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# Solid Waste Facilities Master Plan

City of Seattle

Seattle  
Public  
Utilities

November 2003

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# Contents

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<b>Section</b>	<b>Page</b>
List of Acronyms .....	v
Executive Summary .....	vii
Solid Waste Facilities Master Plan .....	1
1 Introduction .....	1
2 Scope .....	4
3 SPU Planning Action .....	6
4 Solid Waste Facilities Overview .....	10
5 Facility Needs for Waste Shipment .....	19
6 Regional Considerations .....	22
7 Operational Considerations.....	23
8 Regulatory Considerations .....	23
9 History of Facility Changes .....	24
10 Future Trends .....	25
11 Developing Solutions .....	28
12 Range of Options.....	34
13 Analysis Results .....	37
14 Recommended Option .....	48
15 Implementation Schedule .....	56
16 Facility Funding .....	56
17 Conclusions.....	57

## Tables

1 Description of Options .....	35
2 Description of Options 0, 5, 8, and 11 .....	39
3 Range of Costs for Options 0, 5, 8, and 11 .....	42
4 Key Features of Options.....	47
5 Comparison of Recommended Option to Status Quo .....	55
6 Implementation Schedule .....	56

## Figures

1 Map of Solid Waste Facilities in Seattle .....	11
2 Solid Waste Facilities in King County.....	12
3 North Recycling and Disposal Station .....	14
4 NRDS Usage in Tons and Trips, 2001 .....	15
5 South Recycling and Disposal Station .....	16
6 SRDS Usage in Tons and Trips, 2001 .....	17
7 Waste through Transfer Stations in 1960s and 2000s.....	25
8 Screening Criteria for Quality of Service Factors .....	31
9 Total Quality of Service Score–Contributions by Criteria.....	40
10 Net Present Value Comparison.....	42

11 Evaluation of Cost Risk .....43  
12 Net Present Value vs. Quality of Service .....44  
13 Quantitative Evaluation of Options 0-7 .....45  
14 Quantitative Evaluation of Options 0,8-11 .....45  
15 Quantitative Evaluation of Options 0,5,8,11 .....45  
16 Net Present Value Including Time Spent in Queue .....46

**Appendices**

A City Council Resolution 30341  
B Public Involvement Report and Meeting Summaries  
C Recycling and Disposal Station Survey Report  
D System Waste Flows  
E Solid Waste by Rail in the Pacific Northwest  
F Property Search for Intermodal Solid Waste Transfer Station Sites  
G Facility Design Criteria  
H Decision Process Used to Evaluate Options  
I Facility Plan Cost Model  
J Rail Cost Model  
K Modeling Cost Uncertainty  
L Alternatives Considered but Not Recommended

# List of Acronyms

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<b>BNSF</b>	<b>Burlington Northern/Santa Fe railway</b>
<b>CDL</b>	<b>construction, demolition, and landclearing waste</b>
<b>CIP</b>	<b>capital improvement project</b>
<b>DPL</b>	<b>Decision Programming Language</b>
<b>HHW</b>	<b>household hazardous waste</b>
<b>LEED</b>	<b>Leadership in Energy and Environmental Design</b>
<b>MRF</b>	<b>material recovery facility</b>
<b>MSW</b>	<b>municipal solid waste</b>
<b>NPV</b>	<b>net present value</b>
<b>NRDS</b>	<b>North Recycling and Disposal Station</b>
<b>O&amp;M</b>	<b>operation and maintenance</b>
<b>RCW</b>	<b>Revised Code of Washington</b>
<b>RDS</b>	<b>Recycling and Disposal Station</b>
<b>SEPA</b>	<b>Washington State Environmental Policy Act</b>
<b>SMC</b>	<b>Seattle Municipal Code</b>
<b>SPU</b>	<b>Seattle Public Utilities</b>
<b>SRDS</b>	<b>South Recycling and Disposal Station</b>
<b>SWAC</b>	<b>Solid Waste Advisory Committee</b>
<b>SWFMP</b>	<b>Solid Waste Facilities Master Plan</b>

# Executive Summary

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Seattle's solid waste management system has changed substantially over the last 40 years. Yet during that time only minor modifications have been made to the City's two solid waste handling facilities, which were built in the 1960s. These facilities are outdated and lack the capacity and flexibility needed to meet Seattle's current or future solid waste material handling needs.

The 1998 Solid Waste Comprehensive Plan for the City of Seattle identified a need to improve existing solid waste facilities, but did not include a detailed plan for facility upgrades. Rather than take a piecemeal approach to fixing individual problems, Seattle Public Utilities (SPU) decided to take a broad, long-term view of the facility needs in the entire solid waste system. In December 2001, the City Council passed Resolution 30431 directing SPU to develop a Solid Waste Facilities Master Plan that would address the long-term facility needs for managing Seattle's waste.

## Limitations of the Existing System

The two existing solid waste transfer stations, which were built in the South Park and Wallingford neighborhoods, now present numerous obstacles to efficient and cost-effective solid waste management in Seattle. The transfer stations were originally designed for the single purpose of consolidating refuse for transfer to a local landfill for disposal. Renamed "Recycling and Disposal Stations" in the early 1990s to reflect their increasing role in recycling materials, the stations now devote over one third of their space to waste diversion and recycling. Space limitations currently hinder the City of Seattle's efforts to reach its 60-percent recycling goal.

The facilities also lack adequate capacity, and during peak periods lines extend onto public roadways almost daily. Estimates indicate that wait times could exceed 2 hours during peak periods unless changes are made soon. As service levels decline, increased sanitation problems in the city can be expected. The existing system also lacks the flexibility to adapt to a changing waste stream and has almost no excess capacity to deal with emergencies or disaster events that could suddenly generate large quantities of solid waste.

The existing stations also affect the adjacent neighborhoods with odor, dust, noise, traffic, and other problems. The buildings require relatively high maintenance and present several operational inefficiencies. The stations also contain many safety hazards that must be managed to prevent injuries to staff and customers. Costly upgrades, such as seismic retrofits and rewiring, would be required if the buildings are to remain in service. The temporary trailers used for the station offices and employee facilities also need to be replaced. These and other problems warrant immediate attention.

In addition, the way that waste is transferred for disposal has some inherent inefficiencies. Waste is currently compacted into containers at the transfer stations and trucked to a railhead, where it is loaded onto a train for long-haul shipment to a distant landfill. The

stations were not designed for this function, and the modifications have generated several inefficiencies and maintenance problems.

## Values and Goals

Values and goals for the Solid Waste Facilities Master Plan were expressed in City Resolution 30431. The main objectives of the plan as outlined in the Resolution are as follows:

- Minimize long-term financial and environmental costs.
- Minimize negative impacts (noise, traffic, dust, odor, visual, air, water pollution) on affected communities, and consider opportunities for neighborhood economic development when selecting candidate sites.
- Provide a safe and healthy operational environment for customers and workers.
- Provide enhanced self-haul material recovery opportunities, collection of additional materials, and efficient transfer of all solid waste as outlined in the City's Solid Waste Comprehensive Plan.
- Ensure consistency with City Comprehensive and Neighborhood plans and other City priorities and objectives (including conservation, sustainable building, environmental justice, preservation of habitat, and natural drainage systems).
- Align with SPU's strategic objectives and optimize current contract opportunities.
- Incorporate opportunities for partnerships with regional governments, the private sector, and others through which cost savings, improvements to environmental quality, and other benefits can be achieved.
- Take strategic advantage of the City's options to terminate and rebid, or extend, its refuse, recycling, and disposal contracts beginning in 2007.

## Public Input

Beginning in May of 2002, SPU conducted an extensive outreach program to help develop the Solid Waste Facilities Master Plan. SPU invited solid waste experts from areas outside of Seattle to a colloquium to share information on a variety of solid waste topics, such as legal and contracting issues, regulations, state-of-the-art transfer station design, resource recovery, and economics. The utility also held meetings with key stakeholders, and surveyed Recycling and Disposal Station customers to learn more about how they use the current facilities and what improvements they felt were needed. SPU hosted meetings with community groups in early 2003, and held four public workshops in the neighborhoods near the Recycling and Disposal Stations. Input from these meetings helped establish priorities and was used to help shape the recommended system option and features at individual facilities.

## Approach Used to Evaluate Options

SPU used a structured decision process to evaluate options. The process was driven by a series of internal workshops that developed, screened, and analyzed options for solid waste facility improvements. The steps involved in developing options included the following:

1. Define what constitutes an option.
2. Develop initial system options.
3. Define waste flows between facilities for each option.
4. Prepare conceptual layout plans for facilities.
5. Prepare capital cost estimates.
6. Evaluate each option's quality of service (i.e., how well it meets Resolution 30431 goals).
7. Model life-cycle system costs over about a 30-year period to capture potential savings of capital expenditures.
8. Evaluate cost uncertainties.
9. Summarize and compare the life-cycle costs and quality of service of each option.

## Recommended System Option

After analyzing the options relative to the status quo, SPU's Planning Team selected an option for further consideration by the Mayor and City Council. The recommended option has the highest quality of service score relative to its life-cycle costs. It involves adding an intermodal solid waste transfer facility at Harbor Island (or another suitable location) and rebuilding both of the City-owned Recycling and Disposal Stations with just enough additional property added to the sites to accommodate needed services.

Implementation of this option would divert the majority of collection trucks directly to the intermodal facility. Existing buildings at the Recycling and Disposal Stations would be demolished and rebuilt to provide enough space to accommodate customers and provide reuse and recycling opportunities. A brief description of the main facility improvements in the recommended option is provided in Table ES-1.

TABLE ES-1  
Facility Improvements in Recommended Option

	<b>New Intermodal Facility</b>	<b>Improvements at North Recycling and Disposal Station</b>	<b>Improvements at South Recycling and Disposal Station</b>
Add property	10 to 15 acres	1 ½ acres	4 acres
Key features of recommended improvements	Build new tip building to accommodate collection vehicles, transfer trailers from the Recycling and Disposal Stations (RDSs), and other large vehicles.  Onsite rail loading facility at which loaded containers are placed on railcars for transport to a distant landfill.	Rebuild larger tip building. Rezone and add additional property for offices and reuse/recycling.  Separate recycling entrance with drop-off containers and drop boxes.  Separate area for reuse drop off.	Build new tip building for all self-haul materials.  Separate area for dropping off traditional recyclables and new building for all wastes, including mixed construction and demolition material for recycling.  New retail reuse building.



Table ES-2 compares the features of the recommended option to the status quo. As shown, 37 percent of the incoming self-haul tonnage would be diverted, which is close to the 39 percent rate required to meet the system-wide 60-percent recycling goal. Reconstructing buildings would minimize odor, dust, noise, and other impacts to adjacent neighborhoods. The recommended option meets the goals outlined in Resolution 30431, which authorized this plan.

Implementing the recommended option would increase solid waste system costs by about \$1.4 million per year. This represents a 1.15-percent increase in system costs over the current adopted budget of \$121.3 million to operate the solid waste system in 2003. This increase is relatively small compared to the substantial improvements in solid waste services.

TABLE ES-2  
Comparison of Recommended Option to Status Quo

	Status Quo	Recommended Option
Additional cost over status quo	\$0	About a 1.15-percent increase in annual costs of the solid waste system.
Reuse facilities	None, no diversion.	Reuse drop-off at North RDS (NRDS). Reuse drop-off and reuse store at South RDS (SRDS).
Self-haul recycling	No significant change. Currently at 18 percent diversion of self-haul tonnage. May decline in future due to lack of space.	Recycling drop-off areas separate from disposal areas. Separate material recovery facility at SRDS. Estimated diversion rate expected to increase to 37 percent of tons received.
Queue time on a busy day	> 2 hours	< 30 minutes
Customer use areas	No significant change.	Over twice as many unload stalls and multiple entry lanes to reduce wait time.
Health and safety	Meets basic health and safety standards, but many physical hazards remain that must be managed.	Improved safety with a reduction in physical and environmental hazards.
Education opportunities	None.	Viewing areas, classroom, and information displays.
Employee facilities	Rebuild office and employee facilities within space available.	Build new office and employee facilities on adjacent property at NRDS and on existing property at SRDS.
Local environment at stations	Occasional dust, odor, noise.	Reduction in dust, odor, noise, and truck traffic.
Facility appearance	No significant change.	Improved building aesthetics and landscaping, plus 1 percent for art.

## Implementation Schedule

After the Mayor and City Council review this plan and provide input, SPU will complete the final report by the end of 2003 or early 2004.

A plan of this extent requires environmental review under the Washington State Environmental Policy Act (SEPA) before an option can be approved and implemented. The environmental review, along with property assessments, negotiations, and permitting, is scheduled for 2004. Permitting and design will proceed in the following years, pending program approval and funding.

Implementation of the plan is tentatively scheduled to occur in phases as shown in Table ES-3.

TABLE ES-3  
Implementation Schedule

Facility	2004	2005	2006	2007	2008	2009	2010
Intermodal	Permitting	Design	Design	Construction	Operation		
SRDS		Permitting	Design	Design	Construction	Operation	
NRDS			Permitting	Design	Design	Construction	Operation

## Conclusions

The key conclusions of the Solid Waste Facilities Master Plan are as follows:

- The City's solid waste facilities need significant upgrades in order to meet the goals expressed in City Resolution 30431. Continued operation of the existing Recycling and Disposal Stations without improvements will result in unsatisfactory service and continued adverse impacts to adjacent neighborhoods.
- Developing an intermodal facility would be beneficial and cost-effective. An intermodal facility would improve the efficiency of waste transfer, reduce transfer and disposal costs, free the Recycling and Disposal Stations for self-haul customers, reduce adverse impacts to neighborhoods, improve safety, and increase system flexibility and stability.
- Meeting the goals expressed in Resolution 30431 can best be achieved by rebuilding the two Recycling and Disposal Stations. Although remodeling the existing buildings was considered, the remodel option was found to be relatively expensive and failed to meet many of the objectives of Resolution 30431.
- Some additional property adjacent to each Recycling and Disposal Station is needed in order to provide needed services. The existing sites are constrained, and additional space is needed at the North Recycling and Disposal Station for the facility office, employee facilities, reuse facility, and recycling facility. Additional space is needed at the South Recycling and Disposal Station for a vehicle maintenance facility and additional waste diversion facilities of sufficient size to meet waste diversion goals.

- **The recommended option meets the facility plan goals as stated in City Resolution 30431. Implementing the recommended option would improve the reliability and flexibility of the solid waste system and would keep the city clean and at the forefront of waste reduction and diversion for years to come.**

# Solid Waste Facilities Master Plan

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## 1 Introduction

This report addresses the facilities needed to manage solid waste in the city of Seattle over the next 30 years. The report was prepared by Seattle Public Utilities (SPU), the agency responsible for providing solid waste services and solid waste management planning for Seattle.

### 1.1 Basis for Project

This project was begun after the 1998 Solid Waste Comprehensive Plan identified several deficiencies with Seattle's existing facilities. The Plan recommended a more detailed analysis of facility needs to improve the efficiency of solid waste transfer and to improve the recycling rate. In addition, SPU operations staff have identified several problems with the existing City-owned transfer stations that need attention. The aging facilities, built in the mid-1960s, require a relatively high degree of maintenance to stay in operation. In addition, the facilities are outdated, fail to meet the throughput demand without frequent lines, and do not meet today's waste diversion goals.

The problems with City-owned solid waste facilities are approaching crisis levels. Frequent mechanical and electrical failures regularly disrupt operations. The temporary offices, scale houses, and employee facilities are at the end of their useful lives and need replacement. The main structures may not withstand a moderate earthquake and may fail just when they are needed the most. The facilities also lack adequate throughput capacity, and it may be necessary to turn customers away during busy periods in the future unless improvements are made. Rather than take a piecemeal approach to fixing individual problems, this plan takes a broad view of system facilities and focuses on long-range solutions.

#### Challenges and Opportunities

The majority of solid waste system problems are related to the two City-owned transfer stations. However, there are also some potential opportunities for improving the transfer of waste for disposal and diversion.

Problems at the City-owned transfer stations can be divided into customer service, operations, environmental concerns, and waste transfer efficiency, as discussed below.

#### *Customer Service Problems*

- Long wait lines at transfer stations frequently back up onto public roadways.
- Safety concerns regarding fall hazards, traffic conflicts, and air borne emissions.
- Lack of space to expand reuse and recycling facilities.
- No educational components at facilities to encourage waste reduction and recycling.

#### *Operation Problems*

- Inadequate throughput capacity, causing long customer lines and wait times.

- Existing transfer stations require relatively high maintenance (high floor wear requiring frequent replacement, short equipment life due to high wear, frequent breakdowns).
- Numerous safety hazards present risks to employees and customers.
- Facilities are old and require upgrades to remain safe, within code, and operational (drainage improvements; seismic upgrades to main building structures; re-wiring of electrical systems; replacement of temporary buildings currently used for offices; replacement of employee facilities, scalehouses, and equipment shop).
- The shift from disposal at King County's Cedar Hills Landfill in 1990 to a more distant landfill required intermodal container loading facilities to be added to stations, which take up a substantial amount of space and have led to operational problems and inefficiencies. (An intermodal container loading facility compacts the waste and loads it into a container that can be transported by a variety of transportation modes; thus, the name intermodal.)
- Equipment yard at the North Recycling and Disposal Station (NRDS) is too small, and transfer trailers are being damaged due to the tight turning radius.
- Shortage of parking space at NRDS for equipment, employees, and visitors.

#### *Environmental Problems*

- Customer traffic frequently backs up onto public roadways, blocking side streets; idling vehicles add to air emissions.
- Buildings are not designed to contain dust, odor, and other airborne emissions.
- Truck traffic affects neighborhoods with noise and emissions.
- Drainage system at NRDS needs to be updated (combined sewer overflow issues).

#### *Waste Transfer Efficiency Problems*

The City currently contracts with Washington Waste Systems to ship Seattle's waste by rail to the Columbia Ridge Landfill in Oregon. Refuse is loaded into intermodal containers, which are loaded onto a train at the Argo Rail Yard owned by Union Pacific Railroad. This existing transfer system contains some inefficiencies and potential long-term problems, as outlined below:

- Processing waste at the transfer stations and hauling it to an intermodal yard is inefficient because it duplicates trucking. Collection trucks empty their loads at a transfer station and then drive empty to the equipment yard in the south end of Seattle. Transfer trucks haul intermodal containers filled with waste over the same route, from the transfer stations to the rail yard in south Seattle. This procedure results in both full and empty vehicles driving the same route. In addition, scales and yard space must be provided at each location for waste transfer.
- Container capacity is limited by road weight limits because the containers are trucked from the transfer stations to the rail yard over public roads. Loading containers at a rail head would allow for higher density loading, which would result in fewer containers to be handled and shipped, thereby reducing costs.

- Railroad companies require the waste to be pre-containerized before they will accept it for transport. This makes it necessary to fill the containers at each of the existing transfer stations, where space is already limited.
- There is no assurance that the Argo Rail 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, which will place a greater demand on intermodal container loading at the existing intermodal rail yards in Seattle. Also, the demand to ship more waste from King County and other counties is expected to increase. King County plans to close the Cedar Hills Landfill by 2012, which will place over 1 million tons per year of waste on the market requiring 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 Seattle's cargo capacity.
- The Argo Rail Yard is owned 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.

The City has an opportunity to upgrade the transfer stations in a manner that improves customer service, reduces neighborhood impacts (traffic, noise, dust, and odor), improves waste diversion, improves worker conditions and reduces safety hazards, and adds educational and economic incentives to waste reduction and recycling.

### City Council Action

On December 17, 2001, the City Council passed Resolution 30431, instructing Seattle Public Utilities to develop a long-range plan to address solid waste facility needs over the next 20 years. This resolution is provided in Appendix A. For planning purposes, SPU expanded the planning horizon to 30 years in order to capture the full life-cycle cost of capital improvements and operational efficiencies. In addition, some aspects of facility development were considered over an even longer period of time.

The key objectives outlined in the City Resolution include the following:

1. **Financial and environmental cost:** Options considered in this master plan and in a recommended option should minimize financial and environmental costs to city residents and to the region over the long term.
2. **Community impacts:** Options considered in the plan and a recommended option should minimize negative impacts on affected communities to the extent financially practicable. Impacts to be considered should include, for example, noise, traffic, dust, odor, visual/design impacts, and air and water pollution. Opportunities for promoting neighborhood economic development should be considered when selecting candidate facility sites.

3. **Safety and health:** Options considered in the plan and a recommended option should provide an operational environment in which customers and workers are safe from physical injury and undue exposure to health or safety risks.
4. **Consistency with the City's Solid Waste Comprehensive Plan:** Options considered in the plan and the recommended option should support the Solid Waste Comprehensive Plan's goals of providing better opportunities to recover self-haul materials, collecting additional streams of material in the future, and providing efficient transfer of both residential and commercial solid waste.
5. **Consistency with other City plans and priorities:** Options considered in the plan and a recommended option should be consistent with the goals and priorities of the City's Comprehensive Plan, Neighborhood Plans, and other environmental priorities and objectives. (This includes those related to water and electricity conservation, preservation of habitat and natural drainage systems, sustainable building, environmental justice, and others.)
6. **Align with SPU's strategic objectives:** Options considered in the plan and a recommended option should align with SPU's strategic objectives and should optimize current contract opportunities.
7. **Partnerships:** Options considered in the plan and a recommended option should identify and incorporate opportunities for partnerships with other regional governments, the private sector, and other organizations through which cost savings, improvements to local and regional environmental quality, and other benefits can be achieved.
8. **Timing:** Options considered in the plan and a recommended option should schedule improvements to take strategic advantage of the City's options to terminate and re-bid, or extend, its garbage, recycling, and disposal contracts beginning in 2007.

### Previous Studies

This report builds on previous studies that have evaluated station needs, upgrade costs, and methods to improve recycling and waste diversion. A structural analysis of the existing main buildings determined that a seismic retrofit is necessary in order for the buildings to withstand a moderate to large earthquake. An evaluation of the office and employee facilities at the City stations concluded that the temporary building cannot be upgraded to meet building codes and must be replaced in the near future. Recycling studies have indicated that additional space is needed at the stations in order to improve the recycling and diversion rate.

## 2 Scope

The scope of this Solid Waste Facilities Master Plan (SWFMP) is to develop recommendations for facility improvements to the solid waste management system that will meet the city's needs for the next 30 years or longer. The detailed objectives of the scope are outlined in City Resolution 30431, as described above. In addition, SPU's operations division added additional scope objectives, including the following:

- Improve working conditions and facilities for employees.
- Incorporate flexibility in the design of facilities so that they can accommodate changes in the waste stream, technologies, and regulatory requirements over time.
- Provide additional space to accommodate needed facilities.

This plan primarily addresses the two City-owned transfer stations and a potential new intermodal solid waste transfer facility. Their relationship to the operation of privately owned and operated facilities are considered in this plan.

The scope of this report does not include plans for the following solid waste facilities:

- Closed landfills within or owned by the City of Seattle.
- Refuse collection vehicles. (Collection vehicles will be addressed when the collection contracts are up for renewal or re-bid in 2007 and 2008).
- Industrial waste management facilities, including the West Point Wastewater Treatment Plant biosolids processing facility.
- Waste processing facilities that the City contracts with or may contract with in the future, including those for material recovery, reuse, waste to energy, organics processing, recycling, and other waste processing functions.
- Waste disposal facilities (e.g., landfills, incinerators).

A decision was made by SPU planning staff early in the planning process that the City would continue to contract out waste collection and processing facilities to the private sector. Contracting for these services would allow the City to take advantage of new and changing technologies and equipment without being burdened with outdated facilities; the private sector is typically more nimble at making changes in equipment, technologies, labor skills, and staffing than the public sector. Considering the relatively high degree of change in waste collection and processing technologies, it is advantageous to contract for these facilities on a competitive basis.

This is a facility plan and not an operations plan. Although operational changes can affect facility needs and how facilities are used, the objective of this Facilities Master Plan is to recommend facilities that are designed with enough flexibility to accommodate changes in facility operations.

The scope of this SWFMP was limited primarily to municipal solid waste (MSW) generated within the City of Seattle, with an understanding of other solid waste streams and region-wide solid waste management needs. The primary solid waste services that SPU provides include residential and commercial MSW collection, transportation, recycling, and disposal. In addition, SPU ensures that there are adequate facilities to handle other waste, such as construction, demolition, and landclearing (CDL) waste, petroleum-contaminated soil, asbestos-containing material, and other special wastes.

Facility needs for non-municipal, industrial, federally regulated hazardous wastes and for large-scale construction, demolition, and landclearing wastes are typically the responsibility of the generator and are primarily managed by the private sector. In the future, should the private sector fail to provide adequate services and facilities for the management of these



wastes, the City will consider management options on a case-by-case basis to ensure protection of public health and the environment.

## 3 SPU Planning Actions

### 3.1 Planning Team

A Planning Team composed of SPU staff was assembled to develop the plan. The team included the SWFMP project manager, operations staff, solid waste planners, an economist, a communications specialist, and others. SPU hired a consulting firm to assist the team with engineering design, economic evaluations, options analysis, public outreach, and other technical expertise as required. In addition, other SPU staff were consulted as needed.

The Planning Team also obtained input from key stakeholders, operations staff at the transfer stations, the Solid Waste Citizen Advisory Committee (SWAC), other City agencies, and the general public. The project manager gave presentations about the plan at several community council meetings and four public meetings. The Planning Team considered input from these sources in developing the plan.

The project manager also updated a Steering Committee, consisting of selected Executive Team Members at SPU, on a monthly basis. The Steering Committee provided advice and direction to the Planning Team.

### 3.2 Colloquium

The Planning Team felt it would be beneficial to obtain ideas from other technical experts in the field of solid waste management before beginning the assessment of facility needs. Technical experts were brought to Seattle for a one-day colloquium on October 11, 2002, to discuss the problems with the existing solid waste facilities and possible solutions. Individuals with expertise in the following fields were invited:

- Legal and contract issues.
- Regulatory issues.
- State-of-the-art transfer station design.
- Resource recovery (recycling, reuse, material market development).
- Economics.

In addition, solid waste managers from neighboring counties were invited to share their ideas and experiences with upgrading transfer stations and other solid waste facilities.

The colloquium provided the Planning Team with a better understanding of the broad range of factors to consider when developing facilities for the future. Some of the issues discussed at the colloquium include the following:

- **Flow control:** Municipalities have successfully controlled waste flow when they provide equal business opportunities for collection and disposal through contracts. Collection contracts can designate City ownership of the waste once it is collected and designate where the waste is taken.

- **Partner waste:** The existing City long-haul contract allows the City to lower disposal costs by partnering with other organizations to increase the tonnage of waste shipped to the contracted landfill.
- **Regulatory requirements:** State-approved solid waste comprehensive plans may serve as the guiding documents for regulatory compliance.
- **Transfer station design:** Newer designs and technology can improve throughput and waste diversion. The benefits of a flat floor for waste discharge are numerous, but a refuse pit still offers some advantages.
- **Intermodal transfer:** The improved efficiency of locating a waste receiving facility and intermodal container loading facility at a railhead makes this option worthy of more detailed analysis.
- **Waste diversion:** Examples of public-private partnerships to improve waste diversion were discussed, including the concept of a resource recovery park where the byproducts or waste from one business becomes the feedstock for another business. Also, co-locating reuse, recycling, and composting facilities can work synergistically to improve the diversion rate.

Some of these factors are also discussed below in Section 10, Future Trends.

### 3.3 Stakeholder Meetings

In order to obtain broad input into the plan, SPU contacted key stakeholders early in the development of the plan. Stakeholders were divided into three general groups as follows:

1. Internal City and regulatory.
  - Mayor's office and City Council.
  - SPU solid waste facilities employees and labor unions.
  - City departments and permitting agencies.
  - Washington Department of Ecology, Solid Waste Department.
  - Seattle- and King County department of public health.
2. Experts and existing or potential partners.
  - National solid waste industry experts.
  - Adjacent counties.
  - Seattle industrial center action committees.
  - Waste hauling and recycling companies.
  - Railroad companies.
3. External interest groups and potentially affected communities.
  - SPU Solid Waste Citizen Advisory Committee (SWAC).
  - Affected communities, including South Park, Wallingford, and others.
  - Local business councils.
  - Community Coalition for Environmental Justice.
  - Environmental organizations.
  - Recycling organizations.
  - Authorized haulers—University of Washington and Seattle Housing Authority.

More information about stakeholders contacted and the input received can be found in Appendix B.

### 3.4 Community Outreach

SPU met with environmental and community groups, employees, waste haulers, railroad companies, King County, the Solid Waste Citizen Advisory Committee, and other stakeholders as well as neighbors and the general public. Contacts included attending existing meetings, holding meetings with groups (both in person and by phone), and hosting two rounds of public forums in February and April. SPU also distributed fact sheets and provided information through the City and SPU web sites.

A summary of these meetings and other outreach activities is included in the Public Involvement Report, which is attached in Appendix B along with a summary of the January/February and April meetings. Input from these meetings helped establish priorities and more detailed objectives for facility improvements. The most common comments received may be summarized as follows:

- **Concerns with existing facilities:** Comments related to the North and South Recycling and Disposal Stations, in general, focused on known problems, including traffic, odor, litter, noise, appearance, and operations.
- **Concerns with potential operation changes:** Businesses and other customers who currently use the north station are opposed to changes that would require them to use the south station because of the increased time and cost of driving to the south station.
- **Suggestions for improvements:**
  - Provide buffers or other visual improvements.
  - Improve traffic flow and site design.
  - Decrease noise and odor.
  - Increase recycling and reuse opportunities.
  - Factor sustainability into the design and construction of new facilities.
- **Consider the different locations/environments of the two stations:** The north station is in a densely populated neighborhood, and the south station is in an industrial area. Participants at both meeting locations expressed the opinion that these differences merited a different approach to the two stations, particularly in terms of expansion. Despite the different environments of the two stations, people expressed that improvements, whether remodeling or rebuilding, should contribute positively to their respective neighborhoods.
- **Support for an intermodal facility:** Participants at both meeting locations supported the concept of a new intermodal solid waste transfer facility to take the burden off the two existing City-owned facilities, in terms of volume of solid waste and traffic, and to allow for the current facilities to better serve self-haul customer needs. Concerns related to the development of a new intermodal facility centered mostly on cost of and access to the facility. It was recommended that the Interbay area be considered as a location for the intermodal facility in addition to other sites being considered.

### 3.5 Customer Survey

SPU prepared and performed a survey of transfer station customers on March 28 and 29, 2003. The survey was carried out at the North and South Recycling and Disposal Stations in order to solicit input from customers on how they use the current facilities, what aspects they feel are important to improve, and what level of cost increases they felt were reasonable for these improvements. Input was received from 231 customers. The survey report is attached in Appendix C. The survey results indicate the following:

- The majority of customers use the stations out of necessity and feel that the stations are very much needed.
- Although traffic was a major concern at the public forums, most surveyed customers did not want to pay more for a decreased wait time. Many expressed their preference to choose to use the stations during less busy days and times of day.
- The majority of surveyed customers said that they would pre-sort their waste into different waste types (lumber, metal, gypsum wallboard, reuse items, other recyclables) if their fee were reduced.
- About half the surveyed customers said they would pay more for improved recycling and reuse facilities.

### 3.6 Review of Other City Plans

SPU reviewed several other City plans and evaluated facility options' consistency with these other plans. SPU reviewed the draft South Wallingford Amendment to the Wallingford Neighborhood Plan and submitted comments, and considered recommendations in the plan when developing options for the North Recycling and Disposal Station. Similarly, SPU reviewed the South Park Neighborhood Plan for consistency with current and future actions at the South Recycling and Disposal Station. Portions of the other 37 neighborhood plans were reviewed regarding waste management facilities.

The draft South Wallingford Amendment recommended various uses for the North Recycling and Disposal Station site if the station were relocated. The plan also recommended rezoning property around the station to Single Family and Neighborhood Commercial, and maintaining viewsheds along road corridors by limiting development that would block views. None of the other neighborhood plans specifically mentioned the Recycling and Disposal Stations; however, several mentioned a need to keep areas clean and litter-free.

SPU also reviewed other City reports for consistency with waste transport and shipping plans, including *Freight Mobility Strategic Action Plan*, dated November 2002, and *Access Duwamish—A Freight Mobility and Economic Strategy for the Duwamish Area*, dated June 2000. Concepts for an intermodal solid waste transfer facility were created to conform to recommendations in these plans.

SPU staff also met with staff from several other City agencies to discuss solid waste facilities and consistency with other departments. These City agencies included the Seattle Department of Transportation, Department of Neighborhoods, Design Construction and

Land Use (this department will be changed to the Department of Planning and Development in 2004), Fleets and Facilities Department, Department of Finance, and others.

## 4 Solid Waste Facilities Overview

This section provides a brief summary of Seattle's solid waste system and the existing facilities. A table and a flow chart showing how and where different waste streams are collected, transferred, and disposed are included in Appendix D.

### 4.1 Existing Facilities

Seattle's solid waste management system consists of publicly and privately owned facilities. Facilities located within the Seattle city limits are shown in Figure 1. Countywide facilities are shown in Figure 2. King County operates its solid waste system separately from the City of Seattle; however, most privately owned facilities receive waste from both the city and the county. The main facilities in Seattle are as follows:

#### City-Owned

- North Recycling and Disposal Station (NRDS) in Wallingford.
- Aurora Household Hazardous Waste (HHW) Collection Facility near Haller Lake.
- South Recycling and Disposal Station (SRDS) in South Park.
- South Household Hazardous Waste Collection Facility at SRDS.

#### Privately Owned

- Eastmont Transfer Station owned by Waste Management Inc.
- Recycle America Material Recover Facility owned by Waste Management Inc.
- Alaska Street Reload Facility owned by Waste Management Inc.
- Rabanco's Recycling, Transfer, and Intermodal Facility.
- Argo Rail Yard owned by Union Pacific Railroad.
- Cedar Grove Composting Facility.
- Pacific Topsoil's yard waste facility in north Seattle.
- Other private facilities that accept reuse and recyclable materials.

The City-owned transfer stations were renamed "Recycling and Disposal Stations" in the early 1990s to emphasize the role they play in recycling materials in addition to transferring waste for disposal. These stations primarily accept contractor collected and self-haul municipal solid waste. In addition to municipal waste, the privately owned transfer stations receive construction demolition and landclearing (CDL) waste, waste from Seattle businesses, asbestos, contaminated soil, very large bulky items, and other special waste. The handling of CDL waste and other items requires different equipment and procedures; because of this, the privately owned stations perform some different functions than the publicly owned stations. The majority of residential customers and many small businesses prefer to use the publicly owned stations because they cater to self-haul customers. As a result, the different transfer stations complement each other with different functions and services.

170818.61.12\_00728300002A | Master Plan / Fig 1 Map of Solid Waste Facilities in Seattle | 11-4-03 | LW

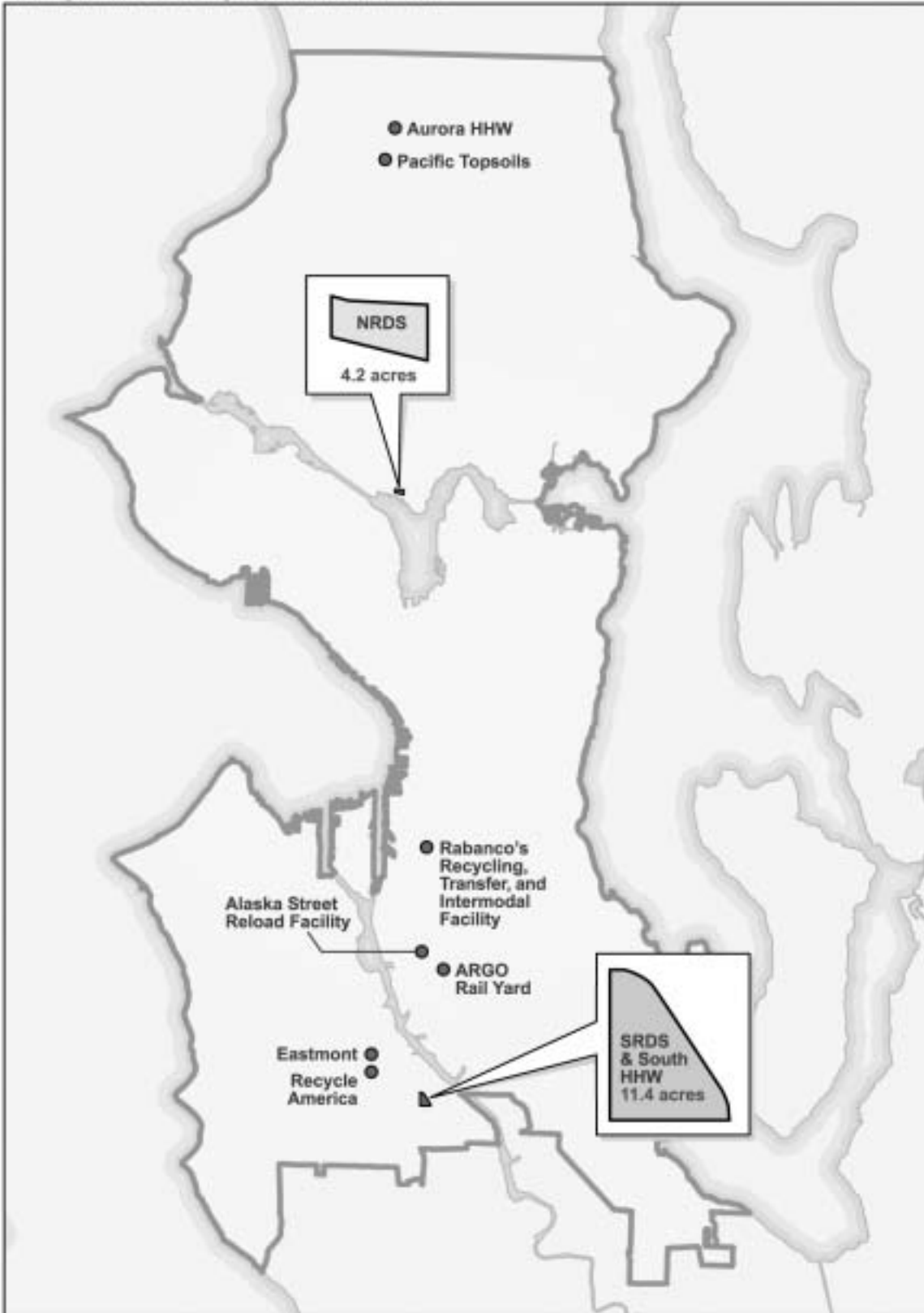
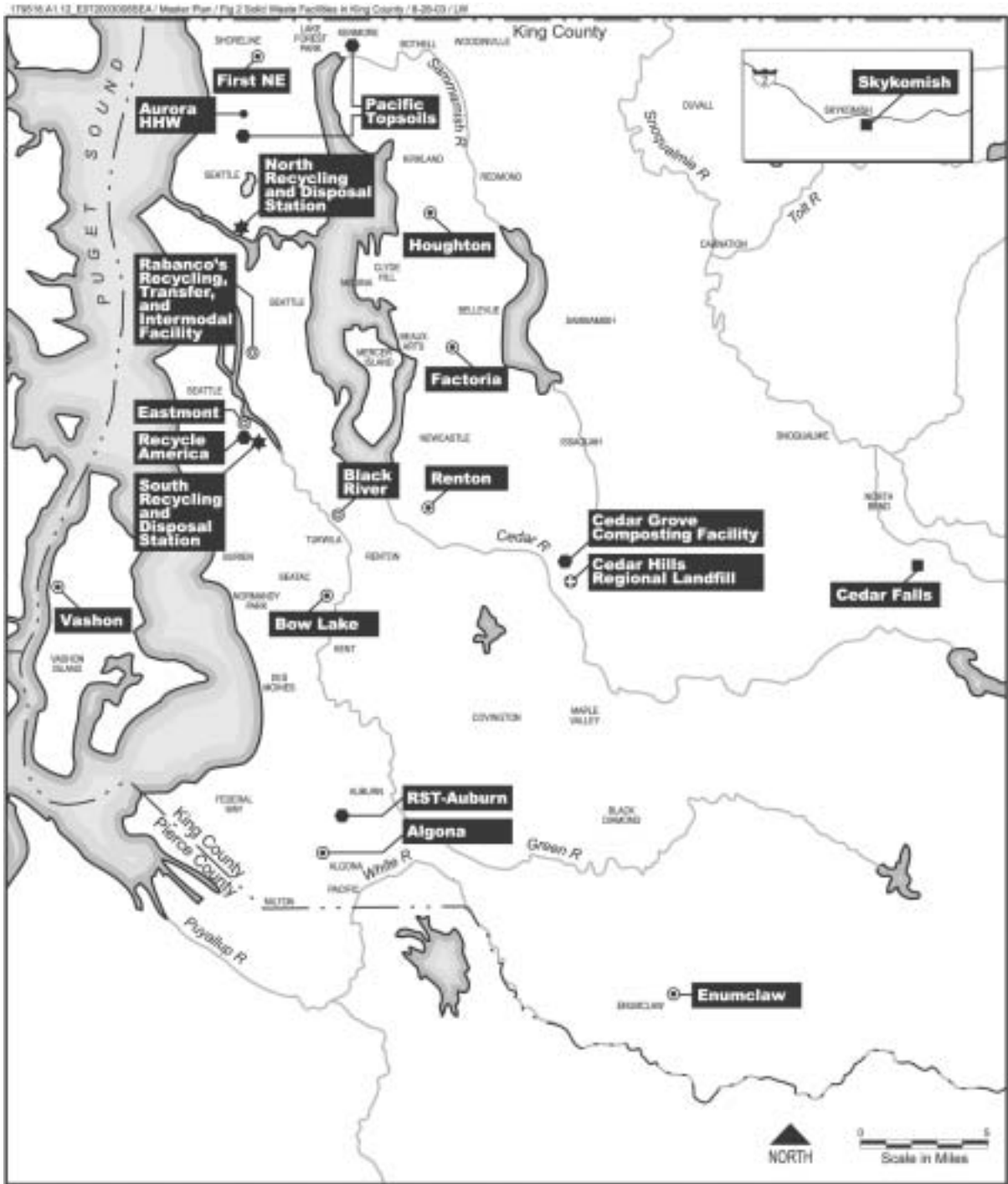


Figure 1  
Map of Solid Waste Facilities in Seattle



LEGEND

- ⊙ King County Transfer Station
- ⊕ King County Regional Landfill
- King County Drop Box
- ⊙ Private Transfer Facility
- Private Recyclables Processing Facility
- ★ City of Seattle Transfer Station (Not part of King County System)

Figure 2  
Solid Waste Facilities in King County

## 4.2 Collection

The City has contracts with two hauling companies to collect residential and commercial solid waste. Almost all residential waste and up to 40 percent of commercial waste is delivered to the City's two Recycling and Disposal Stations for compaction into intermodal shipping containers. The other 60 percent or more of the commercial waste, and almost all CDL waste from construction job sites, is delivered to the two privately owned transfer stations (except self-haul CDL from small businesses and individuals).

Some CDL waste from Seattle is also taken to the Black River Transfer Station in Renton where it is loaded onto a train and shipped to the Roosevelt Landfill in eastern Washington. Also, some CDL waste and industrial waste that is in suitable shipping containers is taken directly from a construction job site to the Argo Rail Yard. The private stations also handle large bulky items and some industrial and special waste (e.g., ash, petroleum-contaminated soil, asbestos, sludge). Most of the waste hauled by individuals and small businesses (self-haul customers) is taken to the City-owned recycling and disposal stations, but some is also taken to the private stations and various reuse and recycling facilities.

### Recycling

The City's contracted hauling companies collect recyclables at the curbside from residential customers, including apartment buildings. Some small businesses choose City-contracted recycling pickup; larger businesses contract directly with recycling companies for collection. City-collected recyclables are processed at Rabanco's material recovery facility (MRF) located next to their transfer station. Recyclables collected at the City's two recycling and disposal stations (e.g., scrap metal, appliances, wood waste, glass) are trucked to recycling facilities. Also, some CDL waste is sorted out for recycling at the private transfer stations. The City's goal is to recycle 60 percent of the municipal waste stream.

### Yard Waste

The City also contracts for yard waste to be collected from residential customers under the same contract as refuse collection. The City's yard waste is consolidated either at Rabanco's transfer station or at the City-owned recycling and disposal stations, and is trucked to Cedar Grove Composting located about 20 miles southeast of Seattle. Pacific Topsoils also accepts yard waste at a facility in northern Seattle.

## 4.3 Specific Facilities

### North Recycling and Disposal Station (NRDS)

The NRDS serves as an intermediate transfer station serving north Seattle (generally north of the ship canal). Figure 3 shows an aerial photograph of the NRDS. Refuse is compacted into intermodal containers and trucked to the Argo Rail Yard for transfer to a train destined for the Columbia Ridge Landfill in Oregon. Yard waste is collected at one end of the station in open-top containers that are trucked to the Cedar Grove Composting Facility. Wood waste is also collected and trucked to SRDS for consolidation and shipment to a recycler. Other recyclable materials, such as scrap metal, aluminum cans, paper, plastics, and other materials, are also collected and transported to recycling facilities.



17955A1\_12\_E0728000895A/Master Plan / Fig 3 North Recycling and Disposal Station / 6-28-03 / LW



Figure 3  
North Recycling and Disposal Station

The majority of the waste processed at this facility comes from residential refuse collection trucks (garbage trucks). A summary of the majority of tons delivered and customer trips at the NRDS in 2001 is provided in Figure 4. Data for smaller quantity vehicle trips are not shown. This figure shows that more than half the tonnage of materials going through NRDS comes from contract-collected refuse and yard waste, while these vehicles make up less than 7 percent of the total traffic. In 2001, the facility received 7,029 garbage truck trips totaling 49,031 tons of municipal waste.

The facility also receives waste from small businesses and local residents who have large objects or excess refuse that will not fit in curbside containers. In 2001, 113,011 self-haul truck customers and 25,210 car customers discharged 55,154 tons of waste. Contracted yard waste collection trucks made 1,923 trips and delivered 12,938 tons of yard waste.

In addition to contracted collection trucks, the University of Washington and Seattle Housing Authority collection trucks also discharge waste at this facility. Beginning in 2002, about 5 percent of the tonnage from contracted commercial refuse collection in Seattle will be discharged at NRDS. Existing commercial collection contracts allow up to 40 percent of the total commercial tonnage collected in Seattle to be directed to the City-owned stations rather than the privately owned stations.

179518.A1.12\_S0720030085EA/Master Plan / Fig 4 NRDS Usage in Tons and Trips 2001 / 8-28-03 / LW

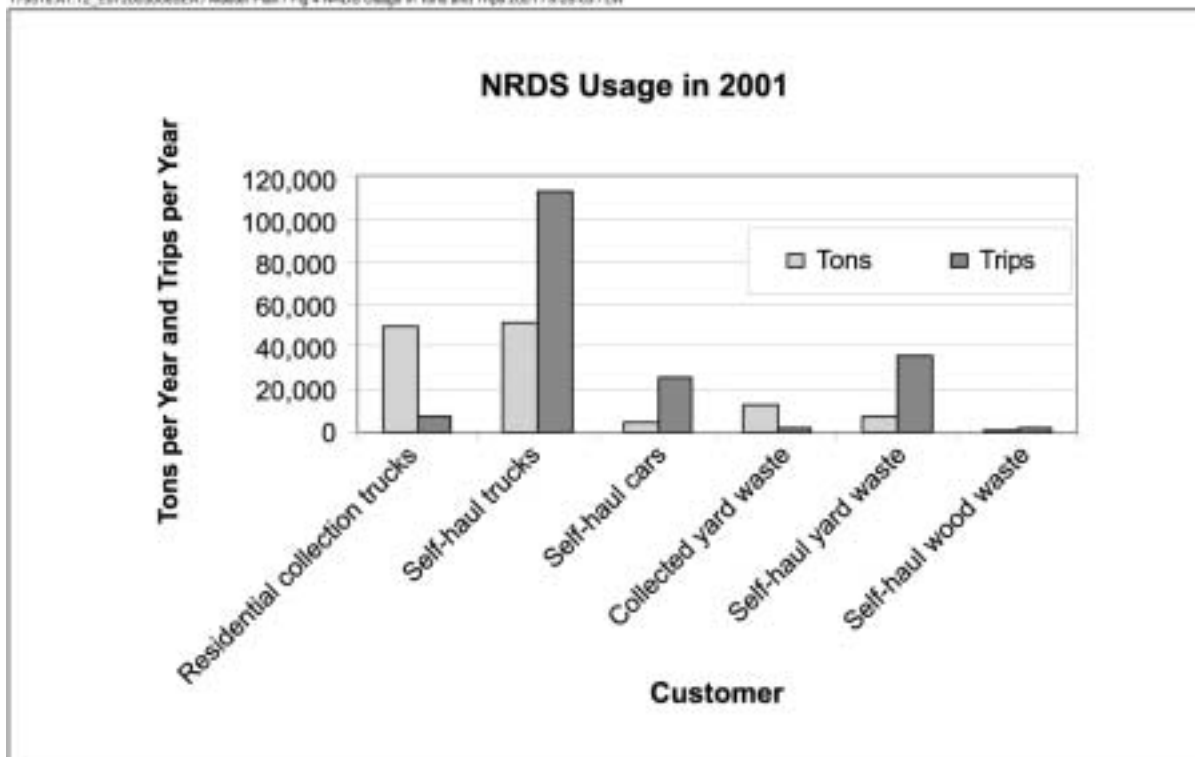


Figure 4  
NRDS Usage in Tons and Trips, 2001

Some of the main problems at NRDS include the following:

- Inadequate throughput capacity, leading to frequent lines that extend onto the public roadway and delay customers.
- Several physical and environmental hazards requiring management to keep employees and customers safe.
- The main building requires a seismic upgrade, and temporary office and employee facilities need to be replaced.
- Space is very limited, and there is limited room to enlarge the disposal building to accommodate customers.
- There is inadequate space for a new station office, employee facilities, and employee and visitor parking.
- The scalehouse, scales, and computer tracking system require replacement or significant upgrades.
- The main building is designed as an open-air structure, making it difficult to control odor and dust.
- An intermodal container loading facility was installed in the station building in 1990 in order to meet the rail shipment requirements; however, this modification was less than ideal and has led to operational and maintenance problems.

- There is insufficient space to improve recycling facilities and add a facility to collect reuse items.

### South Recycling and Disposal Stations (SRDS)

The SRDS serves as an intermediate transfer station serving southern Seattle (generally south of the ship canal). An aerial photograph of the SRDS is shown in Figure 5. Solid waste is compacted into intermodal containers and hauled to the Argo Rail Yard for transfer to trains. Yard waste is collected at one end of the station into open-top containers that are trucked to the Cedar Grove Composting Facility. Clean wood waste, appliances, other scrap metal, plastics, paper, aluminum, and other recyclables are collected and transported to other recycling facilities. This site also has a household hazardous waste (HHW) facility and a vehicle maintenance facility.

170616-A1.12\_EST20030000EA / Master Plan / Fig 5 South Recycling and Disposal Station / 8-25-03 / LW



Figure 5  
South Recycling and Disposal Station

The majority of waste processed at this facility comes from contracted residential refuse collection trucks. Although contracted collection trucks bring in more than twice as many tons of materials than the self-haul customers do, they make up less than 14 percent of the total trips (as shown in Figure 6, 12,976 refuse truck tips discharged 94,982 tons of municipal

waste in 2001.) As mentioned above in the description of NRDS, the existing commercial collection contracts allow up to 40 percent of the total commercial tonnage collected in Seattle to be directed to the City-owned stations; therefore, the City could increase the number of refuse trucks delivering commercial waste to the stations.

179518.A1.12\_ED72030085EA/Master Plan / Fig 6 SRDS Usage in Tons and Trips 2001 / 8.28.03 / LW

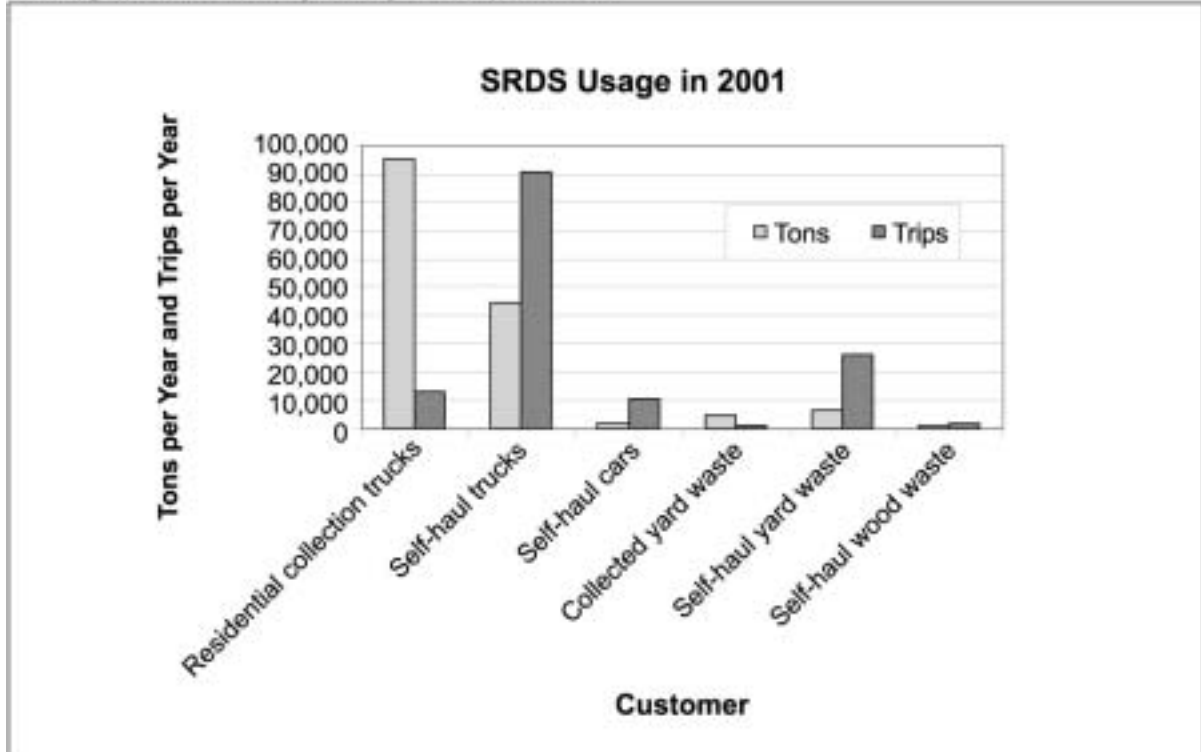


Figure 6  
SRDS Usage in Tons and Trips, 2001

The south facility also receives waste from small businesses and local residents who have large objects or excess refuse that will not fit in curbside containers. In 2001, 90,527 self-haul truck customers and 10,789 car customers delivered 46,329 tons of waste to the SRDS.

Contracted yard waste collection trucks made 894 trips and discharged 4,721 tons of yard waste. In addition to contracted collection trucks, the Seattle Housing Authority collection trucks also discharge waste at this facility.

The problems at NRDS also apply to SRDS. Although the SRDS site is almost twice the size as NRDS, it also has a household hazardous waste (HHW) and vehicle maintenance facility. The main problems at SRDS include the following:

- Inadequate throughput capacity, leading to frequent lines that back up onto the public roadway and delay customers.
- Several physical and environmental hazards.
- The main building requires seismic upgrade, and temporary office and employee facilities need replacement.

- Space is limited, and there is limited room to enlarge the disposal building to accommodate customers.
- There is inadequate space for a new station office, employee facilities, and employee and visitor parking.
- The scalehouse, scales, and computer tracking system require replacement or significant upgrades.
- The main building is designed as an open-air structure, making it difficult to control odors and dust.
- An intermodal container loading facility was installed in the station building in 1990 in order to meet the rail shipment requirements; however, this modification was less than ideal and has led to operational and maintenance problems.
- There is no covered area to work on vehicles; an enclosed shop is needed at this site or at a nearby location.
- There is insufficient space to improve recycling facilities and add a facility to collect reuse items.

#### **Aurora Household Hazardous Waste Facility**

The Aurora Household Hazardous Waste (HHW) facility is located in northern Seattle and collects household hazardous items that are not accepted at the Recycling and Disposal Stations. Waste is currently accepted by appointment only.

This facility is relatively new and is expected to meet future needs without major modifications over the next 30 years. Facility improvements will be made on an as-needed basis. The land surrounding this site is owned by the City and is used for service vehicle parking, which is compatible with the HHW operation.

#### **Argo Rail Yard**

The Argo Rail Yard is where Seattle's waste is transferred onto trains for long-haul shipment to the Columbia Ridge Landfill. The Argo Yard is owned and operated by Union Pacific Railroad Company. The City of Seattle has a contract with Washington Waste Systems, Inc. to transport and dispose waste, and it in turn has an agreement with Union Pacific to use the Argo Rail Yard for rail loading. The contract term is through March 31, 2028; however, the City has the option of terminating the contract on March 31, 2009, 2010, 2011, and 2014.

Refuse compacted into intermodal containers is trucked from the City recycling and disposal stations to Argo Rail Yard by City employees. At the rail yard, Union Pacific contracted employees load the containers onto a train. Empty containers returning from the landfill are placed onto City trucks to be hauled back to one of the recycling and disposal stations.

The Argo Rail Yard also receives waste from other haulers. Contracted refuse collection haulers deliver intermodal containers from the privately owned transfer stations. Some construction and demolition waste from job sites that is already in containers is trucked directly to Argo Rail Yard. Waste from other counties is delivered in intermodal containers

to the Argo Rail Yard and is loaded onto the same trains as Seattle's waste. Containers from ships at the Port of Seattle are also loaded and unloaded onto trains at Argo Rail Yard. Most of this ship container traffic comes from Terminals 5 and 18 at the Port of Seattle.

### Eastmont Transfer Station

The Eastmont Transfer Station is owned and operated by Waste Management Inc. It receives a portion of the City's collected commercial and CDL waste, along with refuse from areas outside of Seattle. This waste is loaded into intermodal containers and, because the Eastmont Transfer Station is not near a rail line, the full intermodal containers are trucked to the Argo Rail Yard. The density of the container loads cannot be maximized because containers must be kept under the road weight limit.

It is uncertain how much additional capacity this facility has; however, the options for expansion are limited.

### Rabanco's Recycling, Transfer, and Intermodal Facility

Rabanco's Recycling, Transfer, and Intermodal Facility is located at 3rd Avenue South and South Lander Street and is owned and operated by Allied Waste Industries under the subsidiary name of Rabanco. The facility includes a material recovery facility (MRF) for processing recyclables, a solid waste transfer station, and an intermodal rail loading yard.

The intermodal yard is located on a siding of the Burlington Northern/Santa Fe (BNSF) rail line and can load intermodal containers from the transfer station onto rail cars. A portion of the City's collected commercial waste and CDL waste is received at Rabanco's intermodal yard. The commercial waste is loaded into intermodal containers and trucked to the Argo Rail Yard for transport to Oregon's Columbia Ridge Landfill. CDL waste is loaded onto rail cars for transport to the Roosevelt Landfill in eastern Washington.

Yard waste collected in the southern portion of Seattle is also consolidated into transfer trailers at this facility and trucked to the Cedar Grove Composting Facility. This facility also has an area for consolidating non-hazardous contaminated soil, which is also shipped by rail to the Roosevelt Landfill.

Rail cars from this station are moved to the Interbay Rail Yard for assembly into a unit train. Long train segments sometimes block at-grade road-rail intersections when the train segments are moved; however, additional road grade separations are planned for near-future construction, which should reduce this current problem.

One disadvantage of this site for the City is that waste directed to a landfill not located on the BNSF rail system must be trucked to Argo Rail Yard or another intermodal loading facility.

Although this facility appears to have additional capacity, it is unclear how much additional waste and how many vehicle trips the facility can accommodate.

## 5 Facility Needs for Waste Shipment

An important goal of the facilities plan is to ensure that adequate facilities are available to ship waste to a disposal facility in a manner coordinated with other freight activities in the

Seattle area. The solid waste shipment system must be highly reliable because even a single day of interrupted service can disrupt the system for several days and generate public complaints. After a few days of interrupted service, sanitary problems can begin to develop and public health concerns may arise. Therefore, it is essential for the City to have an effective and reliable waste transfer system.

Before loose waste can be shipped, it must first be compacted into intermodal containers, which are standard-sized containers that can be placed onto various modes of transportation, such as trucks, trains, ships, or barges. Currently, most landfill sites are located in dry regions several hundred miles from Seattle. The least expensive long-haul mode of transportation for large volume materials is train. Therefore, it is likely that Seattle will continue to ship waste for disposal by way of train. However, the City must also be prepared to ship waste by other means in the event that train service is interrupted or other modes of transportation become less expensive.

Waste must be transported in concert with a variety of other important activities, as illustrated in a recent Seattle Department of Transportation brochure on freight mobility:

“In a single day 70,000 workers drive to work, 6,000 trucks carrying container cargo access the Port of Seattle, 1,400 trucks hauling products arrive from Eastern Washington, 3,000 industrial businesses open their doors, 4,000 passengers board cruise ships for Alaska, 3,000 tourists stroll waterfront shops and restaurants, 60 freight trains rumble on by, 45,000 Mariners fans head for Safeco Field, some 34,000 ferry commuters load and unload again, 20,000 area residents leave for work... Thus the day goes for a small, popular, scenic and congested area of Seattle. An area bulging with opportunity, the Duwamish-Interbay Corridor.”

Amongst all this, over 800,000 tons per year of solid waste is shipped out of Seattle by Union Pacific Railroad five days a week on a dedicated train with each train typically over a mile long. In addition, Burlington Northern/Santa Fe Railroad ships over 1 million tons of solid waste through Seattle, with about half of the tonnage from counties north of King County.

Seattle is expected to remain a center for waste shipment because it is one of the few locations where waste can be consolidated onto a train for long-haul shipment to a landfill or other disposal facility. For this reason, waste generated outside of Seattle is brought into Seattle for shipment, just as many other cargo items are brought to the Port of Seattle for freight consolidation and shipment. Although the City of Seattle ships about 475,000 tons per year of municipal solid waste (MSW) and about 160,000 tons per year of non-municipal waste, over 1.8 million tons per year of waste are shipped by rail through Seattle. This quantity is expected to increase to almost 3 million tons per year in 2012 when the King County Cedar Hills Landfill closes and the County begins to ship waste by rail. More details about waste shipment can be found in Appendix E.

Seattle is likely to remain an important rail shipping location for two reasons. First, Seattle is one of the few locations in the Pacific Northwest where a full-length train can be assembled. Second, it is incrementally less expensive to add rail cars to an existing train than to run a shorter train. In fact, about one-third of Seattle's dedicated solid waste trains contain waste from other counties, such as Whatcom, San Juan, and Island counties. These counties do not generate enough waste to build full-length trains within reasonable waste holding times;

therefore, it is advantageous for them to add their waste to another train that is already going to a landfill. Waste from these counties is trucked in intermodal containers across ferries and highways to Union Pacific's Argo Rail Yard, where the containers are loaded onto the same train contracted for Seattle's waste.

Shipping solid waste requires three different facilities, as follows:

1. Waste receiving and containerization facility. This facility receives waste from refuse collection trucks and other customers and compacts the waste into intermodal containers.
2. Intermodal container loading facility. This facility loads the containers onto the long-haul transport vehicle (e.g., train, truck, container ship, barge).
3. Train assembly and testing (for rail shipment). The loaded train segments must be assembled into a full-length train and the connections and air brakes tested before the train is allowed on the main line.

Currently, Seattle's MSW is received and containerized at the two City-owned recycling and disposal stations and the two privately owned stations. This situation is less than ideal because all but one of the stations were not originally designed to load intermodal containers, and all the stations lack capacity for significant expansion. In addition, the intermodal containers must be trucked to a separate loading facility to be loaded onto trains destined for Seattle's contracted disposal site. One advantage of this system is a substantial redundancy in having four compaction/containerization stations. This redundancy, however, adds to the total system costs. It should be noted that the private stations handle more than just Seattle's waste, they also serve the surrounding region.

A more efficient waste transfer system would have both the waste receiving and container loading facilities located at a rail yard large enough to build a full train. This is the case with Rabanco's intermodal facility; however, it has access to only one rail line, and the rail segments still need to be hauled to the Interbay Yard to be assembled into full-length trains. The ideal facility would combine a waste receiving facility with a container loading facility and would have access to both rail lines and other modes of transportation.

Continued container loading at the Union Pacific Argo Rail Yard is also less than ideal over the long term. The current solid waste container loading operation takes up a significant amount of space at the Argo Rail Yard, and there is no space for expansion. As national and international shipping activity increases at the Port of Seattle, as is expected in the future, the space at Argo Rail Yard will be at a premium; international intermodal traffic is projected to grow between 3.4 percent and 4.4 percent compounded annually over the next 20 years for Pacific Northwest Ports.<sup>1</sup> International shipping has declined in recent years and it may be several years before it begins to increase. Regardless of the current situation, relocating the waste loading operation would increase the city's capacity to handle international cargo in the long-term future.

Developing a separate facility for loading intermodal containers at a railhead with solid waste is in keeping with other plans and recommendations. Washington State Department

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<sup>1</sup> Marine Commerce Forecast prepared for the Washington State Public Port Association and Washington State Department of Transportation, 1999.



of Transportation's recommendations for improving rail freight capacity is to improve terminal areas for cargo handling rather than use limited rail yard space.<sup>2</sup> The railroad companies also prefer that actual cargo handling not take place at railroad facilities. In fact, Union Pacific will only accept solid waste at Argo Rail Yard that is already in intermodal containers. This policy is consistent with other forms of freight shipped by the railroad, such as grain and petroleum products, which are loaded into rail cars at facilities separate from the rail-owned facilities. Also, there is no room at Argo Rail Yard for a waste receiving/containerization facility, according to Union Pacific officials.

A separate facility for solid waste containerization and rail loading would provide long-term assurance of a suitable facility for waste transfer and would free up space at existing rail yards for other container cargo that is shipped through the Port of Seattle. A separate waste receiving facility could be similar in concept to the existing grain-loading facility at Terminal 86 on Elliott Bay. At this facility, the railroad companies simply arrive and depart train cars at the grain terminal. All actual cargo handling occurs on Port of Seattle property at Terminal 86. This operation frees up the railroad sidings and rail yards for other cargo transport activities. In 2001, 2.7 million metric tons of grain were shipped through this facility without impinging on other rail facilities. A separate terminal for handling solid waste from the City of Seattle and other regional sources would improve freight mobility and ensure adequate long-term capacity to transfer waste through a variety of transportation modes in a competitive manner. Capacity needs for Seattle's waste over the next 30 years is about 1 million tons per year and for total regional waste loading is over 3 million tons per year.

The City conducted a property search in 2002 to identify potential sites suitable for an intermodal solid waste transfer station. The most favorable sites are located south of downtown Seattle in industrial area of the city. The property evaluation can be found in Appendix F.

## 6 Regional Considerations

Seattle plays an important role in regional solid waste management because it is a central hub for freight shipments; the waste from five or more counties is shipped through Seattle. Most western counties in Washington have closed all of their landfills and ship their waste to regional landfills located in arid regions of Washington and Oregon. More information about waste shipments can be found in Appendix E.

SPU considered regional issues as part of the planning process for this facilities plan, by reviewing the solid waste management plans for King County and other adjacent counties and by holding a meeting with solid waste planners from adjacent counties to discuss regional solid waste management issues. The Planning Team also held several follow-up discussions during the development of this plan to ensure consistency with regional solid waste management objectives.

Of significant regional importance is the future closure of the Cedar Hills Landfill in King County, currently scheduled for 2012. Once this landfill closes, about 1 million tons per year of additional waste will need to be shipped out of the county, and it is most likely that this

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<sup>2</sup> *Washington State Freight Rail Plan – 1998 Update*, Washington State Department of Transportation.

waste will be shipped through Seattle by rail. In order to handle this increased quantity of waste, the County will need to find additional capacity to load intermodal containers containing waste onto transport vehicles for long haul to a disposal facility.

During development of facility options for Seattle, SPU also considered the impact of increased regional waste requirements. Some of the options developed allow for future capacity expansion to accommodate partner waste or development of adjacent facilities for potential joint operations. Design and cost details of potential partnership arrangements with other solid waste authorities are not included in this report, but may be developed at a later date if such agreements appear feasible and advantageous to the City.

## 7 Operational Considerations

The current physical constraints and operational practices of the two City-operated Recycling and Disposal Stations limit the City's ability to meet solid waste recycling goals, meet customer service needs, or allow for expansion to accept new materials. The existing facilities require a high labor-to-tons ratio when compared to newer facilities. Operational efficiencies and cost effectiveness are difficult to achieve. High maintenance costs are necessary to manage and operate antiquated facilities. Safe operation requires a very high level of diligence for both employee and customer safety. The community impacts of the existing facilities and practices include unacceptable levels of noise, dust, odor, and traffic.

New facilities, incorporating updated technologies, structures, and practices, would provide long-term flexibility to meet future needs, higher levels of recycling, lower labor-per-ton costs, higher customer service levels, and more cost-effective maintenance practices. Incorporating modern applications and practices would result in greatly reduced levels of noise, dust, odor, and traffic.

The current solid waste management system is operating near capacity with very little flexibility to deal with disruptions or changes. Under the current disposal contract, there are just enough containers to operate on a day-by-day basis. A 1-day delay in train service results in a shortage of containers that disrupts the collection and delivery system for days. The waste handling capacity is inadequate to deal with natural and human disasters that generate large volumes of waste, such as earthquakes, fires, floods, and terrorist acts. For example, the solid waste system was severely overloaded during the 1996 ice storm. In order to assist residents, King County offered free disposal service, but the City was unable to provide additional services because Seattle's system lacked capacity to handle disaster debris.

## 8 Regulatory Considerations

The Washington Department of Ecology and the King County Board of Health regulate intermediate solid waste handling facilities such as transfer stations, waste storage facilities, and material recovery facilities. A permit will be required for any significant changes to the existing Recycling and Disposal Stations and any new intermodal facility. In addition, local zoning regulations apply to all solid waste management facilities in Seattle.

The state and county solid waste facility regulations are based on performance rather than design; therefore, it is up to the applicant to develop designs that are capable of meeting the

performance requirements of the regulations. All conceptual options considered during this planning process were developed to meet the performance requirements of the regulations.

A plan of this extent also requires environmental review under the Washington State Environmental Policy Act (SEPA) before an option can be approved and implemented. A discussion of land use and environmental restrictions is included in Section 3 of Appendix G.

## 9 History of Facility Changes

The way solid waste is managed has substantially changed since the two City-owned recycling and disposal stations were built in 1966. These changes have left the City with facilities that no longer meet current and future needs or waste management objectives.

The two City-owned solid waste recycling and disposal stations were built in response to a pending garbage crisis. At that time, the last remaining landfills within the city limits were nearing capacity, and siting new landfills in the city was becoming almost impossible. Seattle had grown to the extent that open spaces suitable for landfill development were no longer available. In response to the pending landfill closures, the City developed two new landfills about 20 miles south of the center of Seattle. This distance was too great to economically send all garbage trucks to the landfill; instead, the two recycling and disposal stations were built in the city. One transfer station was built near the industrial waterfront area of Lake Union to serve north Seattle, and the other was built on the closed South Park Landfill to serve south Seattle. These transfer stations provided the same basic service provided by the in-City landfills: garbage trucks, residents, and businesses unloaded their waste at the transfer stations as they had previously done at the landfills. The waste at the stations was consolidated into transfer trailers that were trucked to the new landfills south of Seattle.

By the 1980s, a major shift in the way waste was disposed began to take place. Environmental problems at landfills across the country led to the development of new federal and state standards for landfill design and operation in the 1980s and 1990s. These requirements increased the costs of landfill facilities and caused many small landfills to close; in 1991, there were a total of 45 MSW landfills in Washington, but by 1999 there were only 22. Seattle's landfills were among those that shut down: the City's Midway Landfill was closed in 1983 and the Kent Highlands Landfill was closed in 1986. Without these landfills, the City began hauling solid waste to King County's Cedar Hills Landfill. This landfill was also forced to make expensive upgrades to meet the new standards, resulting in higher disposal fees to the City. In addition, the County issued unfavorable contract terms to the City. In response, the City began looking for lower-cost disposal options at newer landfills that were designed to meet the improved environmental standards.

The higher cost of waste disposal resulting from more stringent landfill standards provided an economic incentive to recycle more materials and changed the function of the transfer stations. Rather than simply consolidating all waste for transfer to a landfill, the City recycling and disposal stations were modified to divert some waste materials to recycling facilities rather than to the landfill. Also, various disposal bans forced the creation of other facilities to manage the waste. Two household hazardous waste collection facilities were added to the solid waste system. The ban on yard waste disposal led to the creation of

separate areas in the recycling and disposal stations to collect yard waste, which was transported to a composting facility contracted by the City. By the 1990s, over a third of the space at the recycling and disposal stations was converted to areas for collecting recyclables and yard waste rather than waste for disposal. Figure 7 shows the difference in materials management between the 1960s and the present. The figure contains only a partial list of the items currently diverted from disposal at the Recycling and Disposal Stations. It is anticipated that the number of items diverted from disposal will continue to grow.

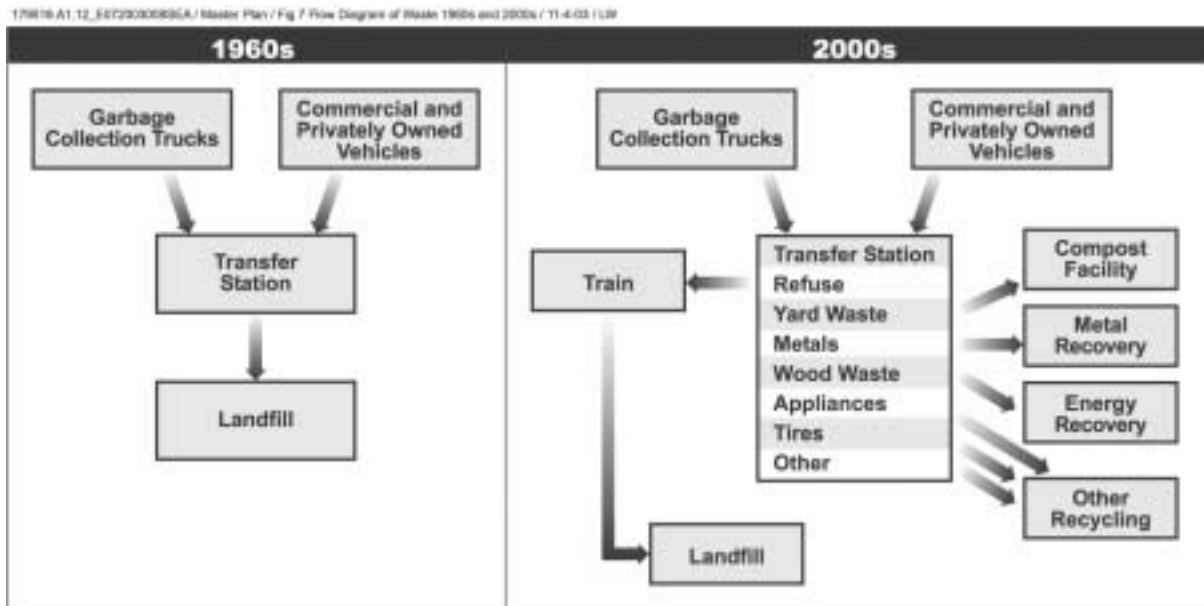


Figure 7  
Flow Diagram of Waste Through  
Transfer Stations in 1960s and 2000s

Another major modification to the recycling and disposal stations occurred in 1990 when the City decided to ship waste to a new modern landfill, Columbia Ridge, located several hundred miles away in Oregon. The least expensive shipment method for long-haul transportation was by rail, which required the waste to be loaded into intermodal containers before shipment. In order to do this, a compactor/container loading system was added to each of the existing recycling and disposal station buildings. Although the compactors have worked reasonably well, the add-ons were somewhat awkward, and have resulted in several operational and maintenance problems.

## 10 Future Trends

One of the main objectives of the SWFMP is to identify solid waste processing facilities that will remain appropriate and functional for the next 30 years or more. Although it is impossible to predict the future with absolute certainty, various trends in solid waste management are apparent and are likely to continue into the future.

As discussed in more detail below, we can anticipate the following future trends:

- No new landfills will be built in or near the city of Seattle.

- The City will continue to long-haul solid waste to a landfill in a dry climate.
- Rail transportation will remain less expensive than truck or barge.
- A significant percentage of the solid waste generated in Seattle will be diverted from disposal through reuse, recycling, composting, and other management options.
- Components of the waste stream will continue to change over time; therefore, facilities need to be designed with enough flexibility to change to accommodate different wastes and management practices.
- Transfer stations will be necessary in the future to consolidate and ship waste to processing, recycling, and disposal facilities.
- The City will maintain flow control over waste generated within the city limits.

In developing this Facilities Master Plan, SPU assumed that these trends would continue. Perhaps the most important assumption is that things will change, and facilities of the future must have the capacity to adapt to a changing waste stream and processing technologies.

### Transporting Waste to Distant Landfills

The trend toward shipping waste to large regional landfills located in dry climates is likely to continue. Over 70 percent of waste generated in Washington is long-hauled (>100 miles) to just a few landfills. The Roosevelt Landfill, located in eastern Washington, received about half of the MSW generated in Washington State in 2000. The Columbia Ridge Landfill, located in northeastern Oregon, has been the disposal site for the majority of Seattle's solid waste since 1991.

Operating landfills in dry regions is usually less expensive than in wet regions. One of the largest costs of operating a landfill is the management of contaminated water (leachate) that is formed when water drains through the waste; as a result, the majority of future landfills are likely to be located in dry climates. The two largest regional landfills accepting waste from Washington state (Roosevelt Landfill and Columbia Ridge Landfill) are located in the relatively dry region of the upper Columbia River, in southeastern Washington and northeastern Oregon. Only a few MSW landfills remain in the wetter regions of Washington. The Port Angeles Landfill is the only remaining MSW landfill on the Olympic Peninsula and is scheduled to close by 2004.

The relatively high cost of landfilling waste is also likely to continue. Current MSW landfill regulations require specific engineering design standards and operational performance standards to be met. In addition, the regulations require post-closure care and monitoring of landfills. Although specific design and operational aspects of MSW landfills may change over the next 30 years, the cost of landfill space is not likely to decrease significantly. Also, the cost of transporting waste long distances to regional landfills is not likely to decrease significantly.

### Transport Waste by Rail

The least expensive way to haul large volumes of materials long distances (>150 miles) has historically been by rail, and many solid waste districts currently use rail to long-haul solid

waste. Other options for hauling solid waste long distances include trucking and barge transport, but currently long-haul solid waste trucking costs are estimated to be significantly higher than rail. Barge transportation costs are even higher. It is anticipated that rail transportation will continue to remain the least expensive way to transport solid waste long distances.

## Waste Diversion

Although the costs for landfilling and transportation are unlikely to decrease, the costs of other waste management alternatives will likely remain competitive with disposal costs for many materials, such as paper, yard waste, metals, and many other materials. Therefore, we can expect the trend toward waste diversion from landfills to remain economical for a variety of materials. In addition to economic reasons, the City of Seattle has a goal of diverting waste from disposal because it is a more sustainable practice. The current City goal is to divert up to 60 percent of MSW from disposal. The City has achieved 40 percent diversion in the past.

Future waste management facilities will probably continue to handle and sort waste into various waste streams for shipment to different end users. For example, yard waste and other organics will probably be directed to composting facilities, and metals, plastics, and other separated materials will be sent to recycling facilities. The composition of the waste stream and the items selected for recycling may change over time, but the basic process of handling different waste streams for shipment to various reuse, recycling, processing, and disposal facilities is likely to remain. Therefore, future transfer station facilities should have the capability to receive and re-distribute a variety of source separated materials.

## Changing Waste Stream

Components of the waste stream will continue to change over time, altering management approaches and opportunities. New products are being invented continually, which results in new types of waste or waste byproducts. For example, cathode ray tubes in computer monitors and televisions now require special management due to hazardous components, although this waste stream is likely to decline as LCD and plasma screens become more economical and replace them in the marketplace. These new materials will have their own set of problems and handling requirements when they become waste. As the waste stream changes, the facilities that receive and process the wastes will also have to change.

## Transfer Stations

New waste disposal options will continue to evolve, but it is likely that transfer stations will still be needed. The relatively high population density of Seattle and relatively high land value makes the city an unlikely place for waste disposal facilities. Organics processing facilities such as composting, anaerobic digestion, and other processes often produce odor and other byproducts that make these facilities difficult to site within a city. Public opposition to refuse incineration has been strong in Seattle in the past and it may be difficult to site thermal destruction facilities inside the city in the future. Even if these facilities are sited within the city, there will be a need to transport the ash and non-combustible materials to a recycling or disposal facility. Regardless of the waste processing and disposal technology selected, there will still be a need for stations to consolidate the waste and transfer it to processing, recycling, and disposal facilities.

## City Control of Waste Flow

It is also assumed that the City of Seattle will maintain the legal right to designate the disposition of solid waste. State law RCW 35.21 gives cities, such as Seattle, the authority to control all solid waste collection through exclusive contracts and to designate the flow of that waste. Seattle Municipal Code (SMC) 21.36.095 gives the City the right to determine the disposition of solid waste. However, numerous federal court decisions have resulted in the loss of flow control by municipal governments. Yet despite various court rulings, the City of Seattle has maintained waste flow control over residential and commercial solid waste and reserves the right to control the location of CDL debris disposal. It is anticipated that the City will maintain flow control in the future because of the regulations in place and through the use of collection contracts that designate the disposition of collected materials.

## 11 Developing Solutions

The Planning Team considered input from stakeholders, solid waste experts, community meetings, and other sources to define feasible facility options for analysis. A series of internal workshops were held to develop options. The complexity of the options and their numerous permutations required a systematic evaluation methodology to screen the options down to a manageable size for more detailed analysis. A technical memorandum describing the decision process is included in Appendix H.

The steps involved in developing options included the following:

1. Define what constitutes an option.
2. Develop initial system options.
3. Define a conceptual waste flow between facilities for each option.
4. Prepare conceptual layout plans for facilities.
5. Prepare capital cost estimates.
6. Evaluate each option's quality of service.
7. Model life-cycle system costs over about 30 years.
8. Evaluate cost uncertainties.
9. Summarize costs and quality of service.

### 11.1 Defining an Option

In defining options, the Planning Team took a whole-system approach in which each option consisted of a combination of facilities working together in an integrated manner. The solid waste system consists of facilities that are interdependent; therefore, each option consists of multiple facilities with a description of how the waste would be directed between them. The options were developed with an understanding of the regional solid waste system. An option could include adding a new facility, replacing existing facilities, or remodeling of existing facilities.

### 11.2 Development of System Options

The Planning Team considered input from stakeholders and brainstormed a series of initial system options. These initial options were created to address a wide variety of possible system configurations and different levels of cost, diversion, and needed property. These

options were then screened and redefined after evaluating conceptual layouts, cost estimates, and the quality of service provided by each option.

### 11.3 Waste Flow

Waste flow refers to the path that waste follows from its source to its final destination. The City exercises flow control by designating who is authorized to collect city waste and directing where it will go. The size and configuration of a facility is determined in part by the types and quantity of waste the facility is anticipated to receive in the future. Therefore, understanding the flow of waste is an integral component of facility planning. Waste flow information can be found in Appendix D. This appendix contains a table listing various waste types, who collects them, where they are processed, and their final disposition. A diagram is also included that shows the current waste flow between existing facilities.

The flow of waste to one facility or another can be directed through contracts. For planning purposes, the theoretical flow of waste and quantity estimates for each option were applied to the following waste streams:

- Contractor-collected residential and commercial refuse.
- Contractor-collected residential yard waste.
- Contractor-collected commercial and/or residential food waste (future potential).
- Self-haul refuse.
- Self-haul yard waste (Clean Green).
- Self-haul recyclables, including construction materials and demolition debris.
- Reuse items.
- Household hazardous waste.

Knowing the quantity and types of waste that will be received at a facility over the next 30 years allowed the Planning Team to develop conceptual layout plans and define the approximate size and configuration of facilities needed to accommodate customers and services.

### 11.4 Conceptual Layout Plans

Engineers with experience in designing solid waste transfer stations assisted the Planning Team in developing design criteria and conceptual layout plans. Design criteria (such as average unload time, truck turning radius, stall width, scale length, etc.) were prepared from industry standards, operational experience, and site-specific requirements. A technical memorandum describing the design criteria is attached as Appendix G. The design criteria were applied to other site constraints, such as property configuration, topography, and operational considerations, to form conceptual layout plans. These facility layout drawings and property boundaries were developed for planning purposes only and do not represent detailed plans for construction. Also, property mentioned in the conceptual plan options was for planning and costing purposes only and does not necessarily represent any intent on the City's part to acquire or develop these properties.

### 11.5 Capital Cost Estimates

Once conceptual layout plans were developed, the Planning Team prepared planning-level costs and staff estimates, based on typical material and construction costs for conceptual



facilities. These cost estimates were input into a cost model which then calculated the total solid waste system costs.

## 11.6 Quality of Service

A structured decision process was used to help the team identify factors that are important to the service SPU provides and rate them in terms of relative importance. One factor that stood out among the others was cost. Because of the importance of cost, the Planning Team decided to analyze cost factors separately from non-monetary factors affecting the decision process. In this analysis, the non-monetary factors affecting the solid waste utility were referred to as quality of service factors.

Quality of service factors include both beneficial and adverse impacts resulting from the services provided. In this way, the Planning Team could account for both positive and negative impacts from an action. For example, expanding the size of a transfer station could be considered a negative impact on the local neighborhood, but a larger facility would also improve throughput, which would reduce other neighborhood impacts by reducing vehicle lines, blocked roadways, emissions from idling vehicles, etc. The combination of all factors makes up the overall quality of service score for each option.

Quality of service factors were broken down into the following main categories:

- Waste reduction and recycling.
- Customer service.
- Work environment.
- Built environment (community impacts).
- Natural environment impacts.

Each of these main categories has several subcategory factors. Figure 8 shows the screening criteria for the quality of service factors.

The Planning Team ranked each of the factors in the quality of service with input from others, in terms of relative importance. This exercise forced the group to identify how important each of the factors is to the project as a whole. A key issue in determining importance is the potential for variability between options. Factors affecting flexibility and customer service are ranked as very important, while other factors such as the natural environment rank much lower. This ranking does not imply that protecting the natural environment is not important, it just means that this factor is not likely to differ much among competing options. For example, all the options being considered would be designed to comply with environmental regulations and would have a similar impact on the natural environment; therefore, protection of the natural environment does not differ much between the options. However, flexibility—an important attribute of an option because it determines how well a facility would remain functional and economical over time as the waste stream, regulations, technologies, and other factors change—is much more variable between options. Because of this, flexibility was assigned quality of service scores higher than many other factors.

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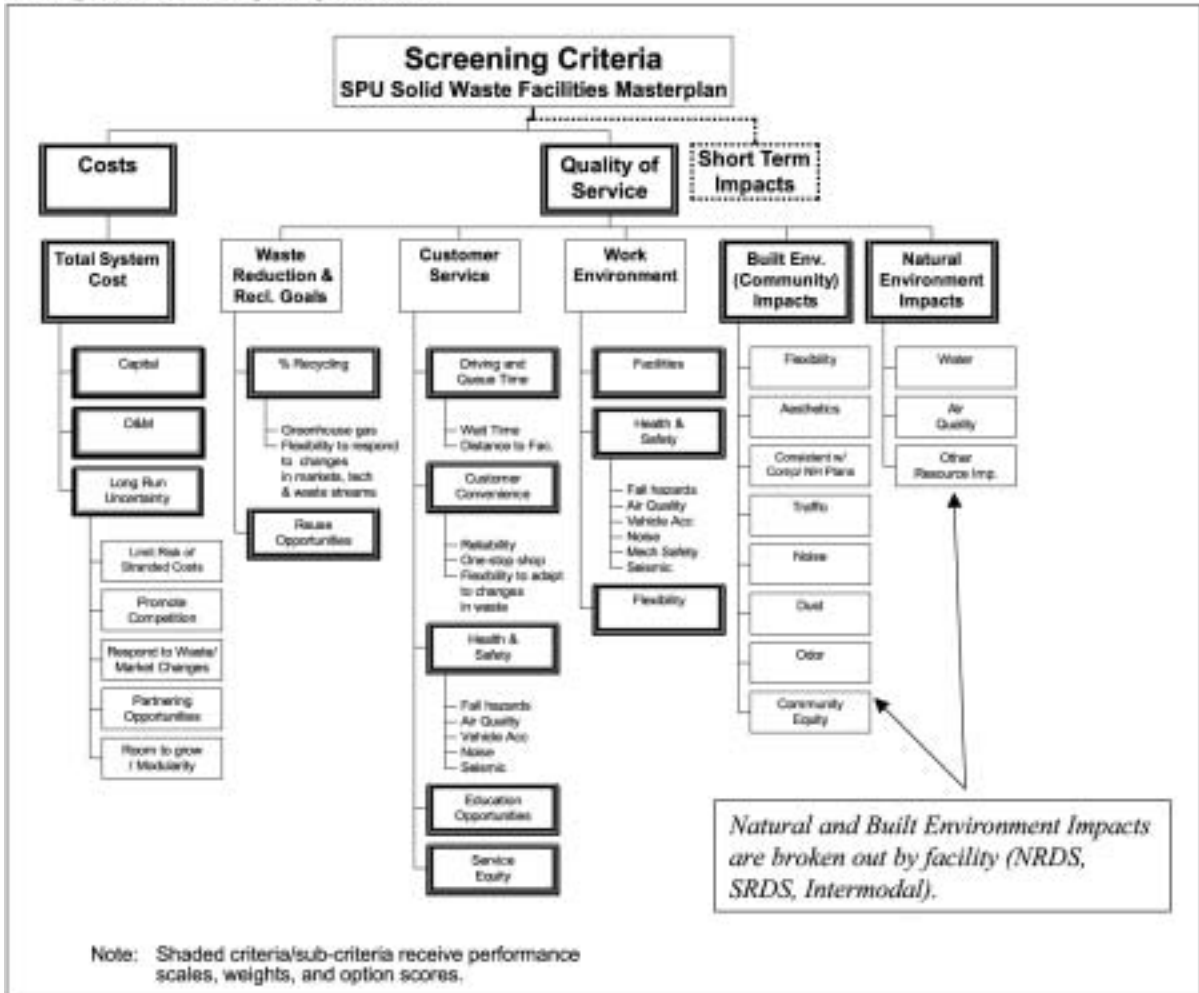


Figure 8  
Screening Criteria for Quality of Service Factors

After ranking the quality of service factors, each factor was quantified in some manner. For example, recycling was quantified in terms of the percent of tons received from self-haul customers that would be recycled under an option. When a factor could not be easily quantified by a measure of units, it was ranked from 1 to 5 with a written definition for each level. For example, health and safety was scored as a 1 if an option did not meet base service levels and a 5 if an option significantly reduced the number of physical and operational safety hazards. A large number of physical and environmental hazards of each facility option were considered during the scoring

A computer model called Criterion Decision Plus was used to normalize the data for comparison purposes. This data manipulation was necessary because the measurements were in different units for different factors. The scored values were then weighted as determined in the previous ranking exercise described above.

## 11.7 Facility Plan Cost Model

A facility plan cost model was created to calculate total system net costs over the 30-year planning period. The cost model is summarized below and described in detail in Appendix I. The model calculates the cost of the following solid waste activities:

- Solid waste transfer (transferring waste and organics from collection vehicles to containers/trailers in preparation for hauling to final destination).
- Rail loading.
- Truck hauling to intermediate site (i.e., Argo Rail Yard or Intermodal).
- Rail haul to landfill.
- Truck haul to organics processing facility.
- Processing organics.
- Disposal (includes unload from train and truck haul to landfill).
- Collection (if an option results in changes to the collection costs).

The model evaluated total system cost for each option. The total system cost can be viewed as a net cost, where all the benefits of an option (such as reduced hauling costs or reduced disposal due to recycling) are incorporated. For example, if an option has a rail loading facility at the same location as the transfer facility, then there is no need to truck-haul the waste, and thus trucking cost was not included in that option. Likewise, if an option had a higher recycling rate, this implies that fewer tons need to be disposed, so the option showed a lower overall disposal cost.

Costs in the model included the following:

- Property purchase or lease.
- Engineering design and construction of facilities.
- Equipment capital.
- Labor and other O&M.
- Contractor payments such as disposal, private transfer, processing, and rail haul.
- Long-term competitive benefits.

The Planning Team gathered input from consulting engineers and operations staff on the types, costs, life expectancy, and processing rates of equipment needed for an option. The model begins by calculating the equipment needed to handle the waste that is projected to flow to each facility every year for 32 years. The calculation is based on how many tons each piece of equipment can process in a given period of time. Then, the model calculates the number and types of staff needed to run a facility, based on the equipment projected to be required at a facility and other functional tasks. The team checked the staffing and types of equipment at other operating transfer stations and intermodal facilities for comparison, and made adjustments until the model yielded realistic results comparable to known and anticipated operations.

The model has several practical features. For example, equipment purchases are based on peak tons to ensure adequate equipment for peak times. The model calculates labor based

on average tons, so that facilities are adequately staffed. The model also allows the modeler to vary the hours of operation of each facility and each function, optimizing equipment and labor.

## 11.8 Rail Cost Model

A rail cost model was developed by Mainline Management in order to estimate the cost of transporting waste by rail to a distant landfill. Currently, the City's contract for rail loading, long-haul, and disposal is combined, so it is not possible to break the costs out into individual components such as container loading, rail hauling, unloading, and disposal. The rail cost model estimates only rail-haul costs, which is necessary in order to evaluate the economics of developing a City-owned intermodal transfer facility. The results from the rail cost model were input into the facility plan cost model. A more detailed discussion of the Rail Cost Model can be found in Appendix J.

The rail cost model estimates cost savings of \$4.30 per ton beginning in 2010, declining to \$3.70 per ton in 2028. These cost savings would be gained by developing an intermodal transfer station. The amount of Seattle's waste currently shipped is about 500,000 tons per year. Therefore, the intermodal facility could save about \$2 million per year in 2010. This amount would decline over time. If the City were to partner with King County on loading and rail haul, the potential savings would go up to \$6.80 per ton in 2010.

## 11.9 Cost Risk Uncertainty Model

Estimating future costs always involves uncertainty; therefore, some form of risk analysis is necessary to determine how overall costs could vary from the expected. To evaluate the range of costs and probabilities, the Planning Team used a decision analysis program called Decision Programming Language (DPL). A technical memorandum describing how cost uncertainties were modeled is included in Appendix K.

The Planning Team developed an influence diagram that illustrates the conditional relationships between decisions, uncertainties, and outcomes. The range of cost uncertainties was developed for the following variables:

- Waste stream growth rate.
- Recycling rate.
- Recycling revenue.
- Rail haul costs.
- Disposal costs.
- Construction costs.
- Equipment costs.
- Labor efficiency.
- Partnering opportunities to increase quantity shipped.

For each variable, states were identified and then probabilities and values were assigned to each state. The facility plan cost model and risk model were then linked, and the two models were run for every combination of variables. This process resulted in thousands of simulated runs through the facility plan cost model. The results produced an expected value for the net present value (NPV) of the total system, and a cumulative probability distribution of the NPVs for each option.

## 11.10 Queuing Time Model

A model was developed to estimate how long lines would be at the recycling and disposal stations under various options. The model also provided estimates of the amount of time customers would spend in line at the stations. The amount of time spent queuing at the stations was included as a factor in the quality of service evaluation. However, the monetary value of customer's time while waiting in line was not included in the cost model or summary of facility costs because these are indirect costs that do not affect the cost of building or operating a facility.

The monetary value of customer's time spent in queues was calculated to provide a check of the reasonableness of implementing a particular option. Stations designed to result in little or no queuing are typically more expensive than stations that have long lines. Thus, investments in station capacity provide time savings benefits to customers that are not captured by a strict monetary evaluation of costs. By including the value of people's time, the total cost to customers in the different options can be compared.

For this study, customer's time was valued at \$12 per hour for residential customers and \$20 per hour for commercial customers. These rates are derived from research in the transportation field (applied to Puget Sound wage rates) that is used to estimate the value of travel-time savings to the public from road improvement projects.<sup>3</sup>

## 12 Range of Options

The Planning Team first developed a broad spectrum of system options. In addition to considering waste flow, the key variables in the options included the following:

- Whether or not the option included a third City-owned facility to receive and compact waste into intermodal containers.
- Whether or not additional property was acquired adjacent to the North and/or South Recycling and Disposal Stations (NRDS or SRDS).
- The extent of structural improvements at NRDS and/or SRDS, including remodeling or rebuilding the waste-receiving buildings and developing facilities for the drop off of reuse items and recyclables.

A brief summary of the main options analyzed is shown in Table 1. Options 0 through 5 were the first set of options developed. These options were modified during the process of developing conceptual layouts and engineering analysis as the Planning Team learned more about the feasibility and function of an option. Some option numbers have a sub-letter denoting a modification of the original option, such as Option 2A or 2B.

Options 7 through 11 represent a recombination of previous options in an attempt to maximize benefits while keeping costs down. Options 0 through 3 and Option 8 do not include a new intermodal facility. Options 0, 2A, 2B, 8, and 9 do not include any additional property at the Recycling and Disposal Stations.

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<sup>3</sup> Forkenbrok, David J. and Glen E. Weisbrod. *Guidebook for Assessing the Social and Economic Effects of Transportation Projects* NCHRP Report 456, Transportation Research Board, National Research Council. 2001. *Highway Economic Requirements System, Technical Report*. Washington D.C. U.S. Department of Transportation. Federal Highway Administration. 2000.

TABLE 1  
Description of Options

Option #	Theme	Intermodal Transfer	NRDS	SRDS
0	No action.	No significant change. Continue to load intermodal containers at the existing stations and transport to Argo Rail Yard or other rail loading yard in the future.	No significant change. Continue to maintain, repair, and replace equipment and facilities as needed.	No significant change. Continue to maintain, repair, and replace equipment and facilities as needed.
1	Minimal upgrade.	Same as Option 0.	Reconfigure floor space and compactor location in existing building and relocate scalehouse farther inside the facility.	Reconfigure floor space and compactor location in the existing building. Add a new recycling area north of the building and CDL drop-off area at the southwest corner of the site.
2A	Rebuild buildings.	Same as Option 0.	Demolish existing buildings and rebuild to improve safety, throughput, efficiency, and reduce environmental impacts. Rebuild building on the west side of the existing site to avoid construction in the industrial buffer.	Demolish existing buildings and rebuild to improve safety, throughput, efficiency, and reduce environmental impacts. Designate a portion of the building floor for enhanced recycling. Add a recycling area at the southeast corner of the site. Add a reuse drop-off facility at the north end of the site.
2B	Rebuild in same footprint.	Same as Option 0.	Same as 2A, but maintain view corridor by rebuilding the building within the east-west limits of the existing building.	Same as 2A.
3	Rebuild to maximize diversion without an intermodal facility.	Same as Option 0.	Add about two acres of additional property. Demolish and rebuild the existing building as in Option 2A. Add an area to drop-off recyclables and reuse items. Move the scalehouse further inside the site.	Add about 19 acres of additional property to the site. Demolish and rebuild the main building as in 2A, but relocate to improve access and accommodate lines on site. Provide enhanced recycling in the building. Add a drop-off area for recyclables on the west side of the site. Add a retail reuse facility.
4A	Intermodal with new SRDS building.	Build an intermodal facility near a railyard south of downtown on about 18 acres to receive collected waste, compact it into intermodal containers, and load the containers onto a train or other transport mode.	Same as Option 1, but without a compactor and addition of about 0.5 acre to provide an area for recyclables drop-off. Divert most collection trucks to the intermodal facility.	Add about 4 acres to the site. Demolish existing buildings and rebuild to improve safety, throughput, efficiency, and reduce environmental impacts. Designate a portion of the building floor for enhanced recycling. Add a recycling area at the north end of the site. Add a retail reuse facility on the site. Divert most collection trucks to the intermodal facility.
4B	Intermodal with new SRDS and NRDS buildings.	Same as Option 4A	Add about 0.25 acre to the site. Rebuild the existing building as in Option 2A, but with open-top containers rather than a compactor for intermodal containers.	Same as Option 4A.

TABLE 1  
Description of Options

Option #	Theme	Intermodal Transfer	NRDS	SRDS
5A	Rebuild to maximize diversion and add an intermodal facility.	Build an intermodal facility similar to 4A, but on a 30-acre site to provide space for partner waste.	Similar to Option 3, but design primarily for self-haul customers with diversion of trucks to intermodal.	Similar to Option 3, but design primarily for self-haul customers with diversion of trucks to intermodal. Further develop reuse and recycling facilities, including a material recovery facility for non-putrescible materials.
5B	Rebuild to maximize diversion with a smaller intermodal.	Same as Option 4A.	Same as Option 5A.	Same as Option 5A.
6	Scaled down 5A.	Same as Option 5A.	Same as Option 4A, with waste flow as in Option 5A.	Same as Option 4A, with waste flow as in Option 5A.
7	Scaled down 5A.	Same as Option 5A.	Same building as in Option 2B. About 1 acre added to the site to provide an area to collect recyclables and reuse items, and build an office and employee facilities.	Same facilities as in Option 4A.
8	Rebuild NRDS and remodel SRDS <u>without</u> an intermodal and no additional property at stations.	Same as Option 0.	Same as Option 2B.	Same as Option 1, but add a yard waste building to the southwest corner of the site.
9	Rebuild NRDS and remodel SRDS <u>with</u> an intermodal and no new property at stations.	Same as Option 4B.	Same as Option 2B, but without the compactor. Divert most collection trucks to the intermodal.	Same as Option 1, but without the compactor. Add on to the existing building to increase the number of stalls. Add a yard waste building as in Option 8. Divert most collection trucks to the intermodal.
10	Rebuild NRDS and SRDS with an intermodal and some additional property at stations.	Same as Option 4A.	Same as Option 7.	Similar to Option 4A, but with a lower-cost building.
11	Rebuild NRDS and SRDS with an intermodal and some additional property at stations, and increased diversion.	Same as Option 4A.	Same as Option 7.	Similar to Option 10, but all waste handling would occur in a single building and waste diversion would be improved with CDL material recovery.

Option 8 was developed to determine what service level could be provided without an intermodal facility and no new buildings. Option 9 was developed to determine what service level could be provided with an intermodal facility, but no additional property at the Recycling and Disposal Stations.

The Planning Team considered many alternatives, but eliminated some from further analysis for various reasons. Appendix L discusses the alternatives that were considered but were eventually eliminated. The Planning Team decided that it would not be practical to eliminate the two City-owned recycling and disposal stations because there is a high public demand for these facilities and the services that they provide. The Planning Team also felt that it would not be in the ratepayer's best interest to turn the entire collection and transfer system over to the private sector, because this could create a lack of long-term competition and the potential for declines in service quality.

## 13 Analysis Results

Analyzing options and developing new options was an iterative process. Adjustments were made to the layout design and individual components of the initial options after results were reviewed. The results provided the Planning Team with insight into what factors were having the greatest affect on the quality of service and costs, and allowed the team to make modifications to the options in order to improve the quality of service scores or lower costs.

The facility plan cost model and quality of service factors were upgraded and improved during the planning process, which resulted in more accurate results. However, these improvements make it difficult to directly compare the results from earlier analyses with later analyses. In all cases, these improvements created across-the-board increases or decreases in scores or costs and did not change the relative ranking of the options.

Options 0 through 5 were analyzed first. Options 6 and 7 were developed shortly thereafter and analyzed during the first model runs.

Option 0 and 8 through 11 were analyzed after the cost models had been updated and improved. These improvements resulted in higher NPV cost estimates for all options; therefore, these costs cannot be compared to the NPV cost estimates of earlier runs. However, the relative ranking of the options to each other are still comparable.

Option 0, 5, 8, and 11 were selected for final evaluations and were analyzed after additional adjustments to the models were made. These adjustments also increased the NPV cost estimates; therefore, the results cannot be compared directly with earlier runs. The relative ranking between options was not changed by this cost increase. These options were selected because they provide a broad range of choices for consideration. The summary scores of all the options are presented at the end of this section.

Option 0 is the status quo option. Option 5 includes the largest amount of land acquisition, largest buildings, and greatest flexibility and waste diversion. Option 8 includes modest improvements to the stations without an intermodal facility and without any additional property. Option 11 is a scaled down version of Option 5 that includes an intermodal, but has less property and a lower cost than Option 5, but also has a lower diversion rate.



## 13.1 Description of Final Options

### Option 0

Option 0 is the status quo option and is considered the no-action alternative, which is required for the State Environmental Impact Statement, which will be performed after the master plan is completed. Also, Option 0 serves as the base case from which to compare all other options. This option includes all necessary maintenance, repairs, and improvements necessary to remain in compliance with existing building codes, health and safety codes, and environmental regulations. Improvements include a seismic retrofit to keep the building standing for the next 30 years, replacement of temporary office buildings, periodic replacement of the compactors and other equipment, and other repairs as required.

### Option 5

Option 5 involves rebuilding the two City-owned Recycling and Disposal Stations and developing a new intermodal solid waste transfer facility. The majority of refuse collection trucks would be directed to the intermodal facility, where waste would be transferred into intermodal shipping containers and loaded onto the long-haul transport vehicle. About 2 acres of additional property would be added to the North Recycling and Disposal Station. The existing station would be replaced with a much larger building (over twice the size) to accommodate customer demand, and a reuse and recycling facility would be added to the station. At the South Recycling and Disposal Station, the existing building would be replaced with a larger building and about 19 acres would be added to the site to provide space for reuse and recycling facilities, a new equipment shop, an office, and employee facilities.

### Option 8

Option 8 involves rebuilding the North Recycling and Disposal Station and remodeling the South Recycling and Disposal Station without adding any additional property to the stations and without adding an intermodal transfer station.

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 toward Lake Union from the roads running north of the facility, thereby conforming to the South Wallingford Amendment to the Neighborhood Plan's objective of maintaining viewsheds along these road corridors. However, rebuilding in the same footprint would violate the industrial buffer zone that was established after the original building was built. A zoning variance or rezone would be necessary for this rebuild option. The enlarged building would more than double the number of unload stalls and would improve the throughput capacity of the facility. The majority of garbage trucks would be diverted to private stations and SRDS to further reduce traffic congestion and maintain adequate traffic throughput of self-haul customers.

The station at SRDS would be remodeled to improve throughput and efficiency.

### Option 11

Option 11 involves adding an intermodal solid waste transfer facility and rebuilding both the City-owned Recycling and Disposal Stations with just enough additional property

added to the sites to accommodate needed services. This option is a scaled-down version of Option 5. Less property would be required than in Option 5 and the building at NRDS would be smaller. Also, the scale of material recovery facility at SRDS would smaller in order to reduce land requirements and costs.

The building at the north transfer station would be replaced as in Option 8. About 1 ½ acres would be added to the site to accommodate traffic lines onsite and to provide space for the station office, employee facilities, and reuse and recycling facilities.

A new building would be constructed at SRDS for customers to drop off reuse items and a contractor would be allocated space to establish a reuse retail business. The existing main building would be replaced with a larger facility. The building would also contain a material recovery facility for non-putrescible waste.

Options 0, 5, 8, and 11 are summarized in Table 2.

TABLE 2  
Description of Options 0, 5, 8, and 11

Option	Intermodal Yes or No	More Property Adjacent to RDS	NRDS Level of Improvements	NRDS Reuse/ Recycle Facilities	SRDS Level of Improvements	SRDS Reuse/ Recycle Facilities
0	N	N	Minimum.	No change.	Minimum.	No change.
5	Y	Y	Rebuild larger disposal building. Rezone. Additional property for operations.	Separate recycling entrance with drop-off containers and drop boxes. Separate area for reuse drop-off.	Build new tip building for self-haul refuse and yard waste. Additional property for operations.	Separate area for dropping off traditional recyclables. New canopied area for CDL drop boxes.
8	N	N	Rebuild larger disposal building. Rezone.	New recycling bypass lane for drop-off into containers.	Retain existing tipping building.	Separate area for dropping off traditional recyclables. New canopied area for CDL drop boxes.
11	Y	Y, both NRDS and SRDS	Rebuild larger tip building. Rezone and add additional property for offices and reuse/recycling.	Separate recycling entrance with drop-off containers and drop boxes. Separate area for reuse drop off.	Build new tip building for all self-haul materials.	Separate area for dropping off traditional recyclables. New expanded tipping shed for all wastes, including mixed CDL for recycling. New retail reuse building

### 13.2 Quality of Service Results

The quality of service score represents how well an option meets the overall non-monetary objectives of the facilities plan. The overall score has been normalized on a scale from 0 to 1, with 1 achieving the goals the best. Option scores can be seen in Figure 9.

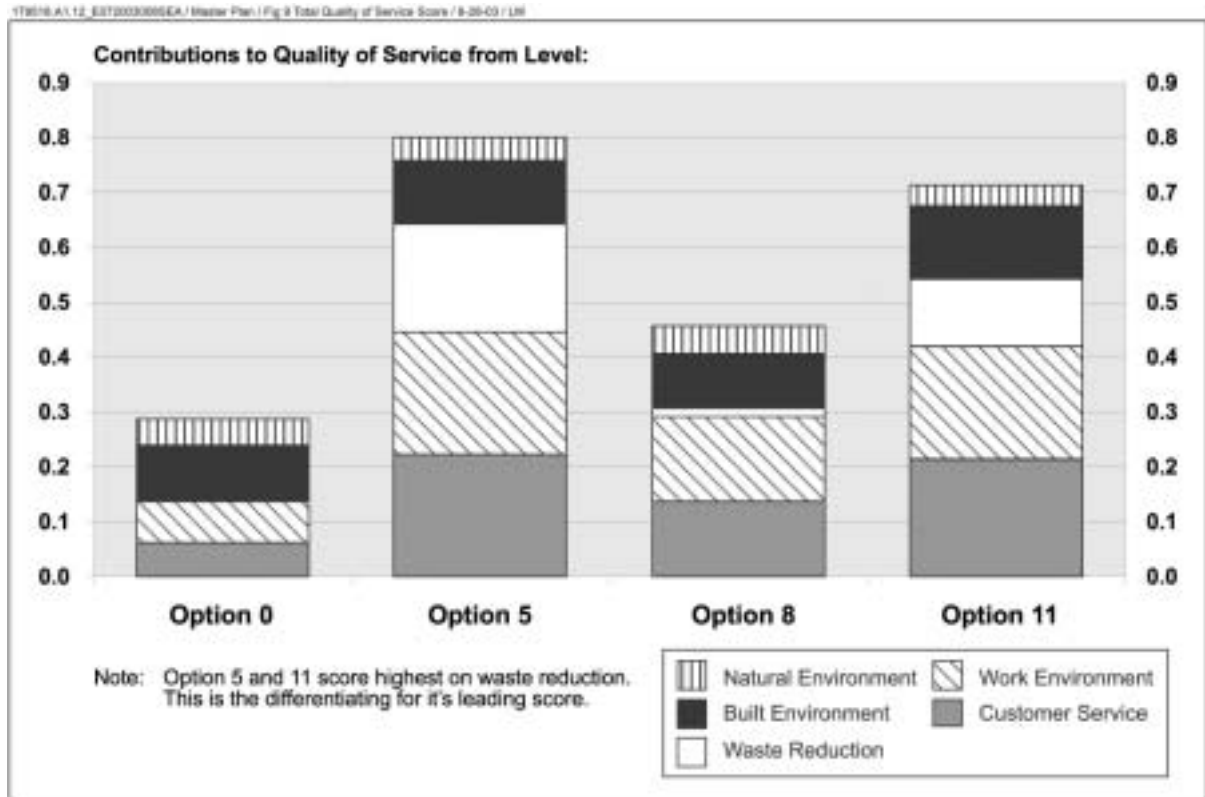


Figure 9  
Total Quality of Service Score – Contributions by Criterion

Option 0, the status quo option, has the lowest score, as can be expected. This option does not include any significant facility improvements, and its low score represents a poor level of service in the long term. Diversion rates (reuse and recycling) would not be improved and would remain at the current 18 percent of tons received. The diversion rate could actually decline in the future under this option, as lines would become longer at the stations and customers could find it too inconvenient to wait in a line to recycle materials. Customer delays and lines would get longer. Throughput studies performed during the engineering analysis of this option indicated that on an *average* day in 2038, lines would be 243 vehicles long at the North Station and 81 vehicles long at the South Station. Lines were estimated to be much longer on peak days. These numbers represent the calculated customer demand on existing facilities; however, it is likely that customers would be turned away before a line grew too long. Local environmental impacts, such as traffic, would get worse, and other impacts, such as odor and dust, would remain the same. Most existing safety hazards would remain, but a necessary seismic retrofit of the main building would slightly improve safety. Overall, these problems contribute to a relatively low quality of service score.

Option 8 would perform better than the status quo, but would still fail to significantly improve the quality of service. Waste diversion rates would still be relatively low and

would increase only 3 percent over the status quo. Throughput would be inadequate and long lines would continue to be a problem. This option also scored poorly on system flexibility and other work environment factors.

Options 5 and 11 scored higher than the other options primarily because they could achieve higher diversion rates. Both options have very similar performance scores. The diversion rate is the distinguishing factor: Option 5 would have a diversion rate of 50 percent, and Option 11 would have a diversion rate of 37 percent. The customer service score is higher with these two options than the other options primarily because the facilities could accommodate customers without lines extending into the public roadways on an average day. Also, an improved work environment along with increased flexibility increases the score for these options above the others.

### 13.3 Cost Results

The facility plan cost model was used to estimate the life-cycle costs, i.e., the net present value (NPV), of the options. The NPV represents the sum of all solid waste system costs over a 32-year evaluation period expressed in current-year dollars. In addition to including facility capital costs, the NPV also includes an option's operation and maintenance costs. Therefore, the NPV provides a number that can be used to compare the full long-term system costs of an option.

Costs of different options are compared over a long period of time in part to capture potential future operational cost savings resulting from initial investments. For example, an option that would construct a new station has a very high initial capital construction cost, which would make it appear much more expensive than the status quo option. However, if the new facility requires less labor and maintenance to operate than the status quo option, it may end up costing less in the long run. Costs for all options were calculated annually for a 32-year period from 2006 to 2038. More information on the facility plan cost model can be found in Appendix I. Figure 10 shows a comparison of the NPV of Options 0, 5, 8, and 11.

Option 0 has the lowest NPV because it contains no significant facility improvements. The NPV of this option over the study period is \$628 million. Options 5, which includes major facility improvements and additional land acquisition, has the highest NPV as compared to all other options: \$796 million, which is 27 percent higher than Option 0. Option 8 has fewer improvements and does not include an intermodal facility. The NPV of this option is \$649 million, which is 3.3 percent higher than Option 0. Option 11 includes major facility improvements and an intermodal facility; its NPV is \$657 million, 4.6 percent higher than Option 0.

Facility improvement costs are relatively small compared to other system costs; therefore, major facility improvements only increase the total system costs by a small to moderate margin. The largest portion of system costs is for transporting waste by rail to the landfill and disposal costs. Disposal and processing costs typically make up about half of the total system costs.

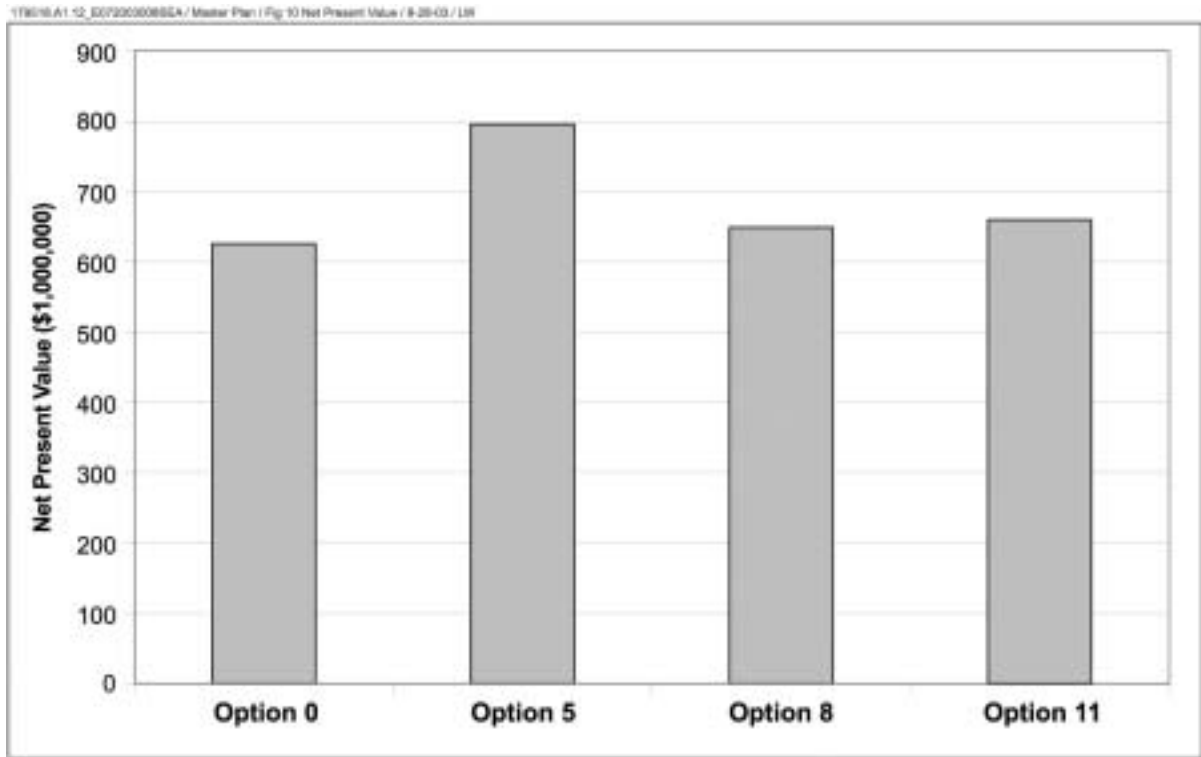


Figure 10  
Net Present Value Comparison

Improved efficiency and competitive pricing for services can lower transfer and disposal costs, which can help to offset facility improvement costs. Detailed analysis of the system costs indicates that an intermodal facility included in Options 5 and 11 would lower costs by about \$8 million in present value over the 32-year project life cycle. This savings is in rail-haul, disposal, and increased transfer efficiency. The \$8 million savings provided by the intermodal facility in Option 11 offsets the \$37 million NPV of upgrading the Recycling and Disposal Stations, resulting in a NPV that is \$29 million higher than Option 0.

### 13.4 Cost Uncertainty

The range of potential costs of the options was evaluated using the Decision Programming Language risk model as described above. The range of costs for Options 0, 5, 8, and 11 is shown in Table 3 and depicted graphically in Figure 11. The costs shown in the table and figure represent the total NPV of an option over the 32-year project life cycle.

TABLE 3  
Range of Costs for Options 0, 5, 8, and 11

Option No.	Net Present Value in Millions of Dollars				
	Base Value	Expected Value	10th %	90th %	10 to 90% Spread
Option 0	628	640	553	742	189
Option 5	796	810	744	893	149
Option 8	649	665	574	769	195
Option 11	657	670	604	744	140

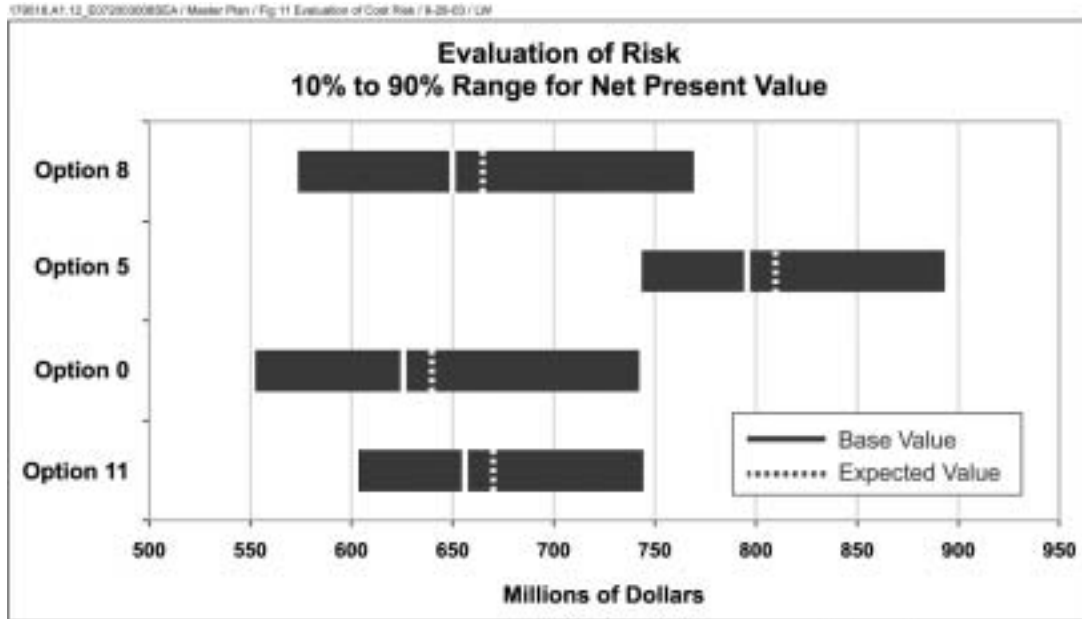


Figure 11  
Evaluation of Cost Risk

The base value shown is the cost estimate before running the risk model. The expected value is a statistical calculation by the computer model of the most probable value. The cost range shown is within the 10- to 90-percent range calculated by the model. More detailed model results are presented in Appendix K.

The results of the analysis indicate several noteworthy points as follows:

- The options without an intermodal facility (0 and 8) have greater cost uncertainties (a higher spread between their 10th and 90th percentiles).
- Growth in the city's waste stream and recycling rate has the greatest impact on total costs.
- Options that include an intermodal facility (5 and 11) are much less sensitive to variations in city waste and recycling growth rates.
- Construction cost uncertainty is lowest for Options 0 and 8.
- In all options, the expected value of costs is 5 to 7 percent greater than the baseline estimates, meaning that estimates have more upside risk than downside opportunity.
- Cost uncertainty substantially decreases for Options 5 and 11 after facilities are built. Therefore, the long-term cost uncertainty substantially decreases early in the project phase of these options, yielding a more economically stable option in the long term.

Also, it is significant to note that the range of cost probabilities substantially overlap, and that the status quo option (Option 0) has about the same maximum cost probability as Option 11.

### 13.5 Combined Cost and Quality of Service Scores

The net present value (life-cycle cost) of an option can be compared with the quality of service score to evaluate the option’s relative benefits and costs. Figure 12 shows how the four final options compare.

Figure 12 shows that Option 11 has a much higher quality of service score than Options 0 and 8, and only a slightly lower score than Option 5. The NPV of Option 11 is less than 5 percent higher than Option 0, indicating a relatively high increase in quality of service with only marginal increase in cost. In comparison, Option 5 provides only a slightly higher quality of service score (0.80 vs. 0.71) compared to Option 11, yet the NPV is \$139 million higher than Option 11 and \$168 million higher than Option 0.

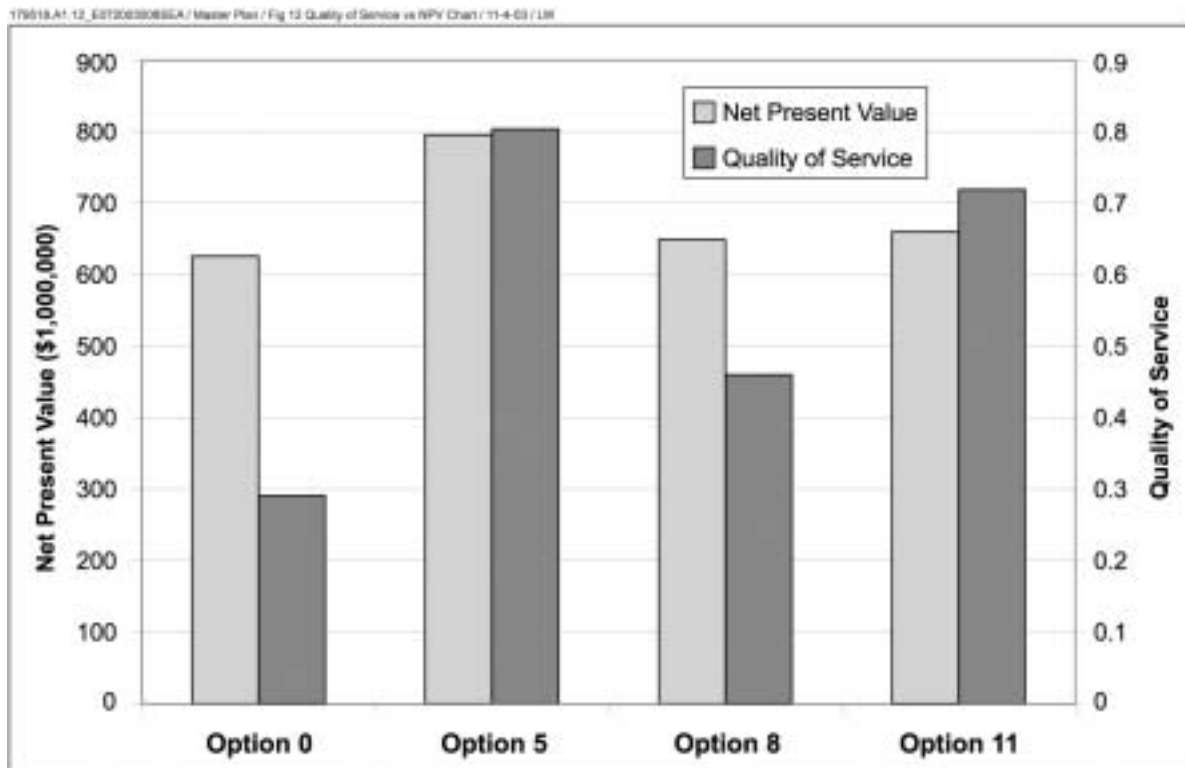


Figure 12  
Net Present Value vs. Quality of Service

The quality of service score versus NPV of all options can be seen in Figures 13 through 15. The results are presented in three separate figures because the evaluations were performed at different times and are not directly comparable, as explained above. Updates to the models increased the overall NPV and modified some of the quality of service factors. Although the NPV and quality of service scores are not directly comparable between figures, the relative ranking of the options remains consistent.

### 13.6 Value of Queuing Time

The value of time spent by customers waiting in queues was calculated and added to the finalist options. Queuing time was estimated for maximum wait times of 45, 60, and

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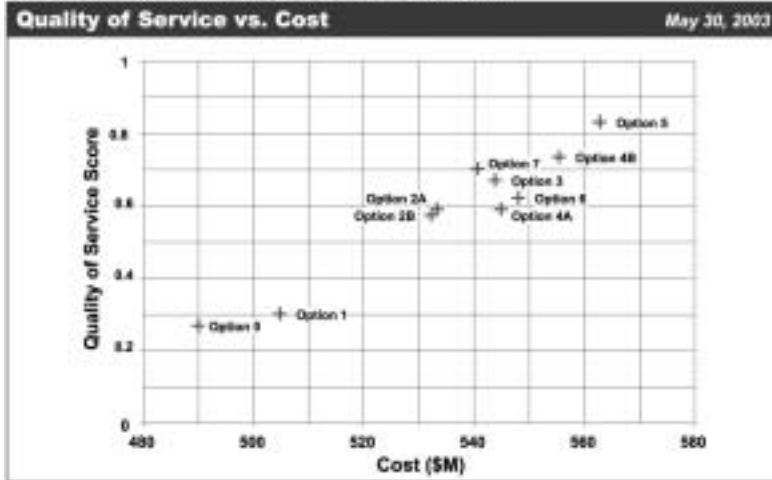


Figure 13  
Quantitative Evaluation  
of Options 0-7



Figure 14  
Quantitative Evaluation  
of Options 0, 8-11

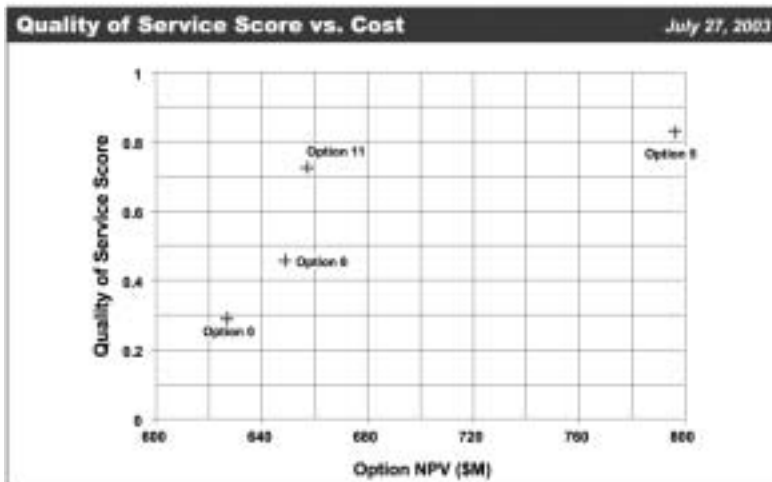


Figure 15  
Quantitative Evaluation  
of Options 0, 5, 8, 11

Note: Results of options are shown separately because the cost model was being refined as options were screened into a shorter list of candidates. Thus, costs of options are consistent within a single figure, but cannot be compared from one figure to another. Quality of service scoring was refined slightly from one figure to another, but are reasonably comparable.



120 minutes. The different maximum wait times were used because it is uncertain how long customers would wait in line at a station before they would stop coming to the station at that time. Of the finalist options, only Options 0 and 8 had long lines. The present value of time spent waiting in line was calculated and added to the net present value (NPV) cost of the options.

Figure 16 shows the incremental cost of time spent in queues when added to the final options. The value of time spent in queues is substantial for Options 0 and 8. A waiting time of up to 45 minutes adds \$18 million to the NPV of Option 0 and a wait time of up to 120 minutes adds \$40 million. For Option 8, a waiting time of up to 120 minutes adds \$20 million to the NPV of this option. Thus, Options 0 and 8 are both more expensive than Option 11 when the value of queuing time is taken into consideration. This estimate is conservative because it includes only time spent in line and does not include time spent by customers who decide to drive to another facility out of the city or drive home and back to the station again in hopes of finding a shorter line at a different time.

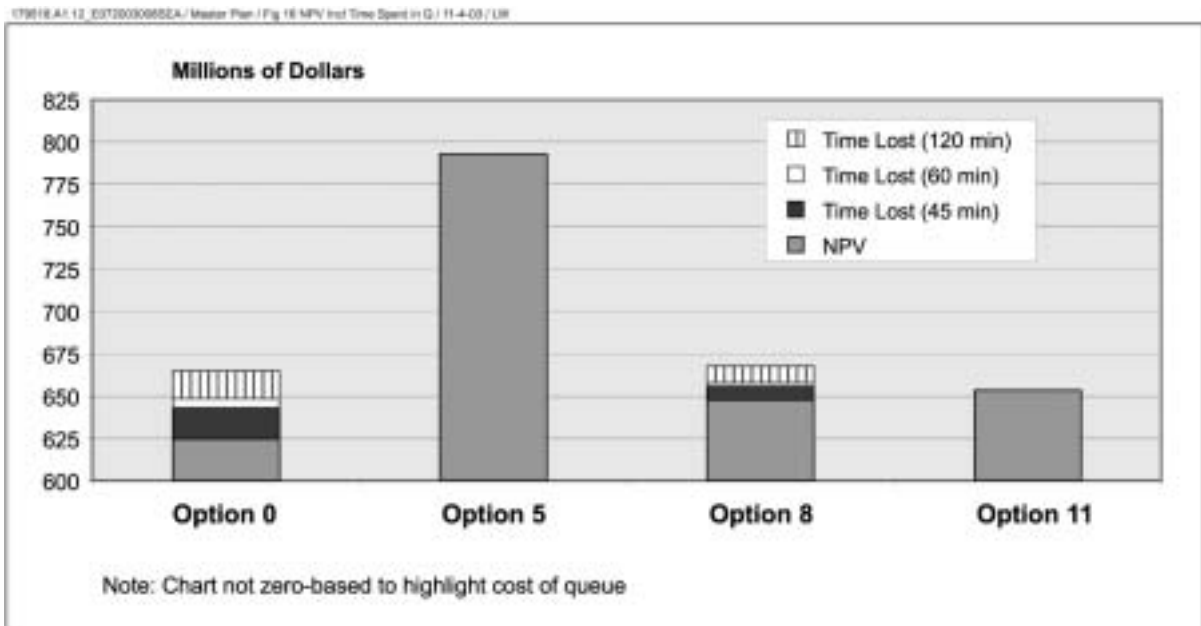


Figure 16  
Net Present Value Including  
Time Spent in Queue

Based on this evaluation alone, the higher cost of Option 11 can be justified in terms of reduced customer wait time. Yet reduced wait time is only one of many added benefits that would result from Option 11 in comparison to the benefits received from Options 0 and 8.

### 13.7 Summary of Options

Table 4 provides a brief summary of the key features of each option and some of the deficiencies that cause an option to fail to meet the objectives of the facilities plan.

TABLE 4  
Key Features and Deficiencies of Options

Option	Theme	Options Comparison
0	No action.	Buildings too small to meet customer demand. Customer wait times get longer over time. Odor, dust, and other emissions continue at unacceptable levels. Inadequate space at NRDS for station office and employee facilities. Waste diversion of 18 percent versus goal of 39 percent. Low flexibility.
1	Minimal upgrade.	Buildings too small to meet customer demand. Customer wait times get longer over time. Odor, dust, and other emissions continue at unacceptable levels. Inadequate space at NRDS for station office and employee facilities. Waste diversion only 19 percent. Low flexibility.
2A	Rebuild buildings.	Building size adequate. Large, costly building at NRDS blocks viewshed. Inadequate space at NRDS for station office and employee facilities. Waste diversion only 25 percent. Low flexibility.
2B	Rebuild in same alignment at NRDS.	Building size adequate. Inadequate space at NRDS for station office and employee facilities. Waste diversion only 25 percent. Low flexibility.
3	Rebuild to maximize diversion without an intermodal.	Building size adequate. Addition of 2 acres at NRDS and 19 acres at SRDS impacts neighborhoods and requires acquisition of multiple parcels. Large building at NRDS inappropriate for neighborhood. Waste diversion meets goal of 39 percent. Low flexibility without an intermodal. High-cost option.
4A	Intermodal with new SRDS building.	At NRDS, building is too small to meet customer demand and would require diverting customers from north Seattle to SRDS. Odor, dust, and other emissions continue at unacceptable levels at NRDS. Inadequate space at NRDS for station office and employee facilities. Waste diversion at 36 percent, close to goal.
4B	Intermodal with new SRDS and NRDS building.	Building size adequate. Inadequate space at NRDS for station office and employee facilities. Waste diversion at 37 percent, close to goal.
5A	Rebuild to maximize diversion and add an intermodal.	Building size adequate. Requires more additional property than all other options (51 acres total). Highest-cost option. Diversion at 50 percent because of material recovery facility at SRDS and recycling at NRDS. High flexibility.
5B	Rebuild to maximize diversion with a smaller intermodal.	Building size adequate. Requires less additional property than Option 5A, but still high (40 acres total). Cost substantially higher than other options. Diversion at 50 percent due to material recovery facility at SRDS and recycling at NRDS. High flexibility.
6	Scaled down 5A.	Inadequate building size at NRDS. Requires diverting customers from north Seattle to SRDS. Odor, dust, and other emissions continue at unacceptable levels at NRDS. Inadequate space at NRDS for station office and employee facilities. Waste diversion at 36 percent, close to goal.
7	Scaled down 5A.	Building size adequate. Cost high because of large intermodal facility and pick line operated by SPU at SRDS. Waste diversion at 37 percent, close to goal.
8	Rebuild NRDS and remodel SRDS <u>without</u> an intermodal and no additional property at stations.	Buildings too small to meet customer demand. Customer wait times get longer over time. Inadequate space at NRDS for station office and employee facilities. Odor, dust, and other emissions continue at unacceptable levels at SRDS. Waste diversion only 21 percent. Low flexibility.
9	Rebuild NRDS and remodel SRDS <u>with</u> an intermodal and no new property at stations.	Building size adequate. Inadequate space at NRDS for station office and employee facilities. Space limited at SRDS. Waste diversion only 21 percent, below goal. Moderate flexibility.
10	Rebuild NRDS and SRDS with an intermodal and some additional property at stations.	Building size adequate. Waste diversion at 26 percent, below goal. High flexibility.
11	Rebuild NRDS and SRDS with an intermodal, some additional property at stations, and increased diversion.	Building size adequate. Waste diversion at 37 percent, close to goal. High flexibility.

## 14 Recommended Option—Option 11

Option 11 is recommended as the option for further consideration. It involves adding an intermodal solid waste transfer facility at Harbor Island (or another suitable location) and rebuilding both the City-owned Recycling and Disposal Stations with just enough additional property added to the sites to accommodate needed services. The benefits of the various facility improvements are discussed in the following sections.

### 14.1 Recommended Option—Intermodal Solid Waste Transfer Facility

An intermodal solid waste transfer facility would include the following facilities:

- Scalehouse and scales to weigh vehicles and control site access.
- Office with employee and visitor parking.
- Container storage.
- Waste receiving building with equipment to consolidate and load waste into intermodal containers.
- Onsite rail sidings with capacity for enough rail cars to accommodate Seattle’s MSW and some partner waste.
- Container loading equipment (top picks, cranes, yard tractors, etc.).

A new intermodal solid waste transfer facility would meet many of the facility plan goals in the following ways:

- Reduces neighborhood impacts by diverting the majority of large truck traffic directly to an intermodal facility.
- Improves the efficiency of waste transfer and reduce costs.
- Reduces truck traffic between the transfer station and intermodal yard.
- Improves safety by separating truck traffic from residential traffic at the stations.
- Provides a reliable long-term facility for intermodal waste transfer.
- Provides the flexibility to send waste by different modes of transportation to different landfills.
- Maintains competition for transportation and disposal services.
- Improves freight mobility and railroad capacity by developing a facility for rail loading and container storage separate from existing rail yards and sidings.

#### North Station Improvements

The building at the north transfer station would be replaced with a new building in the same alignment; however, the building would be extended to the southern boundary of the site. About 1 ½ acres of adjacent property would be added to the station to provide space for an office, employee facilities, and a public drop-off area for reuse items and recyclables.

### *Traffic*

This alternative would resolve the most significant problems that currently exist at this site and would provide additional benefits to the local community. One of the most frequently mentioned problems at this station, as identified at public meetings and written comments, is the long lines extending onto the public roadway. This alternative would reduce the long wait lines with the following strategies:

- Provides over twice as many unload stalls in a larger building.
- Diverts the majority of collection trucks directly to an intermodal facility.
- Relocates the inbound scale further in the site so that traffic queuing would be contained within the site on average days.
- Develops a separate entrance and drop-off area for reuse items and recyclables.

The public also voiced concerns about the amount of traffic entering and leaving this facility. The recommended option would reduce the amount of truck traffic by directing the majority of collection trucks to an intermodal transfer facility. This action would reduce the amount of waste received at the facility by about half, thereby reducing the number of collection trucks and large transfer trailer trucks leaving and entering the site. Also, with the ability to accommodate customers onsite, it would no longer be necessary to route incoming vehicles along residential streets, such as North 35th Street. Instead, customer traffic can be routed on North 34th Street, which is primarily a commercial arterial.

### *Dust, Odor, and Noise*

Another significant concern voiced by the public was the amount of dust, odor, and noise generated by the existing facility. The recommended option would significantly reduce these problems by constructing an enclosed building with air control and diverting the most odorous waste to the intermodal facility. The air control system would create a slight negative pressure that would draw air into the building and filter the exhaust air to remove odor and dust. The collected residential waste and collected yard waste, which is some of the most odorous waste, would be directed to the intermodal facility. Also, the enclosed building would help to block the sound of operations. In addition, the operation would be quieter since it would no longer rely on a bulldozer to crush the waste. Waste would be pushed into open-top containers and trucked away when the containers were full.

### *Aesthetics and Views*

The recommended option would also help preserve the viewshed by keeping the building height at or below the existing height and constructing the new building in the same alignment as the existing building so that it would not block the view down Interlake Avenue North and Ashworth Avenue North. The Wallingford Neighborhood Plan and draft South Wallingford Amendment indicate that road corridors are viewsheds and recommends against building structures that would block views down these corridors. Also, the appearance of the building would be improved to fit in better with the surrounding neighborhood. Architectural details would be developed at a later date through additional public involvement meetings.

### ***Educational Facilities***

In addition to reducing impacts on the local neighborhood, the recommended option would also add benefits to the community with improved educational facilities. The office and employee facilities would include a classroom/meeting room used for employee training, meetings, and orientation of visitor groups during the day. The room could be made available to the community when not in use by the station. Also, the station would be built in a manner that would allow groups to safely tour the facility, adding educational value.

The recommended option also proposes using art program funds generated by the project to support art projects using salvaged materials to create unique sculptures and displays around the site. Not only could this become a visitor attraction, like the Troll under the Aurora Bridge, but it would make people think about the things they throw away, and hopefully encourage people to reduce the amount of waste they generate. This would be an ongoing project that would create new art over time.

### **South Station Improvements**

A new larger building would be constructed at the South Recycling and Disposal Station adding many of the same benefits as at NRDS. The new building would have over twice as many unload stalls and would be able to accommodate customers with little or no wait time.

A new building would be constructed at SRDS for customers to drop off reuse items, and a contractor would be allocated space to establish a reuse retail business. The reuse facility would have a separate entrance and would allow customers an opportunity to drop off items without waiting in line for disposal. Additional space at SRDS would allow for a larger reuse facility than at NRDS, which is expected to provide more diversion than can be achieved at NRDS.

Also, a separate building for recyclable items would be built that could also be accessed separately from the disposal facility. This configuration would provide customers with a more convenient recycling option and would allow customers to offload recyclables before weighing their waste to be dumped at the discharge building.

A new office building with employee facilities would also be constructed. The facility would include a meeting/classroom similar to that at the North Station. The room would also be made available to orient tour groups, and all facilities would be designed with viewing areas so that groups could be taken through to see the operations. The South Station would also include art from trash projects and other educational displays to educate people about waste reduction, product stewardship, hazardous waste management, recycling, composting, and other waste processing technologies.

The household hazardous waste facility at the South Station would remain in its current location and would be maintained and upgraded as necessary. The entrance would be changed to 2nd Avenue North to allow customers access without having to pass over the scales or wait in a line with other customers that have waste for recycling or disposal. This configuration would improve the accessibility to the site and improves customer convenience.

The building would also contain a material recovery facility for non-putrescible waste. The operation of the material recovery portion of this facility would most likely be contracted

out to a private company. It would consist of a pick line to sort construction materials, such as wood, gypsum wall board, metals, fixtures, and other items of economic or recycling value. With this facility, the recovery rate would be much higher than could be achieved at NRDS, and customers with building materials and demolition waste would be encouraged to drive to the South Station to recycle this waste.

It is anticipated that about 4 acres of additional property adjacent to the site would be acquired to accommodate these facility improvements. This additional space would also provide improved flexibility to accommodate changes in the waste stream and to deal with emergencies.

### Benefits of Recommended Option

Specific benefits of the recommended option are outlined below.

#### Customer Service

- Minimizes typical wait time to less than 15 minutes.
- Multiple scales and entrance lines prevent delays and expedite access to different disposal and recycling areas.
- More than twice as many unload stalls compared to the current stations.
- Wider stalls (15-foot wide versus the current 10- to 12-foot width) make it easier to back up and improve safety.
- Separate unload area for cars and larger vehicles minimizes traffic conflicts, safety problems, and delays.
- Separate entrance and exit for reuse items, recyclables, and other items that don't need to be weighed at the scales allows customers to reduce their costs by unloading reuse/recyclables before proceeding to the separate disposal area where larger vehicles are charged by weight.
- A reuse drop-off facility at NRDS and a reuse drop-off and reuse store at SRDS.
- Additional areas to drop off different recyclables with flexibility to change with a changing waste stream and recycling markets in the future.
- Easier and quicker payment methods (like at the grocery store: ATM, credit card, debit card, etc.) and multiple exit lanes.
- Quieter buildings: waste would be pushed or dropped into containers rather than having a bulldozer drive back and forth over the waste inside the building.
- Better lighting and air control in the buildings to reduce odor, dust, and other air pollutants.
- Less odorous with diversion of the garbage trucks to the intermodal (the majority of self-haul waste is non-putrescible and is less odorous).
- Educational components, such as a safe viewing area at the stations, a classroom, and other educational displays and facilities.

### Local Environment

- New buildings designed to meet goal of Leadership in Energy and Environmental Design (LEED) silver certification (more energy efficient, sustainable, and less polluting).
- Improved aesthetic building design and landscaping.
- Rodent controls.
- Improved drainage control.
- Buildings designed to minimize noise and air emissions.
- Improved throughput to minimize vehicle lines on roadways and fewer emissions from idling vehicles.
- Reduced truck traffic in nearby neighborhoods by diverting the majority of large trucks to the intermodal transfer facility.
- Art displays developed from discarded items funded by the 1 percent for art program.

### Employee Facilities

- New office space, employee break room, showers, storage, and safety equipment.
- Nicer and safer work environment (more productive employees, less lost time).
- Safer buildings meeting current seismic, air quality, lighting, and other standards.
- Facilities with greater flexibility allowing operations to adapt to changes in the waste stream, technologies, and regulations.

### Waste Transfer

- Collection trucks directed to the intermodal facility where waste is compacted into containers and loaded onto a transport vehicle (train, trucks, barge, etc.).
- Eliminates the need for intermediate handling at the transfer stations.
- Waste can be compacted to a higher density (33 tons/container vs. 25 tons/container) resulting in fewer containers to handle and lower shipping costs.
- Provides access to both rail companies and several different landfills, resulting in greater flexibility and more competitive pricing.
- Provides long-term assurance of a suitable site to transfer waste onto a train or other modes of transportation should they become more economical, which also results in a more flexible system with backup options.
- Provides greater flexibility to respond to emergencies that result in a sudden increase of waste to be managed.

## 14.2 Conformance with Resolution 30431

A comparison of the recommended option with the goals of City Resolution 30431 is discussed as follows.

## 1. Financial and Environmental Cost

Although the recommended option would cost more than the status quo option, the cost increase is within reason considering the improvements in customer service and reduced environmental impacts. The recommended option would create both cost savings through improved waste transfer efficiency and additional costs for new and improved facilities and services. Implementing the recommended option would add about \$1.4 million a year to the annual solid waste system budget. To put this amount into perspective, the 2003 adopted solid waste program budget was \$121.3 million. Therefore, implementing the recommended option would represent about a 1.15-percent increase in annual system costs. Upon approval of the recommended option, SPU will perform a rate study to determine the most appropriate way to allocate these costs through rate adjustments.

This relatively small increase in system costs is reasonable considering all the benefits achieved by implementing this option. One factor that the Planning Team evaluated in detail was the value of people's time while waiting in line. Time value estimates were performed in a manner similar to transportation studies. Under Option 0, the theoretical wait time could be as long as two hours if nothing were done to improve the stations. The NPV of lost time for Option 0 is \$40 million, while it is zero for Option 11. The NPV of Option 11 is \$29 million higher than Option 0; therefore, the value of reduced queues more than covers the cost of the improvements.

This analysis compares well with comments received from businesses. Business owners have indicated that it would be less expensive for them to pay a slightly higher disposal fee than to pay their employees to wait in a line at the Recycling and Disposal Stations. Waiting in lines reduces the overall productivity of some businesses. Therefore, improving the throughput at the stations should reduce business costs for a wide variety of services in Seattle.

## 2. Community Impacts

The recommended option would minimize negative impacts to affected communities while providing neighborhood economic benefits. The majority of garbage trucks would be diverted to an intermodal transfer facility located on Harbor Island or another suitable intermodal site. This would reduce truck traffic in neighborhoods and significantly reduce the amount of odorous waste received at the stations. The recycling and disposal stations would be reconstructed to minimize noise, dust, odor, and other air emissions. Drainage at the reconstructed stations would also be improved. The plan also calls for improving the appearance of the structures and landscaping around the facilities. The redesigned facilities would significantly reduce the wait lines that currently back up onto public streets at the facilities.

## 3. Safety and Health

Facility improvements would increase customer and worker safety by reducing a number of environmental and physical hazards. The recommended option would result in new buildings designed to meet seismic codes and would be safer than the seismic retrofit planned under Option 0. Traffic congestion and conflicts would be reduced in comparison to Option 0. The majority of large trucks would be diverted to the intermodal station, separating them from self-haul traffic. The self-haul unload areas would also be safer, with



reduced fall hazards. New facilities would have better lighting and sound damping. Better air control would minimize dust and hazardous airborne contaminants.

#### 4. Consistency with the City's Solid Waste Comprehensive Plan

The recommended option would substantially increase reuse and recycling opportunities over Option 0. Improving the recycling rate in the City's solid waste facilities is critical to achieving the City's goal of 60 percent recycling. Under Option 0, the self-haul recycling rate is expected to remain constant at 18 percent. But the rate in the recommended option is expected to be 37 percent—just 2 percent shy of the amount the self-haul waste stream would need to contribute for the City to meet its overall 60-percent recycling goal. This 2 percent shortfall translates into 0.4 percent of the overall goal. However, if the self-haul recycling rate remained at the current level of 18 percent, and even if all other programs achieved their targets, the City would still miss the 60-percent goal by 4 to 5 percentage points under Option 0. The recommended option would bring the rate to 59.6 percent if all other waste diversion programs met their targets.

The recommended option would also improve the throughput at the stations, which is necessary in order to maintain service. The long lines that would form under Option 0 would result in turning customers away, which could result in increased illegal dumping and accumulation of debris and other unsanitary conditions in the city. The recommended option would provide a level of service consistent with recommendation in the Solid Waste Comprehensive Plan.

#### 5. Consistency with Other City Plans and Priorities

The recommended option would replace the existing buildings at the transfer stations, with the goal of meeting LEED silver certification. The intermodal/transfer facility would also be constructed to be certified at the LEED silver level. The building at NRDS would be designed to avoid blocking the view down Interlake Avenue North and Ashworth Avenue North, which would meet the viewshed goals described in the Wallingford Neighborhood Plan. Rezoning the industrial buffer would be necessary to rebuild the NRDS building in its current location. Both the NRDS and SRDS stations would be upgraded to minimize adverse impacts on adjacent neighborhoods.

Developing an intermodal solid waste transfer facility in an industrial area is in keeping with recommendations in Seattle's Freight Mobility Strategic Action Plan. Moving the existing solid waste operations from Union Pacific's Argo Rail Yard would free space in that rail yard to handle more international cargo shipped by rail to and from container ships at Terminals 5 and 18 at the Port of Seattle.

#### 6. Alignment with SPU's Strategic Objectives

The recommended option would meet SPU's strategic objectives by providing more flexibility in future contracting. A City-owned intermodal facility would allow the City to choose between three or more landfills for disposal and two rail companies for rail haul, thereby increasing competition. Project phasing has been scheduled to take advantage of opt-out dates in the current collection and long-haul contracts.

## 7. Partnerships

The recommended option would create several partnership opportunities. The reuse collection facilities would involve a partnership with reuse businesses to collect the materials from the stations, thereby stimulating their businesses. Diverting more recyclables would also benefit the private companies that process these materials. The operation of a material recovery facility at SRDS would be developed as a partnership between the City and a private company contracted to operate this portion of the station and find markets for the recovered materials. The intermodal transfer facility would open up partnership opportunities with King County and others to improve the efficiency of waste transfer and reduce long-haul and disposal costs. Also, the City would have the opportunity to pool tonnage from other sources to take advantage of economies of scale to reduce shipping and disposal costs.

## 8. Timing

The recommended option is being scheduled to take strategic advantage of the City's options to terminate and re-bid or extend its garbage, recycling, long-haul, and disposal contracts. The intermodal transfer facility is scheduled to be operational by 2009 when the long-haul contract is up for renewal or re-bid.

## 14.3 Comparison of Recommended Option with Status Quo

Table 5 compares the recommended option to the status quo option.

TABLE 5  
Comparison of Recommended Option to Status Quo

	Status Quo	Recommended Option
Additional cost over status quo.	\$0	About a 1.15-percent increase in annual costs of the solid waste system.
Reuse facilities.	None, no diversion.	Reuse drop-off at NRDS. Reuse drop-off and reuse store at SRDS.
Self-haul recycling.	No significant change. Currently at 18 percent diversion of self-haul tonnage. May decline in future due to lack of space.	Recycling drop-off areas separate from disposal areas. Separate material recovery facility at SRDS. Estimated diversion rate expected to increase to 37 percent of tons received.
Queue time on a busy day.	> 2 hours	< 30 minutes
Customer use areas.	No significant change.	Over twice as many unload stalls and multiple entry lanes to reduce wait time.
Health and safety.	Meets basic health and safety standards, but many physical hazards remain that must be managed.	Improved safety with a reduction in physical and environmental hazards.
Education opportunities.	None.	Viewing areas, classroom, and information displays.
Employee facilities.	Rebuild office and employee facilities within space available.	Build new office and employee facilities on adjacent property at NRDS and on existing property at SRDS.
Local environment at stations.	Occasional dust, odor, noise.	Reduction in dust, odor, noise, and truck traffic.
Facility appearance.	No significant change.	Improved building aesthetics and landscaping, plus 1 percent for art.

## 15 Implementation Schedule

After the Mayor and City Council review this Facilities Master Plan and provide input, the final report will be completed by the end of 2003.

A plan of this extent requires environmental review under the Washington State Environmental Policy Act (SEPA) before an option can be approved and implemented. The environmental review, along with property assessments, negotiations, and permitting, is scheduled for 2004 and may extend into 2005. Permitting and design will proceed in following years, pending program approval and funding.

Implementation of the plan is tentatively scheduled to occur in phases as show in Table 6.

TABLE 6  
Implementation Schedule

Facility	2004	2005	2006	2007	2008	2009	2010
Intermodal	Permitting	Design	Design	Construction	Operation		
SRDS		Permitting	Design	Design	Construction	Operation	
NRDS			Permitting	Design	Design	Construction	Operation

Facilities would be developed in phases so that only one facility would be developed at a time. This phasing would minimize the impact on the collection and disposal system. The intermodal facility would be developed first because it would reduce traffic and the waste handling needs of the existing Recycling and Disposal Stations. Modifications at SRDS would be implemented second because this facility has more room to set up a temporary drop-off area while the existing buildings are being replaced. Also, SRDS would have more capacity than NRDS once it is rebuilt and would be able to serve customers from the north end of Seattle while the NRDS station is being rebuilt. Portions of a station could be rebuilt out of sequence and ahead of schedule if advantageous; for example, new office, reuse, and recycling facilities could be developed at NRDS before the main building is demolished and rebuilt.

## 16 Facility Funding

The solid waste utility is operated under an enterprise fund, which is separate from the City's general fund. An enterprise fund is an account in which revenue generated from a utility is kept separate and balanced against expenditures. The enterprise fund is supported entirely by solid waste user fees and solid waste per-ton taxes.

Any facility improvements recommended by this plan or approved otherwise will be funded out of the solid waste enterprise fund. Each year, SPU submits a 6-year capital improvement project (CIP) budget and a more detailed 1-year CIP budget for City Council review and approval. The Solid Waste Facilities Master Plan implementation budget submitted for 2004 was about \$5 million. The long-range CIP budget from 2004 through 2010, which would fund all improvements outlined in the recommended option, would be about \$126 million in 2003 dollars. SPU will update the budget estimate as more specific

plans and details are developed. The City Council will review the budget each year before authorizing spending for facility improvements.

Relatively large capital expenditures for facilities and equipment are usually financed through revenue bonds. The bonds allow the utility to spread the costs out over a period of years to minimize the cost impact of a facility improvement in any one year. Securing bonds to pay for capital improvements is similar to a homeowner obtaining a mortgage to purchase a house. Revenue from user fees and solid waste per-ton taxes are used to pay the principal and interest of revenue bonds.

Implementation of the recommended option is expected to increase solid waste system costs by slightly more than 1 percent. Upon approval of a recommended option, a rate study will be performed to determine the most appropriate way to allocate an increase in costs through rate adjustments.

## 17 Conclusions

After analyzing the options for solid waste facility improvements, SPU'S Planning Team reached several conclusions. It is apparent that significant upgrades are needed to Seattle's solid waste facilities in order to meet the goals expressed in City Resolution 30431. Continued operation of the existing Recycling and Disposal Stations without improvements will result in unsatisfactory service. Without improvements, customer wait times and lines are projected to get very long, and it will be necessary to turn some customers away. Neighborhood impacts from the sites such as noise, odor, and dust will remain, along with safety hazards. System reliability would decline and the ability to manage waste during a disaster would be inadequate.

Developing an intermodal facility would be beneficial and cost effective. An intermodal facility would accomplish the following:

- Improve waste transfer efficiency.
- Maintain competition for transport and disposal of waste.
- Reduce transfer and disposal costs.
- Make Recycling and Disposal Stations more accessible to self-haul customers.
- Minimize the amount of additional property needed at the stations.
- Reduce neighborhood impacts such as traffic, lines, noise, odor, and other emissions.
- Improve safety by separating large trucks from private self-haul vehicles.
- Increase system flexibility and stability.
- Reduce cost uncertainty.

In order to adequately reduce neighborhood impacts, increase throughput to meet customer demand, and increase waste diversion rates, it is necessary to rebuild the two Recycling and Disposal Stations with some additional property. Remodeling the existing buildings would be relatively expensive and would fail to meet improvement objectives. It would be more cost-effective to demolish the existing structures and rebuild them than to remodel them. Also, it would be very difficult to achieve adequate throughput and reduction in emissions by remodeling the buildings. Additional space is needed at NRDS for the facility office, employee facilities, reuse facility, and recycling facility. Additional space is also needed at

**SRDS for a vehicle maintenance facility, along with additional waste diversion facilities of sufficient capacity to meet waste diversion goals.**

**Options 5 and 11 adequately meet the objectives in Resolution 30431, but Option 11 does so in a more cost-effective manner. Implementing Option 11, the recommended option, would increase solid waste system costs by about \$1.4 million per year, which is a 1.15-percent increase in annual solid waste system costs. A rate study is needed to determine the best way to allocate this increase in costs.**