	**34,147**	**34,881**	**35,631**	**36,397**	**37,179**	**37,979**	**38,795**	**39,629**	**40,481**	**41,352**	**42,241**	**43,149**	**44,077**	**45,024**
	Total Self-Haul Disposed	Updated	2004																																
C	Wood Waste	32.6%	32.6%		36,366	37,132	37,898	38,653	39,394	40,241	41,106	41,990	42,893	43,815	44,757	45,719	46,702	47,706	48,732	49,780	50,850	51,943	53,060	54,201	55,366	56,557	57,773	59,015	60,283	61,580	62,903	64,256	65,637	67,049	68,490
C	Construction Debris	17.8%	17.8%		19,838	20,255	20,674	21,085	21,490	21,952	22,424	22,906	23,398	23,901	24,415	24,940	25,476	26,024	26,583	27,155	27,739	28,335	28,944	29,567	30,202	30,852	31,515	32,193	32,885	33,592	34,314	35,052	35,805	36,575	37,362
	All C&D	*50%*	*50%*		*56,203*	*57,387*	*58,572*	*59,738*	*60,884*	*62,193*	*63,530*	*64,896*	*66,291*	*67,716*	*69,172*	*70,659*	*72,178*	*73,730*	*75,315*	*76,935*	*78,589*	*80,278*	*82,004*	*83,768*	*85,569*	*87,408*	*89,288*	*91,207*	*93,168*	*95,171*	*97,218*	*99,308*	*101,443*	*103,624*	*105,852*
O	Yard Waste	3.6%	3.6%		4,064	4,150	4,235	4,320	4,402	4,497	4,594	4,693	4,793	4,897	5,002	5,109	5,219	5,331	5,446	5,563	5,683	5,805	5,930	6,057	6,187	6,320	6,456	6,595	6,737	6,882	7,030	7,181	7,335	7,493	7,654
O	Food Waste	2.6%	1.0%		2,919	2,981	3,042	3,103	3,162	3,230	3,300	3,371	3,443	3,517	3,593	3,670	3,749	3,830	3,912	3,996	4,082	4,170	4,259	4,351	4,444	4,540	4,638	4,737	4,839	4,943	5,049	5,158	5,269	5,382	5,498
O	Other Paper	1.0%	2.6%		1,085	1,108	1,131	1,153	1,176	1,201	1,227	1,253	1,280	1,307	1,336	1,364	1,394	1,424	1,454	1,485	1,517	1,550	1,583	1,617	1,652	1,688	1,724	1,761	1,799	1,838	1,877	1,917	1,959	2,001	2,044
O	Other Organics	2.6%	2.6%		2,912	2,974	3,035	3,095	3,155	3,223	3,292	3,363	3,435	3,509	3,584	3,661	3,740	3,820	3,903	3,986	4,072	4,160	4,249	4,340	4,434	4,529	4,626	4,726	4,828	4,931	5,037	5,146	5,256	5,369	5,485
	All Organics	*10%*	*10%*		*10,981*	*11,212*	*11,443*	*11,671*	*11,895*	*12,151*	*12,412*	*12,679*	*12,951*	*13,230*	*13,514*	*13,805*	*14,102*	*14,405*	*14,715*	*15,031*	*15,354*	*15,684*	*16,021*	*16,366*	*16,718*	*17,077*	*17,444*	*17,819*	*18,203*	*18,594*	*18,994*	*19,402*	*19,819*	*20,245*	*20,681*
T	Newspaper	0.2%	0.2%		207	211	215	220	224	229	234	239	244	249	254	260	266	271	277	283	289	295	302	308	315	322	328	336	343	350	358	365	373	381	389
T	Corrugated-Karft	2.5%	2.5%		2,778	2,837	2,895	2,953	3,010	3,074	3,140	3,208	3,277	3,347	3,419	3,493	3,568	3,645	3,723	3,803	3,885	3,968	4,054	4,141	4,230	4,321	4,414	4,509	4,605	4,704	4,806	4,909	5,014	5,122	5,232
T	Computer-Office Paper	0.8%	0.8%		855	873	891	909	927	947	967	988	1,009	1,031	1,053	1,075	1,098	1,122	1,146	1,171	1,196	1,222	1,248	1,275	1,302	1,330	1,359	1,388	1,418	1,448	1,480	1,511	1,544	1,577	1,611
T	Mixed Scrap Paper	1.4%	1.4%		1,596	1,630	1,664	1,697	1,729	1,767	1,805	1,843	1,883	1,923	1,965	2,007	2,050	2,094	2,139	2,185	2,232	2,280	2,329	2,379	2,431	2,483	2,536	2,591	2,646	2,703	2,761	2,821	2,881	2,943	3,007
T	Other Paper	0.4%	0.4%		465	475	485	494	504	515	526	537	549	560	572	585	597	610	623	637	650	664	679	693	708	723	739	755	771	788	804	822	839	857	876
T	Plastics	5.7%	5.7%		6,311	6,444	6,577	6,708	6,836	6,983	7,134	7,287	7,444	7,604	7,767	7,934	8,105	8,279	8,457	8,639	8,825	9,014	9,208	9,406	9,608	9,815	10,026	10,241	10,462	10,687	10,916	11,151	11,391	11,636	11,886
T	Beverage Glass	0.4%	0.4%		441	450	460	469	478	488	498	509	520	531	543	554	566	578	591	604	617	630	643	657	671	686	701	716	731	747	763	779	796	813	831
T	Container Glass	0.1%	0.1%		57	59	60	61	62	63	65	66	68	69	71	72	74	75	77	78	80	82	84	85	87	89	91	93	95	97	99	101	103	106	108
T	Other Glass	1.6%	1.6%		1,755	1,792	1,829	1,866	1,901	1,942	1,984	2,027	2,070	2,115	2,160	2,207	2,254	2,303	2,352	2,403	2,454	2,507	2,561	2,616	2,672	2,730	2,789	2,848	2,910	2,972	3,036	3,101	3,168	3,236	3,306
T	Food Cans	0.1%	0.1%		66	67	68	70	71	73	74	76	77	79	81	83	84	86	88	90	92	94	96	98	100	102	104	106	109	111	114	116	118	121	124
T	Other Ferrous	3.3%	3.3%		3,702	3,780	3,858	3,935	4,010	4,097	4,185	4,275	4,367	4,461	4,556	4,654	4,754	4,857	4,961	5,068	5,177	5,288	5,402	5,518	5,636	5,758	5,881	6,008	6,137	6,269	6,404	6,541	6,682	6,826	6,973
T	Aluminum Beverage	0.1%	0.1%		57	58	59	60	61	63	64	65	67	68	70	71	73	74	76	78	79	81	83	85	86	88	90	92	94	96	98	100	102	105	107
T	Other Aluminum	0.1%	0.1%		161	165	168	172	175	179	182	186	190	194	199	203	207	212	216	221	226	231	235	241	246	251	256	262	268	273	279	285	291	298	304
T	Other Non-Ferrous	0.1%	0.1%		132	135	137	140	143	146	149	152	155	159	162	166	169	173	177	180	184	188	192	196	201	205	209	214	218	223	228	233	238	243	248
	All Traditionals	*17%*	*17%*		*18,584*	*18,975*	*19,367*	*19,753*	*20,132*	*20,564*	*21,007*	*21,458*	*21,920*	*22,391*	*22,872*	*23,364*	*23,866*	*24,379*	*24,904*	*25,439*	*25,986*	*26,545*	*27,115*	*27,698*	*28,294*	*28,902*	*29,524*	*30,158*	*30,807*	*31,469*	*32,146*	*32,837*	*33,543*	*34,264*	*35,001*
Z	Miscellaneous	23.2%	23.2%		25,877	26,421	26,967	27,504	28,031	28,634	29,250	29,878	30,521	31,177	31,847	32,532	33,232	33,946	34,676	35,421	36,183	36,961	37,756	38,567	39,396	40,244	41,109	41,993	42,895	43,818	44,760	45,722	46,705	47,709	48,735
	Total Self Haul Disposed**				**111,645**	**113,996**	**116,350**	**118,665**	**120,942**	**123,542**	**126,198**	**128,911**	**131,683**	**134,514**	**137,406**	**140,360**	**143,378**	**146,461**	**149,609**	**152,826**	**156,112**	**159,468**	**162,897**	**166,399**	**169,977**	**173,631**	**177,364**	**181,178**	**185,073**	**189,052**	**193,117**	**197,269**	**201,510**	**205,842**	**210,268**
	** Does not include FMP assumption of 24.8 net of yw recovered																																		
	Revised 60% Program Recycle Rate				*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*
	TRADITIONALS	Imp	Ramp	Marg. Recycle Rate																															
☑ 160	Expand Inspection & Enforcement Program	2010	5																																
12.6%	*All Traditionals*			5%	0.0%	0.0%	1.0%	2.0%	3.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
	Subtotal				-	-	146	299	457	622	794	811	828	846	864	883	902	921	941	962	982	1,003	1,025	1,047	1,069	1,092	1,116	1,140	1,164	1,189	1,215	1,241	1,268	1,295	1,323
☑ 283	Rate Structure Review for Garbage Collection	2010	3																																
12.6%	*All Traditionals*			1%	0.0%	0.0%	0.3%	0.7%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
	Subtotal				-	-	48	98	149	151	153	156	159	163	166	170	174	177	181	185	189	193	197	201	206	210	215	219	224	229	234	239	244	249	255
☑ 298	Beverage Container Deposit System	2020	5																																
0.1%	*Aluminum Beverage*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
	Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	13	26	39	53	68	70	71	73	74	76	77	79	81	83	84	86	88	90	92
0.4%	*Beverage Glass*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
	Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	97	199	305	415	530	541	553	565	577	589	602	615	628	642	656	670	684	699	714
0.15%	*Plastics*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
	Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	37	75	115	157	200	205	209	214	218	223	228	233	238	243	248	253	259	264	270
	Subtotal Recycled			90%	-	-	-	-	-	-	-	-	-	-	-	-	132	270	413	563	719	734	750	766	783	799	817	834	852	870	889	908	928	948	968
☑ 367 / 332	Adjust Rate Structure for Self Haul Disposal at City Owned Transfer Stations / Raise Self Haul Tipping Fees and Illegal Dumping Fines	2015	3																																
12.6%	*All Traditionals*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				-	-	-	-	-	-	-	516	1,055	1,616	1,651	1,687	1,712	1,737	1,763	1,789	1,815	1,854	1,894	1,935	1,977	2,019	2,063	2,107	2,152	2,199	2,246	2,294	2,343	2,394	2,445
☑ 240	Performance-Based Contracting For Solid Waste Service Contracts	2016	3																																
12.6%	*All Traditionals*			2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.3%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Subtotal				-	-	-	-	-	-	-	-	100	199	305	312	316	321	326	331	336	343	350	358	365	373	381	390	398	406	415	424	433	443	452
	Total Shifted to Recycling Collection				**-**	**-**	**195**	**397**	**605**	**773**	**947**	**1,483**	**2,143**	**2,825**	**2,987**	**3,051**	**3,104**	**3,157**	**3,211**	**3,266**	**3,322**	**3,394**	**3,467**	**3,541**	**3,617**	**3,695**	**3,775**	**3,856**	**3,939**	**4,023**	**4,110**	**4,198**	**4,288**	**4,381**	**4,475**
	Total Shifted to Organics Collection																																		
	Net Shifted to Private Recycling Facility				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**132**	**270**	**413**	**563**	**719**	**734**	**750**	**766**	**783**	**799**	**817**	**834**	**852**	**870**	**889**	**908**	**928**	**948**	**968**
	Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
	Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System																																		
	Total Eliminated from Disposal																																		
	OTHER	Imp	Ramp	Marg. Recycle Rate																															
☑ 265	Take-Back Program For Carpet	2015	7																																
5.82%	*Miscellaneous*			20%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.9%	5.7%	8.6%	11.4%	14.3%	17.1%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
	Subtotal				-	-	-	-	-	-	-	214	438	671	914	1,168	1,431	1,706	1,742	1,780	1,818	1,857	1,897	1,938	1,979	2,022	2,066	2,110	2,155	2,202	2,249	2,297	2,347	2,397	2,449
	Subtotal Recycled			60%	-	-	-	-	-	-	-	129	263	403	549	701	859	1,023	1,045	1,068	1,091	1,114	1,138	1,163	1,188	1,213	1,239	1,266	1,293	1,321	1,349	1,378	1,408	1,438	1,469
☑ 152	(Other) Disposal Bans	2015	5																																
0.02%	*Miscellaneous*			50%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	20.0%	30.0%	40.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
	Subtotal				-	-	-	-	-	-	-	3	5	8	11	14	14	14	15	15	15	16	16	16	17	17	17	18	18	19	19	19	20	20	21
	Subtotal Recycled			90%	-	-	-	-	-	-	-	2	5	7	10	13	13	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17	18	18	19
☑ 160	Expand Inspection & Enforcement Program	2015	3																																
0.02%	*Miscellaneous*			5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	3.3%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
	Subtotal				-	-	-	-	-	-	-	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Subtotal Recycled			90%	-	-	-	-	-	-	-	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
☑ 367 / 332	Adjust Rate Structure for Self Haul Disposal at City Owned Transfer Stations / Raise Self Haul Tipping Fees and Illegal Dumping Fines	2015	3																																
0.02%	*Miscellaneous*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				-	-	-	-	-	-	-	1	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4
	Subtotal Recycled			90%	-	-	-	-	-	-	-	1	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4
	Total Shifted to Recycling Collection																																		
	Total Shifted to Organics Collection																																		
	Net Shifted to Private Recycling Facility				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**132**	**270**	**414**	**562**	**717**	**875**	**1,040**	**1,063**	**1,085**	**1,109**	**1,133**	**1,157**	**1,182**	**1,207**	**1,233**	**1,260**	**1,287**	**1,314**	**1,343**	**1,372**	**1,401**	**1,431**	**1,462**	**1,493**
	Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
	Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System																																		
	Total Eliminated from Disposal																																		
	SMALL APPLIANCES AND ELECTRONICS	Imp	Ramp	Marg. Recycle Rate																															
☑ 217	Self-Haul Computer Parts	2008	3																																
0.8%	*Miscellaneous*			5%	1.7%	3.3%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
	Subtotal				15	30	46	47	48	49	50	51	52	53	54	56	57	58	59	60	62	63	64	66	67	69	70	72	73	75	76	78	80	81	83
☑ 376	On-Call Curbside Electronic Waste Recycling Including Appliances with Circuit Boards	2012	5																																
1.4%	*Miscellaneous*			20%	0.0%	0.0%	0.0%	0.0%	4.0%	8.0%	12.0%	16.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
	Subtotal				-	-	-	-	66	135	207	281	359	367	375	383	391	399	408	417	426	435	444	454	464	474	484	494	505	516	527	538	550	561	573
	Subtotal Recycled			90%	-	-	-	-	59	121	186	253	323	330	337	345	352	359	367	375	383	391	400	408	417	426	435	445	454	464	474	484	495	505	516
☑ 367 / 332	Adjust Rate Structure for Self Haul Disposal at City Owned Transfer Stations / Raise Self Haul Tipping Fees and Illegal Dumping Fines	2015	3																																
1.4%	*Miscellaneous*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				-	-	-	-	-	-	-	58	118	181	185	189	193	197	202	206	210	215	220	224	229	234	239	244	249	255	260	266	272	277	283
	Total Shifted to Recycling Collection				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**58**	**118**	**181**	**185**	**189**	**193**	**197**	**202**	**206**	**210**	**215**	**220**	**224**	**229**	**234**	**239**	**244**	**249**	**255**	**260**	**266**	**272**	**277**	**283**
	Total Shifted to Organics Collection																																		
	Total Shifted to Private Recycling Facility				**-**	**-**	**-**	**-**	**59**	**121**	**186**	**253**	**323**	**330**	**337**	**345**	**352**	**359**	**367**	**375**	**383**	**391**	**400**	**408**	**417**	**426**	**435**	**445**	**454**	**464**	**474**	**484**	**495**	**505**	**516**
	Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sys				**15**	**30**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**56**	**57**	**58**	**59**	**60**	**62**	**63**	**64**	**66**	**67**	**69**	**70**	**72**	**73**	**75**	**76**	**78**	**80**	**81**	**83**
	Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System																																		
	Total Eliminated from Disposal																																		
	WHITE GOODS / BULKY ITEMS / FURNITURE	Imp	Ramp	Marg. Recycle Rate																															
☑ 170	On-Demand Free Annual Or Biannual Bulky Item Recycling Collection (With Set # Limit)	2008	3																																
0.8%	*Miscellaneous*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				29	59	90	92	93	95	97	99	102	104	106	108	111	113	115	118	120	123	126	128	131	134	137	140	143	146	149	152	156	159	162
	Subtotal Recycled			60%	17	35	54	55	56	57	58	60	61	62	64	65	66	68	69	71	72	74	75	77	79	80	82	84	86	88	89	91	93	95	97
3.3%	*Other Ferrous*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				123	252	386	393	401	410	418	427	437	446	456	465	475	486	496	507	518	529	540	552	564	576	588	601	614	627	640	654	668	683	697
	Subtotal Recycled			90%	111	227	347	354	361	369	377	385	393	401	410	419	428	437	446	456	466	476	486	497	507	518	529	541	552	564	576	589	601	614	628
0.1%	*Other Non Ferrous*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				4	9	14	14	14	15	15	15	16	16	16	17	17	17	18	18	18	19	19	20	20	20	21	21	22	22	23	23	24	24	25
	Subtotal Recycled			80%	4	7	11	11	11	12	12	12	12	13	13	13	14	14	14	14	15	15	15	16	16	16	17	17	17	18	18	19	19	19	20
0.02%	*Other Aluminum*			10%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
	Subtotal				1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4
	Subtotal Recycled			80%	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3

Appendix C
Diversion Model Output - Scenario 4 Self-Haul Sector

Tonnage Projections for New 60% plus New Zero Waste Strategies - Self-Haul

Self-Haul Sector	Imp	Ramp	Marg. Recycle Rate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Total Self-Haul Generated				136,220	138,874	141,561	144,216	146,839	149,996	153,220	156,515	159,880	163,317	166,828	170,415	174,079	177,822	181,645	185,550	189,540	193,615	197,778	202,030	206,374	210,811	215,343	219,973	224,702	229,533	234,468	239,509	244,659	249,919	255,292
Total Self-Haul Recycled (Revised)		Growth Rate:	2.15%	24,575	24,879	25,212	25,551	25,897	26,454	27,023	27,604	28,197	28,803	29,423	30,055	30,701	31,361	32,036	32,724	33,428	34,147	34,881	35,631	36,397	37,179	37,979	38,795	39,629	40,481	41,352	42,241	43,149	44,077	45,024
☑ 367 / 332 Adjust Rate Structure for Self Haul Disposal at City Owned Transfer Stations / Raise Self Haul Tipping Fees and Illegal Dumping Fines	2015	3																																
0.8% *Miscellaneous*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				-	-	-	-	-	-	-	33	67	102	104	106	109	111	113	116	118	121	123	126	129	132	134	137	140	143	146	149	153	156	159
Subtotal Recycled			60%	-	-	-	-	-	-	-	20	40	61	62	64	65	67	68	69	71	72	74	76	77	79	81	82	84	86	88	90	92	94	96
3.3% *Other Ferrous*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				-	-	-	-	-	-	-	140	286	438	447	457	467	477	487	498	508	519	530	542	553	565	577	590	603	615	629	642	656	670	685
Subtotal Recycled			90%	-	-	-	-	-	-	-	126	257	394	403	411	420	429	438	448	457	467	477	488	498	509	520	531	542	554	566	578	590	603	616
0.1% *Other Non Ferrous*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				-	-	-	-	-	-	-	5	10	16	16	16	17	17	17	18	18	18	19	19	20	20	21	21	21	22	22	23	23	24	24
Subtotal Recycled			80%	-	-	-	-	-	-	-	4	8	12	13	13	13	14	14	14	14	15	15	15	16	16	16	17	17	18	18	18	19	19	19
0.13% *Other Aluminum*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				-	-	-	-	-	-	-	6	11	18	18	18	19	19	20	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	28
Subtotal Recycled			80%	-	-	-	-	-	-	-	4	9	14	14	15	15	15	16	16	16	17	17	17	18	18	19	19	19	20	20	21	21	22	22
Total Shifted to Recycling Collection																																		
Total Shifted to Organics Collection																																		
Total Shifted to Private Recycling Facility				-	-	-	-	-	-	-	612	783	960	981	1,002	1,023	1,045	1,068	1,091	1,114	1,138	1,163	1,188	1,213	1,239	1,266	1,293	1,321	1,349	1,378	1,408	1,438	1,469	1,501
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sys				132	270	414	422	430	439	449																								
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System																																		
Total Eliminated from Disposal																																		
CONSTRUCTION & DEMOLITION	Imp	Ramp	Marg. Recycle Rate																															
☑ 221 Residential On-Demand Collection Of Waste (C&D) Building Materials	2008	5																																
50.3% *All C&D*			4%	0.8%	1.6%	2.4%	3.2%	4.0%	4.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				450	918	1,406	1,912	2,435	2,488	2,541	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
☑ 379 Create Larger Differential Between Disposal Tip Fee and Fee to Dump Recyclables	2010	3																																
7.5% *Construction Debris*			10%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	283	572	867	885	904	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.6% *Wood Waste*			10%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal				-	-	590	1,193	1,809	1,847	1,887	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
☑ 209 Develop Private Mixed C&D Debris Recycling Facility	2010	5																																
50.3% *All C&D*			75%	0.0%	0.0%	15.0%	30.0%	45.0%	60.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Subtotal				-	-	8,444	16,819	25,098	34,183	43,648	48,672	49,718	50,787	51,879	52,994	54,134	55,298	56,487	57,701	58,942	60,209	61,503	62,826	64,176	65,556	66,966	68,405	69,876	71,379	72,913	74,481	76,082	77,718	79,389
Subtotal Recycled			50%	-	-	5,066	10,091	15,059	20,510	26,189	29,203	29,831	30,472	31,127	31,797	32,480	33,179	33,892	34,621	35,365	36,125	36,902	37,695	38,506	39,334	40,179	41,043	41,926	42,827	43,748	44,688	45,649	46,631	47,633
☑ 363 Take-Back Program for Used Building Materials at Home Product Centers	2012	7																																
7.5% *Construction Debris*			5%	0.0%	0.0%	0.0%	0.0%	0.7%	1.4%	2.1%	2.9%	3.6%	4.3%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Subtotal				-	-	-	-	33	49	47	69	89	109	130	132	135	138	141	144	147	150	154	157	160	164	167	171	175	178	182	186	190	194	198
Subtotal Recycled			60%	-	-	-	-	20	29	28	42	53	65	78	79	81	83	85	86	88	90	92	94	96	98	100	102	105	107	109	112	114	116	119
☑ 173 C&D Recyclables Disposal Ban	2015	5																																
50.3% *All C&D*			50%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	20.0%	30.0%	40.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Subtotal				-	-	-	-	-	-	-	1,615	3,297	5,046	6,865	8,766	8,955	9,147	9,344	9,545	9,750	9,960	10,174	10,392	10,616	10,844	11,077	11,315	11,559	11,807	12,061	12,320	12,585	12,856	13,132
Subtotal Recycled			60%	-	-	-	-	-	-	-	969	1,978	3,028	4,119	5,260	5,373	5,488	5,606	5,727	5,850	5,976	6,104	6,235	6,370	6,507	6,646	6,789	6,935	7,084	7,237	7,392	7,551	7,714	7,879
☑ 367 / 332 Adjust Rate Structure for Self Haul Disposal at City Owned Transfer Stations / Raise Self Haul Tipping Fees and Illegal Dumping Fines	2015	3																																
50.3% *All C&D*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	6.7%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Subtotal				-	-	-	-	-	-	-	485	879	1,177	1,030	877	895	915	934	954	975	996	1,017	1,039	1,062	1,084	1,108	1,132	1,156	1,181	1,206	1,232	1,259	1,286	1,313
Subtotal Recycled			60%	-	-	-	-	-	-	-	291	527	706	618	526	537	549	561	573	585	598	610	624	637	651	665	679	694	708	724	739	755	771	788
Total Shifted to Recycling Collection																																		
Total Shifted to Organics Collection																																		
Net Shifted to Private Recycling Facility				-	-	5,066	10,091	15,078	20,539	26,217	30,020	31,401	32,758	33,883	35,032	35,785	36,554	37,340	38,143	38,963	39,801	40,657	41,531	42,424	43,336	44,268	45,219	46,192	47,185	48,199	49,235	50,294	51,375	52,480
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System						1,688	2,483	3,302	3,373	3,445	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer Syst				450	918	1,688	2,483	3,302	3,373	3,445	485	989	1,514	2,060	2,630	2,686	2,744	2,803	2,863	2,925	2,988	3,052	3,118	3,185	3,253	3,323	3,395	3,468	3,542	3,618	3,696	3,776	3,857	3,940
Total Eliminated from Disposal																																		
SELECT SELF-HAUL WASTE	Imp	Ramp	Marg. Recycle Rate																															
☑ 323 Ban Self Haul Disposal at City Owned Transfer Stations	2015	5																																
9.8% *All Organics*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Subtotal			55%	-	-	-	-	-	-	-	1,260	2,574	3,944	5,371	6,858	7,006	7,156	7,310	7,467	7,628	7,792	7,959	8,131	8,305	8,484	8,666	8,853	9,043	9,237	9,436	9,639	9,846	10,058	10,274
8.8% *All Other*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Subtotal			67%	-	-	-	-	-	-	-	1,367	2,772	4,216	5,700	7,224	7,324	7,425	7,585	7,748	7,915	8,085	8,259	8,436	8,618	8,803	8,992	9,186	9,383	9,585	9,791	10,001	10,216	10,436	10,660
1.4% *Misc. Small Appliances and Electronics*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Subtotal			67%	-	-	-	-	-	-	-	211	429	656	893	1,141	1,165	1,190	1,216	1,242	1,269	1,296	1,324	1,352	1,381	1,411	1,441	1,472	1,504	1,536	1,569	1,603	1,638	1,673	1,709
9.0% *Misc. White Goods/Bulky Items/Furniture*			90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	36.0%	54.0%	72.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Subtotal			67%	-	-	-	-	-	-	-	1,371	2,784	4,239	5,774	7,372	7,531	7,692	7,858	8,027	8,199	8,376	8,556	8,740	8,928	9,120	9,316	9,516	9,720	9,929	10,143	10,361	10,584	10,811	11,044
50.3% *Misc. Construction and Demolition*			50%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	20.0%	30.0%	40.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Subtotal			67%	-	-	-	-	-	-	-	947	1,659	2,143	2,499	2,659	2,716	2,774	2,834	2,895	2,957	3,021	3,086	3,152	3,220	3,289	3,360	3,432	3,506	3,581	3,658	3,737	3,817	3,899	3,983
Total Shifted to Recycling Collection																																		
Total Shifted to Organics Collection				-	-	-	-	-	-	-	1,260	2,574	3,944	5,371	6,858	7,006	7,156	7,310	7,467	7,628	7,792	7,959	8,131	8,305	8,484	8,666	8,853	9,043	9,237	9,436	9,639	9,846	10,058	10,274
Total Shifted to Private Recycling Facility																2,716	2,774	2,834	2,895	2,957	3,021	3,086	3,152	3,220	3,289	3,360	3,432	3,506	3,581	3,658	3,737	3,817	3,899	3,983
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sys				-	-	-	-	-	-	-	3,896	7,644	11,254	14,865	18,395	16,020	16,308	16,659	17,017	17,383	17,756	18,138	18,528	18,927	19,333	19,749	20,174	20,607	21,051	21,503	21,965	22,438	22,920	23,413
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer Syst				-	-	-	-	-	-	-	76,880	71,452	66,183	61,643	57,185	58,223	59,280	60,462	61,668	62,897	64,250	65,631	67,042	68,484	69,956	71,460	72,996	74,566	76,169	77,807	79,479	81,188	82,934	84,717
Total Eliminated from Disposal																																		
SELECT ZERO WASTE AND PRODUCT STEWARDSHIP	Imp	Ramp	Marg. Recycle Rate																															
☑ -- Institute "Group B" Zero Waste Strategies	2020	5																																
0.7% *Misc. Hazardous*			13%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	5.2%	7.8%	10.4%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	27	55	84	114	146	149	152	156	159	162	166	169	173	177	181	184	188	192	197
12.6% *Misc. Traditionals*			10%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	3.9%	5.9%	7.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	304	617	939	1,270	1,612	1,646	1,682	1,718	1,755	1,792	1,831	1,870	1,910	1,952	1,994	2,036	2,080	2,125	2,171
9.8% *All Organics*			3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	1.1%	1.7%	2.2%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	78	158	243	331	422	431	441	450	460	470	480	490	501	511	522	534	545	557	569
0.0% *Misc. Other*			3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	1.0%	1.5%	2.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
1.4% *Misc. Small Appliances and Electronics*			2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.6%	0.9%	1.2%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	6	12	18	25	32	32	33	34	34	35	36	37	37	38	39	40	41	42	43
10.1% *Misc. White Goods/Bulky Items/Furniture*			0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.3%	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	14	29	44	60	76	78	80	81	83	85	87	88	90	92	94	96	98	100	103
50.3% *All Construction and Demolition*			5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.9%	2.9%	3.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%
Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	77	156	240	326	417	426	435	444	454	464	474	484	494	505	516	527	538	550	561
Total Shifted to Recycling Collection																																		
Total Shifted to Organics Collection																																		
Total Shifted to Private Recycling Facility				-	-	-	-	-	-	-	-	-	-	-	-	505	1,027	1,568	2,127	2,705	2,763	2,822	2,883	2,945	3,008	3,073	3,139	3,206	3,275	3,346	3,418	3,491	3,566	3,643
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer System																																		
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer System																																		
Total Eliminated from Disposal																																		
																																		1.73%
Total Generated				136,220	138,874	141,561	144,216	146,839	149,996	153,220	156,515	159,880	163,317	166,828	170,415	174,079	177,822	181,645	185,550	189,540	193,615	197,778	202,030	206,374	210,811	215,343	219,973	224,702	229,533	234,468	239,509	244,659	249,919	255,292
Total Disposed - All Sectors (Net of 60% Program				111,645	113,996	116,350	118,665	120,942	123,542	126,198	128,911	131,683	134,514	137,406	140,360	143,378	146,461	149,609	152,826	156,112	159,468	162,897	166,399	169,977	173,631	177,364	181,178	185,073	189,052	193,117	197,269	201,510	205,842	210,268
60% Program Recycle Rate				18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Total Shifted to Recycling Collection				-	-	195	397	605	773	947	1,541	2,261	3,006	3,172	3,241	3,297	3,355	3,413	3,472	3,533	3,609	3,686	3,765	3,846	3,929	4,014	4,100	4,188	4,278	4,370	4,464	4,560	4,658	4,758
Total Shifted to Organics Collection				-	-	-	-	-	-	-	1,260	2,574	3,944	5,371	6,858	7,006	7,156	7,310	7,467	7,628	7,792	7,959	8,131	8,305	8,484	8,666	8,853	9,043	9,237	9,436	9,639	9,846	10,058	10,274
Net Shifted to Private Recycling Facility				-	-	5,066	10,091	15,138	20,661	26,403	31,018	32,777	34,462	35,763	37,095	41,388	43,071	44,653	46,279	47,950	48,981	50,034	51,110	52,209	53,331	54,478	55,649	56,846	58,068	59,316	60,591	61,894	63,225	64,584
Total Collected by Other Vehicle Type FOR RECYCLING at City Transfer Sys				147	300	2,148	2,952	3,780	3,861	3,944	3,948	7,697	11,307	14,920	18,451	16,077	16,366	16,718	17,077	17,445	17,820	18,203	18,594	18,994	19,402	19,819	20,245	20,681	21,125	21,580	22,044	22,517	23,002	23,496
Total Collected by Other Vehicle Type FOR DISPOSAL at City Transfer Syst				450	918	1,688	2,483	3,302	3,373	3,445	77,365	72,441	67,697	63,702	59,815	60,910	62,024	63,265	64,531	65,822	67,238	68,683	70,160	71,668	73,209	74,783	76,391	78,033	79,711	81,425	83,176	84,964	86,791	88,657
Total Eliminated from Disposal				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Disposed - All Sectors (Net of 60% Program PLUS Zero Waste Program				111,498	113,695	108,940	105,225	101,419	98,248	94,904	91,145	86,375	81,795	78,180	74,715	75,610	76,513	77,516	78,530	79,557	81,267	83,014	84,799	86,622	88,485	90,387	92,330	94,316	96,343	98,415	100,531	102,692	104,900	107,155
Separated at RDS Sort for Recycling						24,315	23,486	25,152	24,365	23,536	22,604	21,421	20,285	19,389	18,529	18,751	18,975	19,224	19,475	19,730	20,154	20,588	21,030	21,482	21,944	22,416	22,898	23,390	23,893	24,407	24,932	25,468	26,015	26,575
60% Program PLUS Zero Waste Program PLUS Sort Recycle Rate				18%	18%	40%	43%	48%	51%	53%	56%	59%	62%	65%	67%	67%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%

Appendix D

Argo Yard Analysis

Private Facility Analysis

Union Pacific Railroad Argo Yard Capacity Analysis

Introduction

The Seattle Public Utilities (SPU) Zero Waste Strategy is explicit in the importance of the city's continuing analysis of existing facilities and their capacity for the management and movement of solid waste. An important component of the facilities analysis is a review of the Union Pacific Railroad Argo Yard.

This issue paper reviews, through a brief historical analysis, the capacity and future facility opportunities for the SPU at the Union Pacific Railroad Argo Yard.

Research Review

The consultant team (URS Corporation (URS) and Herrera Environmental Consultants) reviewed the pertinent appendices (E and F) from the SPU Solid Waste Facilities Master Plan (CH2Mhill 2003). These documents, as well as December 2006 SPU rail volume summary, consider the volumes and flow of waste by rail in the Pacific Northwest. The team also interviewed representatives of the Port of Seattle, Union Pacific Railroad, Seattle Public Utilities, as well as a private sector rail expert.

Research Documents

Appendix E, Solid Waste by Rail in the Pacific Northwest (SPU Facilities Master Plan 2003)

The data for this document (2000) demonstrates that the Argo Yard operation was transferring over 800,000 tons of waste for delivery to the Columbia Ridge Landfill. The city's share, 63% of that volume, was delivered by a dedicated unit train five days per week. The remaining waste, 37%, was from five Washington counties: King, Whatcom, Snohomish, Island and San Juan.

The Burlington Northern/Santa Fe Railroad was transferring and delivering over 1.168 million tons of waste to the Roosevelt Regional Landfill in 2000.

This document also described the (then) future closure of the Port Angeles Landfill (2004) and the King County Cedar Hills Landfill (2012). It forecasts the transfer of over 3 million tons of waste through Seattle beginning in 2012.

Appendix F, Property Search for Intermodal Solid Waste Transfer Sites, (SPU Facilities Master Plan 2003)

W&H Pacific conducted a transfer station property search for SPU in 2002. This search supported the city's Solid Waste Facilities Master Plan. The research conducted as part of this process included important information about the capacity and operation of the Argo Yard. Specific, direct explanations in Appendix F include:

Rail Service

The current mode of long-haul transport of waste to a landfill is by train. The City of Seattle has a contract with Washington Waste Systems, Inc. (dba Waste Management Incorporated) for the transportation and disposal of city waste. In turn, Washington Waste Systems has a contract with Union Pacific Railroad Company to use the Argo rail yard to load intermodal containers of waste onto the train for transport to the Columbia Ridge Landfill located in north central Oregon. The contract term is through March 31, 2028 with an option to terminate on March 31, 2008, March 31 2010, or March 31, 2011.

Argo Compactor Capacity

There is no space available at the Argo yard to install a waste compactor to consolidate waste into intermodal containers; therefore, waste must be compacted into intermodal containers at off-site locations. This situation requires that the two city and two private transfer stations each have the ability to compact waste into intermodal containers and haul the containers to the Argo yard. Container loads are limited to road weight limits when transporting waste to Argo yard. Also, valuable space is taken up at the current transfer stations in order to load intermodal containers.

Argo Site Capacity

There is no assurance that Argo yard will have the capacity or that Union Pacific Railroad Company will have the desire to handle additional waste in the future. The Port of Seattle plans to increase international container shipping in the future, which will place a greater demand on the existing intermodal rail yards in Seattle. Also, the demand to ship more waste from King County and other counties is expected to increase in the future. King County plans to close the Cedar Hills Landfill by 2012,which will place over one million tons per year of waste on the market that will require long-haul to another landfill.

Although the city has a contract that is valid through March 31, 2028, which ensures the city a place to load containers onto a train, this activity limits the Port of Seattle's capacity to load other intermodal cargo by rail. Therefore, it may be in the city's long-term interest to develop a separate intermodal facility for handling solid waste in order to improve the cargo capacity of the city.

Argo Disposal Limitations

Argo yard is limited to the Union Pacific Railroad which limits disposal options to landfills accessible from that rail line. If the city decides to ship refuse in the future to a *landfill accessible by the Burlington Northern/Santa Fe (BNSF) rail line, it will probably be necessary to load the containers at another rail yard connected to the BNSF line.*

<u>Waste By Rail Shipped Through Seattle, Seattle Public Utilities, December 2006</u>

The SPU conducts an annual review of solid waste that is shipped by rail service through Seattle. This research includes waste that is transferred in Seattle, as well as waste that travels through the city (without transfer), for disposal at regional landfills in the Pacific Northwest. This information format was the basis for Appendix E (see above) of the city's 2003 Facilities Master Plan.

The data for this document (2005) demonstrates that the Argo Yard operation transferred over one millions tons of waste for delivery to the Columbia Ridge Landfill. That is a 25% increase in material volume through the yard since 2000 (versus over 800,000 tons of waste for delivery to the Columbia Ridge Landfill). The city's share of this transferred waste was approximately 50% in 2005, which is a decrease of 13% (versus 63% in 2000). King County's contribution increased to almost 31% (versus 21% in 2000). The remaining waste continues to flow from Whatcom, Snohomish, Island and San Juan Counties.

The Burlington Northern/Santa Fe Railroad transferred approximately 860,000 tons of waste in its Seattle rail yards for delivery to the Roosevelt Regional Landfill (RRL) in 2005. The BNSF also shipped approximately 760,000 tons of waste through Seattle (without transfer) to the RRL site. The total of transferred and delivered waste to RRL through Seattle in 2005 was approximately 1.620 million tons (versus 1.168 million tons of waste in 2000). That's an increase of approximately 39% (452,000 tons) since 2000.

The Union Pacific and BNSF railroads each ship six dedicated unit trains of waste to their respective disposal destinations, the Columbia Ridge Landfill in Arlington, Oregon and the Roosevelt Regional Landfill in Goldendale, Washington. These rail operations delivered a combined total of approximately 2.675 millions tons of waste in 2005, which is an increase of approximately 35% since 2000.

Summary Analysis

1. The volume of waste transferred through the Argo Yard has increased by 25% over five years.
2. The volume of Seattle waste as a percentage of the total Argo Yard transfer operation declined 13% over five years (2000 to 2005).
3. The total volume of Seattle waste transferred through the Argo Yard has remained relatively constant over five years (2000 to 2005). The volume of MSW has dropped and the volume of CDL has increased in that time.
4. The SPU has three option years to terminate its UP Argo Yard contract beginning in March 2008.
5. Argo Yard has no space for an on-site compaction operation and offers no assurance of long-term future capacity for waste transfer and delivery.

6. Waste volumes transferred and shipped through Seattle rail yards have increased 35% between 2000 and 2005.
7. The Cedar Hills Landfill is scheduled to close in 2012, which will increase the waste volumes transferred and delivered through Seattle to over 3 million tons per year.

References

1. *Appendix E, Solid Waste by Rail in the Pacific Northwest, SPU Solid Waste Facilities Master Plan, CH2M Hill, 2003.*

2. *Appendix F, Property Search for Intermodal Solid Waste Transfer Station Sites, SPU Solid Waste Facilities Master Plan, CH2M Hill, 2003.*

3. *Waste By Rail Shipped Through Seattle, SPU, by Henry Friedman, December 2006.*

4. *Teleconference with Kent Christopher, Port of Seattle, by Michael Sievers (URS) on December 6, 2006.*

5. *Teleconference with Charlie Balters, Union Pacific Railroad, by Michael Sievers (URS) on December 7, 2006.*

6. *Teleconference with Robert Wallace, WIH Resource Group, by Michael Sievers (URS) on January 22, 2007.*

7. *Teleconference with Henry Friedman, SPU, by Michael Sievers (URS) on January 23, 2007.*

Waste By Rail Shipped Through Seattle

By Henry Friedman, Seattle Public Utilities
henry.friedman@seattle.gov

Union Pacific Rail Line

Solid Waste Transferred at Argo Yard (Seattle) to Columbia Ridge Landfill in 2005		
Source	**Tons (US) per Year**	**Percent**
Seattle Municipal Solid Waste (MSW)[1]	440,663	41.7%
Seattle Construction, Demolition and Landclearing (CDL) Waste[2]	84,497	8.0%
King County (excluding Seattle MSW & C&D)[3]	409,539	30.8%
Whatcom County[4]	85,178	8.1%
Snohomish County[4]	59,788	5.7%
Island County[4]	49,476	4.7%
San Juan County[4]	11,645	1.1%
TOTAL	**1,056,290**	**100%**

Burlington Northern/Santa Fe Rail Line

Solid Waste Transferred in Seattle Railyards to Roosevelt Landfill in 2005		
Source	**Tons (US) per Year**	**Percent**
Seattle Construction, Demolition and Landclearing (CDL) Waste[2]	68,963	8.0%
King County (excluding Seattle)[5]	758,761	88.3%
Alaska (shipped by Alaska Marine Lines)[6]	31,545	3.7%
Total tons loaded in Seattle Railyards	**859,269**	**100.0**
Solid Waste Loaded North of Seattle Passing Through to Roosevelt Landfill in 2005		
Snohomish County[4] (Originates in Everett)	477,806	62.9%
Skagit County[4]	96,923	12.8%
Whatcom County[4]	83,349	11.0%
Island County[4]	7,110	0.9%
British Columbia (Surrey, Vancouver, Powell River, Abbotsford)[6]	94,730	12.5%
Total tons Loaded North of Seattle	**759,918**	**100%**
Total Solid Waste Tons Through Seattle on BNSF	**1,619,187**	

[1]Data Source: Seattle Public Utilities, Garbage Report 2005
http://www.seattle.gov/util/About_SPU/Garbage_System/Reports/Garbage_Reports/index.asp

[2]Data Source: Seattle Public Utilities 2005 CDL Report
http://www.seattle.gov/util/About_SPU/Garbage_System/Reports/CDL_Reports/index.asp

[3]Total quantity of solid waste received at Columbia Ridge Landfill from King County minus the City of Seattle MSW & CDL tonnage. Data source: Washington Department of Ecology Waste Disposal by County Spreadsheet 2005 and data from City of Seattle reference 1 & 2.
http://www.ecy.wa.gov/programs/swfa/solidwastedata/recycle/CountyTotals05.xls

[4]Data Source: Washington Department of Ecology waste disposal by county spreadsheet. Year 2005 summary.
http://www.ecy.wa.gov/programs/swfa/solidwastedata/recycle/CountyTotals05.xls

[5]Total quantity of solid waste received at Roosevelt Landfill from King County minus the City of Seattle MSW & CDL tonnage. Data source: Washington Department of Ecology Waste Disposal by County Spreadsheet 2005 and data from City of Seattle reference 1 & 2.

[6]Data Source: *Solid Waste in Washington State-Fourteenth Annual Status Report*, December 2005; page 107, Map B, 2004 Solid Waste to Roosevelt Regional Landfill.
http://www.ecy.wa.gov/biblio/0507046.html

Develop Private Facility for Intermodal Waste Transfer and Waste Processing (#207)

Description

The City of Seattle (City) would solicit bids for the design, build, operate, and ownership (DBOO) of an intermodal/waste processing facility. The principal reasons for privatizing are to bring in private sector investment and improve operational efficiency.

Background

Currently, nonrecyclable wastes delivered to the North Recycling and Disposal Station (NRDS) and the South Recycling and Disposal Station (SRDS) are compacted into intermodal containers. The containers are truck-hauled to the Union Pacific Railroad's Argo Rail Yard where they are loaded onto trains and sent to Waste Management's Columbia Ridge Landfill in Gilliam County, Oregon for final disposal. Green wastes are received separately from solid waste at each transfer station, are not commingled with solid waste, and are truck-hauled to Cedar Grove for composting.

The Argo Rail Yard and the Columbia Ridge Landfill are both owned and operated by private companies. The City of Seattle has a contract with Washington Waste Systems, Inc. (dba Waste Management Inc.) to transport and dispose of the City's solid waste. In turn, Washington

Waste Systems has a contract with the Union Pacific Railroad to use the Argo Rail Yard to load intermodal containers of waste onto the train for transport to the Columbia Ridge Landfill. The contract term is through March 31, 2028 with an option to terminate on March 31, 2008, March 31, 2010, or March 31, 2011 (COS).

Although this shipping arrangement has worked well, it may not be the best option for the long-term future. Beyond the term of the existing transportation and disposal contract, there are no long-term plans for waste shipping and disposal. Although the transportation and disposal contract could be re-negotiated or re-bid after the expiration date, a renewal would leave the City with many of the limitations currently in place. These limitations include the following:

- There is no space available at the Argo Rail Yard to install a waste compactor to consolidate waste into intermodal containers; therefore, waste must be compacted into intermodal containers at off-site locations. This situation requires that the two City and two private transfer stations each have the ability to compact waste into intermodal containers and haul the containers to the Argo Rail Yard. Container loads are limited to road weight limits when transporting waste to the Argo Rail Yard. Also, valuable space is taken up at the current transfer stations in order to load intermodal containers.

- There is no assurance that the Argo Rail Yard will have the capacity or that the Union Pacific will have the desire to handle waste after 2028. The Port of Seattle plans to increase international container shipping in the future, which will place a greater demand on the existing intermodal rail yards in Seattle. Also, the demand to ship more waste from King County and other jurisdictions is expected to increase in the future. As of early 2007, King County planned to close its Cedar Hills Regional Landfill by some time after 2015. This would place over one million tons per year of waste, requiring long-haul to another landfill, "on the market". Although the City has a valid contract through March 31, 2028 that ensures the City a place to load containers onto a train, this activity limits the ability of the Port of Seattle and others to have their intermodal cargo loaded onto rail cars at the Argo Yard. Therefore, it may be in the City's long-term interest to develop a separate intermodal facility for handling solid waste in order to improve the cargo capacity of the City.
- The Argo Rail Yard is owned/operated by the Union Pacific Railroad, which limits disposal options to landfills accessible from that rail line. If the City decides to ship refuse in the future to a landfill accessible by the Burlington Northern Santa Fe (BNSF) rail line, it will probably be necessary to load the containers at another rail yard connected to the BNSF line. (COS)

The development of a new intermodal/waste processing facility to handle more waste would allow the City to coordinate the transfer of wastes using a combination of transportation modes (truck, rail, and barge) to ensure that the City has the ability to transfer solid waste out of the City. The City has performed an Environmental Impact Statement on four alternative sites. After evaluating costs, rail access, flexibility, and other factors, the City determined that the most suitable site was a property between South Corgiat Drive and Airport Way South, south of South Albro Street.

The City can either solicit bids for the design and construction or privatize the entire intermodal/waste processing facility by soliciting bids for the design, build, operate, and ownership (DBOO) of the new facility. The DBOO privatization is addressed in this analysis.

In 2006, RW Beck prepared a report that presented the pros and cons of a design, build, and operate (DBO) contract for the City's intermodal/waste processing facility. Their findings are summarized in Table 1.

In addition to the RW Beck report, King County Solid Waste Division (KCSWD) also looked at privatizing the ownership and operation of their future intermodal facility, which will eventually have to be constructed once they move toward waste export when the Cedar Hills Regional Landfill is final closed. Their findings are summarized in Table 2.

Table 1. RW Beck Assessment of a DBO contract for the Intermodal/Waste Processing Facility

	Design, Build, and Operate
Likely Contracting Team	Likely led and operated by waste management firm with designer and constructor in subcontractor roles.
	Rail loading/staging could be by subcontract.
Pros	Potentially saves about $6.6 M based on base case assumptions ($5.4 M to $8.2M depending on assumptions).[1]
	Single point of responsibility for design, construction, and operation.
	Cost certainty for operations in addition to design and construction.
	Highest potential for design innovation.
	Operational efficiency due to integration of design and operations.
	Better assurance of quality of equipment and materials relative to a design-build (DB) because contractor has long-term operating responsibility.
	More certainty of funding of ongoing maintenance relative to DB and general contractor/construction manager (GC/CM).
	Long-term operating control gives greater assurance relative to DB that off-site impacts will be appropriately managed during construction.
Cons	Failure or delay in securing site by SPU. Could be mitigated by timing DBO procurement to start once there is a reasonable assurance that SPU can secure a site. Potentially initiate RFQ/RFI phase earlier and ask how willing potential DBO contractors would be to procure site if needed. Other measures to mitigate risk could include writing contract with SPU delay option.
	Some risk of union issues with respect to waste compaction operations as traditional work.
	Depending on contractor selected for DBO and on the contractor selected for long-haul and disposal, this delivery method could lead to more vertical integration within SPU's overall collection, transfer, and disposal system. Mitigate risk of long-term impacts by having shorter term contract with extension options allowing SPU to "rebid" if needed to maintain competition.
	Change in DBO firm ownership. Could be mitigated by selection process that considers firm stability and by including contract terms that provide SPU with leverage and options in the event of a change in ownership.

1 Net present value life cycle costs including SPU internal costs.

Source: Project Delivery Study for Solid Waste Facility Improvements, Seattle Public Utilities, RW Beck, May 2006.

Table 2. KCSWD Assessment of a Private Ownership and Operation contract for the Intermodal/Waste Processing Facility

	Private Ownership and Operation
Pros	The County would avoid upfront capital costs of developing intermodal facility(ies). Those costs would, however, be reflected in the cost of service to rate payers.
	The County would not be responsible for the siting of intermodal facility(ies). (Note: In the case of SPU, this is not true, as the Corgiat site has already been selected.)
	The County could expect the cost-competitive bundling of services between the intermodal facility(ies) operation and long-haul and disposal to drive down costs to the lowest possible level.
	If operation of the intermodal facility(ies) is bundled with long-haul responsibility, the County could require the operating contractor to provide backup transportation and reserve containers in the event of a rail system disruption.
	The County would not have the responsibility for facility(ies) maintenance.
	The County would avoid having to interface directly with the serving railroad.
Cons	The County would lack the guaranteed intermodal capacity under its exclusive control and could find itself without such service or access to the rail system in the future.
	The County would have much less flexibility to coordinate all elements of the solid waste system and would need to rely on contract terms to ensure that its interests and waste export needs are addressed.
	The County would very likely enable a single, vertically integrated company to handle all aspects of waste export and disposal, which could work against the County's long-term interests by discouraging future competition in the region.

Source: Preliminary Transfer & Waste Export Facility Recommendations and Estimated System Costs, Rate Impacts & Financial Policy Assumptions, Fourth Milestone Report, KCSWD, February 2006.

The DBOO contracting method generally involves one contract, between the Owner (SPU) and the waste management firm. The Owner may have on his project team a design engineer. The design engineer will assist the Owner in developing the basis of design, conceptual engineering drawings, and performance specifications, which are used to define the Owner’s project requirements. The design engineer also assists in developing the request for qualifications (RFQ) and request for proposals (RFP). The RFQ is a tool for the Owner to pre-qualify firms that will bid on the RFP.

Once the RFP is made public, pre-qualified DBOO firms (typically led by waste management firms) will develop and submit a proposal to meet the Owner’s requirements. Upon award of contract, the waste management firm acts as the prime contractor in procuring all the design and construction activities. These activities are closely performed and most importantly include the considerations of the party (usually the waste management firm) that will be operating the facility. The DBOO firm is responsible for the cradle-to-grave development of the facility, including all capital and operational costs of the facility. The DBOO firm has a special interest in minimizing delays and ensuring operations is on schedule, so that they can start generating revenue to offset their debt. Once the construction of the facility is completed, the DBOO firm is responsible for operating the facility in accordance with the terms of service at the service fees established in the DBOO proposal. The terms of service and service fees must be reasonable and competitive to entice DBOO firms to submit proposals.

The DBOO approach of developing facilities has been successful in both water and wastewater projects as well as in solid waste management projects. The RFQ, RFP, and the contract between the Owner and the DBOO firm must be carefully written to protect the Owner and to offer provisions for the Owner to enforce standards for facility maintenance, equipment maintenance, and level of service; and to conduct inspections to ensure acceptable operational practices.

Materials Involved

All waste materials.

Implementation Timeframe

Implementation: 2020 **Ramp Period:** Short

Expected Participation and Efficiency

Participation: High

Efficiency:High

Diversion Potential

Diversion Potential: This option alone will not cause the diversion of any waste type.

Cost

Capital costs for this option would be negligible since no new facilities would be required of the City to privatize the design, build, operate, and ownership of the intermodal/waste processing facility. The DBOO firm would be responsible for the funding required to design, construct, operate, and maintain the facility.

If a design engineer is used by the Owner to develop the RFQ and RFP, the costs is assumed to be offset by what would be required if a traditional contracting method were used.

Annual costs for inspections by the City would be required, but none of these costs can be considered additional costs if compared with a traditional contracting method.

Fixed Cost	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
O&M	$0	$173,900	$173,900*	$173,900*	$73,600*	$73,600*
Capital 10 Yr.	$0	$0	$0	$0	$0	$0
Capital 25 Yr.	$0	$0	$0	$0	$0	$0

* O&M costs escalate at 80% of CPI

Variable Cost	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Per Ton	$0	$0	$0	$0	$0	$0

SPU Cost: up to ~$200,000 per year Risk: Low

Ratepayer Cost: $0

Consumer Cost: $0

Action Feasibility

The King County report (KCSWD, 2006) stated the following:

A private-only system where the public sector is not involved in service delivery, rate settingor long term planning, is not allowed under current state law (RCW 70.95.020), or county policy. A privatized system would involve contracting out work that has historically been done by the public sector, and faces significant legal obstacles. Courts have found where public employees have customarily and historically performed a service, civil service principles require that civil servants provide the service when new need arises, unless they are unable to provide the service (Joint Crafts Council and Teamsters Union Local 117 v. King County, 76 Wn. App. 18; 881 P.2d 1059 (1994)).

The issue is not whether employees are unionized or not -- it is whether they are civil service or private sector employees. Both public and private sector solid waste employees in King County are unionized and are represented by the Teamsters union. Even if it were less expensive, potential cost savings from the use of private entities was not found to be sufficient reason for civil servants not to provide the service. In a MWSMAC meeting attended by the haulers on December 19, 2005, all haulers agreed that if required to use the same standards for siting and construction of facilities as King County, there would be no significant difference in costs.

Washington State collective bargaining law, RCW 41.56. generally requires that an employer bargain over the contracting out of bargaining unit work. Whether the *employer has to bargain over the decision to contract out is determined by a balancing test between the core entrepreneurial interest of the employer and the interest of the employees. Even where an employer is not required to bargain over the decision to contract out, the employer is still required to bargain with the union over the effects of contracting out (International Longshoremen's and Warehousemen's Union, Local 9 v. Port of Seattle, Decision 1989 – PERB (1995)).*

Privatization might be considered analogous to a scenario of going out of business, in which case contracting out could be permissible. To justify this action, the county would have to show cause for removing itself from the transfer business. Whether or not King County operates transfer stations, it still maintains planning authority for solid waste under state law and the interlocal agreements, and cannot be considered "out of the business."

A decision by policy makers regarding the issue discussed above directly affects the feasibility of this option.

Risk of Not Achieving Results within Timeframe

Low

Pros and Cons

A consolidated pros and cons list, including applicable pros and cons from Tables 1 and 2, is included in Table 3.

Table 3. Pros and Cons for Option #207: Develop Private Facility For Intermodal Waste Transfer And Waste Processing

Pros	Single point of responsibility for design, construction, and operation.
	Cost certainty for operations in addition to design and construction.
	Highest potential for design innovation.
	Operational efficiency due to integration of design and operations.
	Better assurance of quality of equipment and materials because contractor has long-term operating responsibility.
	More certainty of funding of ongoing maintenance, because DBOO firm may have more flexibility in acquiring funds than a government entity.
	Long-term operating control gives greater assurance that off-site impacts will be appropriately managed during construction.
	The City would avoid upfront capital costs of developing the intermodal facility. Those costs would, however, be reflected in the cost of service to rate payers.
	The City would avoid costs for equipment, waste handling, and transportation.

	The City could expect the cost-competitive bundling of services between the intermodal facility operation and long-haul and disposal to drive down costs to the lowest possible level.
	If operation of the intermodal facility is bundled with long-haul responsibility, the City could require the operating contractor to provide backup transportation and reserve containers in the event of a rail system disruption.
	The City would not have the responsibility for facility and equipment maintenance.
	The City would avoid having to interface directly with the serving railroad.
	Operating contractor has a special interest to increase operational efficiency in order to achieve a higher profit margin. Private firms can more easily increase efficiency because they have more management flexibility to hire qualified staff, pay staff according to their performance, terminate unsatisfactory workers, adjust hours to service demand. The private firm is less restricted by bureaucracy in obtaining spare parts for repairs and leasing equipment when they are needed. Operational and maintenance activities can be inspected by the City (if included in the contract) to ensure project requirements are met.
Cons	Some risk of union issues with respect to waste compaction operations as traditional work.
	Depending on contractor selected for DBOO and on the contractor selected for long-haul and disposal, this delivery method could lead to more vertical integration within SPU's overall collection, transfer, and disposal system. Mitigate risk of long-term impacts by having shorter term contract with extension options allowing SPU to "rebid" if needed to maintain competition.
	Change in DBOO firm ownership. Could be mitigated by selection process that considers firm stability and by including contract terms that provide SPU with leverage and options in the event of a change in ownership.
	The City could lack the guaranteed intermodal capacity under its exclusive control and could find itself without such service or access to the rail system in the future.
	The City could have much less flexibility to coordinate all elements of the solid waste system and would need to rely on contract terms to ensure that its interests and waste export needs are addressed.
	The City would very likely enable a single, vertically integrated company to handle all aspects of waste export and disposal, which could work against the City's long-term interests by discouraging future competition in the region.
	If the contract is not drafted to allow for oversight by the City, the ratepayers may be penalized in excess fees by a DBOO firm interested in turning a higher profit.
	Potential improper disposal of unacceptable wastes.

Assumptions

- Program management and educational labor demands on the City will be reduced to one inspector starting in Year 4 of the program. The initial 3 years of the program will demand more City time for planning, implementing, and evaluating the program.

- All capital costs will be incurred by private contractor.

References

Guidance Pack, Private Sector Participation in Municipal Solid Waste Management. Cointreau-Levine, Sandra. 2000.

COS. Appendix F, Property Search for Intermodal Solid Waste Transfer Station Sites. City of Seattle. Date Unknown.

KCSWD, 2006. Preliminary Transfer & Waste Export Facility Recommendations and Estimated System Costs, Rate Impacts & Financial Policy Assumptions, Fourth Milestone Report, KCSWD, February 2006.

RW Beck, 2002. Alternative Project Delivery, Texas Water Development Board. RW Beck, January 2002.

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Appendix E

Facility Queuing Comparison

Option Results from Facility Plan Cost Model

Total Planning Level Net Present Value Cost Comparison of Facility Options

Facility Queuing Comparison

SPU SOLID WASTE FACILITY MASTER PLAN - SYSTEM OPTIONS COMPARISON - 95% PEAK TRAFFIC OBSERVATIONS																						
			Inbound Scales				Outbound Scales					Tipping building size (sf)				Traditional	Tipping Stalls					
Option	Facility		Number	Maximum queue length (ft)	Maximum queue time (min)	On-site queue space (ft)	Number	Maximum queue length (ft)	Maximum queue time (min)	On-site queue space (ft)	Scale Houses (number)	Garbage/ Organics	CT/MRF	Total	Waste Storage Area	Recycling/ Reuse Unloading Stalls	Self-Haul CDL	Self-Haul Garbage	Collected Garbage	Self-Haul Organics	Collected Organics	Total Tipping Stalls
16.1	**NRDS**	Criteria	1	900	30	900	2	514	30	1,028	3	52,200	0	52,200	8,780	11	2	16	0	4	0	22
		Provided	1	593	20	500	2	0	0	800	3	52,200	0	52,200	8,910	11	2	16	0	4	0	22
	SRDS	Criteria	1	900	30	900	2	514	30	1,028	2	50,040	43,170	93,210	7,190	9	7	10	0	3	0	20
		Provided	1	153	5	900	2	0	0	1,100	2	50,040	43,170	93,210	45,000	9	7	10	0	3	0	20
	Intermodal	Criteria	1	300	5	300	1	300	5	300	1	57,000	0	57,000	22,937	0	0	0	7	0	2	9
		Provided	1	0	0	300	1	0	0	300	1	57,000	0	57,000	22,725	0	0	0	12	0	3	15
16.4	**NRDS**	Criteria	1	900	30	900	2	514	30	1,028	3	35,445	0	35,445	3,677	3	1	7	0	5	0	13
		Provided	1	0	0	500	2	0	4	800	3	35,445	0	35,445	9,750	3	1	7	0	5	0	13
	SRDS	Criteria	1	900	30	900	2	514	30	1,028	2	35,445	32,670	68,115	4,925	3	5	5	0	3	0	13
		Provided	1	553	19	900	2	0	0	1,100	2	35,445	32,670	68,115	29,250	3	5	5	0	3	0	13
	Intermodal	Criteria	1	300	5	300	1	300	5	300	1	51,000	0	51,000	19,005	0	0	0	7	0	3	10
		Provided	1	0	0	300	1	0	0	300	1	51,000	0	51,000	19,695	0	0	0	9	0	4	13
17.4	**NRDS**	Criteria	1	900	30	900	2	514	30	1,028	3	35,445	0	35,445	3,677	3	1	7	0	5	0	13
		Provided	1	0	0	500	2	0	4	800	3	35,445	0	35,445	9,750	3	1	7	0	5	0	13
	SRDS	Criteria	1	900	30	900	2	514	30	1,028	2	35,445	32,670	68,115	4,925	3	5	5	0	3	0	13
		Provided	1	553	19	900	2	0	0	1,100	2	35,445	32,670	68,115	29,250	3	5	5	0	3	0	13
18.1	**NRDS**	Criteria	2	900	30	1,800	2	514	30	1,028	4	60,345	0	60,345	13,946	11	2	15	2	3	1	23
		Provided	2	0	0	800	2	53	3	500	4	60,345	0	60,345	17,250	11	2	15	2	3	1	23
	SRDS	Criteria	2	900	30	1,800	2	514	30	1,028	3	56,295	47,670	103,965	16,313	9	7	8	4	3	1	23
		Provided	2	0	0	900	2	122	7	1,100	3	56,295	47,670	103,965	51,750	9	7	8	4	3	1	23
18.2	**NRDS**	Criteria	1	900	30	900	2	514	30	1,028	3	60,345	0	60,345	13,511	9	2	15	2	3	1	23
		Provided	1	870	29	600	2	13	1	500	3	60,345	0	60,345	17,250	9	2	15	2	3	1	23
	SRDS	Criteria	1	900	30	900	2	514	30	1,028	2	56,295	47,670	103,965	15,242	9	7	8	4	3	1	23
		Provided	1	786	26	900	2	22	1	1,100	2	56,295	47,670	103,965	51,750	9	7	8	4	3	1	23
18.3	**NRDS**	Criteria	1	900	30	900	2	514	30	1,028	3	60,345	0	60,345	13,438	9	2	15	2	3	1	23
		Provided	1	812	27	600	2	7	1	500	3	60,345	0	60,345	17,250	9	2	15	2	3	1	23
	SRDS	Criteria	1	900	30	900	2	514	30	1,028	2	56,295	47,670	103,965	15,171	9	7	8	4	3	1	23
		Provided	1	728	24	900	3	16	1	1,100	2	56,295	47,670	103,965	51,750	9	7	8	4	3	1	23
18.4	**NRDS**	Criteria	1	900	30	900	2	514	30	1,028	3	41,850	0	41,850	11,645	3	1	6	2	3	1	13
		Provided	1	0	0	600	2	0	0	500	3	41,850	0	41,850	11,760	3	1	7	2	3	1	14
	SRDS	Criteria	1	900	30	900	2	514	30	550	2	42,180	33,105	75,285	13,100	3	4	3	4	3	1	15
		Provided	1	0		900	2	0		1,100	2	42,180	33,105	75,285	33,750	3	4	3	4	3	1	15
19.4	**NRDS**	Criteria	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
		Provided	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
	SRDS	Criteria	2	900	30	1,800	3	514	30	1,542	4	71,520	50,370	121,890	25,056	3	7	5	5	5	2	24
		Provided	2	0	0	1,800	3	144	8	1,650	4	71,520	50,370	121,890	63,000	3	8	6	6	6	2	28
20.4	**NRDS**	Criteria	2	900	30	1,800	3	514	30	1,542	5	70,215	48,090	118,305	24,999	3	8	6	5	6	2	27
		Provided	2	0	0	560	3	125	7	700	5	70,215	48,090	118,305	60,750	3	8	6	5	6	2	27
	SRDS	Criteria	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
		Provided	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
21.4	**NRDS**	Criteria	1	900	30	900	2	514	30	1,028	3	37,530	37,755	75,285	9,145	3	4	4	2	3	1	14
		Provided	1	0	0	900	2	0	0	550	3	37,530	37,755	75,285	33,750	3	4	5	2	3	1	15
	SRDS	Criteria	1	900	30	900	2	514	30	1,028	2	49,200	0	49,200	15,557	3	1	7	4	3	1	16
		Provided	1	38	1	900	2	0	0	1,100	2	49,200	0	49,200	15,600	3	1	7	4	3	1	16

Highlighted cells indicate situations where the provided feature fails to meet what is required by the design criteria based on conceptual layouts. These situations may be improved with further layout desig

Option Results

Table 2	**Scenario**		**Scenario**		**Scenario**		**Option**		**Option**		**Option**		**Option**		**Option**		**Option**		**Option**	
	16.1		**16.4**		**18.1**		**18.4**		**17.4**		**18.2**		**18.3**	**Base**	**19.4**	**Base**	**20.4**	**Base**	**21.4**	**Base**
Optimize Facilities	**2006**	**2038**	**2006**	**2038**	**2006**	**2038**	**2006**	**2038**	**2006**	**2038**	**2006**	**2017**	**2006**	**2038**	**2006**	**2038**	**2006**	**2038**	**2006**	**2038**
Tonnage																				
Recycling Rate																				
Residential	55%	66%	55%	70%	55%	66%	55%	70%	55%	70%	55%	63%	55%	66%	55%	70%	55%	70%	55%	70%
Commercial	48%	70%	48%	75%	48%	70%	48%	75%	48%	75%	48%	67%	48%	70%	48%	75%	48%	75%	48%	75%
Self-Haul Net of YW	7%	22%	7%	22%	7%	22%	7%	15%	7%	22%	7%	22%	7%	22%	7%	15%	7%	15%	7%	15%
Tonnage Growth Rate																				
Residential	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%
Commercial	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%
Self-Haul Net of YW	1.3%	1.3%	0.9%	0.9%	1.3%	1.3%	0.9%	0.9%	0.9%	0.9%	1.3%	1.3%	1.2%	1.2%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
Peak Tonnage Factor																				
Self-Haul Garbage	1.21		1.21		1.21		1.21		1.21		1.21		1.21		1.21		1.21		1.21	
All other Garbage	1.09		1.09		1.09		1.09		1.09		1.09		1.09		1.09		1.09		1.09	
Organics/Yard Waste	1.49		1.49		1.49		1.49		1.49		1.49		1.49		1.49		1.49		1.49	
NTS																				
Construction Cost (net of Recycle)	$38,624,000		$26,646,000		$38,323,000		$29,160,000		$26,646,000		$38,133,000		$38,133,000		$1,747,000		$53,310,000		$33,451,000	
Construction Year	2008		2008		2007		2007		2007		2007		2007		2007		2007			
1st Year Operation post Construction	2012		2012		2011		2011		2011		2011		2011		2011		2011		2011	
FTEs 5th Year Operation	22.3		14.2		23.2		19.2		14.2		23.2		23.2		0.0		38.6		19.2	
Recycling FTEs 5th Yr	3.4		3.4		3.4		3.4		3.4		3.4		3.4		3.4		24.5		24.5	
Facility NPV	$81,562,817		$63,994,078		$98,896,762		$83,187,327		$63,545,937		$98,393,998		$98,334,161		$1,510,462		$169,761,324		$159,199,899	
NPV dollars per ton	$43.88		$35.98		$24.79		$21.78		$35.72		$24.46		$24.48		$2.11		$19.93		$41.68	
Annual Tonnage	143,767	69,948	143,181	62,600	193,872	199,958	193,287	188,332	143,181	62,600	193,797	170,716	193,758	202,324	193,287	0	193,287	494,497	193,287	188,332
Levelized Annual Facility Cost	$4,000,380		$3,138,693		$4,850,552		$4,080,057		$3,116,713		$4,825,893		$4,822,958		$74,083		$8,326,219		$7,808,217	
STS																				
Construction Cost (net of Recycle)	$42,860,000		$37,687,000		$44,963,000		$40,406,000		$37,687,000		$44,788,000		$44,788,000		$50,916,000		$9,075,000		$36,205,000	
Construction Year	2007		2007		2006		2006		2006		2006		2006		2006		2006		2006	
1st Year Operation post Construction	2011		2011		2010		2010		2010		2010		2010		2010		2010		2010	
FTEs 5th Year Operation	26.3		22.2		29.9		25.9		23.1		29.9		29.9		33.0		0.0		25.9	
Recycling FTEs 5th Yr	13.9		13.9		13.9		13.9		13.9		13.9		13.9		13.9		4.8		4.8	
Facility NPV	$149,744,752		$137,056,812		$172,922,679		$159,670,883		$144,068,036		$165,663,860		$171,846,959		$197,244,229		$57,620,545		$141,865,497	
NPV dollars per ton	$70.68		$67.51		$30.66		$29.82		$70.96		$29.20		$30.33		$21.69		$45.46		$26.49	
Annual Tonnage	175,143	76,917	174,557	68,753	285,376	285,587	284,790	262,184	174,557	68,753	285,301	246,704	285,262	287,952	284,790	494,497	284,790	0	284,790	262,184
Levelized Annual Facility Cost	$7,344,474		$6,722,173		$8,481,273		$7,831,317		$7,066,050		$8,125,252		$8,428,512		$9,674,162		$2,826,093		$6,958,023	
IMF																				
Construction Cost	$61,630,000		$59,821,000		$0		$0		$0		$0		$0		$0		$0		$0	
Construction Year	2007		2007		2007		2007		2007		2007		2007		2007		2007		2007	
1st Year Operation post Construction	2011		2011		2011		2011		2011		2011		2011		2011		2011		2011	
FTEs 5th Year Operation	24.8		24.8		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Facility NPV	$119,924,581		$120,310,405		$0		$0		$15,717,387		$0		$0		$0		$0		$0	
NPV dollars per ton	$7.58		$7.76		$0.00		$0.00		$7.07		$0.00		$0.00		$0.00		$0.00		$0.00	
Annual Tonnage	0	1,002,619	0	968,026	0	0	0	0	0	123,055	0	0	0	0	0	0	0	0	0	0
Levelized Annual Facility Cost	$5,881,895		$5,900,818		$0		$0		$770,885		$0		$0		$0		$0		$0	
All Facilities																				
Construction Cost (net of Recycle)	$143,114,000		$124,154,000		$83,286,000		$69,566,000		$64,333,000		$82,921,000		$82,921,000		$52,663,000		$62,385,000		$69,656,000	
FTEs 5th Year Operation	73.3		61.3		53.1		45.0		37.4		53.1		53.1		33.0		38.6		45.0	
Recycling FTEs 5th Yr	17.3		17.3		17.3		17.3		17.3		17.3		17.3		17.3		29.3		29.3	
Facility NPV	$351,232,149		$321,361,294		$271,819,441		$242,858,210		$223,331,359		$264,057,858		$270,181,120		$198,754,692		$227,381,869		$301,065,396	
NPV dollars per ton	$31.67		$29.85		$24.52		$22.56		$20.74		$23.49		$24.06		$18.46		$21.12		$27.96	
Annual Tonnage	318,909	1,149,485	317,739	1,099,379	479,248	485,545	478,077	450,516	317,739	254,408	479,098	417,420	479,020	490,276	478,077	494,497	478,077	494,497	478,077	450,516
Levelized Annual Facility Cost	17,226,749		15,761,685		13,331,824		11,911,374		10,953,648		12,951,145		13,251,470		9,748,245		11,152,312		14,766,240	
Full Facilities & Contract Costs																				
Scenario NPV	$813,898,057		$886,512,714		$803,672,970		$883,375,424		$921,592,340		$803,000,199		$823,849,723		$829,361,725		$858,387,108		$920,982,818	
NPV dollars per ton	$73.39		$82.34		$72.49		$82.04		$85.59		$71.43		$73.37		$77.03		$79.72		$88.39	
Annual Tonnage	504,348	1,207,002	503,177	1,156,943	504,348	573,968	503,177	552,291	503,177	657,402	504,198	494,373	504,120	586,819	503,177	552,061	503,177	552,061	503,177	552,291
Levelized Annual Facility Cost	39,918,947		43,480,451		$39,417,441		$43,326,577		$45,200,988		$39,384,444		40,407,043		40,677,388		42,100,985		46,675,835	

	Option 16.4	Option 18.1	Option 18.4	Option 17.4	Option 18.2	Option 18.3	Option 19.4	Option 20.4	Option 20.4
NPV Differences from Option 16.1	$72,614,657	-$10,225,086	$69,477,367	$107,694,283	-$10,897,858	$9,951,667	$15,463,669	$44,489,051	$107,084,762
Levelized Cost Diff from Option 16.1	$3,561,503	-$501,506	$3,407,630	$5,282,040	-$534,503	$488,096	$758,441	$2,182,038	$6,756,888

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COST COMPARISON OF FACILITY OPTIONS

Total NPV Costs by Component	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Scale	$ 27,202,185	$ 15,897,502	$ 20,619,180	$ 19,315,532	$ 19,264,094	$ 11,956,438	$ 11,791,508	$ 7,830,472	$ 9,128,612	$ 11,956,438
Waste Compaction	$ 38,067,167	$ 38,067,167	$ 30,144,125	$ 30,144,125	$ 30,144,125	$ 30,144,125	$ 18,652,619	$ 19,901,253	$ 18,841,772	$ 30,144,125
Hauling	$ 19,057,077	$ 20,590,030	$ 32,350,566	$ 32,829,534	$ 32,824,806	$ 33,515,405	$ 22,365,133	$ 33,945,860	$ 42,193,755	$ 33,515,405
Rail Loading	$ 14,354,700	$ 14,354,700	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Recycling Construct and O&M	$ 75,845,033	$ 70,770,627	$ 79,569,495	$ 72,988,591	$ 79,171,690	$ 72,821,682	$ 70,990,320	$ 56,993,454	$ 69,877,603	$ 82,436,108
General Facility	$ 38,294,662	$ 37,528,724	$ 26,960,779	$ 26,892,698	$ 26,889,027	$ 26,671,374	$ 26,032,212	$ 19,248,271	$ 18,520,523	$ 26,671,374
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ 110,785,225	$ 96,526,445	$ 54,549,196	$ 54,261,277	$ 54,261,277	$ 40,123,086	$ 51,501,108	$ 33,209,281	$ 41,193,503	$ 56,688,957
Existing Facility	$ 27,626,100	$ 27,626,100	$ 27,626,100	$ 27,626,100	$ 27,626,100	$ 27,626,100	$ 21,998,459	$ 27,626,100	$ 27,626,100	$ 27,626,100
Argo	$ 4,794,107	$ 4,771,380	$ 20,394,395	$ 20,348,681	$ 20,325,007	$ 19,433,971	$ 18,795,523	$ 19,433,971	$ 19,433,971	$ 19,433,971
Disposal and Processing	$ 318,203,603	$ 308,827,898	$ 345,912,289	$ 349,623,957	$ 349,305,409	$ 339,913,936	$ 331,253,602	$ 339,913,936	$ 339,913,936	$ 339,913,936
Changes to Upstream Costs	$ 140,225,888	$ 252,971,272	$ 137,788,281	$ 139,480,584	$ 154,549,068	$ 250,761,230	$ 250,761,230	$ 253,105,075	$ 253,057,828	$ 250,761,230
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ 25,557,455	$ 25,571,334	$ 27,758,565	$ 29,489,120	$ 29,489,120	$ 30,408,077	$ 97,450,626	$ 18,154,052	$ 18,599,504	$ 30,408,077
Partner Revenue	$ (26,115,146)	$ (26,990,465)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ 813,898,057	$ 886,512,714	$ 803,672,970	$ 803,000,199	$ 823,849,723	$ 883,375,424	$ 921,592,340	$ 829,361,725	$ 858,387,108	$ 909,555,722
Levelized Annual Facility Cost	$ 39,918,947	$ 43,480,451	$ 39,417,441	$ 39,384,444	$ 40,407,043	$ 43,326,577	$ 45,200,988	$ 40,677,388	$ 42,100,985	$ 46,675,835

Comparison 16.1 - Others	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Scale	$ -	$ 11,304,683	$ 6,583,004	$ 7,886,653	$ 7,938,090	$ 15,245,747	$ 15,410,677	$ 19,371,713	$ 18,073,573	$ 15,245,747
Waste Compaction	$ -	$ -	$ 7,923,042	$ 7,923,042	$ 7,923,042	$ 7,923,042	$ 19,414,547	$ 18,165,914	$ 19,225,395	$ 7,923,042
Hauling	$ -	$ (1,532,952)	$ (13,293,489)	$ (13,772,457)	$ (13,767,729)	$ (14,458,328)	$ (3,308,056)	$ (14,888,782)	$ (23,136,678)	$ (14,458,328)
Rail Loading	$ -	$ -	$ 14,354,700	$ 14,354,700	$ 14,354,700	$ 14,354,700	$ 14,354,700	$ 14,354,700	$ 14,354,700	$ 14,354,700
Recycling Construct and O&M	$ -	$ 5,074,406	$ (3,724,462)	$ 2,856,441	$ (3,326,658)	$ 3,023,351	$ 4,854,713	$ 18,851,578	$ 5,967,429	$ (6,591,076)
General Facility	$ -	$ 765,938	$ 11,333,883	$ 11,401,964	$ 11,405,635	$ 11,623,288	$ 12,262,450	$ 19,046,391	$ 19,774,139	$ 11,623,288
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ -	$ 14,258,781	$ 56,236,029	$ 56,523,948	$ 56,523,948	$ 70,662,140	$ 59,284,117	$ 77,575,944	$ 69,591,722	$ 54,096,268
Existing Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,627,641	$ -	$ -	$ -
Argo	$ -	$ 22,727	$ (15,600,287)	$ (15,554,574)	$ (15,530,899)	$ (14,639,864)	$ (14,001,416)	$ (14,639,864)	$ (14,639,864)	$ (14,639,864)
Disposal and Processing	$ -	$ 9,375,705	$ (27,708,686)	$ (31,420,354)	$ (31,101,806)	$ (21,710,333)	$ (13,049,999)	$ (21,710,333)	$ (21,710,333)	$ (21,710,333)
Changes to Upstream Costs	$ -	$ (112,745,383)	$ 2,437,607	$ 745,305	$ (14,323,180)	$ (110,535,342)	$ (110,535,342)	$ (112,879,187)	$ (112,831,940)	$ (110,535,342)
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ -	$ (13,880)	$ (2,201,110)	$ (3,931,665)	$ (3,931,665)	$ (4,850,622)	$ (71,893,171)	$ 7,403,403	$ 6,957,951	$ (4,850,622)
Partner Revenue	$ -	$ 875,319	$ (26,115,146)	$ (26,115,146)	$ (26,115,146)	$ (26,115,146)	$ (26,115,146)	$ (26,115,146)	$ (26,115,146)	$ (26,115,146)
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ -	$ (72,614,657)	$ 10,225,086	$ 10,897,858	$ (9,951,667)	$ (69,477,367)	$ (107,694,283)	$ (15,463,669)	$ (44,489,051)	$ (95,657,665)
Levelized Annual Facility Cost	$ -	$ (3,561,503)	$ 501,506	$ 534,503	$ (488,096)	$ (3,407,630)	$ (5,282,040)	$ (758,441)	$ (2,182,038)	$ (6,756,888)

COST COMPARISON OF FACILITY OPTIONS

	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Comparison 16.4 - Others										
Scale	$ (11,304,683)	$ -	$ (4,721,678)	$ (3,418,030)	$ (3,366,592)	$ 3,941,064	$ 4,105,994	$ 8,067,030	$ 6,768,890	$ 3,941,064
Waste Compaction	$ -	$ -	$ 7,923,042	$ 7,923,042	$ 7,923,042	$ 7,923,042	$ 19,414,547	$ 18,165,914	$ 19,225,395	$ 7,923,042
Hauling	$ 1,532,952	$ -	$ (11,760,536)	$ (12,239,505)	$ (12,234,777)	$ (12,925,376)	$ (1,775,103)	$ (13,355,830)	$ (21,603,725)	$ (12,925,376)
Rail Loading	$ -	$ -	$ 14,354,700	$ 14,354,700	$ 14,354,700	$ 14,354,700	$ 14,354,700	$ 14,354,700	$ 14,354,700	$ 14,354,700
Recycling Construct and O&M	$ (5,074,406)	$ -	$ (8,798,868)	$ (2,217,965)	$ (8,401,063)	$ (2,051,055)	$ (219,693)	$ 13,777,173	$ 893,024	$ (11,665,481)
General Facility	$ (765,938)	$ -	$ 10,567,945	$ 10,636,026	$ 10,639,697	$ 10,857,350	$ 11,496,512	$ 18,280,453	$ 19,008,201	$ 10,857,350
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ (14,258,781)	$ -	$ 41,977,249	$ 42,265,168	$ 42,265,168	$ 56,403,359	$ 45,025,337	$ 63,317,163	$ 55,332,941	$ 39,837,488
Existing Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,627,641	$ -	$ -	$ -
Argo	$ (22,727)	$ -	$ (15,623,014)	$ (15,577,301)	$ (15,553,626)	$ (14,662,591)	$ (14,024,143)	$ (14,662,591)	$ (14,662,591)	$ (14,662,591)
Disposal and Processing	$ (9,375,705)	$ -	$ (37,084,390)	$ (40,796,058)	$ (40,477,511)	$ (31,086,037)	$ (22,425,703)	$ (31,086,037)	$ (31,086,037)	$ (31,086,037)
Changes to Upstream Costs	$ 112,745,383	$ -	$ 115,182,990	$ 113,490,688	$ 98,422,203	$ 2,210,042	$ 2,210,042	$ (133,803)	$ (86,557)	$ 2,210,042
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ 13,880	$ -	$ (2,187,230)	$ (3,917,785)	$ (3,917,785)	$ (4,836,743)	$ (71,879,292)	$ 7,417,282	$ 6,971,830	$ (4,836,743)
Partner Revenue	$ (875,319)	$ -	$ (26,990,465)	$ (26,990,465)	$ (26,990,465)	$ (26,990,465)	$ (26,990,465)	$ (26,990,465)	$ (26,990,465)	$ (26,990,465)
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ 72,614,657	$ -	$ 82,839,744	$ 83,512,515	$ 62,662,991	$ 3,137,290	$ (35,079,626)	$ 57,150,989	$ 28,125,606	$ (23,043,008)
Levelized Annual Facility Cost	$ 3,561,503	$ -	$ 4,063,009	$ 4,096,006	$ 3,073,408	$ 153,873	$ (1,720,537)	$ 2,803,063	$ 1,379,466	$ (3,195,385)

	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Comparison 18.1 - Others										
Scale	$ (6,583,004)	$ 4,721,678	$ -	$ 1,303,648	$ 1,355,086	$ 8,662,742	$ 8,827,673	$ 12,788,708	$ 11,490,568	$ 8,662,742
Waste Compaction	$ (7,923,042)	$ (7,923,042)	$ -	$ -	$ -	$ -	$ 11,491,506	$ 10,242,872	$ 11,302,353	$ -
Hauling	$ 13,293,489	$ 11,760,536	$ -	$ (478,968)	$ (474,240)	$ (1,164,839)	$ 9,985,433	$ (1,595,294)	$ (9,843,189)	$ (1,164,839)
Rail Loading	$ (14,354,700)	$ (14,354,700)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Recycling Construct and O&M	$ 3,724,462	$ 8,798,868	$ -	$ 6,580,903	$ 397,805	$ 6,747,813	$ 8,579,175	$ 22,576,041	$ 9,691,892	$ (2,866,613)
General Facility	$ (11,333,883)	$ (10,567,945)	$ -	$ 68,081	$ 71,752	$ 289,405	$ 928,567	$ 7,712,508	$ 8,440,256	$ 289,405
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ (56,236,029)	$ (41,977,249)	$ -	$ 287,919	$ 287,919	$ 14,426,110	$ 3,048,088	$ 21,339,915	$ 13,355,693	$ (2,139,761)
Existing Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,627,641	$ -	$ -	$ -
Argo	$ 15,600,287	$ 15,623,014	$ -	$ 45,713	$ 69,388	$ 960,423	$ 1,598,872	$ 960,423	$ 960,423	$ 960,423
Disposal and Processing	$ 27,708,686	$ 37,084,390	$ -	$ (3,711,668)	$ (3,393,120)	$ 5,998,353	$ 14,658,687	$ 5,998,353	$ 5,998,353	$ 5,998,353
Changes to Upstream Costs	$ (2,437,607)	$ (115,182,990)	$ -	$ (1,692,302)	$ (16,760,787)	$ (112,972,949)	$ (112,972,949)	$ (115,316,794)	$ (115,269,547)	$ (112,972,949)
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ 2,201,110	$ 2,187,230	$ -	$ (1,730,555)	$ (1,730,555)	$ (2,649,512)	$ (69,692,061)	$ 9,604,513	$ 9,159,061	$ (2,649,512)
Partner Revenue	$ 26,115,146	$ 26,990,465	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ (10,225,086)	$ (82,839,744)	$ -	$ 672,771	$ (20,176,753)	$ (79,702,453)	$ (117,919,370)	$ (25,688,755)	$ (54,714,138)	$ (105,882,751)
Levelized Annual Facility Cost	$ (501,506)	$ (4,063,009)	$ -	$ 32,997	$ (989,602)	$ (3,909,136)	$ (5,783,546)	$ (1,259,947)	$ (2,683,543)	$ (7,258,394)

COST COMPARISON OF FACILITY OPTIONS

Comparison 18.2 - Others	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Scale	$ (7,886,653)	$ 3,418,030	$ (1,303,648)	$ -	$ 51,438	$ 7,359,094	$ 7,524,025	$ 11,485,060	$ 10,186,920	$ 7,359,094
Waste Compaction	$ (7,923,042)	$ (7,923,042)	$ -	$ -	$ -	$ -	$ 11,491,506	$ 10,242,872	$ 11,302,353	$ -
Hauling	$ 13,772,457	$ 12,239,505	$ 478,968	$ -	$ 4,728	$ (685,871)	$ 10,464,401	$ (1,116,326)	$ (9,364,221)	$ (685,871)
Rail Loading	$ (14,354,700)	$ (14,354,700)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Recycling Construct and O&M	$ (2,856,441)	$ 2,217,965	$ (6,580,903)	$ -	$ (6,183,099)	$ 166,910	$ 1,998,271	$ 15,995,137	$ 3,110,988	$ (9,447,517)
General Facility	$ (11,401,964)	$ (10,636,026)	$ (68,081)	$ -	$ 3,671	$ 221,324	$ 860,486	$ 7,644,427	$ 8,372,175	$ 221,324
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ (56,523,948)	$ (42,265,168)	$ (287,919)	$ -	$ -	$ 14,138,191	$ 2,760,169	$ 21,051,996	$ 13,067,774	$ (2,427,680)
Existing Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,627,641	$ -	$ -	$ -
Argo	$ 15,554,574	$ 15,577,301	$ (45,713)	$ -	$ 23,675	$ 914,710	$ 1,553,158	$ 914,710	$ 914,710	$ 914,710
Disposal and Processing	$ 31,420,354	$ 40,796,058	$ 3,711,668	$ -	$ 318,548	$ 9,710,021	$ 18,370,355	$ 9,710,021	$ 9,710,021	$ 9,710,021
Changes to Upstream Costs	$ (745,305)	$ (113,490,688)	$ 1,692,302	$ -	$ (15,068,484)	$ (111,280,646)	$ (111,280,646)	$ (113,624,491)	$ (113,577,245)	$ (111,280,646)
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ 3,931,665	$ 3,917,785	$ 1,730,555	$ -	$ -	$ (918,957)	$ (67,961,506)	$ 11,335,068	$ 10,889,616	$ (918,957)
Partner Revenue	$ 26,115,146	$ 26,990,465	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ (10,897,858)	$ (83,512,515)	$ (672,771)	$ -	$ (20,849,524)	$ (80,375,224)	$ (118,592,141)	$ (26,361,526)	$ (55,386,909)	$ (106,555,523)
Levelized Annual Facility Cost	$ (534,503)	$ (4,096,006)	$ (32,997)	$ -	$ (1,022,599)	$ (3,942,133)	$ (5,816,543)	$ (1,292,944)	$ (2,716,541)	$ (7,291,391)

Comparison 18.3 - Others	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Scale	$ (7,938,090)	$ 3,366,592	$ (1,355,086)	$ (51,438)	$ -	$ 7,307,656	$ 7,472,587	$ 11,433,622	$ 10,135,482	$ 7,307,656
Waste Compaction	$ (7,923,042)	$ (7,923,042)	$ -	$ -	$ -	$ -	$ 11,491,506	$ 10,242,872	$ 11,302,353	$ -
Hauling	$ 13,767,729	$ 12,234,777	$ 474,240	$ (4,728)	$ -	$ (690,599)	$ 10,459,673	$ (1,121,053)	$ (9,368,949)	$ (690,599)
Rail Loading	$ (14,354,700)	$ (14,354,700)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Recycling Construct and O&M	$ 3,326,658	$ 8,401,063	$ (397,805)	$ 6,183,099	$ -	$ 6,350,009	$ 8,181,370	$ 22,178,236	$ 9,294,087	$ (3,264,418)
General Facility	$ (11,405,635)	$ (10,639,697)	$ (71,752)	$ (3,671)	$ -	$ 217,653	$ 856,815	$ 7,640,756	$ 8,368,504	$ 217,653
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ (56,523,948)	$ (42,265,168)	$ (287,919)	$ -	$ -	$ 14,138,191	$ 2,760,169	$ 21,051,996	$ 13,067,774	$ (2,427,680)
Existing Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,627,641	$ -	$ -	$ -
Argo	$ 15,530,899	$ 15,553,626	$ (69,388)	$ (23,675)	$ -	$ 891,035	$ 1,529,484	$ 891,035	$ 891,035	$ 891,035
Disposal and Processing	$ 31,101,806	$ 40,477,511	$ 3,393,120	$ (318,548)	$ -	$ 9,391,473	$ 18,051,807	$ 9,391,473	$ 9,391,473	$ 9,391,473
Changes to Upstream Costs	$ 14,323,180	$ (98,422,203)	$ 16,760,787	$ 15,068,484	$ -	$ (96,212,162)	$ (96,212,162)	$ (98,556,007)	$ (98,508,760)	$ (96,212,162)
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ 3,931,665	$ 3,917,785	$ 1,730,555	$ -	$ -	$ (918,957)	$ (67,961,506)	$ 11,335,068	$ 10,889,616	$ (918,957)
Partner Revenue	$ 26,115,146	$ 26,990,465	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ 9,951,667	$ (62,662,991)	$ 20,176,753	$ 20,849,524	$ -	$ (59,525,700)	$ (97,742,617)	$ (5,512,002)	$ (34,537,385)	$ (85,705,998)
Levelized Annual Facility Cost	$ 488,096	$ (3,073,408)	$ 989,602	$ 1,022,599	$ -	$ (2,919,534)	$ (4,793,945)	$ (270,345)	$ (1,693,942)	$ (6,268,793)

COST COMPARISON OF FACILITY OPTIONS

	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Comparison 18.4 - Others										
Scale	$ (15,245,747)	$ (3,941,064)	$ (8,662,742)	$ (7,359,094)	$ (7,307,656)	$ -	$ 164,931	$ 4,125,966	$ 2,827,826	$ -
Waste Compaction	$ (7,923,042)	$ (7,923,042)	$ -	$ -	$ -	$ -	$ 11,491,506	$ 10,242,872	$ 11,302,353	$ -
Hauling	$ 14,458,328	$ 12,925,376	$ 1,164,839	$ 685,871	$ 690,599	$ -	$ 11,150,272	$ (430,455)	$ (8,678,350)	$ -
Rail Loading	$ (14,354,700)	$ (14,354,700)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Recycling Construct and O&M	$ (3,023,351)	$ 2,051,055	$ (6,747,813)	$ (166,910)	$ (6,350,009)	$ -	$ 1,831,362	$ 15,828,227	$ 2,944,078	$ (9,614,427)
General Facility	$ (11,623,288)	$ (10,857,350)	$ (289,405)	$ (221,324)	$ (217,653)	$ -	$ 639,162	$ 7,423,103	$ 8,150,851	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ (70,662,140)	$ (56,403,359)	$ (14,426,110)	$ (14,138,191)	$ (14,138,191)	$ -	$ (11,378,022)	$ 6,913,804	$ (1,070,418)	$ (16,565,871)
Existing Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,627,641	$ -	$ -	$ -
Argo	$ 14,639,864	$ 14,662,591	$ (960,423)	$ (914,710)	$ (891,035)	$ -	$ 638,448	$ -	$ -	$ -
Disposal and Processing	$ 21,710,333	$ 31,086,037	$ (5,998,353)	$ (9,710,021)	$ (9,391,473)	$ -	$ 8,660,334	$ -	$ -	$ -
Changes to Upstream Costs	$ 110,535,342	$ (2,210,042)	$ 112,972,949	$ 111,280,646	$ 96,212,162	$ -	$ -	$ (2,343,845)	$ (2,296,598)	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ 4,850,622	$ 4,836,743	$ 2,649,512	$ 918,957	$ 918,957	$ -	$ (67,042,549)	$ 12,254,025	$ 11,808,573	$ -
Partner Revenue	$ 26,115,146	$ 26,990,465	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ 69,477,367	$ (3,137,290)	$ 79,702,453	$ 80,375,224	$ 59,525,700	$ -	$ (38,216,916)	$ 54,013,698	$ 24,988,316	$ (26,180,298)
Levelized Annual Facility Cost	$ 3,407,630	$ (153,873)	$ 3,909,136	$ 3,942,133	$ 2,919,534	$ -	$ (1,874,411)	$ 2,649,189	$ 1,225,592	$ (3,349,258)

	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Comparison 17.4 - Others										
Scale	$ (15,410,677)	$ (4,105,994)	$ (8,827,673)	$ (7,524,025)	$ (7,472,587)	$ (164,931)	$ -	$ 3,961,035	$ 2,662,895	$ (164,931)
Waste Compaction	$ (19,414,547)	$ (19,414,547)	$ (11,491,506)	$ (11,491,506)	$ (11,491,506)	$ (11,491,506)	$ -	$ (1,248,634)	$ (189,152)	$ (11,491,506)
Hauling	$ 3,308,056	$ 1,775,103	$ (9,985,433)	$ (10,464,401)	$ (10,459,673)	$ (11,150,272)	$ -	$ (11,580,727)	$ (19,828,622)	$ (11,150,272)
Rail Loading	$ (14,354,700)	$ (14,354,700)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Recycling Construct and O&M	$ (4,854,713)	$ 219,693	$ (8,579,175)	$ (1,998,271)	$ (8,181,370)	$ (1,831,362)	$ -	$ 13,996,866	$ 1,112,717	$ (11,445,788)
General Facility	$ (12,262,450)	$ (11,496,512)	$ (928,567)	$ (860,486)	$ (856,815)	$ (639,162)	$ -	$ 6,783,941	$ 7,511,689	$ (639,162)
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ (59,284,117)	$ (45,025,337)	$ (3,048,088)	$ (2,760,169)	$ (2,760,169)	$ 11,378,022	$ -	$ 18,291,827	$ 10,307,605	$ (5,187,849)
Existing Facility	$ (5,627,641)	$ (5,627,641)	$ (5,627,641)	$ (5,627,641)	$ (5,627,641)	$ (5,627,641)	$ -	$ (5,627,641)	$ (5,627,641)	$ (5,627,641)
Argo	$ 14,001,416	$ 14,024,143	$ (1,598,872)	$ (1,553,158)	$ (1,529,484)	$ (638,448)	$ -	$ (638,448)	$ (638,448)	$ (638,448)
Disposal and Processing	$ 13,049,999	$ 22,425,703	$ (14,658,687)	$ (18,370,355)	$ (18,051,807)	$ (8,660,334)	$ -	$ (8,660,334)	$ (8,660,334)	$ (8,660,334)
Changes to Upstream Costs	$ 110,535,342	$ (2,210,042)	$ 112,972,949	$ 111,280,646	$ 96,212,162	$ -	$ -	$ (2,343,845)	$ (2,296,598)	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ 71,893,171	$ 71,879,292	$ 69,692,061	$ 67,961,506	$ 67,961,506	$ 67,042,549	$ -	$ 79,296,574	$ 78,851,122	$ 67,042,549
Partner Revenue	$ 26,115,146	$ 26,990,465	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ 107,694,283	$ 35,079,626	$ 117,919,370	$ 118,592,141	$ 97,742,617	$ 38,216,916	$ -	$ 92,230,615	$ 63,205,232	$ 12,036,618
Levelized Annual Facility Cost	$ 5,282,040	$ 1,720,537	$ 5,783,546	$ 5,816,543	$ 4,793,945	$ 1,874,411	$ -	$ 4,523,600	$ 3,100,003	$ (1,474,848)

COST COMPARISON OF FACILITY OPTIONS

Comparison 19.4 - Others	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Scale	$ (19,371,713)	$ (8,067,030)	$ (12,788,708)	$ (11,485,060)	$ (11,433,622)	$ (4,125,966)	$ (3,961,035)	$ -	$ (1,298,140)	$ (4,125,966)
Waste Compaction	$ (18,165,914)	$ (18,165,914)	$ (10,242,872)	$ (10,242,872)	$ (10,242,872)	$ (10,242,872)	$ 1,248,634	$ -	$ 1,059,481	$ (10,242,872)
Hauling	$ 14,888,782	$ 13,355,830	$ 1,595,294	$ 1,116,326	$ 1,121,053	$ 430,455	$ 11,580,727	$ -	$ (8,247,895)	$ 430,455
Rail Loading	$ (14,354,700)	$ (14,354,700)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Recycling Construct and O&M	$ (18,851,578)	$ (13,777,173)	$ (22,576,041)	$ (15,995,137)	$ (22,178,236)	$ (15,828,227)	$ (13,996,866)	$ -	$ (12,884,149)	$ (25,442,654)
General Facility	$ (19,046,391)	$ (18,280,453)	$ (7,712,508)	$ (7,644,427)	$ (7,640,756)	$ (7,423,103)	$ (6,783,941)	$ -	$ 727,748	$ (7,423,103)
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ (77,575,944)	$ (63,317,163)	$ (21,339,915)	$ (21,051,996)	$ (21,051,996)	$ (6,913,804)	$ (18,291,827)	$ -	$ (7,984,222)	$ (23,479,676)
Existing Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,627,641	$ -	$ -	$ -
Argo	$ 14,639,864	$ 14,662,591	$ (960,423)	$ (914,710)	$ (891,035)	$ -	$ 638,448	$ -	$ -	$ -
Disposal and Processing	$ 21,710,333	$ 31,086,037	$ (5,998,353)	$ (9,710,021)	$ (9,391,473)	$ -	$ 8,660,334	$ -	$ -	$ -
Changes to Upstream Costs	$ 112,879,187	$ 133,803	$ 115,316,794	$ 113,624,491	$ 98,556,007	$ 2,343,845	$ 2,343,845	$ -	$ 47,246	$ 2,343,845
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ (7,403,403)	$ (7,417,282)	$ (9,604,513)	$ (11,335,068)	$ (11,335,068)	$ (12,254,025)	$ (79,296,574)	$ -	$ (445,452)	$ (12,254,025)
Partner Revenue	$ 26,115,146	$ 26,990,465	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ 15,463,669	$ (57,150,989)	$ 25,688,755	$ 26,361,526	$ 5,512,002	$ (54,013,698)	$ (92,230,615)	$ -	$ (29,025,383)	$ (80,193,996)
Levelized Annual Facility Cost	$ 758,441	$ (2,803,063)	$ 1,259,947	$ 1,292,944	$ 270,345	$ (2,649,189)	$ (4,523,600)	$ -	$ (1,423,597)	$ (5,998,447)

Comparison 20.4 - Others	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Scale	$ (18,073,573)	$ (6,768,890)	$ (11,490,568)	$ (10,186,920)	$ (10,135,482)	$ (2,827,826)	$ (2,662,895)	$ 1,298,140	$ -	$ (2,827,826)
Waste Compaction	$ (19,225,395)	$ (19,225,395)	$ (11,302,353)	$ (11,302,353)	$ (11,302,353)	$ (11,302,353)	$ 189,152	$ (1,059,481)	$ -	$ (11,302,353)
Hauling	$ 23,136,678	$ 21,603,725	$ 9,843,189	$ 9,364,221	$ 9,368,949	$ 8,678,350	$ 19,828,622	$ 8,247,895	$ -	$ 8,678,350
Rail Loading	$ (14,354,700)	$ (14,354,700)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Recycling Construct and O&M	$ (5,967,429)	$ (893,024)	$ (9,691,892)	$ (3,110,988)	$ (9,294,087)	$ (2,944,078)	$ (1,112,717)	$ 12,884,149	$ -	$ (12,558,505)
General Facility	$ (19,774,139)	$ (19,008,201)	$ (8,440,256)	$ (8,372,175)	$ (8,368,504)	$ (8,150,851)	$ (7,511,689)	$ (727,748)	$ -	$ (8,150,851)
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ (69,591,722)	$ (55,332,941)	$ (13,355,693)	$ (13,067,774)	$ (13,067,774)	$ 1,070,418	$ (10,307,605)	$ 7,984,222	$ -	$ (15,495,454)
Existing Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,627,641	$ -	$ -	$ -
Argo	$ 14,639,864	$ 14,662,591	$ (960,423)	$ (914,710)	$ (891,035)	$ -	$ 638,448	$ -	$ -	$ -
Disposal and Processing	$ 21,710,333	$ 31,086,037	$ (5,998,353)	$ (9,710,021)	$ (9,391,473)	$ -	$ 8,660,334	$ -	$ -	$ -
Changes to Upstream Costs	$ 112,831,940	$ 86,557	$ 115,269,547	$ 113,577,245	$ 98,508,760	$ 2,296,598	$ 2,296,598	$ (47,246)	$ -	$ 2,296,598
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ (6,957,951)	$ (6,971,830)	$ (9,159,061)	$ (10,889,616)	$ (10,889,616)	$ (11,808,573)	$ (78,851,122)	$ 445,452	$ -	$ (11,808,573)
Partner Revenue	$ 26,115,146	$ 26,990,465	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ 44,489,051	$ (28,125,606)	$ 54,714,138	$ 55,386,909	$ 34,537,385	$ (24,988,316)	$ (63,205,232)	$ 29,025,383	$ -	$ (51,168,614)
Levelized Annual Facility Cost	$ 2,182,038	$ (1,379,466)	$ 2,683,543	$ 2,716,541	$ 1,693,942	$ (1,225,592)	$ (3,100,003)	$ 1,423,597	$ -	$ (4,574,851)

COST COMPARISON OF FACILITY OPTIONS

	Option 16.1	Option 16.4	Option 18.1	Option 18.2	Option 18.3	Option 18.4	Option 17.4	Option 19.4	Option 20.4	Option 21.4
Comparison 21.4 - Others										
Scale	$ (15,245,747)	$ (3,941,064)	$ (8,662,742)	$ (7,359,094)	$ (7,307,656)	$ -	$ 164,931	$ 4,125,966	$ 2,827,826	$ -
Waste Compaction	$ (7,923,042)	$ (7,923,042)	$ -	$ -	$ -	$ -	$ 11,491,506	$ 10,242,872	$ 11,302,353	$ -
Hauling	$ 14,458,328	$ 12,925,376	$ 1,164,839	$ 685,871	$ 690,599	$ -	$ 11,150,272	$ (430,455)	$ (8,678,350)	$ -
Rail Loading	$ (14,354,700)	$ (14,354,700)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Recycling Construct and O&M	$ 6,591,076	$ 11,665,481	$ 2,866,613	$ 9,447,517	$ 3,264,418	$ 9,614,427	$ 11,445,788	$ 25,442,654	$ 12,558,505	$ -
General Facility	$ (11,623,288)	$ (10,857,350)	$ (289,405)	$ (221,324)	$ (217,653)	$ -	$ 639,162	$ 7,423,103	$ 8,150,851	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Prop, Constr & Lease	$ (54,096,268)	$ (39,837,488)	$ 2,139,761	$ 2,427,680	$ 2,427,680	$ 16,565,871	$ 5,187,849	$ 23,479,676	$ 15,495,454	$ -
Existing Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,627,641	$ -	$ -	$ -
Argo	$ 14,639,864	$ 14,662,591	$ (960,423)	$ (914,710)	$ (891,035)	$ -	$ 638,448	$ -	$ -	$ -
Disposal and Processing	$ 21,710,333	$ 31,086,037	$ (5,998,353)	$ (9,710,021)	$ (9,391,473)	$ -	$ 8,660,334	$ -	$ -	$ -
Changes to Upstream Costs	$ 110,535,342	$ (2,210,042)	$ 112,972,949	$ 111,280,646	$ 96,212,162	$ -	$ -	$ (2,343,845)	$ (2,296,598)	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Private Transfer	$ 4,850,622	$ 4,836,743	$ 2,649,512	$ 918,957	$ 918,957	$ -	$ (67,042,549)	$ 12,254,025	$ 11,808,573	$ -
Partner Revenue	$ 26,115,146	$ 26,990,465	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Scenario NPV	$ 95,657,665	$ 23,043,008	$ 105,882,751	$ 106,555,523	$ 85,705,998	$ 26,180,298	$ (12,036,618)	$ 80,193,996	$ 51,168,614	$ -
Levelized Annual Facility Cost	$ 6,756,888	$ 3,195,385	$ 7,258,394	$ 7,291,391	$ 6,268,793	$ 3,349,258	$ 1,474,848	$ 5,998,447	$ 4,574,851	$ -