

**City of Seattle: Past, Present and Future  
and  
The Role of Full Cost Accounting in Solid Waste  
Management**

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This paper begins with a brief look at Seattle's past decade's journey from crisis to an international reputation as a leader in municipal recycling. It will then describe Seattle: our current and projected population, our household types and sizes and our occupations. It also will describe Seattle's waste: what we throw away, how much is landfilled and how much is recycled, how the waste from residents and businesses compares, who handles our waste, and how the system is managed.

The next section will describe in more detail the events of 1987 and 1988 which lead to the City adopting a 60% recycling goal and adoption of *The Road to Recovery*<sup>1</sup>, the City's solid waste plan. This includes a discussion of what the crisis was and what tools Seattle used to address the crisis. Decisions were made based on extensive economic analysis (full cost accounting) as well as public input. The result of choices made in 1988 about the future path for solid waste management in Seattle has resulted in over 12 million dollars in savings to City ratepayers from recycling programs which began in 1988.

This is followed by a discussion of the current situation in Seattle. We have just completed our new long range plan after another round of economic analysis and extensive public input. Strategies emphasized in this new plan, *On the Path to Sustainability*<sup>2</sup>, represent a blend of program refinements and bold new initiatives. For the next decade, the City proposes to expand its recycling program, increase efforts in waste reduction and market development, initiate new product stewardship activities, and improve upon the City's own solid waste practices.

Finally, there is mention of the future direction Seattle Public Utilities could take as we try to lay out a framework for full environmental cost accounting.

## Past as Prologue

In 1987 Seattle's waste management system faced a crisis. The last two Seattle-owned landfills, closed in 1983 and 1986, had become Superfund sites that would cost more than \$90 million to make environmentally safe. We began hauling our garbage to the King County landfill which increased customer rates by 82 percent. The City's contract with the County required us to find an alternative disposal site by 1993 or be locked in for the next four decades. Seattle thought there must be a less expensive option, and set out to find it.

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<sup>1</sup> City of Seattle, *On the Road to Recovery: Seattle's Integrated Solid Waste Management Plan*. 1989.

<sup>2</sup> City of Seattle, *On the Path to Sustainability: Seattle's Solid Waste Plan*. August 1998.

The Solid Waste Utility<sup>3</sup> considered incinerating City garbage. Citizens immediately and overwhelmingly expressed their opposition. No one wanted an incinerator in the neighborhood and many were concerned about air pollution and final disposal of the ash. Seattle seized the opportunity. The City Council directed the Utility to figure out how much recycling could be done for the cost of incineration, and to propose alternative ways of handling the remaining waste.

Since private businesses and non-profit organizations were already recycling 28% of Seattle's garbage — much more than most cities — Seattle used the crisis as an opportunity for an experiment in waste reduction and recycling that had never been attempted on such a large scale.

In 1989, with adoption of its solid waste plan, *On the Road to Recovery*, Seattle decided to take a new direction:

- To provide curbside recycling and yard waste collection for residents.
- To work towards reducing, recycling, or composting 60% of all wastes by 1998.
- To landfill remaining wastes in an arid landfill.
- To ban yard waste from curbside garbage.
- To set up a rate structure to encourage recycling.
- To create an education program that would show citizens how to achieve waste reduction and recycling goals, and give them the tools to do it.

Since 1987, Seattle has been a leader in reducing, reusing, and recycling. The new program made it easy for people to recycle. It saved money. It preserved resources. Some parts of the program started up quickly while others lagged behind, and some parts just didn't work. But as residents and businesses, office and field workers embraced recycling, Seattle's program became a byword among cities, a success story acclaimed worldwide. Sydney and Seoul, New York and Kyoto, Munich and Milan — all sent representatives to learn from Seattle's experience.

Why? Because Seattle increased recycling from 28% of its wastes in 1988 to 44% in 1995; single-family homes recycled 60% of their waste in 1995. We've made long strides

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<sup>3</sup> Until 1997, the Solid Waste Utility (part of the Seattle Engineering Department) was responsible for all solid waste planning and management. In January 1997 solid waste staff were incorporated into the new Seattle Public Utilities, which provides storm water, water, drainage, and wastewater services as well as solid waste services.

towards understanding and practicing waste reduction; 94% of City residents now believe reducing waste is important.<sup>4</sup> Citizens in all parts of Seattle have shared in this success.

In 1998 there is no longer a crisis. The present system works. Seattleites are satisfied — over 90% say very satisfied<sup>5</sup>— with how we manage our waste.

In addition to keeping garbage out of landfills by reducing waste and recycling, Seattle has a long-term disposal contract for landfilling that helps keep remaining garbage costs low. The City's Recycling and Disposal (transfer) station staff have improved operational efficiency while expanding services.

Seattle has traveled far along the Road to Recovery. Our commitment to recycling has made a difference in money saved and resources conserved. We are now world leaders in recycling, and we've reduced the amount of waste landfilled each year. However, the average amount of material individuals put out for collection (garbage, recyclables, and yard wastes) hasn't changed since 1988 and the total amount continues to increase. The only difference is that we now put it into different containers. Our next challenge is to truly reduce the amount of "stuff" we use and discard.

## Who We Are: Seattle's People

In the midst of the rapidly growing Puget Sound region, Seattle is a medium sized city which is already densely settled and is growing slowly. In 1995 there were 533,660 residents — an increase of 25,760 (5%) since 1988. Current projections estimate that by 2014 there will be another 4% increase bring the total population up to 554,360 residents.<sup>6</sup>

Seattle's local government is a strong mayor strong council where there are seven council members elected at large from the city in a non-partisan election.

In 1988, Seattleites lived in 230,540 households, averaging 2.11 persons per household. In 1995, there were 247,770 households averaging 2.07 persons each. With population growing and household size shrinking, by 2014 the number of households is projected to be 270,290, with an average household size of 1.98 persons.

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<sup>4</sup>City of Seattle, Solid Waste Utility. *City of Seattle Comprehensive Waste Management Plan Survey*. Elway Research Inc. December 1995.

<sup>5</sup>City of Seattle, Office of Management and Planning. *1996 Citywide Residential Survey, City of Seattle: Ratings of the Quality of Life in Seattle and Satisfaction with City Services*. October 1996.

<sup>6</sup> All population figures are derived from *Seattle City Light's Economic and Demographic Model*, 1996. They are based on predicted moderate population growth.

The number of people living in multi-family housing is increasing (26% in 1988 and 30% in 1995) and this trend is expected to continue. By 2014 population density is expected to increase, with 35% of the population living in multi-family housing.

The solid waste Seattle has to manage is much influenced by numbers of employees, and types of businesses in the City. The total population of Seattle is about the same as the total number of employees. This implies that there is a large number of workers who commute in each day! The number of people working in Seattle is increasing rapidly. Between 1988 and 1995, employment increased by 16% and is expected to increase another 25% by 2014. As Seattle moves into the future, the proportion of jobs in different employment sectors will remain relatively stable, with some shift away from manufacturing and trade and a more rapid increase in health-related jobs. Although the greatest growth is in the health field, the greatest number of jobs will still be in the office and government category.

## What We Throw Away: Seattle's Waste<sup>7</sup>

As we live our lives, leftovers build up. What doesn't go into the sewer system we call solid waste. Mattresses, milk jugs, pop tops, old socks, apple cores, broken dishwashers, yesterday's newspaper, broken chain saws, dead light bulbs, sheet rock scraps, disposable cameras, and blunt razors are among the things we discard.

Solid waste is divided into several categories based on how it is handled and regulated. One category is Municipal Solid Waste (MSW), all the garbage, yard waste, and recyclables that Seattle residents and businesses set out for collection or haul to a City Recycling and Disposal station. It includes some materials and items that need special handling, such as old refrigerators and tires.

Another important category of waste is Construction and Demolition Debris (C&D). This includes materials from construction and demolition activities such as wood, asphalt shingles, concrete, metal, rocks, brick, and drywall. Some construction materials are disposed of in residential and commercial garbage and at the City's Recycling and Disposal stations, and treated as if it were MSW. However, if construction waste is separated at a construction or demolition site, and take to special facilities, it is no longer measured as MSW.

The City is also responsible for managing Moderate Risk Wastes (MRW). These are hazardous or toxic chemicals exempt from State regulation as hazardous wastes because

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<sup>7</sup>Data from the City's waste stream composition studies; 1994 Recycling Potential Assessment, and Department of Ecology's annual recycling surveys. 1995 data are used because this is the most recent year for which we have a full set of figures.

they come from home uses or in specified small quantities from businesses, institutions, government agencies, and others. MRW includes used motor oil, pesticides, antifreeze, paint, and solvents. For more detail on MRW see the Seattle-King County *Local Hazardous Waste Management Plan*.<sup>8</sup> When households generate MRW, it is called Household Hazardous Waste (HHW). When business and others generate MRW, it is called Small Quantity Generator Waste (SQGW).

Other special categories of waste include "biosolids" and biomedical wastes.

## Municipal Solid Waste

### *How Much MSW Does Seattle Make?*

In 1995, Seattle residents, workers, and visitors generated approximately 765,000 tons of waste (garbage plus recyclables and compostables). This is 115,048 tons more than in 1988. However, the average amount of waste generated by individual residents and workers has stayed relatively stable at approximately 2.7 lbs /day for residents, and 4.2 lbs /day for workers.

### *How Much Is Recycled? How Much Is Landfilled?*

Of the 765,000 tons of waste generated in 1995, 19,000 tons were composted or grasscycled in people's back yards, 330,000 tons were recycled or composted through collection programs, recycling drives, or drop-off at Recycling and Disposal stations and other places. The remaining 426,000 tons went to the City's contract landfill in Eastern Oregon. This is a recycling rate of 44%

Although total waste has increased over the past eight years, the amount of waste being landfilled has decreased by 8.5% from 465,600 tons in 1988 to 426,000 tons in 1995. At the same time, the amount of waste being recycled and composted has increased 84% from 184,000 tons in 1988 to 339,000 tons in 1995.

### *Who's Making All This Waste?*

Almost one-half of all waste comes from businesses and nearly a third from single-family residences. Residents of multi-family buildings generate less than a tenth of all Seattle's waste. The remaining waste comes from self-haulers, (people who bring wastes directly to transfer stations). Self-haulers who drive cars are mostly residents; those who drive trucks are 36% residents and 64% businesses.

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<sup>8</sup> King County, City of Seattle, Seattle-King County Department of Public Health, and the Suburban Cities Association. *Local Hazardous Waste Management Plan for King County: Final Plan (LHWMP)*. May 1997.

Since 1988, the proportion of commercial waste has grown very slightly, and the proportion from single-family residences has shrunk a little. In the future, as the population in multi-family housing increases, we can expect waste from that sector to increase proportionately.

In 1995, single-family households (70% of the population) generated 74% of all residential waste, while multi-family households (30% of the population) generated 26% of all residential waste. These proportions have changed very little since 1988.

Multi-family residents and self-haulers have the lowest recycling rates (percentage of total tons generated that are recycled), but they also make the fewest tons of waste. The self-haul recycling rate is low, in part because Recycling and Disposal stations have limited facilities for separating recyclables, and in part because self-haulers don't have an economic incentive to recycle if they bring in loads that contain garbage as well as yard waste and recyclables. Multi-family recycling is low partly because the program started after single-family recycling, and only a little over half of all buildings are participating. It's rate is also hampered by the lack of economic incentives to recycle through lower garbage rates. The building owner, not the tenant, pays the garbage bill. The multi-family sector also does not have the large amount of yard waste found in the single family sector.

### *What's in the Garbage?*

The composition of the garbage that goes to the landfill has changed since 1988 because we compost and recycle more; less yard waste or paper is in the garbage today because more is separated out. We recycle about twice as much now as we did in 1988.

Nevertheless, the garbage still contains many tons of materials that can be recycled through programs currently in place. By far the greatest tonnage of recyclables still found in the garbage are paper products — newspaper, cardboard, and mixed paper, nearly 83,000 tons altogether.

In 1995 about 1,275 tons of garbage didn't go into garbage containers, but was thrown out as litter or illegally dumped onto streets and vacant lots, into ravines, under freeways, and on parking strips throughout Seattle. This material includes couches, mattresses, fast food containers, bottles, and paper.

### *Construction and Demolition Debris*

A sizable portion of the City's waste consists of construction and demolition (C&D) debris. Historically most C & D debris has been disposed of separately from MSW and does not get measured as MSW. C & D is separated because the requirements for landfilling "inert" C & D debris are less stringent than for garbage. Today C & D is increasingly being recycled.

In 1995:

- About 67,000 tons were thrown into residential, commercial, or self-haul garbage. In addition, several thousand tons of clean wood waste and metals were recycled at the City Recycling and Disposal stations. These tons are included in the discussion of MSW wastes above.
- Another 119,463 tons were separated from garbage and discarded. The most common materials were painted or stained wood (7.5%), composition shingles (6.4%), mixed/demolition drywall (6%), new drywall (4.1%), and new lumber (3.8%).<sup>9</sup> Of all the disposed materials, approximately 40% is potentially recyclable.
- An unknown quantity is separated on the job site and hauled to local facilities that accept separated wood, gypsum, metals, and other construction materials for recycling. The number of these firms is increasing as more and more contractors establish job site recycling programs, and as new processors open up.

### *Moderate Risk Waste*

Seattle Public Utilities (SPU) staff estimates Seattle generates about 2,500 tons of HHW each year. The Washington State Department of Ecology estimates over 50% of HHW is used motor oil. Other major hazard categories include: flammable liquids like fuels, solvents, and oil-based paint; yard and garden products like pesticides and herbicides; acids and bases like household cleansers and hobby chemicals; antifreeze; batteries; and latex paint.

The amount of HHW Seattleites and other King County residents brought to City Household Hazardous Waste Collection Sites (Haz Sites) has increased over the past six years to 320 tons in 1995. In addition, 140 tons of used motor oil, one ton of oil filters, and 42 tons of vehicle batteries were brought to the City Recycling and Disposal stations for recycling in 1995, and an unknown amount of oil was collected by local auto parts stores and gas stations.

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<sup>9</sup>City of Seattle, Seattle Public Utilities. *Construction, Demolition and Landclearing Debris Waste Composition Study: Final Report*. Cunningham Environmental Consulting et al., September 1997.

Although the Seattle Municipal Code prohibits disposal of HHW or SQGW in the garbage, in 1995 SPU measured 670 tons of HHW in residential garbage, 949 tons of SQGW in commercial garbage, and 917 tons of MRW in self-hauler garbage.

## Back to the Past

In this section, we shall describe the background which led to the 60% recycling goal being adopted in more detail.

Facing a crisis in solid waste management, the City of Seattle initiated a major planning process in early 1987. The City had closed its last remaining landfills in 1983 and 1986. Both were subsequently declared Superfund sites and were under federal order to be cleaned up. Particularly embarrassing for the City was the fact that families living next to the landfill had to be evacuated from their houses due to high methane levels detected in their basements, over a holiday weekend!

The estimated remediation costs would soon total to more than \$90 million. When Seattle turned to the nearby County landfill, tipping fees skyrocketed. Moreover, Seattle's new disposal contract with the County carried a tough, two-year deadline. By October, 1988, the City had to commit itself to leaving the County system within five years, or staying for forty years. The Solid Waste Utility could not resolve these problems without extensive, long-term planning. Seattle needed a comprehensive analysis of all its disposal options.

### *Approaching the Problem*

The City had some experience with these planning needs. The City of Seattle owns and operates an electric utility and a water utility. Both require substantial capital resources to supply their services, and both use long range planning models to predict future service demands. These models also allow the utilities to evaluate different "resource packages" that could meet their projected demands on the basis of cost effectiveness and other important criteria. The electric utility's model also included the capability to analyze conservation programs on the same level as capital projects such as hydro-electric or coal fired generation facilities.

The City decided that it needed a similar tool to help analyze its waste management options. The model would predict future demands for solid waste services, and evaluate the resource options required to satisfy those demands.

To create the model, the City loaned several personnel from the electric utility to the Solid Waste Utility. They were charged with developing a tool that could: 1) forecast future waste generation; 2) assess the potential for recycling this waste; 3) identify options for managing unrecycled waste; and 4) calculate cost estimates for these recycling and disposal options.

The tool that was developed was known as the Recycling Potential Assessment Model (RPA). This model played a critical role in helping the City develop its Integrated Solid Waste Management Plan.

The model first projects the waste stream's growth, including which sectors the growth will occur and what the composition of the wastes will be. Second, the model projects recycling program impacts by combining recycling programs and then using the assumptions about the program such as participation and costs. The model can then predict the effectiveness of the programs; the tonnage impacts and the costs. From there the RPA calculates the benefits from the recycling program. The benefits, also known as the avoided costs, are the savings that will occur when waste that was once disposed of no longer needs to be collected, transferred and disposed of as garbage. Lastly, the model shows for each program, a cost/benefit analysis indicating whether a particular program is cost effective.

The challenge in developing the model and carrying out the analysis was collecting the financial and tonnage information that was the foundation for the model. The utility was uniquely poised to carry out the analysis. Because of its status as an enterprise fund, all the costs for administering and operating the solid waste collection and disposal system in Seattle were known<sup>10</sup>. Historically the utility had contracted with private companies for collection services but owned and operated transfer facilities and long haul trucking capabilities.

### *Other Major Initiatives in Response to Crisis*

Several other major initiatives were begun along with the analysis. The Utility began planning a major, city-wide curbside recycling program. In the spring of 1987 the utility issued a Request for Proposals (RFP) asking potential contractors to present plans for curbside recycling in the City. Collection began in February, 1988. This program was to be the cornerstone of the upcoming comprehensive recycling system that would be built by the City.

The second major initiative was developing and issuing an Request for Proposals (RFP) for new garbage collection contracts. In these contracts, the Utility switched from backyard to curbside garbage collection and initiated a yard waste collection and composting program. The switch from backyard to curbside garbage collection saved substantial amounts of money, which helped fund new recycling programs. The Solid Waste Utility also improved the collection contracts by making the payments partially dependent on tonnage. As recycling increased, the utility saved money on garbage collection. Another tool used to increase competition among the companies responding

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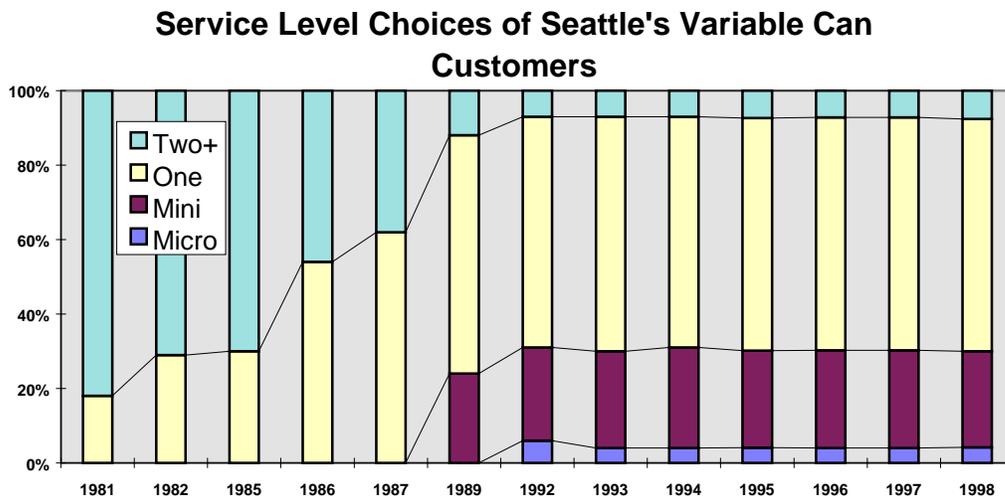
<sup>10</sup> A common barrier to performing this type of full cost of service analysis is not being able to identify all the costs of operations because they are intertwined with other city government costs.

to the RFP had to do with dividing the City into sectors. In the past contract for collection, the City had been divided evenly into two sectors. The RFP specified that there would be two companies collecting in Seattle. In the 1989 RFP, the City was split into three pieces. This caused intense competition between the existing companies as they were competing against each other for a portion of Seattle that they had previously served. The RFP specified that there would be at least two contractors and potentially three companies collecting garbage and yard waste in the City. The result of this process was one company was awarded two thirds of the City and a second company got the remaining one third.

The third planning process was to design a new rates forecast model and rate structure that would support the recycling goals and enhance implementation of the new garbage contract. Seattle already had volume based rates (also known as the variable can rate). Before 1989, over 60% of all customers were on the smallest can size, a 32 gallon can collected once per week. These customers had no economic incentive to recycle because they could not reduce their service to a lower level. As a result of this rate study, Seattle added a new 19 gallon service level called the mini-can. In addition to the new can size, the new rate structure was designed with steeply escalating rates that would encourage waste reduction and recycling. The results of these two efforts, steeply escalating the rates and the addition of the mini-can, was remarkable.

Figure 1 illustrates the effect on the service level choices by customers. Over 20% of the customers chose the mini-can rate and over 90% of the customers were now on a 32 gallon service level or smaller! In 1992, a micro can rate (12 gallons) was introduced to further reward customers for reducing their waste.

Figure 1



The variable can rate structure used by Seattle is considered an important factor in the success of Seattle's recycling program.

### *RPA Indicated the Recycling 60% Was Less Costly*

One of the surprising conclusions of the RPA analysis was that recycling 60% and disposing of the remaining 40% was the least costly of any of the combinations of voluntary recycling and disposal options that were considered. A package of programs which were mostly mandates and bans came in less costly but was considered unacceptable from a policy perspective. The City's curbside recycling program will be used to illustrate this result. From the City's perspective, it wanted to develop options on how to handle waste generation which were the least costly. While there are significant costs to the curbside program, the savings are even more substantial.

Table 1 illustrates this using data from 1993. In 1993 the savings from the recycling program totaled \$98.50 per ton. This amount can be broken into four components. The first is the avoided cost of collection. Because material that is recycled no longer needs to be collected in the garbage trucks, and because we had structured our payments to the garbage contractor to vary with tonnage, the savings from not having to collect the material was \$32 per ton. Additional savings are attributable to not having to transfer or transport the material. Since these functions are performed by the Utility, the savings are the portion of the total costs that varies by tonnage. Finally, since Seattle has a long term contract for disposal and the payment method is simply per ton, there were savings in 1993 from disposal of \$44 per ton. The costs of the recycling program in 1993 included a \$93 per ton payment to the contractors<sup>11</sup> who collect the material plus \$2 per ton for administration and public information costs incurred by the City. Thus in 1993, the costs were \$3.50 per ton less than the benefits.

**Table 1: Avoided Cost of Garbage**

Cost Category	Total Cost Per Ton	% Variable w/Tons	Variable Per Ton
Collection	\$63.56	50%	\$31.78
Transfer	\$18.66	73%	\$13.62
Truck Haul	\$10.15	85%	\$8.63
Rail + Disposal	\$44.47	100%	\$44.46
Total Cost	\$136.84		\$98.50
Recycling Program Cost			\$95.00
Net Benefit			\$3.50

The table above illustrates the costs and benefits in just one year. However, the correct way to view the costs and benefits is using a long term perspective. In the RPA analysis, we used a 20 year time period. The annual costs each year were estimated then compared with the annual benefits using present value analysis. Figure 2 illustrates this perspective. In the initial years of the program there were rather large start-up costs associated with

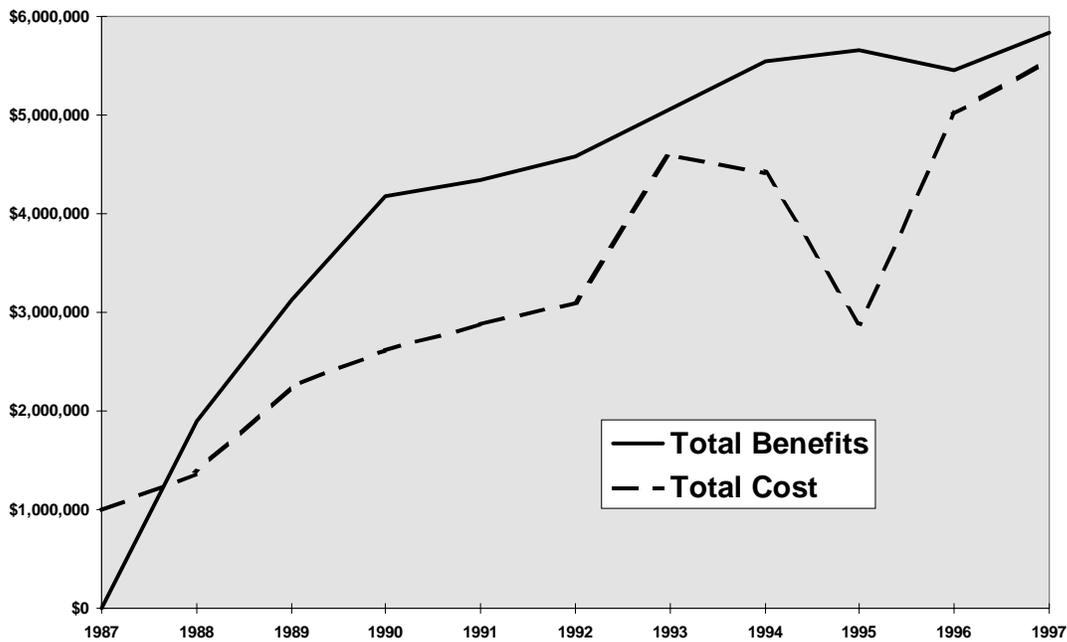
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<sup>11</sup> The contractor is responsible for processing and marketing the material after collection. They receive the revenue from selling the material.

massive amounts of public outreach. However, over time the program costs have fallen below the benefits and the program has been cost effective. The variability in the costs of the programs are due to changes in market values for the recycled materials. As prices rise, the City benefits and as prices fall the City pays the contractor an additional amount. The year 1995 stands out in particular. This was a time when world-wide paper prices reached all time highs. For example, the price for baled newspaper reached \$125 per ton compared with a current price today of about \$35 dollars per ton and a five year average of about \$38 per ton.

**Figure 2**

### **Curbside Recycling Cost/Benefit**



The cost effective package of programs that was to achieve the City’s 60% goal included the curbside recycling program, a curbside yard waste program, a transfer station drop-off program for yard waste, an aggressive backyard yard waste composting program, commercial recycling programs and an apartment recycling program. The City would be responsible for the residential programs while the private sector would continue to be used for commercial programs.

### **The Present**

Since 1988 when the curbside program was first initiated through 1995, the City estimated that the recycling programs have saved customers over 12 million dollars.

However, as indicated in the introduction, not all programs have gone as planned. The 60% goal was only achieved in the single family residential sector. The new solid waste plan, *On the Path to Sustainability*, has been developed based on extensive feedback from customers, citizens, stakeholders, and City staff over the past several years, with a focus on three key values identified during that process:

- Protecting public and environmental health.
- Improving cost-effectiveness and system efficiency.
- Responding to customer and community needs.

The plan envisions a future in which we continue to improve our waste management practices on the path to a more sustainable future.

For the next steps along this path, the City has set the following eight goals with zero waste as a guiding principle.

- Increase waste reduction and resource conservation.
- Recycle 60% of all waste generated in Seattle by 2008.
- Increase the efficiency, fairness, convenience, and accessibility of services.
- Expand local recycling markets and increase purchases of recycled-content products.
- Increase producer and consumer responsibility for sustainable waste management practices.
- Implement the Seattle Sustainable Building Action Plan.
- Improve sustainable waste management and resource conservation practices in all City operations.

These recycling goals were again set using the RPA and other modeling tools to analyze options and determine which set of programs would allow us to reach 60%.<sup>12</sup> It was determined that in order to reach this recycling goal three very aggressive actions need to be taken.

- The addition of food waste to the City's recycling programs.

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<sup>12</sup> New modeling tools were built to support analysis of the entire solid waste system including collection methods and transfer locations. This new model titled RPA/SAM is described in a technical support document to *On the Path to Sustainability; Volume 1: Recycling Potential Assessment/System Analysis Model, December 1998*.

- Aggressive education campaigns aimed at capturing the large amounts of paper and wood still left in the waste stream.
- Building a recycling center at a city transfer station to allow more convenient access to recycle for customers who bring waste directly to the stations.

## The Future

Back in 1987/88, the City broke new ground using economic analysis, now termed “Full Cost Accounting”, to analyze the costs and benefits of a waste management system which included aggressive recycling programs. We have employed this method of analysis for the past 10 years to help guide decisions on whether to expand existing programs or add new programs. Meanwhile, the concept of “Environmental Cost Accounting” is being explored world wide, whereby costs other than monetary ones, are included in the analysis. Seattle did not consider non-monetary costs in the latest planning process. This comment was included by an expert panel review of our new plan as a shortcoming.

In light of this, we are now embarking on a project which will hopefully lead us to incorporating the non-monetary costs on society of waste generation, recycling and disposal. There are many compelling reasons for this. There are recent studies in the United States which call into question the projected lifetime of landfill liner systems. If these studies prove to be true, then there are potential future costs associated with environmental damage due to leakage of landfills that may need to be considered when making future decisions on how much to recycle versus landfill. Another reality concerning environmental costs in the Puget Sound region of Washington State is the listing of several species of salmon as endangered under the federal endangered species act. Environmental costs of our actions, once not considered, are now coming back to haunt us. There are no real accurate estimates about the monetary effect the listing will have on this region but clearly the amount will be sky-high as individuals and governments at every level begin to realize how current practices will need to change.

The way in which Seattle could incorporate environmental cost accounting into it’s decision-making process could be something as simple as a qualitative listing of these environmental costs and benefits to something more complicated like using research being pioneered around the world to assign values to some of the external costs and benefits. It remains to be seen how quickly we will move in this direction.