# City of Milwaukee

# Recycling Task Force

# Final Report and Recommendations to the

# Common Council

# January 2010

## ***INTRODUCTION***

The City of Milwaukee Common Council established the Recycling Task Force (RTF) on January 16, 2009, with the adoption of Common Council File # 081212 and amended it with Common Council File 090233.

## ***MISSION STATEMENT***

This Task Force was charged with conducting a comprehensive study of the fiscal and operational impacts of a conversion to single-stream recycling in the City of Milwaukee. The task force was directed to submit those findings and recommendations to the Common Council by January 11, 2010.

## ***MEMBERSHIP***

The Recycling Task Force members consisted of five members:

Preston Cole, appointed by the Commissioner of Public Works as his designee and appointed as chair by the Common Council President

Ald. Joe Dudzik, appointed by the Common Council President

Lisa Schaal, citizen member appointed by the Common Council President with experience and knowledge of municipal public works operations

Michael Daun, appointed by the Milwaukee Comptroller as his designee

Erick Shambarger, appointed by the Budget and Management Director as his designee

## ***MEETING DATES***

The Task Force held the following public meetings in 2009:

April 6, 2009
April 27, 2009
May 18, 2009
June 8, 2009
June 29, 2009
July 27, 2009
September 14, 2009
October 26, 2009
December 16, 2009

## ***SUMMARY***

**During the regular meetings of the task force, members discussed a series of issues, questions and recommendations by task force members, the Consultant Earth Tech/AECOM and others relating to:**

- Recycling citation process;
- Single stream recycling;
- Recycling programs of other cities;
- The current recycling contract;
- The type of equipment required for the recycling program and its cost;
- The "Pay As You Throw" program;
- The cost of converting to a single-stream collection process;
- Feasibility and cost/benefit of depositing collected recyclables at the existing Germantown facility compared to the City upgrading and using its own facility;
- Continuation of contracting out recycling collection; and
- Impact of the weather on impact the recycling collection and processing.

**The following individuals appeared at one or more of the task force meetings to answer questions, offer suggestions and to provide legal advice:**

- Mr. Rick Meyers, Department of Public Works, Sanitation Division
- Ms. Wanda Booker, Department of Public Works, Sanitation Division
- Mr. Donald Stone with Department of Public Works, Sanitation Division
- Ald. Nik Kovac
- James Carroll, Legislative Reference Bureau
- Jim Michalski, Comptroller's Auditing Division
- Deputy City Attorney Linda Burke
- Assistant City Attorney Jay Unora with the ordinance Enforcement Division
- Mr. Donald F. Pirrung, PE and Mr. Paul Matz with Earth Tech/AECOM Consultant Firm
- Mr. Perry Lindquist, Land Resources Manager with Waukesha County

**During the task force meetings the following presentations were made:**

Mr. Rick Meyers, City of Milwaukee, Environmental Recycling Specialist, gave a PowerPoint presentation on the City of Milwaukee Department of Public Works' current recycling program **(APPENDIX A).**

Member Erick Shambarger gave a brief summary of the La Follette School of Public Affairs (Madison, WI) policy study on the Pay-As-You-Throw program, which was done at the request of the City of Milwaukee's Department of Administration, Budget & Management Division. The report is titled "Impacts of Pay-As-You-Throw Municipal Solid Waste Collection" and is attached to this report **(APPENDIX B)**. A copy of the report can also be found at: http://www.lafollette.wisc.edu/publications/workshops/2009/waste.pdf

Mr. Perry Lindquist, Land Resources Manager with Waukesha County, gave a PowerPoint presentation on the Waukesha County Recycling System Study **(APPENDIX C).**

Mr. Donald F. Pirrung, PE and Mr. Paul Matz with Earth Tech/AECOM, gave a series of PowerPoint presentations relating to a “Recycling Facility Alternatives Study." The “Recycling Facility Alternatives Study” is attached to this report **(APPENDIX D).**

The Recycling Task Force also attended tours of the City of Milwaukee Materials Recovery Facility (1313 W. Mount Vernon Ave) and the Waste Management Materials Recovery Facility (W132 N10487 Grant Dr., Germantown, WI) on June 29, 2009.

The minutes of all meetings of the Task Force are accessible on the Internet at http://milwaukee.legistar.com/calendar.aspx and in Common Council File #090072.

**Given the breadth of recycling topics and areas of examination, the task force chose to focus its efforts on evaluating costs and benefits associated with single stream recycling and continuation/renegotiation of the existing recycling contract. The results of this focus are the four recommendations stated below and the material contained in the four appendixes, which support these recommendations.**

## ***RECOMMENDATIONS***

*The recommendations may require further refinement and review and may require ordinance amendments or contract negotiation to be implemented. Time has not allowed for a complete review of their legality and enforceability.*

**We, the members of the City of Milwaukee Recycling Task Force hereby recommend the following:**

1. Implement single stream recycling within the next 1-4 years as the recycling collection and processing system to serve the City of Milwaukee.

   ***According to the Recycling Facility Alternatives Study, prepared by AECOM (APPENDIX D, Page ES-2):***

   ***"A Single stream processing means all the recyclables are collected in a single undivided cart and then sorted at the Material Recycling Facility (MRF). This approach is more user friendly and collection friendly resulting in more recyclables being placed at the curb by the public and more efficient collection by the recycling truck operation. Single stream collection is more user friendly because the public can simply consolidate all recyclables in the home and place them all in one cart without further sorting. The recycling industry is moving toward single stream recycling nationwide. Single stream can accommodate fully automated collection, which improves efficiency by allowing carts to be serviced without the driver exiting the vehicle."***

2. Include internal and external stakeholders in a detailed investigation of the Recycling Facility Study's top two options:
   i. Alternative D – One Transfer Station at Existing City Facility
   ii. Alternative F – Regional Single Stream MRF at Existing City Facility

   ***According to the Recycling Facility Alternatives Study, prepared by AECOM (APPENDIX D, pages ES-2and ES-3):***

   ***"Alternative D would consist of converting the existing City MRF into a recycling transfer station. A compactor and related improvements would be added to the MRF. The transfer station would be operated by a third party, which would transport the recyclables by semi truck to a processing facility. Transfer station capital equipment could be provided directly by the third party firm and are estimated for this study. For this evaluation, the Waste Management Recycle America (WMRA) MRF in Germantown was used for the cost evaluation."***

   ***"Alternative F considers Waukesha County, City of Wauwatosa, and City of Milwaukee developing a MRF at the City's existing MRF on Mount Vernon. The City's current dual stream processing would be replaced with single stream processing equipment. The existing equipment would be replaced entirely due to its age, size, and condition. The structural aspects of the facility would remain basically the same. A cost allowance is included for some structural improvements to accommodate the new process equipment. Staffing is expected to increase from the current level based on additional recycling tonnage and is estimated based on the Waukesha County Report. The processing would be performed by a private firm as currently done."***

3. Immediately implement three-week recycling collection to increase recycling volumes and revenues. Schedule recycling collection and require the cart to be located at the curb or alley line to improve collection efficiency. End summer walk-up driveway service except for hardships.

   ***According to the Recycling Facility Alternatives Study, prepared by AECOM (APPENDIX D, Page ES-4):***

   ***"The most cost-effective method was to collect the recyclables on a three-week frequency with placement of the cart at the curb by the resident. Three week frequency is estimated to increase recyclables volume by ten percent."***

4. Implement Pay-As-You-Throw features for garbage collection in conjunction with increased recycling collection service to optimize effectiveness of both programs.

   ***According to the Recycling Facility Alternatives Study, prepared by AECOM (APPENDIX D, Page ES-4):***

   ***"There is increasing interest in managing municipal solid waste through "Pay-As-You-Throw" (PAYT) programs. The most common approach is for the user to pay for a certain size garbage container(s) and the recycling cart is free. The PAYT program results in a decrease in the trash tonnage and increase in recycling tonnage. A 16 to 17 percent diversion from residential trash is the average, which is generally divided equally among recycling, yard waste and source reduction."***

# APPENDIX A

PowerPoint presentation on the City of Milwaukee Department of Public Works' current recycling program

# Recycling Task Force Meeting
# April 27, 2009

## Agenda Item 4:

Presentation by DPW Sanitation staff on the City's recycling program

Presented by Rick Meyers, Recycling Specialist

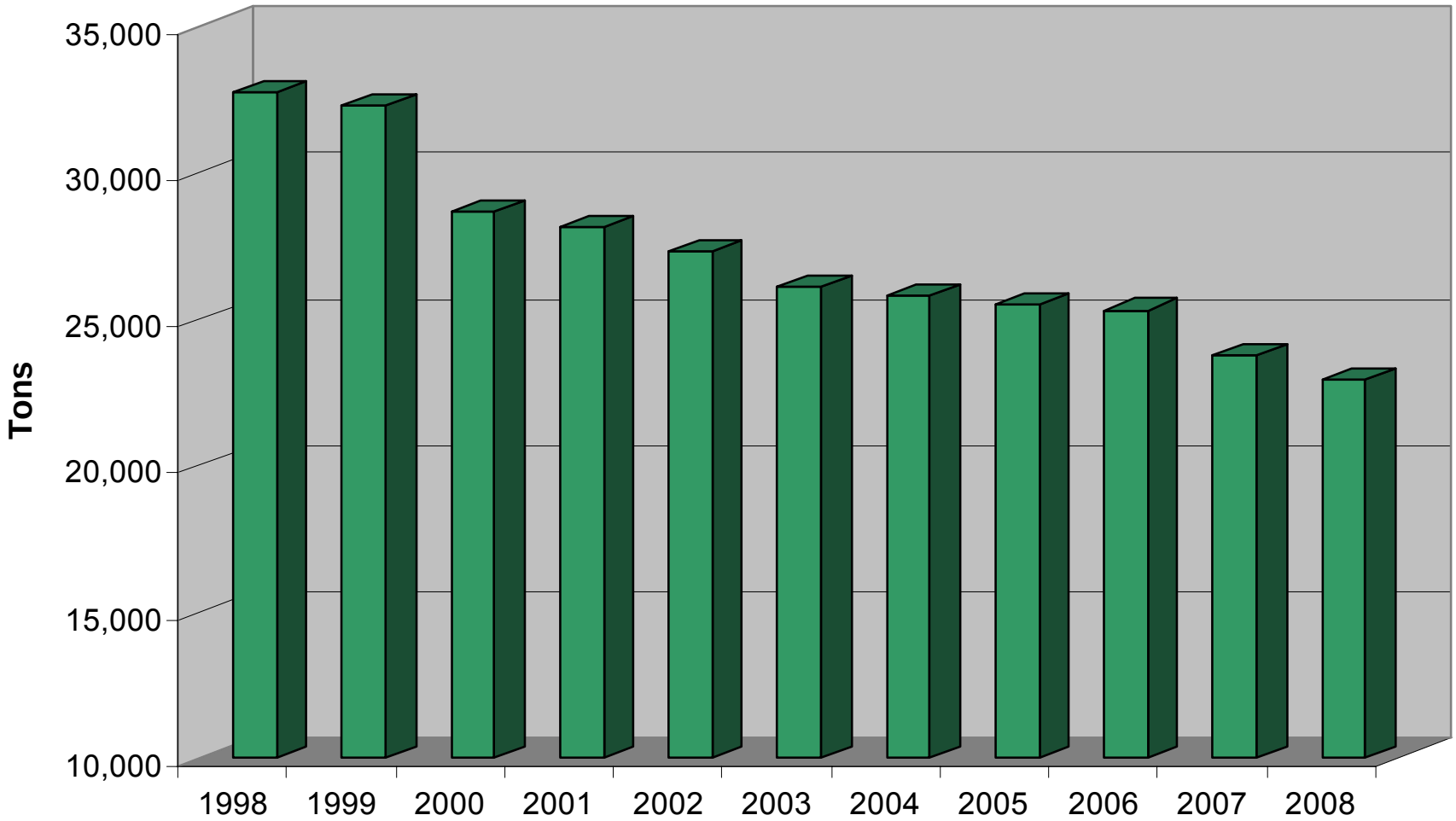

# City of Milwaukee Residential Recycling

## Program History:

- 1971: drop-off sites established for glass, tin-cans, and newspaper
- 1977: experiment with refuse-derived fuel plant
- 1989: curbside pilot program initiated
- **1995: city wide curbside program implemented**

# City of Milwaukee Residential Recycling

1998 - 2008



# City of Milwaukee Residential Recycling

## Program Overview:

- 190,000 single family through 4-unit properties
- 34 recycling routes in winter, 31 in summer
- 85% of HH's serviced with 95-gallon carts picked up monthly (2 summer routes 2X/month)
- 15% of HH's serviced with 18-gallon bins picked up weekly

# Recycling Collection Details

- Dual stream program, municipal collection
- Split carts and split recycling packers
- Semi-automated, single cart system
- Single person collection crew
- High material quality with dual stream collection

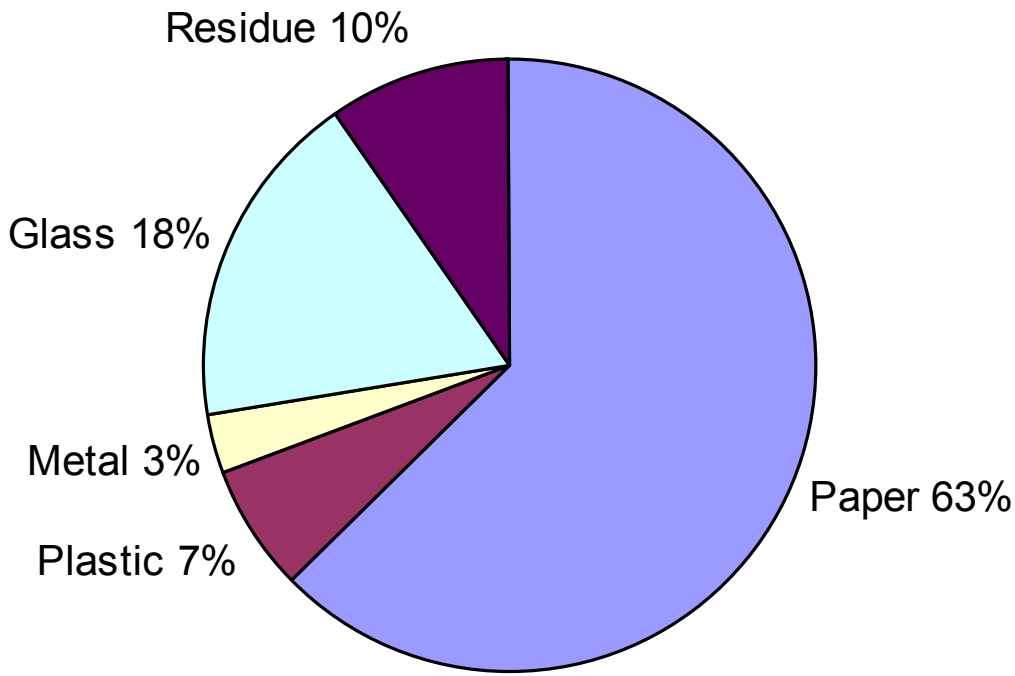
# Recyclables Processing & Marketing

- City owns its Materials Recovery Facility (MRF)
- Contracts out its operation & marketing of recyclables
  - July 1, 2009 entering first of up to 5 optional extension years
  - Could continue contract through June 30, 2014
  - Contract basics:
    - Per ton processing fee, annually adjusted (CPI)
    - 50% revenue share from sale of processed recyclables

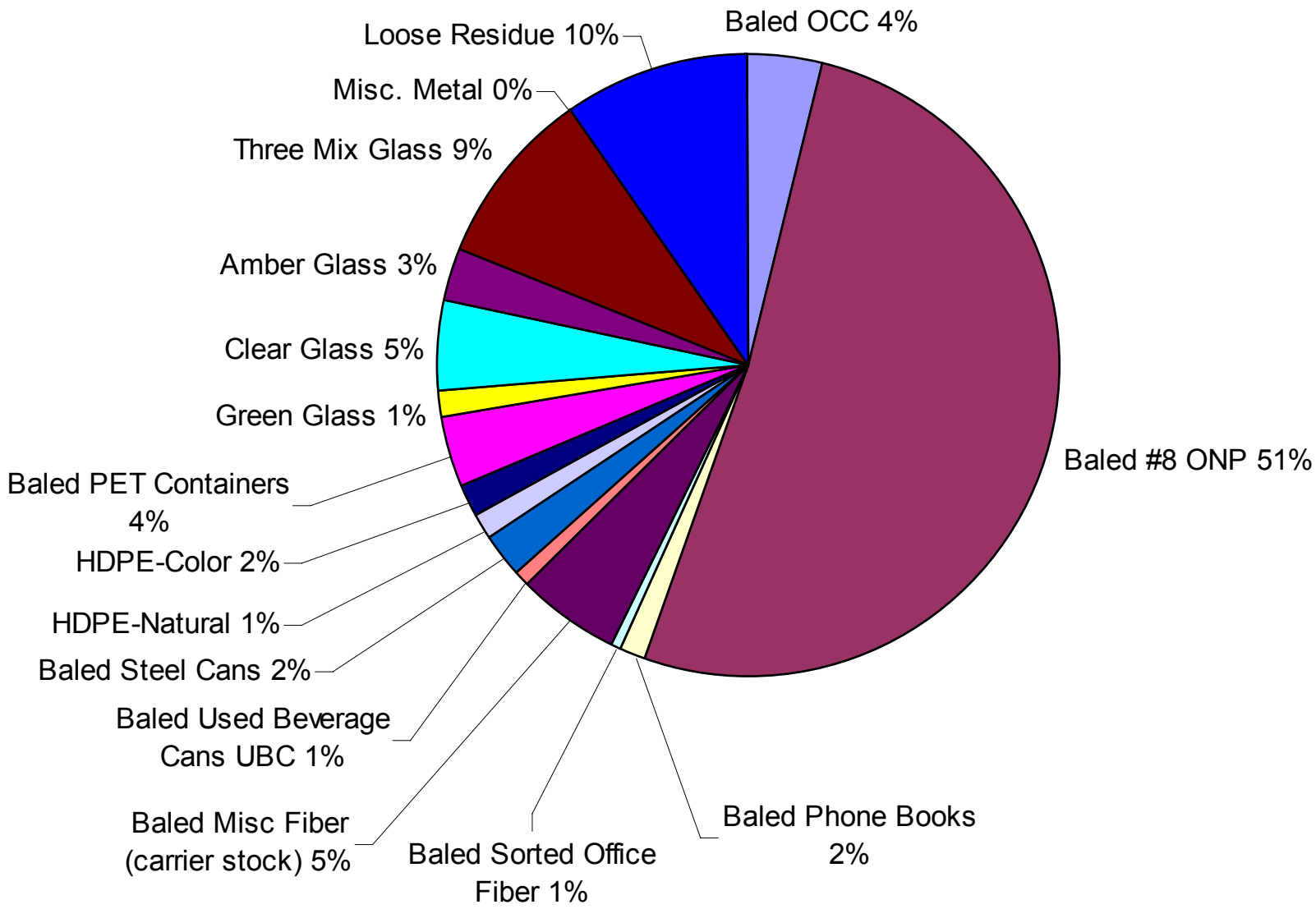
# Milwaukee's Materials Recovery Facility

- Dual stream processing
  - Paper fibers
  - Commingled containers


# City of Milwaukee MRF
# Materials Processed by Weight
# 2007



# City of Milwaukee MRF
# Materials Processed by Weight (2007)



# Financial Data

Revenue to City: **$7.4 mil.** to General Fund (2004-2008)

2008:

Net Revenue: $376,395 ($15.16/T)

Avoided disposal costs: $725,896 ($29.24/T)

**Total net benefit: $1,102,291 ($44.40/T)**

# Education and Outreach

- UW Grant outreach
- EPA RCC Recycling With a Personal Touch
- Recycling DVD, 3 segments/age groups
- Recycle For Good
  - New advertisements
  - Website
  - Neighborhood campaigns
- Recycle More Wisconsin
- MRF tours & educational programs (Keep Greater Milwaukee Beautiful)

# New promotional campaign launched Sept 30, 2008


LET'S MAKE MILWAUKEE CLEAN & GREEN.


MILWAUKEE
RECYCLE FOR GOOD!
LET'S MAKE MILWAUKEE CLEAN & GREEN.
MilwaukeeRecycles.com
City of Milwaukee
32217
MILWAUKEE

# Looking forward

- Guaranteed schedule, biweekly
- Potential changeover of some bins to carts
- Single or dual stream collection?
- Public vs. private MRF?

# Required components of an effective recycling program (NR 544.04)

- Public information and education program
- Ordinance reflecting State law
- System for collecting recyclables from single family and 2 to 4 unit residences
- Equipment and staff to implement the recycling program
- Require owners of multiple family dwellings and non−residential facilities and properties to provide recycling at their facilities and properties
- A means of adequately enforcing the requirements of the effective recycling program
- A compliance assurance plan
- Submittal of an annual program report

# Compliance Assurance Plan

- City of Milwaukee's CAP Created in July of 2006

- The CAP, at a minimum, shall contain the procedure to follow when addressing at least one specific compliance issue

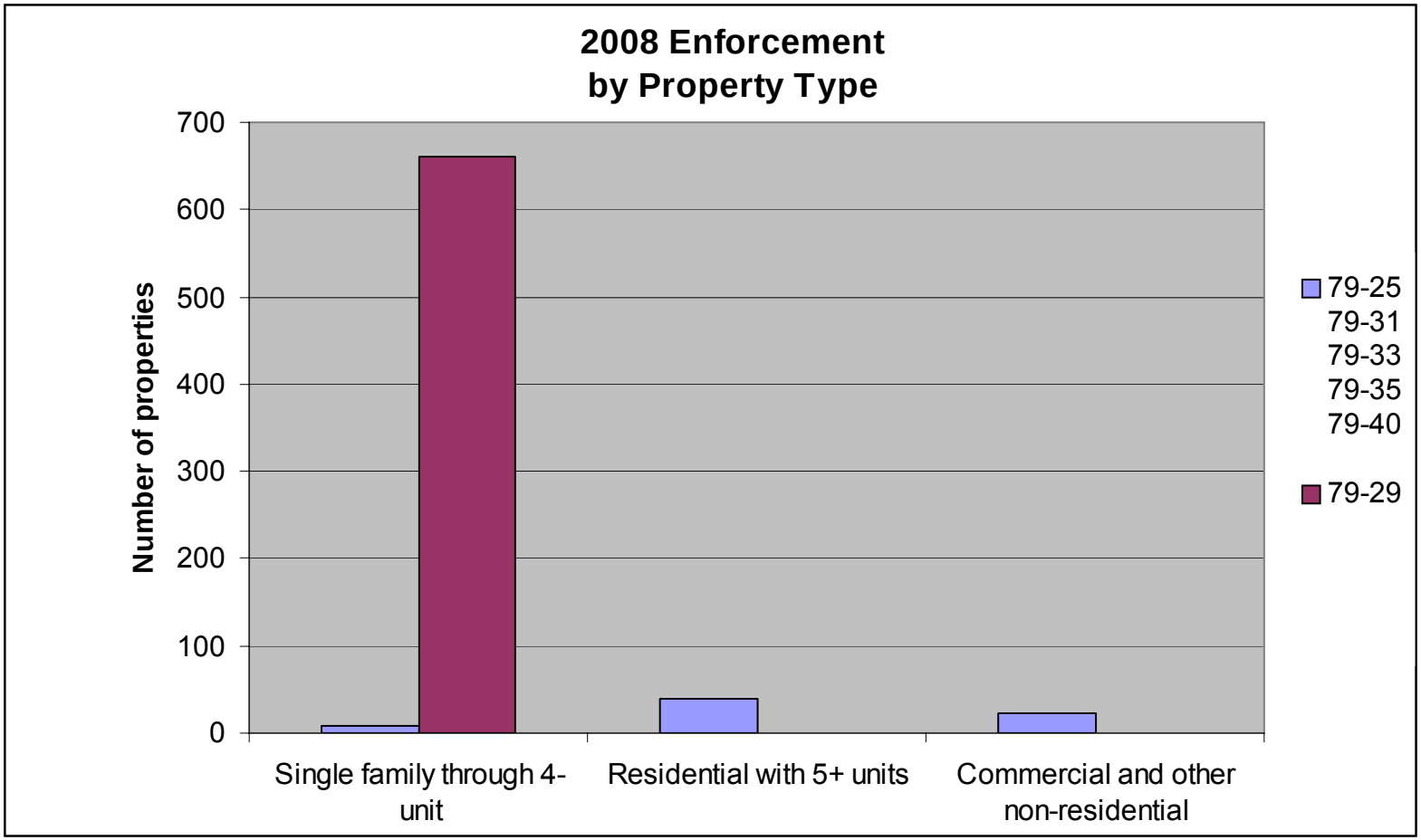
Ours: 3 scenarios

  - –Violations by Businesses / >4-Unit Multifamily Dwellings / Institutions
  - –Violations by Residents—Example of contamination of recycling cart
  - –Violations by Residents, Single Family through 4-plex – Example of Non-Participation

# Recycling Violations and Penalties

| Code | Violation | Violation Frequency (within 12 months) | Penalty |
|---|---|---|---|
| **79-29** | Improper Sorting and Storage of Recyclable Materials | 1st | Written Notice |
| | | 2nd | $20 |
| | | 3rd or more | $40 |
| **79-33, 79-35** | Failure to provide containers for collection and provide removal of recyclable materials by Multi-Family Dwellings and Non-Residential Properties | 1st & 2nd | $50 - $200 |
| | | 3rd or more | $100 - $500 |
| **79-40** | Removal of Recyclables or Recycling Containers | 1st or more | $25 - $500 |
| **79-25** | Non-compliance with separation of recycling materials | 1st | $10 |
| | | 2nd or more | $25 |

# Properties Enforced in 2008



# Enforcement

- Recycling assistance integrated into enforcement process
- Compliance Summary through 2008
    - 161 properties enforced (145 attained compliant status)
    - 30 special charges issued totaling $3,850.64
- Compliance Summary 2008 alone
    - 65 properties enforced (50 attained compliant status)
    - 23 special charges issued totaling $3,047.38
- Cart contamination
    - 2006: 315 notices issued resulting in 141 special charges totaling $2,775
    - 2007: 667 notices issued resulting in 379 special charges totaling $11,215
    - 2008: 661 notices issued resulting in 353 special charges totaling $9,915

# Recycling Tons, Wisconsin RUs

| Top RUs by Population | Total Household Recyclables per Capita (lbs.) | Rank (out of 25 largest RUs) |
|---|---|---|
| Milwaukee | 86.4 | 24 |
| Waukesha, County | 157.6 | 7 |
| Madison | 137.7 | 11 |
| Outagamie, County | 187 | 1 |
| Green Bay | 146.5 | 10 |
| Eau Claire, County | 123.3 | 17 |
| Kenosha | 123.8 | 16 |
| Racine | 107.3 | 20 |

*Data taken from Appendix 3 "Recycling Tons in Wisconsin 25 Largest Responsible Units", of the Audit of the City of Milwaukee Recycling Program, June 2008*

# Residential Recycling in the U.S.

| City | Residential Recycling Rate | Frequency | How collected |
|---|---|---|---|
| **Columbus** | 12% | Weekly | Commingled |
| **Austin** | 28% | Weekly | Source-Separated |
| **Memphis** | 27% | Weekly | Commingled |
| **Baltimore** | 27% | Weekly | Source-Separated |
| **MILWAUKEE** | 25% | Monthly | Source-Separated |
| **Fort Worth** | 20.6% | Weekly | Commingled |
| **Charlotte** | 11.5% | Weekly | Commingled |
| **El Paso** | 2% | NA | NA |
| **Boston** | 23% | Weekly | Source-Separated |

*Data taken from Appendix 5 "Municipal Recycling in the U.S.- 30 largest cities by population", of the Audit of the City of Milwaukee Recycling Program, June 2008*

# Possible Incentive Programs

- **PAYT**
- **Recycle Bank**
  - Need at least 10,000 households on a set schedule to start a pilot program
  - Some communities that utilize Recycle Bank also have a PAYT system

# APPENDIX B

Impacts of Pay-As-You-Throw Municipal Solid Waste Collection Study

# City of Milwaukee:

# Impacts of Pay-As-You-Throw Municipal Solid Waste Collection

Prepared by
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For the
City of Milwaukee, Department of Administration,
Budget and Management Division

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# Foreword

Students in the master of public affairs program in the Robert M. La Follette School of Public Affairs at the University of Wisconsin–Madison produced this report for the City of Milwaukee's Department of Administration's Budget and Management Division. The opinions and judgments presented in the report do not represent the views, official or unofficial, of the La Follette School or of the clients for whom the students prepared the report.

The authors are enrolled in the Public Affairs Workshop, Domestic Issues, the capstone course in their graduate program. The La Follette School offers a two-year graduate program leading to a master of public affairs or a master of international public affairs degree. The workshop provides practical experience applying the tools of analysis acquired during three semesters of coursework to actual issues clients face in the public, non-governmental, and private sectors. Students work in teams to produce carefully crafted policy reports that meet high professional standards within the timeframe of a single academic semester. The reports are research-based, analytical, and when appropriate, evaluative.

This report would not have been possible without the encouragement and leadership of the City of Milwaukee's dedicated employees. A University of Wisconsin–Madison Engage grant for collaborative work from the Division of Information Technology supported additional costs of this report, including travel costs of meeting with clients. The report also benefited greatly from the support of the staff of the La Follette School. Outreach Director Terry Shelton, along with Kari Reynolds, Mary Mead, and Gregory Lynch, contributed logistical and practical support. Karen Faster, La Follette Publications Director, edited the report and shouldered the task of producing the final bound document.

This report was generated primarily for the educational benefit of its student authors. The purpose of the project was to improve their analytical skills by applying them to an issue with a substantial policy or management component. This culminating experience is the ideal equivalent of the thesis for the La Follette School degrees in public affairs.

Dr. Susan Webb Yackee
Assistant Professor of Public Affairs and Political Science
May 2009

## Acknowledgments

We thank the following people for their guidance and assistance in preparing this report: Mark Nicolini, City of Milwaukee Budget Director, for commissioning the project; Erick Shambarger, City of Milwaukee Economist, for his feedback; Rick Meyers, City of Milwaukee Recycling Specialist, for his assistance; the various municipal employees who took the time to respond to our comparative cities survey; the vendors and manufacturers who provided pricing and equipment details; Karen Faster for her editing and comments; Professor Jack Huddleston for statistical guidance; and Professor Susan Yackee for her mentoring and guidance.

# Executive Summary

This report analyzes the possible implementation of a pay-as-you-throw (PAYT) user fee system for municipal solid waste (MSW) collection in the City of Milwaukee. PAYT collection systems serve more than 25 percent of the U.S. population and more than half of Wisconsin communities. These programs replace flat fees with charges based on the quantity of MSW generated per household. PAYT systems may cause residents to recognize the cost of their individual disposal habits and reduce their waste. Pay-As-You-Throw can also promote behavioral change in the form of greater recycling. Municipalities and residents find these systems to be equitable, since those who generate more waste pay more for collection services. PAYT revenue may also provide financial benefits to the city by fully compensating program costs.

Milwaukee charges each household $150 per year for MSW and recycling services. This flat rate creates insufficient revenue for complete program cost recovery. Milwaukee wishes to pursue a PAYT user fee system that fully pays for the MSW and recycling programs, particularly as landfill rates charged for waste disposal continue to rise.

Our analysis draws upon research from the U.S. Environmental Protection Agency (EPA), academic studies, City of Milwaukee MSW and recycling data, contacts with MSW equipment suppliers, and a survey of 10 comparable U.S. cities using PAYT systems. We assess three program options for Milwaukee: the status quo, a multiple cart system with pricing based on household waste cart size, and a weight-based program that charges per pound of refuse collected. We examine each alternative based on metrics of efficiency, effectiveness, equity, and ease of implementation to determine which MSW system best suits Milwaukee.

We recommend a weight-based PAYT system for Milwaukee.
The weight-based model offers the greatest efficiency and creates the greatest incentive to reduce waste. This alternative also scores highest in equity measures. In contrast, the current system and multiple carts allow greater disparities between the price per unit paid by households with low levels of MSW disposal and the prices paid by those with high levels. The weight-based system also requires less capital investment than a multiple cart system.

We also recommend a series of implementation measures to ease the transition to a PAYT system. Recycling rates rise an average of 16–17 percent in PAYT communities. Increasing the frequency of recycling collection (as recommended in the 2008 Audit of the City of Milwaukee Recycling Program) before PAYT is instituted would prepare residents and city staff before the anticipated increase in recycling. In addition, Milwaukee should conduct a pilot program to review equipment performance, implement new billing software, and gauge program acceptance. Steps to enhance responsiveness to the PAYT program include education and outreach, billing comparisons to show customer savings for MSW reductions, and collection of program feedback from pilot households.

# Introduction

This report examines the City of Milwaukee's solid waste and recycling collection structure and fees. Milwaukee charges each household an annual $150 flat fee for municipal solid waste (MSW) and recycling collection. This fee does not fully cover Milwaukee's cost for providing the services and charges each household the same rate, regardless of the amount of solid waste it generates.

More than 7,000 U.S. communities operate pay-as-you-throw (PAYT) municipal solid waste collection systems as an alternative to traditional flat rates. This report includes a comparative analysis of PAYT implementation and impacts in U.S. cities similar to Milwaukee. The analysis also examines potential impacts of reduced solid waste generation should Milwaukee implement a variable price structure. To evaluate the policy alternatives, the report considers the efficiency, effectiveness, equity, and ease of implementation in the current program, a multiple cart PAYT alternative, and a weight-based PAYT alternative.

**Research Question**
Which PAYT garbage collection system, that can be practically implemented, most effectively covers Milwaukee's solid waste and recycling costs while equitably charging residents for their solid waste output?

**Definitions**
The following definitions are used in this report:

- **Bin**: A small container used for recycling collection, typically less than 20 gallons in size.
- **Cart:** A wheeled receptacle used for municipal solid waste, recycling, or yard waste collection. Typical cart sizes range from 30 to 128 gallons.
- **Municipal solid waste (MSW)**: Household garbage that is taken to a landfill or incinerator.
- **Pay-as-you-throw (PAYT):** Any MSW collection system that charges users a variable price based on the amount of waste they dispose of. PAYT systems are typically volume-based, but some are weight-based.
- **Recycling:** Any goods accepted by the municipal recycling program. It is illegal to dispose of recyclables in a landfill, although this is rarely enforced (Prohibitions on Land Disposal and Incineration 2008).
- **Tipping fee:** The charge, typically in dollars per ton, for unloading solid waste at a landfill.

# Background

Traditional municipal solid waste programs charge households a flat fee for MSW collection and/or include garbage collection fees as part of the property tax levy. The rate per household applies uniformly regardless of the amount of waste generated. PAYT solid waste programs utilize variable rates that charge households for collection based on the amount of MSW they generate. PAYT systems fall into volume-based and weight-based categories, described in the following section (U.S. EPA 2008b).

**Volume-Based PAYT Systems**
These systems charge variable rates based on the volume of municipal solid waste a household generates. Volume-based PAYT systems commonly take three implementation forms:

1. **Prepaid bags:** This system uses uniquely colored or marked trash bags for solid waste collection. Residents purchase the bags from the municipality or local retail outlets, and they must place all garbage in these bags. The cost per bag is set to cover all or part of the solid waste collection service plus a small fee for retail outlets distributing the bags.
   **Advantages:** Prepaid bag systems are relatively easy to administer, simple for customers to understand, and provide a strong incentive for customers to reduce their MSW. Prepaid bag systems are compatible with existing billing systems and may allow for the elimination of billing for MSW collection all together.
   **Disadvantages:** Prepaid bag systems are incompatible with the automated and semi-automated MSW collection trucks used by most mid-sized and large municipalities as they require collectors to manually check the bags and load them into the truck. Prepaid bag systems also result in unsteady revenue streams for the municipality since customers may purchase large numbers of bags at one time and then none for a number of months. Non-compliant bags are generally not collected, which can lead to solid waste accumulation for households.

2. **Prepaid tags:** This system functions similarly to prepaid bag systems, except residents purchase tags or stickers to attach to their own trash bags.
   **Advantages:** Prepaid tag systems have the same advantages as prepaid bag systems with the additional advantage that tags are smaller than bags and easier for retailers to handle.
   **Disadvantages:** Prepaid tags have the same disadvantages as prepaid bags.

3. **Multiple cart sizes:** This system uses different sized MSW carts and charges residents based on the size of their cart. Most municipalities using this system offer two or three cart sizes, although some offer as many as six. Many communities using multiple carts also utilize a prepaid bag or tag system for MSW items exceeding the cart size.

**Advantages:** Multiple cart programs are compatible with automated and semi-automated MSW collection vehicles used in many municipalities. In municipalities moving from a single cart program to a multiple cart program, customers are already familiar with how the cart and collection system works. Multiple cart programs are relatively easy to administer once the billing system is established.
**Disadvantages:** Multiple cart systems provide no economic incentive to customers to reduce their waste unless they can reduce it enough to move to a smaller cart size; this can be partially overcome by offering a large number of cart sizes. The purchase of a large number of carts to implement the program and billing administration can be costly for municipalities.

**Weight-Based PAYT Systems**
These systems weigh MSW during collection and bill residents per pound of MSW they generate.

1. **Truck-mounted scales:** Most weight-based systems utilize carts and a scale on the collection vehicle. The collection vehicle scans a bar code or radio frequency tag on the cart, weighs the cart as it is emptied, and records the cart number and weight in an on-board computer. This information is then uploaded into the billing system.
   **Advantages:** Weight-based systems provide the greatest incentive for residents to reduce waste, as they can see a clear cost reduction with even small reductions in waste. Weight-based systems are compatible with automated and semi-automated collection vehicles when outfitted with the appropriate equipment. The systems are simple to understand and generally perceived as the most equitable form of PAYT (Skumatz 1995).
   **Disadvantages:** The equipment needed to accurately weigh MSW and bill residents may be complicated and more expensive than other options (U.S. EPA 1994). Additionally, billing administration can be more complex. To date, weight-based PAYT programs in the United States have been limited to a number of pilot programs and a handful of municipalities.

Despite disadvantages in all PAYT systems, numerous communities nationwide have found it beneficial to adopt various forms of these systems to reduce solid waste output, promote greater equity, and increase recycling by residents (Miranda and Aldy 1996; Skumatz and Freeman 2006).

**PAYT Links to Recycling**
Successful PAYT programs operate in conjunction with comprehensive recycling programs. This allows residents to reduce much of their waste, and therefore their MSW bill, by increasing their recycling rates. The municipality benefits to the extent that recycling lowers landfill tipping fees and potentially increases revenue from the resale of recyclables.

Milwaukee operates a residential recycling program that collects recyclables monthly from the majority of households using 95-gallon carts, although a portion of the city uses 18-gallon bins and receives weekly collection. In 2008, the Milwaukee Comptroller conducted an audit of the city's recycling program at the request of the Common Council. The audit highlighted anecdotal evidence that many households completely fill their recycling carts in less than one month (Morics 2008). This implies that residents have little opportunity to increase their recycling rates under the monthly collection schedule and, as a result, residents may encounter difficulty reducing their MSW output. The audit recommended that Milwaukee conduct feasibility studies of moving to biweekly recycling collection throughout the city (Morics 2008). Biweekly collection allows households that fill their recycling carts before collection to increase their recycling rates. Increased residential recycling presumably results in less solid waste, which in turn results in smaller MSW bills for households under a PAYT program and lower tipping fees for the city.

To implement a successful PAYT program, the city must ensure that residents are able to recycle as much of their waste as possible. Monthly recycling collection provides inadequate opportunity for residents to increase recycling rates. Implementation of a PAYT system should be accompanied with an increase in residential recycling capacity, accomplished through increased collection frequency.

## Rationale for PAYT

More than 7,000 American communities operate PAYT systems, covering 25 percent of the population and 30 percent of the nation's largest cities. This has led to the diversion of 6.5 million tons of MSW per year from landfills. Wisconsin ranks among the states with the most communities using PAYT systems, with more than 500 programs (Skumatz and Freeman 2006).

PAYT offers a market-based solution that encourages behavioral changes that serve the public welfare (Folz and Giles 2002). Economists often advocate unit-pricing approaches like PAYT because of their efficiency (Van Houtven and Morris 1999). Residents frequently overuse solid waste services in a flat fee system because local tax levies or flat fees for solid waste collection remain largely invisible to consumers (Van Houtven and Morris 1999). Essentially, flat fees and property-tax-based MSW systems break the link between the act of discarding waste and the payment for collection services. Households face the same cost regardless of how much MSW they generate, with little or no incentive to produce less waste. This can lead people to generate more MSW than they would if charged a variable rate.

In contrast, PAYT systems support efficiency and effectiveness goals by assigning proportional charges to various levels of service. A properly designed unit pricing system charges households based on the amount of waste management services they use (Van Houtven and Morris 1999). Many PAYT systems reduce overall MSW, allowing cities to extend collection routes, reduce the size and increase the automation of truck fleets, and reduce the number of collection crews or crew sizes. Less MSW may also reduce landfill tipping fees and the city's transportation costs and extend landfill life (Folz and Giles 2002). Additionally, PAYT systems promote equity because they reflect individual MSW service usage and enable residents to exercise some control over their solid waste collection costs (Skumatz and Freeman 2006; Folz and Giles 2002).

PAYT systems encourage recycling and composting. According to a Duke University study, communities experience a 20–35 percent increase in the weight of materials going through their recycling and composting programs after implementing PAYT (Miranda and Aldy 1996). Milwaukee's main recycling facility operates at only half capacity, ready to process additional recycling expected under a PAYT system (R. Meyers, personal communication February 26, 2009).

Overall, PAYT provides a link between behavior and bills. Research shows that the average tonnage of waste disposed is 16–17 percent less in PAYT communities than comparable non-PAYT communities, with approximately one-third of this reduction attributable to source reduction, one-third to increased recycling, and one-third to composting. PAYT proves to be one of the most cost-effective methods to promote waste reduction (Harrison 2000).

# Methodology

This section describes the methods of our investigation of PAYT programs employed in United States cities comparable to Milwaukee. This section also describes the methods, data, assumptions, and limitations in developing our quantitative analysis of the policy alternatives.

**Comparable City Selection**

We investigated PAYT programs in American cities that are comparable to Milwaukee to better understand the potential costs, benefits, and other impacts of implementing PAYT in Milwaukee. Identification of eligible cities began with the U.S. Environmental Protection Agency's website, which provides extensive resources on PAYT communities and programs (U.S. EPA 2008a). Initial criteria for comparable cities included populations between approximately 250,000 and 750,000, although a few cities beyond this range were included to broaden the selection, including Eau Claire, the largest municipality in Wisconsin using PAYT.

We also considered racial and ethnic composition, income and poverty data, and the ratio of owner- versus renter-occupied housing when selecting the most comparable cities. Finally, we included climate, particularly annual snowfall, because municipal snow removal equipment and labor needs overlap with that of MSW collection in Milwaukee. The additional data came from the U.S. Census Bureau's American FactFinder webpage (http://factfinder.census.gov) and the National Oceanic and Atmospheric Administration Satellite and Information Service webpage (http://cdo.ncdc.noaa.gov). From this research, we established an initial sample of 14 comparative cities.

**Comparable Cities Data Collection**

We collected PAYT program information specific to each city in the sample from each city's official website. We eliminated Eau Claire from the comparison because the city uses a system of multiple private haulers, each offering slight variations of PAYT that would have little in common with a Milwaukee program.

Next, in March 2009, we telephoned individuals working for each of the remaining 13 municipalities. Initial contact targets included directors of public works or solid waste or recycling management departments. If our first contacts were unable to provide specific information regarding PAYT, we asked them to direct us to a source better able to do so. Upon reaching the appropriate contact, we confirmed the details of the city's PAYT program. At this point, we eliminated Albuquerque, New Mexico, because the city's program details did not represent full PAYT implementation, and Oakland, California, due to an inability to access data from the city's private contractor. San Francisco, California, gave no response after repeated contact attempts, resulting in a final pool of 10 comparative cities. Similarities to Milwaukee among the final sample of comparable cities are depicted in Table 1. Appendix A describes the criteria used to determine each city's comparability to Milwaukee in given categories.

**Table 1:** Responding City Comparison

| City | Population | Racial Composition | Median Household Income | Families Below Poverty Level | Owner-Occupied Housing | Climate |
|---|---|---|---|---|---|---|
| Milwaukee, WI | 602,782 | 45% white/ 55% non-white or mixed race | $35,233 | 21% | 49% | seasonal snow |
| ***Most Comparable to Milwaukee*** | | | | | | |
| Fort Worth, TX | **Yes** | No | **Yes** | **Yes** | **Yes** | No |
| Lansing, MI | No | No | **Yes** | **Yes** | **Yes** | **Yes** |
| Minneapolis, MN | No | No | **Yes** | **Yes** | **Yes** | **Yes** |
| Sacramento, CA | **Yes** | **Yes** | No | **Yes** | **Yes** | No |
| ***Moderately Comparable to Milwaukee*** | | | | | | |
| Austin, TX | **Yes** | No | No | **Yes** | **Yes** | No |
| Grand Rapids, MI | No | No | **Yes** | **Yes** | No | **Yes** |
| Portland, OR | **Yes** | No | No | **Yes** | **Yes** | No |
| ***Least Comparable to Milwaukee*** | | | | | | |
| Plano, TX | No | No | No | No | No | No |
| San Jose, CA | No | **Yes** | No | No | No | No |
| Seattle, WA | **Yes** | No | No | No | **Yes** | No |

Sources: Barrett (2007), National Oceanic and Atmospheric Administration Satellite and Information Service (2009), U.S. Census Bureau (2005-2007)

We asked our final contact within each city to complete a survey administered electronically using SurveyMonkey (http://www.surveymonkey.com). The survey questions were designed to obtain a more detailed understanding of PAYT implementation, effectiveness, and other issues specific to each city. When possible, we created multiple choice questions based on our research of typical PAYT programs in order to make the survey more user-friendly. We also provided opportunities for the respondent to expand on answers in narrative form. Seven contacts responded immediately. The remaining three cities were resent the survey after seven to 10 days passed without response and each city subsequently responded. In total, we received 100 percent survey response from our 10 comparative city sample. See Appendix B for the complete survey and responses.

**Milwaukee MSW Generation Distribution**

The City of Milwaukee does not collect household level data regarding the amount of MSW residents generate. The finest level of data available for this analysis lists the average weight of solid waste collected per route during an eight-month period in 2007 (City of Milwaukee 2007). These data allow for analysis of routes and provide an overall average MSW weight per household. However, without more specific data, the distribution of average MSW weight per household remains unknown. In other words, we cannot know exact amounts of solid waste each household generates.

The lack of household-level MSW data presents particular problems with regard to the multiple cart PAYT program alternative. Knowing household MSW output allows us to estimate the number of households that will choose each cart size and appropriately set pricing for the different sizes. The lack of data also creates problems in determining an equity index for this project. The equity index serves as a measure of price paid per unit of MSW by households. To overcome these data limitations we made certain assumptions and produced multiple scenarios about the distribution of MSW in Milwaukee (see Appendix C for full details).

**Setting Prices for Each Alternative**

A program's full cost recovery depends on accurate establishment of prices for MSW collection. Prices represent the total amount of money paid for collection services, whether as a flat fee, volumetric charge, bag or tag price, or a combination of these charges. Costs that need to be recovered include personnel expenses, administrative costs, capital costs, collection expenses, and tipping fees.

Of these expenses, only the tipping fee varies significantly with the amount of MSW collected. To illustrate this, consider two households. One household disposes of 1 pound of waste per week, while the other disposes of 100 pounds each week. Milwaukee's collection costs for both households are the same, but disposing of the waste from the one pound household costs much less than from the 100 pound household. However, Milwaukee's tipping fee constitutes only a fraction of the overall cost of the program.

Given this, we determined that the PAYT alternatives should have a flat base fee with a variable fee added to it. The base prices described in this section partially cover the fixed collection costs to Milwaukee, while the variable fee reflects the amount of MSW disposed as well as some of the fixed costs.

Pricing for the Status Quo was left at the 2009 rate of $150 per year.

Pricing for Alternative I, Multiple Cart Sizes, was complex. For this alternative, we devised scenarios using the standard deviations described in Appendix C to find the maximum number of households that might change from their current 95-gallon cart to a 32- or 64-gallon cart. We set annual cart prices at $48 for a 32-gallon cart, $96 for a 64-gallon cart, and $144 for a 95-gallon cart; this represents a $4 difference per month between each cart size. The pricing differential of $4 per month is low relative to comparative cities but large enough to remain visible on residents' bills. We placed these annual cart prices into a formula established to set the base price assuming full cost recovery. The base price plus the cart price equals the total cost for MSW collection per household.

Establishing pricing for Alternative II, the Weight-Based Program, was relatively straightforward: We placed the base price of $50 per year into a formula specifying both full cost recovery for the program and the amount of MSW generated each year. The formula produced the price per ton of MSW that the City would charge to customers based on those factors. This price could then be converted into a price per pound that customers understand is more easily.

Sample budget and pricing tables for the status quo and each alternative are presented in Appendix D.

## Comparative Cities Analysis

Our survey results from comparable cities show that Milwaukee would be a relative pioneer in choosing to implement PAYT. Few similarly sized American cities with PAYT programs exist. Moreover, we find no PAYT systems in Midwest cities with population, climate, and demographics similar to Milwaukee. Given this, we identified cities using PAYT programs with roughly the same profile as Milwaukee. Although Milwaukee remains distinct within the profile of PAYT communities, experiences with the impacts of other PAYT systems nationwide provide valuable information, as many cities resemble Milwaukee in one or more of the comparable criteria categories (see Table 1 and Appendix A).

**Survey Responses**
The complete survey and survey responses are provided in Appendix B.

**Program Descriptions**
The PAYT systems surveyed function under varying conditions. All comparable programs service residential homes. In addition, 90 percent of these municipalities collect MSW from two- to four-unit multifamily residences; 30 percent include PAYT in multifamily homes beyond five units. Approximately 44 percent of the cities have unionized municipal employees. Another 22 percent employ non-unionized municipal collectors, and one-third utilize contract labor.

Eight of the 10 survey cities operate with multiple cart systems. The remaining two cities use bag and tag systems only. Of the eight multiple cart communities, three cities use a three-cart system. Two additional cities began with three-cart systems, then later added 10–20 gallon “micro-can” sizes. Cities most comparable to Milwaukee, where at least four of the six criteria match “yes” in Table 1, include Fort Worth, Sacramento, and Minneapolis. Each uses multiple cart systems.

Many cities using multiple cart systems identified customer choice and a variety of household family sizes as reasons for their cart size offerings. Eighty percent of responding communities identified increasing recycling as a goal tied to their programs. Seventy percent also wanted to increase their municipality’s diversion rates, decrease trash output, and promote equity by charging unit rates with variable pricing systems.

Most comparable cities allow MSW in excess of the cart limit for an additional fee. Three cities require prepaid bags or tags for additional waste. These items are available for purchase at grocery stores or retail outlets. Three other cities collect MSW beyond the cart limit and bill the household for additional service. One city allows bulky waste set outs beyond the cart limit one time per month.

**Program Implementations**

Two-thirds of the PAYT communities surveyed conducted pilot programs in their implementation process. Examples include a one-year pilot of 3,000 households in Austin and pilots with 17 neighborhoods in San Jose. Full-scale implementation varied by municipality. While Austin used a three year phase-in process for PAYT, five other communities moved directly from pilot programs to full implementation, and three cities moved directly from flat rate systems to full implementation without a phase-in period.

Almost 90 percent of the comparable cities promoted their PAYT programs to residents through education and outreach efforts. Cities used a broad range of techniques, from information included with the utility bill to public service announcements on radio and television, press releases, advertising, and news articles.

Seven cities identified a need for program change in conjunction with or subsequent to implementation. These include the introduction of smaller can sizes and changes such as switching recycling to carts from bins that are unrelated to the institution of PAYT. Six cities required administrative or billing changes for their MSW program. Necessary investments included software purchases; system adjustments for each new can size; expanded customer data, including tracking carts by serial number; and, in some cases, entire billing system overhauls. Specific cost estimates for enacting such changes were not specified by survey respondents and follow-up calls to comparable cities yielded no specific investment amounts.

**Program Results**

Seven of the 10 cities surveyed report decreases in MSW tonnage under their PAYT systems. Reductions varied in terms of landfilled tonnage and actual MSW collected. For example, Fort Worth reports a 12.5 percent tonnage decline and 25 percent less in MSW collections. San Jose reports average weekly household MSW rates at approximately 96 gallons prior to PAYT and averages near 32 gallons per household after program implementation. Austin reports an initial decrease in tonnage that leveled off in subsequent years. Three respondent cities indicate tonnage rates similar or higher under a PAYT system to that under flat rates. Respondents report total landfill diversion rates from 22 percent in Fort Worth to 52 percent in Sacramento and 60 percent in San Jose.

These findings reinforce research that shows households alter disposal behaviors, purchasing habits, and recycling rates to reduce output with a PAYT system (Skumatz and Freeman 2006). The research and our comparable cities survey show no noticeable illegal dumping or additional littering as a method for residents to reduce the MSW in their carts (Van Houtven and Morris 1999; Skumatz 2008). Instead, the survey shows 80 percent of cities report recycling increases that complement MSW reduction. Fort Worth indicates an average weekly household increase in recycling from 3.92 pounds in 2002 before PAYT,

to 11.59 pounds the year after PAYT implementation, and 13.54 pounds in 2008. Other cities reflect similar results, with recycling tonnage rising from 12,000 tons per year to 40,000 tons per year in Sacramento and a 23 percent increase in Portland. The two municipalities without increases have recycling rates similar to those seen before PAYT.

Some limitations of PAYT systems are apparent in the survey results. Only two-thirds of responding municipalities achieve full cost recovery under their programs. Another 11 percent report higher revenues under PAYT, but fall short of cost recovery, and two cities, or 22 percent, indicate the same revenues now as they experienced prior to PAYT. However, these shortfalls represent a program design limitation and are not PAYT specific. Fort Worth initially experienced some difficulty with full implementation due to the large number of households served. Portland also notes the revenue difficulty for municipalities due to low recycling resale rates in current recessionary economic conditions. Austin finds inefficiency with the additional prepaid bags outside carts, due to incompatibility with a semi-automated collection system. Despite pricing structures to encourage the use of a larger bin size as opposed to extra bags, some residents continue to use additional bags.

**Comparative Cities Summary**

Overall, the majority of comparable cities with PAYT programs use multiple cart systems. These programs work with union and non-union labor hired by the municipality or a contractor. Sixty percent of municipalities reported a need to retrain collection employees on the new system, which generally included minor actions, not significant investments. Nearly all survey cities took steps to prepare, such as resident education efforts, pilot programs, or both, before introducing PAYT to their communities. Many cities also adjusted their billing systems to accommodate variable pricing, but respondents did not specify adjustments or associated costs.

Once implemented, the comparable cities generally experienced MSW tonnage declines paired with recycling increases. Two multiple cart cities added more cart sizes in later years in the form of 10-20 gallon “micro-cans” in response to MSW reduction trends. Other cities reported only modest gains in terms of revenue and MSW reductions under PAYT, and a few results could be considered neutral. Other limitations under PAYT include insufficient pricing gaps to create incentive for cart size changes and inconveniences from manual pickup of additional bags or tagged items.

# Policy Options and Analysis

This section describes the three policy alternatives evaluated in this report: the status quo solid waste collection program, PAYT using multiple solid waste cart sizes, and PAYT using weight-based solid waste collection. The alternatives are analyzed in the context of the evaluative criteria of efficiency, effectiveness, equity, and ease of administration.

**Selecting Viable Alternatives**

The administrative and equipment capabilities of Milwaukee and information gathered from comparable cities narrow the list of appropriate PAYT policies for analysis. Among specific PAYT options, both weight-based and volume-based systems serve as feasible options.

Within volume-based options, bag and tag PAYT programs are widespread throughout Wisconsin and the United States (U.S. EPA 1999a). These programs offer relatively simple administration and eliminate the need for a billing system (Folz and Giles 2002). However, bag and tag programs require manual collection of MSW to ensure residents' proper use, along with a distribution system through local retailers or the municipality for selling the appropriate supplies. Manual collection aligns best with smaller communities. The largest bag or tag system in Wisconsin operates in Manitowoc, with a population of approximately 34,000; Milwaukee is approximately 18 times larger in population and faces significantly different logistical challenges relative to small communities (U.S. EPA 1999b). Many communities including Milwaukee have moved to automated or semi-automated collection systems to speed MSW collection and reduce potential workers' compensation claims stemming from lifting and moving trash bags into trucks. Bag and tag systems lack compatibility with automated or semi-automated collection vehicles, like those used in Milwaukee. Milwaukee's size and semi-automated collection system eliminate bag and tag programs from further consideration in our analysis.

The remainder of this section compares the City of Milwaukee's current MSW and recycling collection program with two alternatives: a weight-based program and a multiple cart system.

**Policy Criteria for Evaluation**

The following policy goals guide our evaluation of the alternatives. Appendix E provides a detailed description of the development of the criteria.

- **Efficiency:** An efficient PAYT system diverts the greatest amount of MSW, while charging the lowest possible fee for customers and using the fewest taxpayer dollars in the long run. To evaluate this, we consider capital investments relative to potential savings and new benefits of the PAYT alternatives. Full program cost recovery also serves as an efficiency metric for Milwaukee. We define cost recovery as the percentage of

program expenses paid by program income.

- **Effectiveness:** Guidelines for effectiveness include resident compliance with the collection program. Physical impacts, such as changes in MSW diversion and recycling rates, also measure effectiveness. A more effective program creates higher MSW diversion and recycling rates.

- **Equity:** Equity measures the ability of a program to charge residents based on the amount of service they consume, or, in other words, the amount of solid waste they generate. We defined an equity index to consistently measure the relative fairness of each policy alternative. This index shows the ratio of the prices paid between those that generate the most MSW and those that generate the least. An index of 1.0 indicates the most equitable system possible, where all residents pay the same price for each unit of MSW they generate. By comparison, an index of 2.0 indicates that households generating the least MSW pay twice as much per unit of MSW as those generating the most waste.

- **Ease of implementation:** This criterion examines the administrative requirements of the status quo and alternatives to compare the structural changes and information dissemination necessary for implementation.

We also consider political feasibility in our analysis. Because the City of Milwaukee has expressed interest in a PAYT program, we believe a full analysis of benefits and limitations under various alternatives will yield an acceptable result for the client. Therefore, feasibility discussion within each alternative occurs within the cost and administrative aspects listed in our policy goals, rather than as a stand-alone criterion for evaluation.

**Status Quo: Current Milwaukee MSW and Recycling Collection Program**

Milwaukee's solid waste program provides weekly collection of refuse from all single-family and multi-family homes with up to four units, totaling approximately 190,000 households. Recycling collection using 95-gallon carts occurs approximately once per month for most households, although 15 percent of households have weekly recycling collection using 18-gallon bins. Households pay a $150 annual flat fee for MSW and recycling collection, which covers approximately 91 percent of the $35.7 million combined program budgets for 2009. Milwaukee covers remaining costs through revenue from the resale of recyclables, state recycling grants, and the local property tax levy.

Households place their solid waste in 95-gallon carts, which two-person crews empty weekly using semi-automated collection trucks. The semi-automated system requires operators to connect the cart to the truck, which then automatically empties the cart. Households may request a second cart at no additional charge if they consistently produce more than 95 gallons of MSW per week. Residents may also place up to 4 cubic yards of additional solid waste out

with the cart for collection at no charge. More than 4 cubic yards of waste or large items require special pickup at a $50 fee. Table 2 depicts the various services and charges under the status quo.

**Table 2:** Description of Status Quo: Current Milwaukee MSW Collection System

| | |
|---|---|
| **Type of System** | Single cart size |
| **Size of MSW Carts** | 95-gallons |
| **Charge for Single-Cart Service** | $150/year ($12.50/month) |
| **Charge for Additional Carts** | $0 |
| **Charge for Additional MSW (Not in Cart)** | $0 (up to 4 cubic yards/week) |
| **Charge for Special Pickup (Large Items)** | $50/pickup |
| **Charge for Recycling Collection** | $0 (included in MSW collection fees) |

Source: R. Meyers, personal communication January 30, 2009

Most Milwaukee households also use 95-gallon carts for recycling collection. These carts have a divided interior for separation of paper recyclables from glass, metal, and plastic recyclables. No set schedule exists, but Milwaukee collects recycling approximately once per month. Approximately 28,000 households use 18-gallon bins for their recycling collection. Bin use occurs in central city areas that have a majority of rental properties and alley pick-up service rather than curbside collection. Milwaukee collects bin recyclables weekly on set days.

Recycling markets continue to experience sharp variability with the recent economic downturn. Milwaukee contracts with Waste Management Recycle America to process and market recyclables at an annually adjusted fee of more than $40 per ton. The proceeds from the resale of recyclables are split evenly between the city and Waste Management Recycle America. In 2008, the City received resale revenue of $58 per ton, resulting in a net income of $18 per ton after paying the processing fee. The 2009 budget figures in Table 3 rely on projected recycling resale revenues of $40 per ton. Due to recycling resale declines, the City expects zero net revenue after paying for processing. Should recycling resale values drop below $40 per ton, the total cost and cost per household figures may rise for collection services. However, overall cost savings can still be achieved relative to landfilling as the landfill tipping fee is avoided.

**Table 3:** Status Quo: Ongoing Income, Costs, and Cost Recovery

| | |
|---|---|
| **Total Income/Revenue** | +$33,165,000 |
| **Total Expenses/Costs** | -$36,325,385 |
| **Net Income/Loss** | -$3,160,385 |
| **Percentage Cost Recovery** | 91.30% |

Source: E. Shambarger, personal communication February 16, 2009; authors' calculations

Note: Assumes standard deviation of 12.00 pounds, municipal tipping fee of $30/ton, and 0% MSW reduction; see Appendix C for more details

**Efficiency:** Milwaukee's current system presents several opportunities to improve efficiency. The status quo provides little incentive, beyond offering recycling services without additional charge, for residents to divert more MSW. Households

pay the same flat rate regardless of their waste output. As Table 3 shows, the status quo does not achieve full cost recovery. In 2009, Milwaukee expects $28.6 million in revenue from MSW user and special collection fees. State recycling grants and the resale of recyclables will generate an additional $4.5 million. These revenue streams cover approximately 91 percent of the total cost for the MSW and recycling programs, leaving a $3.1 million shortfall that must be covered by the local property tax levy.

The status quo provides efficiency benefits with respect to financial feasibility. The current MSW and recycling system requires little capital investment, limited to regular annual maintenance and adjustments for existing budgetary considerations.

The loss of value for recyclables due to economic recession and rising landfill fees are unfavorable economic trends that will make full cost recovery less attainable without increases in the flat fee. Continuing the current system rather than adopting PAYT maintains Milwaukee's reliance on property taxes to balance the MSW budget. Without change, the combination of these two trends may increase pressure on the budget.

**Effectiveness:** The status quo results in effective resident compliance. Milwaukee experiences no noticeable issues arising from illegal dumping (R. Meyers, personal communication February 26, 2009). However, this alternative shows less effectiveness due to a lack of incentive for households to divert MSW.

**Equity:** Flat fee MSW systems lack equity. Under the status quo, all Milwaukee households pay the same rate despite the amount of waste. As a result, residents who create little waste pay a higher rate per pound than residents who generate significantly more solid waste. Using the equity index described in Appendix E, City of Milwaukee households with the lowest disposal rates pay a range of 1.5 to 5.3 times as much per pound as households disposing the highest levels of MSW under the status quo. Appendix D provides detailed equity index calculations under different scenarios in the status quo.

**Ease of implementation:** Milwaukee's current system requires no implementation changes. Table 4 reflects the potential costs to implementing a different MSW program, but because the status quo is already in operation, there are no upfront costs to this program.

**Table 4:** Status Quo: Program Startup Costs

| | |
|---|---|
| **New Cart Purchases** | $0 |
| **Updated Billing System** | $0 |
| **Truck Modification** | $0 |
| **Education/Outreach** | $0 |
| ***Total Startup Costs*** | *$0* |

Source: Authors' calculations

**Alternative I: Multiple Cart Sizes**

Introduction of additional cart sizes for MSW, with higher prices for larger carts, shifts toward a full cost recovery PAYT system by aligning user fees with the amount of MSW collected. Many possible permutations of numbers of carts, gallon capacity combinations, and fee differentials exist when designing an optimal multiple cart PAYT system. Our peer cities survey shows that eight of our 10 responding cities use a multiple cart PAYT system. Of these, three operate a three-cart model, including Fort Worth and Sacramento, two of the most comparable cities to Milwaukee demographically (See Table 1 and Appendix A). In a three-cart model, Milwaukee would maintain the current 95-gallon carts as the largest MSW size option and as the standard size for recycling at all non-bin residences. Two new cart options include 32- and 64-gallon sizes.

By analyzing average tonnage rates for 2007 summer routes, we estimate a range of multiple cart pricing options. To achieve full cost recovery, we consider several scenarios to reflect data variance and two landfill fee scenarios for Milwaukee. Depending on the variables used, each household choosing a 32-gallon cart pays in the range of $116 to $136 annually under the multiple cart system. A household with a 64-gallon cart pays $164 to $184 per year. A household with a 95-gallon cart pays $212 to $232. These rates consist of a base rate plus a variable rate dependent upon the cart size each household chooses (see Setting Prices on page 9 for base rate details and Appendix C for additional details). These charges are shown in Table 5.

**Table 5:** Description of Alternative I: Multiple Cart Size MSW Collection

| | |
|---|---|
| **Type of System** | Multiple Cart |
| **Size of MSW carts** | 32, 64, and 95-gallons |
| **Base charge** | $68–$88/year |
| **Cart charge** | 32-gallon: $48/year<br>64-gallon: $96/year<br>95-gallon: $144/year |
| **Charge for additional carts** | Same as cart charge for first cart |
| **Charge for additional MSW (not in cart)** | $3/30-gallon bag |
| **Charge for special pickup (large items)** | $50/pickup |
| **Charge for recycling collection** | $0 (included in MSW collection fees) |

Source: Authors' calculations

Beyond the regular cart fees, a multiple cart system commonly involves extra charges for excess waste beyond the cart size. Based on peer city responses and research, we find pricing for additional bags of MSW and special pickups to be critical. Per bag and special pickup pricing may influence the cart size a household selects, and reinforce diversion and recycling MSW behaviors. In this multiple cart model, residents pay a $3 charge for each 30-gallon garbage bag left outside the cart. Only distinct bags, sold through local retailers, will be collected. We assume that $1 of each bag's cost will be used to cover administrative costs as well as reimburse retailers for distributing the bags. In addition, excess waste outside the cart, up to 4 cubic yards, costs $50 per pickup, the same as a special

pick-up request. A second cart costs each household the same amount (base fee not included) as the first cart of the same volume. As an example, a second 64-gallon cart costs $96 per year in addition to the $166–$186 per year for the first 64-gallon cart. Table 6 outlines these charges.

**Table 6:** Alternative I: Ongoing Income, Costs, and Cost Recovery Projections

| | |
|---|---|
| **Total Income/Revenue** | +$36,386,737 |
| **Total Expenses/Costs** | -$36,386,737 |
| **Net Income/Loss** | $0 |
| **Percentage Cost Recovery** | 100.00% |

Source: Authors' calculations

Note: Assumes standard deviation of 12.00 gallons, municipal landfill/tipping fee of $30/ton, and 0% MSW reduction; see Appendix C for more details

**Efficiency:** The multiple carts alternative allows Milwaukee to introduce pricing incentives that influence household disposal behaviors. Using three set monthly rates achieves greater efficiency than the status quo. This alternative requires significant investment in new carts, however, which detracts from efficiency. Current average household MSW rates indicate that instituting a multiple cart system would result in the vast majority of households switching to 32-gallon or 64-gallon carts. This reduces efficiency of the multiple cart system, because significant cart investments will be necessary to meet actual household disposal rates. Most households generate far less than 95 gallons of MSW on a weekly basis (authors' calculations, see Appendix D).

Non-binding price estimates from cart manufacturers Schaefer Systems and Rehrig Pacific Company create the basis for cart investment estimates. Schaefer Systems provides the lower price estimate at $35 per 32-gallon cart and $45 per 64-gallon cart. Based on the assumption that households would select the least expensive cart option to meet their MSW needs, we estimate a need to purchase 24,759 to 67,228 of the 32-gallon carts and 107,507 to 165,239 of the 64-gallon carts (see Appendix C). Zero to 15,265 households would keep the current 95-gallon bin. This totals an estimated $5.7 million to $9.8 million in capital investment costs for carts alone, using the lowest estimated rates for carts. These costs are reflected in Table 7.

**Table 7:** Alternative I: Program Startup Costs

| | |
|---|---|
| **New Cart Purchases** | $5,700,000–$9,800,000 |
| **Updated Billing System** | $0 |
| **Truck Modification** | $0 |
| **Education/Outreach** | $200,000 |
| ***Total Startup Costs*** | *~$5,900,000–$10,000,000* |

Source: Authors' calculations

Potential exists for modest cost recovery on carts. Milwaukee can eliminate recycling bin costs for several years by reserving the unused 95-gallon carts for this purpose. Milwaukee may also possibly sell any excess cart overstock

back to the product distributor for $15–$20 each (Schaefer Systems, personal communication April 3, 2009). Milwaukee could also consider a phase-in period to reduce the financial impact of cart investments in any single budget cycle or consider requiring residents to purchase smaller carts with the recognition that households would recover the cost during the first year of the program.

**Effectiveness:** A multiple cart system influences household disposal and MSW diversion rates more than the status quo. Multiple carts should garner effectiveness in terms of residential compliance and acceptance because the cart rate remains consistent from one collection period to the next.

Pricing drives diversion rates in this system. Austin uses a $5 per month gap between cart sizes, which is too small to motivate residents to switch to smaller carts (see Appendix B). Pricing carts and additional MSW services requires balance between incentives and revenues to find the threshold in each community for cart rates.

**Equity:** Multiple cart options enhance the equity of MSW services. Variable pricing based on household waste output reflects Milwaukee's goal of equitably establishing an MSW user fee system to a greater degree than the status quo, using common guidelines found in other U.S. cities. This alternative enhances both the process and perception of equity in municipalities. The equity index for multiple carts ranges from 1.22 to 4.40. This ranks more equitably than the status quo under all household disposal scenarios.

**Ease of implementation:** Switching to a multiple cart system would require few changes in the physical collection process of MSW. This system would require notable changes elsewhere, however. For the multiple cart system to work effectively, Milwaukee would need to implement a bag or tag system for excess waste. This includes establishing a network of local grocers and retailers to sell the bags or tags. Billing administration requires investment for modifications as well, although changes would be minor and would primarily require data input time as opposed to actual software changes (E. Shambarger, personal communication April 13, 2009; D. Rasmussen, personal communication April 24, 2009). Billing needs to reflect extra cart charges and collection fees for up to 4 cubic yards of MSW. We anticipate a need for Milwaukee to hire one additional employee or to train a current employee to manage multiple cart billing. This cost is included in all budget scenarios depicted in Appendix D.

**Alternative II: Weight-Based Program**

Weight-based programs use technology to measure weekly household MSW disposal. Under this alternative, Milwaukee would contract with a company to install weight measuring scales in the lift mechanism of the current semi-automated MSW and recycling collection fleet. During collection, the truck calculates the MSW cart weight through the load cells outfitted in the lifting mechanism. Radio frequency identification transponder chips or bar code tags are attached to each customer's cart. As the lifting mechanism empties the cart, a receiver detects the cart's identification code and sends the registered weight information wirelessly to a computer in the truck. The computer decodes the identification number into a street address and records the average weight of several readings taken during the collection process (McLellan 1994). The data would be transmitted to Milwaukee's MSW billing system. Overall, this process adds less than 10 seconds to the collection (Luken and Smith 1994).

Unlike the multiple cart system, few examples of weight-based PAYT systems exist. In place of comparable cities data, we rely primarily on research and discussions with equipment vendors to evaluate this alternative. We find that Seattle and Minneapolis are among the most comparable communities with published results of weight-based pilot projects.

Seattle conducted the first weight-based pilot program in two phases during 1989 and 1990, with financing from a U.S. Environmental Protection Agency grant. The second phase of Seattle's pilot used semi-automated trucks, like those found in Milwaukee, and electronic identification tags comparable to technology available today. Weights recorded during collection were included in mock billing given to residents as a supplement to their regular, non-pilot MSW fees. Post-project analysis suggests that households accepted the system change and reduced their MSW rates by an average of 15 percent. This is significant because Seattle already operated under an established multiple cart PAYT system. The published case study identifies weight-based PAYT in Seattle's long-term MSW plans. However, more than a decade later, Seattle still uses multiple carts (Skumatz 1995; L. Skumatz, personal communication April 13, 2009).

Minneapolis conducted a pilot test for weight-based systems in the spring and summer of 1993. They installed weight-reading load cells in the lift mechanisms of their semi-automatic MSW collection trucks and recorded household information with electronic identification software. Minneapolis reported good accuracy and scale reliability in a post-pilot report, but ultimately decided against weight-based PAYT due to the short-term nature of their pilot and concerns about an unfamiliar system creating dissatisfaction for customers (Skumatz 1995).

Loadman On-Board Scales, a company based in Texas, specializes in weight-based equipment for MSW collection and recycling trucks. Their representatives contributed cost and accuracy information used in our considerations. Although the technology continues to develop, details for the weight-based alternative

require some speculation beyond our research and interviews. The basic features of the weight-based PAYT alternative are described in Table 8.

**Table 8:** Description of Alternative II: Weight-Based MSW Collection

| | |
|---|---|
| **Type of System** | Weight-based |
| **Size of MSW Carts** | 95 gallons |
| **Base Charge** | $50/year |
| **Charge per Pound of MSW** | 7.7–11.1 cents |
| **Charge for Additional Carts** | Charged at same rate per pound |
| **Charge for Additional MSW (Not in Cart)** | Charged at same rate per pound |
| **Charge for Special Pickup (Large Items)** | $50/pickup |
| **Charge for Recycling Collection** | $0 (included in MSW collection fees) |

Source: Authors' calculations

In contrast with the current flat fee system, this alternative would include full cost recovery as a requirement when MSW collection charges are established. This results in income and revenue exactly equaling expenses and costs as shown in Table 9.

**Table 9:** Alternative II: Ongoing Income, Costs, and Cost Recovery

| | |
|---|---|
| **Total Income/Revenue** | +$36,448,089 |
| **Total Expenses/Costs** | -$36,448,089 |
| **Net Income/Loss** | $0 |
| **Percentage Cost Recovery** | 100.00% |

Source: Authors' calculations

Note: Assumes standard deviation of 12.00 pounds, municipal tipping fee of $30/ton, and 0% MSW reduction; see Appendix C for more details

**Efficiency:** Weight-based PAYT offers the highest incentive for efficiency by tying charges to the amount of household MSW. Charging by the pound provides clear incentives for residents to divert the greatest amount of MSW. We project full cost recovery as a result (see Table 9). Moreover, Milwaukee pays fees to the landfill by the ton. A weight-based system creates consistency between the unit of measure the City charges to residents and pays to the landfill.

Converting to a weight-based program would require capital investments in the loading equipment and software. This would include $14,500 to retrofit each of Milwaukee's 173 rear-loading MSW and recycling fleet. An additional $570,000–$950,000 investment would cover electronic tag installation on Milwaukee's carts (D. Hoven, personal communication April 23, 2009). This totals $3 million to $3.5 million for fleet retrofitting, cart tags, and software investments. If Milwaukee refrained from retrofitting its 49 recycling trucks, capital investments would drop to $2.2 million to $2.6 million. However, retrofitting the recycling trucks might prove beneficial in the event that Milwaukee needed to deploy MSW trucks for other purposes.

This truck system also requires approximately $36,000 in expenditures to make Milwaukee's billing system compatible with the weight-based equipment (D. Hoven, personal communication April 23, 2009; K. Klawitter, personal communication, April 24, 2009). In addition, two additional municipal staff positions may be required. These include one billing administrator for the weight-based system and a municipal technician for equipment service and maintenance. The price scenarios in Appendix C include two new employees, paid $40,000 each annually and the associated fringe costs. Alternatively, Milwaukee may invest in training current employees to manage these functions. For the weight-based system, capital and additional staff investments total significantly less than the multiple cart alternative, although future maintenance costs remain unclear.

**Effectiveness:** Weight-based systems create little visible change in the physical process of collection services from residents' perspective. The primary concern arises in the need for Milwaukee to explain cost changes, the purpose behind them, and the new billing method to which residents must adapt. Otherwise, problems may surface with resident compliance. Residents may find a different monthly MSW bill unacceptable, compared to a consistent rate under the status quo or multiple cart system. With the proper outreach and education, opportunities under weight-based systems are extensive for diversion and recycling behavioral change. Milwaukee can charge a set rate per pound to achieve greater program cost recovery than under the status quo.

One concern with this alternative is that residents may subvert the weight system by, for example, disposing of MSW in a neighbor's cart. Research frequently examines this concern and consistently finds no evidence of this occurring (Folz and Giles 2002; Morris and Van Houtven 1999; Harrison 2000). Other concerns include "migrating" carts that do not remain with their assigned households. This may be best solved by stenciling the assigned address on each cart, although this complicates reuse of carts at other addresses. Electronic tagging can also tie each cart to a specific household, allowing Milwaukee to pinpoint carts that have been separated from their households. While using electronic tags without stenciling does not allow residents to know if they have their own carts, residents could label their own carts at their own expense.

**Equity:** In terms of paying for service use, weight-based PAYT programs promote the greatest equity of any alternative, outscoring the status quo and multiple cart system in all but one scenario. The equity index for Milwaukee in the weight-based model ranges from 1.09 to 1.80. In theory, weight-based systems could achieve an ideal 1.0 equity rating, where all households pay the same rate per pound of MSW. However, our pricing operates with a $50 annual base fee, which makes a 1.0 equity rating unattainable.

**Ease of implementation:** A weight-based MSW collection system would function nearly identically to the current system in use in Milwaukee. In fact, residents would likely only notice changes in their bills. Under this alternative,

semi-automated trucks would collect MSW from 95-gallon carts. Loadman On-Board Scales sends technicians to install the weighing equipment between the city MSW truck bodies and the lifting mechanism. The trucks weigh the waste as it is emptied into the truck, and the weight is logged in the billing system. Because all MSW can be weighed, no additional fee would be charged for extra carts or for additional MSW outside the cart. Extra MSW would be placed into the household cart, weighed during a second emptying cycle, and included in the total weight billed for that week. Households that regularly generate excess MSW beyond 95-gallons would receive another RFID-tagged cart to save the manual labor of loading extra bags for a second weigh cycle. Single, odd-shaped items that do not fit in the cart, but are not considered laborious special pick-up items, may be collected free of charge once per month. These items constitute only a negligible percentage of MSW collection. Table 8 depicts the various services and charges under the weight-based alternative.

Equipment effectiveness relative to performance certification requirements is a concern with weight-based PAYT. A suburban Minnesota pilot encountered difficulties meeting state-mandated weight accuracy standards with its truck scales. When charging residents per pound of refuse, the scale needs to reflect the same accuracy as the fee structure. Streets on hills or sharply crowned roads may compromise some scale types when tilting more than 3 degrees (Luken and Smith 1994). Loadman On-Board Scales guarantees scale accuracy within a 1.5 percent margin of error. For a home disposing of 30 pounds of MSW per week, this means the scales and recording equipment will register a weight between 29.55 pounds and 30.45 pounds (K. Klawitter, personal communication April 3, 2009). The manufacturer claims that the scales maintain accuracy on uneven surfaces and guarantees the return of equipment failing to meet performance standards (K. Klawitter, personal communication April 3, 2009 and April 24, 2009).

Loadman runs full testing with Bayne MSW collection vehicles, including the TaskMaster and TaskMaster Hi-Lift models used in Milwaukee. With this partnership and equipment familiarity, Milwaukee may avoid some of the implementation challenges other pilot programs faced in the 1990s. Currently, the equipment meets Wisconsin Department of Agriculture, Trade, and Consumer Protection guidelines for commercial maintenance accuracy. The agency's initial equipment test uses more restrictive weight tolerances though, which may require the passage of legislation to allow the equipment's use in Milwaukee. Overriding the initial tolerance does not detract from the regular truck scale performance requirements. The legislative action does, however, create an additional political acceptability consideration for the weight-based alternative.

Weight-based systems also involve greater administrative complexity than the status quo or multiple carts. Weekly variability in billing rates per household requires more attention than a flat rate or established cart rate during the three-month billing accrual period. Milwaukee may choose to adapt the current billing system, similar to the way water meter reading occurs, to accommodate weight-

based billing (D. Rasmussen, personal communication April 24, 2009). This can be accomplished through the Loadman company's software writing capabilities for a onetime fee (K. Klawitter, personal communication April 24, 2009). Rehrig Pacific Company could also replace the current billing software with a web-based system for a $36,000 annual fee (D. Hoven, personal communication April 23, 2009). Table 10 reflects this and other costs for the weight-based alternative.

Due to the relatively unprecedented use of weight-based PAYT systems, education and outreach efforts to explain the purpose and goals of this system could make implementation easier and enhance the program's effectiveness. Adoption of a weight-based system also would require corresponding changes to Milwaukee's recycling systems, such as increased collection frequency or larger bins, to handle expected increases in recycling volume (Skumatz and Freeman 2006).

Initial startup expenses are lower for this alternative than for the multiple cart alternative. An estimate of program startup costs is provided in Table 10.

**Table 10:** Alternative II: Program Startup Costs

| | |
|---|---|
| **New Cart Purchases** | $0 |
| **RFID Tags for Existing Carts** | ~$570,000 - $950,000 |
| **Updated Billing System** | ~$36,000 |
| **Truck Modification** | ~$2,500,000 |
| **Education/Outreach** | $200,000 |
| ***Total Startup Costs*** | *~$3,306,000 - $3,686,000* |

Source: Authors' calculations

## Recommendation and Conclusion

Based on analysis of research, comparable cities, City of Milwaukee data, and various alternatives, we recommend the weight-based PAYT system. The weight-based system creates the greatest efficiency and effectiveness with the least equity disparity among our alternatives. While less empirical information exists about the use of weight-based systems relative to other PAYT programs, Milwaukee benefits financially from substantially lower capital investment in weight-based equipment. The weight-based system presents implementation concerns to the extent that it requires more investment in maintenance, in the form of a municipal employee and potential equipment repairs. However, our calculations project that intermittent maintenance, staffing, and billing under a weight-based system require substantially less investment, even over a 10-year time horizon, than the additional millions of dollars in upfront costs necessary to implement a multiple cart system.

To ease the implementation process, we recommend that Milwaukee conduct a one-year pilot program that encompasses approximately 10 percent of the city's collection routes. Pilot programs for various aspects of MSW collection have been used in Milwaukee in the past (R. Meyers, personal communication February 26, 2009). A comprehensive pilot program could verify efficiency and effectiveness of the equipment and billing systems prior to full-scale implementation. Additionally, a one-year pilot would ensure that the equipment functions properly under all weather conditions. The lack of weight-based models and historical PAYT funding opportunities through the U.S. EPA may create possibilities for federal funding to support such a program (See Appendix B, Question 11). In addition, scale manufacturers have an economic incentive to provide equipment on favorable terms or at reduced prices to the extent that successful demonstration may open up new markets for them. Throughout the pilot process, detailed data tracking for waste collected per household will help to inform effectiveness of weight-based PAYT and contribute to Milwaukee's knowledge of MSW and recycling trends in the current flat rate system.

The new and generally unfamiliar weight-based program requires extensive education and outreach to residents to explain the transition to PAYT. These efforts could include information dissemination through billing statements, media outlets, advertisements on buses, and online resources. During the pilot period, Milwaukee might wish to institute a "dual billing" system to show residents their current flat fee monthly rates in comparison to the rates they would pay under a weight-based system. Milwaukee might consider sharing data with residents to show how their amount of garbage compares with other households on their route. Evidence from utility companies shows that social factors, such as neighbor comparisons, can add effectiveness to rolling out new programs. Some systems use graphics included with municipal service bills to demonstrate collection rates compared to the average and to those who throw away the lowest weight of solid waste (Ceniceros 2008; Kaufman 2009).

In conjunction with broad and effective communication enhancing political support for PAYT, some administrative changes can boost public acceptance. Communities attribute actions such as visibly removing the trash fee from the tax levy before imposing PAYT as being key to their success. Other communities attribute their success to receiving input from haulers when designing the PAYT program or using a pilot program or a phase-in approach for the PAYT program (Skumatz 2008).

Implementation of a weight-based Pay-as-You-Throw system will allow Milwaukee to enhance the efficiency and cost effectiveness of its municipal solid waste collection. While the lack of a weight-based operation in the United States creates some concerns, this alternative promotes the greatest equity and requires the least upfront capital investment of the PAYT alternatives. This alternative also meets Milwaukee's needs while making the greatest use of existing equipment and carts. Experts identify weight-based PAYT as the ideal system to reduce MSW generation, increase recycling, and create a sense of personal responsibility for households with respect to their waste. Implementing weight-based PAYT provides a genuine opportunity for Milwaukee to lead comparable cities and the rest of the United States in municipal solid waste service design and delivery.

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# Appendix A: Comparative City Selection Criteria

We administered a survey to a sample of 10 U.S. cities with PAYT programs. Within the final sample of responding cities, we denoted in Table 1 whether these cities were sufficiently comparable to Milwaukee based on specific criteria, including population, racial composition, median household income, families below poverty level, type of housing occupancy, and climate. Table 11 depicts the data on which we based our comparisons.

**Table 11:** Comparative Cities Data

| City | Population | Racial Composition | Median Household Income | Families Below Poverty Level | Owner-Occupied Housing | Climate |
|---|---|---|---|---|---|---|
| **Milwaukee, WI** | **602,782** | **45% white/ 55% non-white or mixed race** | **$35,233** | **21%** | **49%** | **Seasonal snowfall** |
| Austin, TX | 725,306 | 64/36 | $48,227 | 13% | 47% | No |
| Fort Worth, TX | 635,612 | 62/38 | $44,804 | 14% | 59% | No |
| Grand Rapids, MI | 193,671 | 67/33 | $38,792 | 17% | 62% | Yes |
| Lansing, MI | 115,366 | 67/33 | $35,990 | 20% | 59% | Yes |
| Minneapolis, MN | 362,513 | 68/32 | $44,478 | 16% | 54% | Yes |
| Plano, TX | 255,591 | 76/24 | $79,687 | 4% | 67% | No |
| Portland, OR | 541,550 | 79/21 | $45,512 | 11% | 57% | No |
| Sacramento, CA | 446,721 | 50/50 | $48,584 | 12% | 52% | No |
| San Jose, CA | 898,901 | 49/51 | $76,354 | 7% | 62% | No |
| Seattle, WA | 565,809 | 71/30 | $56,319 | 7% | 51% | No |

Sources: Barrett (2007), National Oceanic and Atmospheric Administration Satellite and Information Service (2009), U.S. Census Bureau (2005-2007)

Cities in Table 1 received a ranking of "Yes" in each respective category if the following standards were met relative to Milwaukee:

- Population: Within 200,000 residents
- Racial Composition: Within 10 percent of white and 10 percent of non-white or mixed race residents
- Median Household Income: Within $10,000 per household
- Families Below Poverty Level: Within 10 percent of families
- Owner-Occupied Housing: Within 10 percent of owner-occupied housing units
- Climate: Experiences regular seasonal snowfall

Cities that did not match the preceding standard received a "No" in the corresponding category.

# Appendix B: Comparative City PAYT Survey Results

To better understand the potential costs, benefits, and impacts of pay-as-you-throw programs, we surveyed 10 U.S. cities that use them: Austin, TX; Fort Worth, TX; Grand Rapids, MI; Lansing, MI; Minneapolis, MN; Plano, TX; Portland, OR; Sacramento, CA; San Jose, CA; and Seattle, WA. They are comparable to Milwaukee in size, population, demographics, and climate. We asked a contact within each city's government to complete a survey using SurveyMonkey (http://www.surveymonkey.com). We designed the questions to obtain more detailed understanding of PAYT implementation, effectiveness, and other issues specific to each city. When possible, we created multiple choice questions based on our research of typical PAYT programs. We also provided opportunities for respondents to expand on some answers in narrative form. This appendix provides the full comparative survey and results.

Each respondent answered every question. The results below indicate the frequency that respondents chose an answer as well as the actual number of times the answer was chosen. The results also include verbatim text that were typed by respondents into "Other" or "Comments" text boxes as well as answers to open-ended questions.

**Question 1:** What type of Pay-As-You-Throw system is being utilized by your municipality?

| Answer Options | Frequency | Count |
|---|---|---|
| Prepaid bags | 0.0% | 0 |
| Prepaid tags | 0.0% | 0 |
| Multiple cart sizes | 80.0% | 8 |
| Other (please specify) | 20.0% | 2 |

Other:

- Prepaid bags and multiple cart sizes
- All above options are being used.

**Question 2:** What cart sizes are used in your system? Check all that apply.

| Answer Options | Frequency | Count |
|---|---|---|
| 10 gallon | 12.5% | 1 |
| 15 gallon | 12.5% | 1 |
| 30/32/35 gallon | 87.5% | 7 |
| 45 gallon | 0.0% | 0 |
| 60/65 gallon | 87.5% | 7 |
| 90/95 gallon | 100.0% | 8 |
| Other (please specify): | 37.5% | 3 |

Other:

- 32, 64 & 96 gallon carts
- 20 gallon
- 20 gallon mini-cans. This size is not supplied by franchised haulers and must be purchased by the residential customer

**Question 3:** Why were these particular cart sizes chosen?

| Answer Options | Count |
|---|---|
| Open ended question | 7 |

Answers:

- Pilot study indicated need for 95 gallon for once/week collection. 60-68 gallon chosen as incentive for reducing waste. 32 gallons tested but we had problems with collection arm in servicing this size.
- 32 gal was std industry garbage can size. We pretty much worked off of multiples or fractions of that, although the Mini-can that was available is 20 gallon and the micro-can size available is 10 gallon
- Standard 32 gallon increments, Manufacturer Availability
- Based on historical volumes.
- Standard sizes used by cities in Bay Area (CA); also sufficient movement between sizes including the "mini" size of 22 gallons - also all still can receive automated collection
- To provide standardized choice along with two frequencies of service (monthly and weekly) to meet a variety of residential needs. Roll carts supplied by the hauler result in a slightly higher cost than containers supplied by the customer.
- It was a good range of sizes to accommodate all sizes of families.

**Question 4:** Why was the specific number of cart offerings chosen (two cart sizes vs. three sizes...)?

| Answer Options | Count |
|---|---|
| Open ended question | 7 |

Answers:

- Started with 32 gal, 64, 96 for customer choice. Then added mini (20 gal) and micro (10 gal) as folks recycled more
- 32 gallon carts for single person households 64 gallon carts for small families and 96 gallon carts for large families
- To offer a wider range of savings to fit the customers' needs.
- Because we have found that there is a variety of needs throughout the community due to different family & household sizes, cultural practices, frequency of service, and other factors; and we wish to avoid the practice of extra set-outs when possible. Please note that recycling & yard debris containers are standardized to ONE size (65 gallon roll carts) and all are provided by the hauler.
- We have a variety of family sizes in Austin.

**Question 5:** Are residents allowed to place out solid waste that does not fit in their cart?

| Answer Options | Frequency | Count |
|---|---|---|
| Yes, and there is no additional charge | 12.5% | 1 |
| Yes, but waste must be in prepaid bags or have a prepaid tag on it | 25.0% | 2 |
| Yes, and residents are billed separately for additional waste | 37.5% | 3 |
| No, residents must take additional waste to the dump or hold it for later pickup | 0.0% | 0 |
| No, residents must call for special pickup | 0.0% | 0 |
| Other (please describe) | 25.0% | 2 |

Other:

- No. Residents have the option of placing items that cannot fit into the cart for once monthly bulky waste collection or taking the items to the transfer stations (limited to 2x per month). We do collect items outside of cart the week after holidays.
- Additional solid waste bags can be placed outside of the cart but each bag must have a $4.00 sticker which can be purchased at area grocery stores. There is an $8.00 per bag charge for each unstickered bag

**Question 6:** Why was this specific type of program selected over other Pay As You Throw programs or alternative options? Check all that apply.

| Answer Options | Frequency | Count |
|---|---|---|
| Compatibility with existing collection equipment | 60.0% | 6 |
| Ease of implementation | 50.0% | 5 |
| Accurately charges users for their solid waste output | 80.0% | 8 |
| Politically feasible | 60.0% | 6 |
| Other (please specify) | 30.0% | 3 |

Other:

- We originally used prepaid stickers for “extra garbage” beyond the cart, but that proved to be a huge hassle.
- Encourage recycling/diversion
- Garbage collection & recycling service is not required for SFR homes unless they are a rental property (all rental property owners & managers are required to provide garbage & recycling to tenants).

**Question 7:** What were the goals of the municipality in changing to a Pay As You Throw program? Check all that apply.

| Answer Options | Frequency | Count |
|---|---|---|
| Recovering a higher cost ratio for services provided | 20.0% | 2 |
| Increasing the solid waste diversion rate | 70.0% | 7 |
| Decreasing trash output | 70.0% | 7 |
| Promoting equity for residents by charging per unit rather than a flat fee | 70.0% | 7 |
| Increasing recycling rates | 80.0% | 8 |
| Other (please specify) | 0.0% | 0 |

**Question 8:** Approximately how many households are served by the program?

| Answer Options | Count |
|---|---|
| Open ended question | 10 |

Answers:

- 14,750; 55,000; 68,000; 105,000; 130,000; 150,000; 150,000; 175,000; 195,000; 202,000

**Question 9:** What types of homes are served by the program? Check all that apply.

| Answer Options | Frequency | Count |
|---|---|---|
| Single family homes | 100.0% | 10 |
| Multifamily homes, 2-4 units | 90.0% | 9 |
| Multifamily homes, 5+ units | 30.0% | 3 |
| Other (please specify) | 20.0% | 2 |

Other:

- Multifamily complexes (regardless of the number of units) currently have an option to choose individual carts or common bins.
- Multi-family includes moorages, group homes, trailer parks, congregate care & retirement facilities, etc.

**Question 10:** What year was the Pay As You Throw program implemented in?

| Answer Options | Count |
|---|---|
| Open ended question | 10 |

Answers:

- 1968; 1973; 1989; 1993; 1995; 1996; 1997; 1998; 2000; 2003

**Question 11:** Were pilot programs conducted before full implementation of the program?

| Answer Options | Frequency | Count |
|---|---|---|
| No | 33.3% | 3 |
| Yes (describe the size and scope of the pilot program) | 66.7% | 6 |

Answers:

- 8,000 homes with 32 and 68 gallon containers
- Several thousand homes
- There was a pilot cart program but it was not PAYT. Areas were selected based on varying demographics but all waste was collected with no additional cost.
- From July 1991 thru July 1992 the Solid Waste Department conducted a one year PAYT pilot with 3000 households which tested all elements of the new approach, including different cart sizes and variable rates.

- The program began as part of a federal study to determine the feasibility of cost-per-unit collection systems as opposed to flat rate unlimited services in regard to their potential for limiting trash generation.

**Question 12:** Was the program rolled out to all participants at one time, or was it phased in?

| Answer Options | Frequency | Count |
|---|---|---|
| All participants at one time | 88.9% | 8 |
| Phased in (please describe) | 11.1% | 1 |

Answers:

- City Council approved a three year, phased in conversion, of the entire city to begin in 1993. Service implementation began with Phase I in Aug 1993, Phase II in June 1994, Phase III-A in Nov 1995, and Phase III-B in June 1996.
- City Council adopted variable rates in July 1997, and all customers citywide were converted to PAYT in 1997.

**Question 13:** Was there an education or outreach program targeted at citizens alerting them to the changes in solid waste collection and costs?

| Answer Options | Frequency | Count |
|---|---|---|
| No | 11.1% | 1 |
| Yes (describe education/outreach programs) | 88.9% | 8 |

Answers:

- Articles in citywide newsletter, press release, website
- Direct mail, print and electronic media advertising
- News articles, water bill inserts, mass mailing
- Bill stuffers and mailers.
- A comprehensive public outreach campaign aimed at single-family households explained the new variable rates being introduced, the new categories of recyclables being added to the services provided, and the benefits of participating. All materials were produced in three languages (English, Spanish, and Vietnamese). The campaign was guided by the information received during a series of focus groups in the three languages, baseline and follow-up telephone surveys, and shopping mall intercept surveys. More than 250 community meetings were held in 1993, and a block leader program and school education program were organized. See EPA case study at http://www.epa.gov/epawaste/conserve/tools/payt/tools/ssanjose.htm
- At the time of implementation, we were bringing several complementary programs on-line. We were adding materials to our curbside recycling program, and expanding our yard trimmings program. Educating the public about PAYT was a comprehensive, multi-media approach to information which included paid advertisement and inserts about program guidelines in the Austin American Statesman, 14 billboards around town

with program guidelines, utility bill inserts about the new extra garbage stickers, radio advertisements and press releases about the message "Recycle or PAYT, it's your choice", direct communication with neighborhoods and new neighborhoods as they were added to the program, door hangers with program guidelines, and bi-monthly newsletters to neighborhood associations, and presentations at neighborhood meetings. To keep awareness of the new program high, messages using the tagline "Recycling Right" and "Take the bin to the curb" were also run during the early stages of the implementation.

- Mailings and school students and advertisements.
- Media releases and mailings

**Question 14:** Have there been any significant changes to the program since its original implementation?

| Answer Options | Frequency | Count |
|---|---|---|
| No | 30.0% | 3 |
| Yes (please describe) | 70.0% | 7 |

Answers:

- Introduced mini can and micro can after initial rollout
- Changed from bi-weekly to weekly.
- No longer offer 128 gallon cart, now offer 22 gallon cart
- Residential solid waste collection has been a franchised service historically in Portland. With the mandate that recycling be available to all residents, there have been multiple changes to the Portland Recycles! program with pilot programs and ongoing training & educational outreach to residents and businesses.
- Garbage collection rates and extra garbage fees have gone up over the years, but recycling is still included in the base rate at no extra charge. Garbage collection is now fully automated. We have just over the last several months switched from the bin system for recycling to a 90 gallon cart based single stream recycling program. We accept more materials in the recycling program and materials can all be co-mingled in the recycling cart.
- The addition of various sized carts was implemented in 1997. 21/32/65/95 gallon carts.
- Added the refuse cart program (various sizes). Added appliance stickers and bulk sticker items.

**Question 15:** Were major changes to the solid waste billing or administration program required with implementation of the PAYT program?

| Answer Options | Frequency | Count |
|---|---|---|
| No | 40.0% | 4 |
| Yes (please describe) | 60.0% | 6 |

Answers:

- Each time we added a size of can, we needed to modify the billing system
- Varying pay rates had to be set up, cart tracking by serial number, new customer service tracking program implemented. The PAYT started at the same time the City of Fort Worth took control of customer service for solid waste collections; this was previously a function of the collections contractor.
- Setup billing system and expand data on customer base.
- Software required to bill residents appropriately
- Our rates are adjusted annually through review by independent economists, and the most recent (2008) change to the recycling program (mandating hauler-provided roll carts for recycling & yard debris collection) resulted in a significant increase in residential rates and tipping fees (commercial rates are determined by the hauler & business customer in a non-franchised system).
- Prior to implementing variable billing rates, the City of Austin had to update its entire billing system.

**Question 16:** Did implementation of the PAYT program require retraining of solid waste collectors?

| Answer Options | Frequency | Count |
|---|---|---|
| Yes | 60.0% | 6 |
| No | 40.0% | 4 |

Comments:

- A little bit when we introduced semi-automated carts
- All services are contracted
- City collects single family residential and some commercial customers.
- Likely to some degree but still mainly just emptying carts regardless of what's in them.

**Question 17:** Which statement best describes the status of solid waste collectors in your municipality?

| Answer Options | Frequency | Count |
|---|---|---|
| Unionized municipal employees | 44.4% | 4 |
| Non-unionized municipal employees | 22.2% | 2 |
| Unionized contract employees | 22.2% | 2 |
| Non-unionized contract employees | 11.1% | 1 |

Comments:

- Private franchised haulers
- They have the option to join the Municipal Employees Union which offers membership to all municipal, federal, state and county employees. Membership dues are deducted from employee paychecks.
- Private haulers are permitted to acquire as many customers as they would like, no franchise agreements and these are almost all non-union employees that the municipality competes against. There are also no requirements on the days that areas are served. As a result there are many trucks in many areas on different days. We are working toward improving that as we write.

**Question 18:** Per capita solid waste (garbage) tonnage collected has...

| Answer Options | Frequency | Count |
|---|---|---|
| Increased | 10.0% | 1 |
| stayed the same | 20.0% | 2 |
| Decreased | 70.0% | 7 |

Please describe magnitude of change:

- Have relatively few residents that have elected to participate with smaller container and lower fee. 68 GAL CARTS - 3,612; 95 GAL CARTS - 65,349
- Overall recycling rate across all waste streams has gone from 24% to 48.4%. Increase is even greater for single family sector - now reaching near 60% recycling. This is due to introduction of curbside yard waste and curbside recycling collection as well as PAYT
- Based on the information available the total tonnage was reduced by about 12.5% & garbage collected was reduced by about 25%
- disposal has deceased with recycling increasing significantly, from 12,000 tons per year to over 40,000 tpy
- Prior to PAYT and the cart-based recycling program, residents set out an average of three 32-gallon garbage carts per week. Now approx. 80% have one, 32-gallon garbage carts.
- Unclear at this time - not enough data. Overall our recycling rates have increased from mid 40 percentile in mid-90s to 63% in 2007.
- Solid Waste Services tracks performance measures by residential customer account, or household, not per capita. Our per household garbage tonnage

decreased since the beginning of the program, and then has leveled off and stayed consistent since.

- For the city crews, we are not aware of the private sector experience. They own the landfill, we pay to tip there.

**Question 19:** Per capita recycling tonnage collected has...

| Answer Options | Frequency | Count |
|---|---|---|
| Increased | 80.0% | 8 |
| Stayed the same | 20.0% | 2 |
| Decreased | 0.0% | 0 |

Please describe magnitude of change:

- .0194% increase
- City -wide all waste streams we are at 48+% recycling as of 2007
- 02-03 - 3.92 pounds per household per week 03-04 - 11.59 pounds per household per week Last year 13.54 pounds per household per week
- Increased from 12,000 tpy in 2000 to 36,000 tpy in 2004 to a little over 40,000 tpy in 2008.
- The volume of recyclables and yard trimmings being collected more than doubled the levels recorded prior to the cart-based recycling program and PAYT.
- Solid Waste Services tracks performance measures by residential customer account, or household, not per capita. Before PAYT implementation, tonnage was low but increasing. Since implementation, levels have been static

**Question 20:** Solid waste (garbage) diversion rates have...

| Answer Options | Frequency | Count |
|---|---|---|
| Increased | 77.8% | 7 |
| Stayed the same | 22.2% | 2 |
| Decreased | 0.0% | 0 |

Please describe the magnitude of change:

- Residential diversion increased from 39.8% to 41.1%. This number includes yard trimmings composting, HHW recycling and reuse, electronic recycling and appliance recycling.
- up to 48+%
- 02-03 diversion rate was 5.48% 03-04 diversion rate was 19.3% The last couple of years we are running between 22 & 23%
- Currently at approximately 52%
- Diverted 60% in 2006 and 44% in 1995 according to the CIWMB (http://www.ciwmb.ca.gov/LGTools/mars/JurDrSta.asp?VW=In)
- Solid Waste Services defines diversion rate as the amount of yard trimmings and recyclables diverted as a percentage of the total amount of garbage, recyclables, and yard trimmings generated and collected through weekly curbside pickups. Through the PAYT program and enhancements

to the curbside recycling program, the diversion rate went up and has, with minor fluctuations, remained constant over the last twelve years or so.

**Question 21:** Has there been any noticeable increase in littering or illegal dumping since implementing the PAYT program?

| Answer Options | Frequency | Count |
|---|---|---|
| Yes | 0.0% | 0 |
| No | 100.0% | 10 |

Comments:

- Littering/illegal dumping is a chronic low-level problem, but has not gone up w/ PAYT
- We opened citizen drop off stations along with the start of the PAYT program and have actually had a decrease in illegal dumping.
- In the beginning we did have instances where extra bags came from neighbors, but that leveled off.

**Question 22:** How has PAYT impacted solid waste revenues? Check all that apply.

| Answer Options | Frequency | Count |
|---|---|---|
| The program is at full cost recovery | 66.7% | 6 |
| The program is at less than full cost recovery and revenues are higher under PAYT than previously | 11.1% | 1 |
| The program is at less than full cost recovery and revenues are the same under PAYT as previously | 22.2% | 2 |
| The program is at less than full cost recovery and revenues are lower under PAYT than previously | 0.0% | 0 |

Comments:

- We have a profit sharing contract for our recycle processing and the revenue generated depends on the market. The last two quarters have seen drastic drops in commodity prices and our share of the revenue.
- Recycling is subsidized by payment per ton by the processer.
- Check back later
- We are an enterprise fund and through the rates that we charge our customers, we generate excess money that goes to the general fund. Also, with PAYT we realize more money through charging for larger carts, extra carts and collection of extra garbage.
- Just barely coming out even.
- The refuse program is supplemented by a refuse millage

**Question 23:** Please describe any unanticipated problems or difficulties with the Pay As You Throw program.

| Answer Options | Count |
|---|---|
| Open ended question | 9 |

Answers:

- None (x4)
- Contamination in recycling is high. Full implementation at one time was difficult due to the number of households.
- The cost savings are not difficult for the customer to see.
- Sustained economic downturn has affected recycling markets - recycling subsidizes residential garbage rates in Portland, and this loss of income has negatively impacted haulers. Given that the changes to our recycling program were implemented less than a year ago, it's hard to quantify how the changes have impacted our recovery rates, etc - simply not enough data AND too many variables.
- Manual collection of extra garbage bags creates inefficiencies with a system designed to tip garbage carts with automated trucks. Also, there are households that regularly generate larger volumes of extra garbage, and its more desirable to all parties concerned, if they properly size their garbage carts, ie, go to a larger sized garbage cart. Although it goes against the philosophy of PAYT, its cheaper for these customers to upgrade to a larger sized cart, and more efficient for our collection. There are also administrative costs to tracking and billing for extra garbage.
- We have to drive every street looking for the bags, there is no subscription requirement!! More fuel, more time, more cost!

**Question 24:** Please describe any other major issues, benefits, or relevant points associated with the program.

| Answer Options | Count |
|---|---|
| Open ended question | 7 |

Answers:

- The citizens get it. It is logical and is perceived as equitable. We are applying PAYT to our curbside yard waste/food waste composting collection with 13 gal, 32 gal and 96 gal options.
- Increased diversion has resulted in decreased disposal, and therefore stabilized disposal rates.
- There is some concern (and some anecdotal evidence) that, in order to save money, people will choose a smaller sized garbage bin and put their garbage into the larger recyclables cart. Some people do seem to do this but it's not the majority of people and tagging carts for contamination rather than just picking them up.
- The City of Portland currently provides commercial food generators with food composting - we hope to site a local composting facility to offer this service to residents in the next 18 months to 2 years.

- We found that if you allow for extra garbage, you must have a large enough rate gap between garbage cart sizes to incentivize recycling.
- We hope with the upcoming conversion to single stream recycling, from sort separated at curb, that we begin to see volume of trash being landfilled decline.
- None

## Appendix C: Constructing a Distribution of MSW Production

Milwaukee does not collect data on the amount of municipal solid waste each household in the city produces. The best data available show the average amount of MSW per collection route during an eight-month period in 2007 (City of Milwaukee 2007). This data can provide route-level information, but specific household data cannot be derived from it because the standard deviation of the data is unknown. The standard deviation describes how tightly all of the observations in a data set cluster around the mean (average) of the data. For example, if the mean of a data set is 40.00 and the standard deviation is 2, the majority of the data points fall between 38.00 and 42.00.

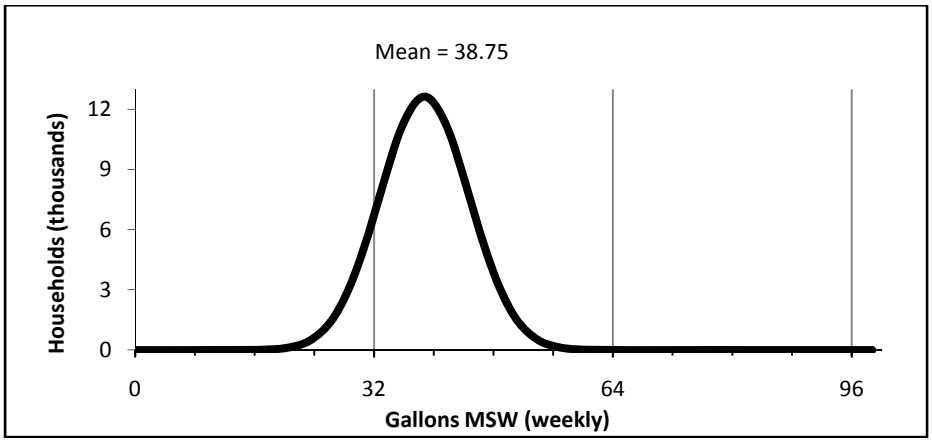
If the standard deviation and mean of a data set are known, the distribution of data points can be known. In this case, the mean of the MSW is known, but the standard deviation for Milwaukee's data is unknown. Therefore, the distribution of MSW generation by household cannot be generated from empirical records. The only relevant information that can be drawn from the available data is that the average household disposed of 43.16 pounds of MSW per week during this period. We converted this figure to an average weekly volume of 38.75 gallons using a standard conversion of 225 pounds per cubic yard of MSW.

The distribution of household MSW determines the pricing structure for a multiple cart PAYT system by determining the number of households that may subscribe to each cart size. To develop reasonable estimates of the unknown distribution of households, standard deviations from 1.00 to 38.00 (just less than the mean of 38.75 gallons per household) were considered. This range produced wide variation in the number of households potentially using each cart size. Using a more plausible range of standard deviations from 6.00 to 18.00 also produced widely varying estimates of the number of households using each cart size.

However, when these estimates were placed into the pricing formula, the range of prices for each cart size was fairly narrow and stable. In fact, the range of prices varied by only a few dollars for each cart size, even when the distribution of carts changed considerably. Given this, we examined the status quo and each alternative using theoretical distributions with standard deviations of 6.00, 12.00, and 18.00. The standard deviations were measured in either pounds or gallons depending on what was relevant for each alternative.

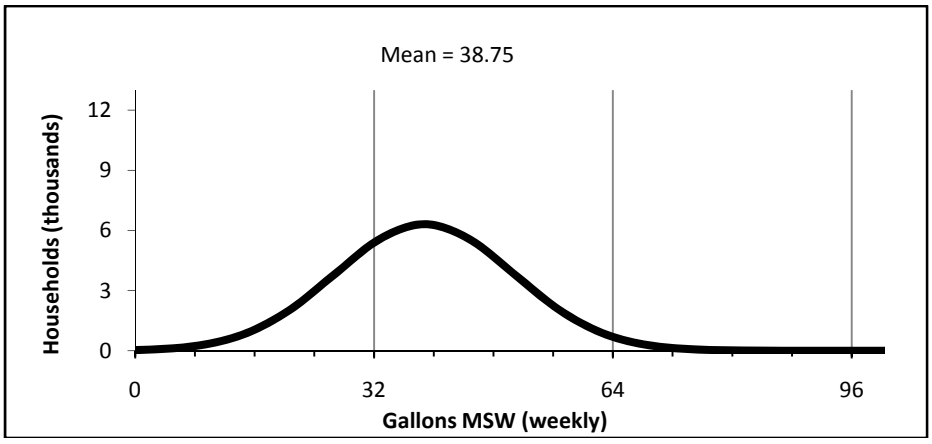
Figures 1, 2, and 3 graphically depict these standard deviations.

**Figure 1:** Normal MSW Distribution with Standard Deviation of 6.00



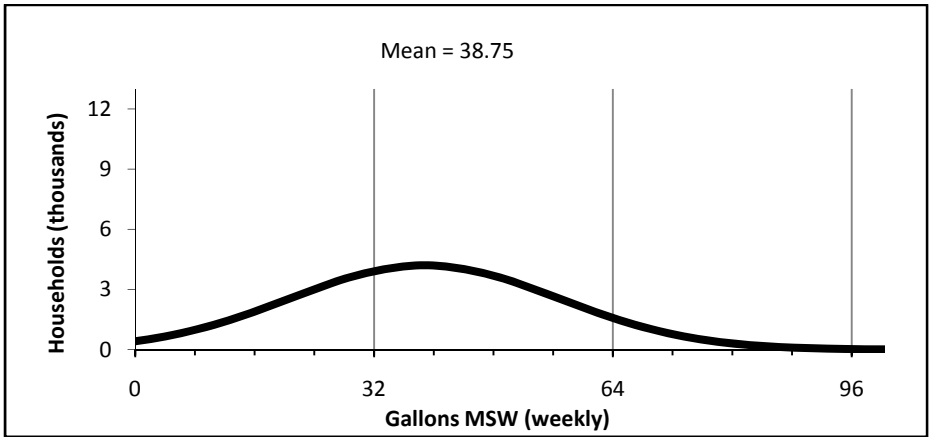

Source: Authors' calculations

**Figure 2:** Normal MSW Distribution with Standard Deviation of 12.0




Source: Authors' calculations

**Figure 3:** Normal MSW Distribution with Standard Deviation of 18.0




Source: Authors' calculations

## Appendix D: Alternative Budget and Pricing Development

This section describes the method used to establish budgets and an equity index for the status quo and both alternatives. Because we did not know the standard deviation for household MSW distribution, we outlined scenarios using hypothetical standard deviations of 6.00, 12.00, and 18.00. We also hypothesized scenarios using a tipping fee of $30 per ton, the approximate rate Milwaukee pays in 2009 to unload waste at the dump, and $35 per ton, which the client asked us to include. Finally, we projected scenarios using current levels of MSW generated by the city, a 10 percent reduction in total waste, and a 20 percent reduction in total waste. These waste reduction figures fall within the reasonable range of waste reduction reported by the comparative cities we surveyed and literature on cities moving to PAYT systems from flat-rate MSW collection.

These considerations resulted in six status quo scenarios, where no waste reduction was analyzed; 18 Alternative I scenarios; and 18 Alternative II scenarios. For each alternative, only one budget scenario is presented in this appendix, demonstrating a standard deviation of 6.00, a tipping fee of $30, and zero reduction in MSW.

We started with a budget for the status quo which was based on the 2009 Milwaukee Solid Waste Budget (City of Milwaukee). This base budget was used for all of the pricing and equity index scenarios, with changes that are described below for each alternative.

Tables 12, 14, and 16 show the prices and the equity index for each scenario of each alternative. These tables show the standard deviation, the tipping fee, the waste collection charge, the equity index, and the cost recovery percentage for each scenario. The tables also present the total annual price that would be paid by the median Milwaukee household under each scenario.

**Status Quo Summary: Current MSW and Recycling Program**

Six scenarios were constructed for the status quo. These used standard deviations of 6.00, 12.00, and 18.00, each with a landfill tipping fee of $30 or $35 per ton. Because no municipal solid waste reduction is assumed under the status quo, the scenarios do not reflect any reduction in MSW.

Under the status quo, the median household (in fact all households) pays $150 per year for its MSW and recycling collection. This results in a program cost recovery of 88 to 91 percent depending on the tipping fee that is used. Table 12 displays these summary results as well as the equity index for each scenario.

**Table 12:** Status Quo Scenarios

| Scenario | Std. Dev. | Tipping Fee | 0% MSW Reduction Median Charge | % Cost Recovery |
|---|---|---|---|---|
| SQ1 | 6.00 | $30 | $150<br>Equity Index: 1.23 | 91.3% |
| SQ2 | 6.00 | $35 | $150<br>Equity Index: 1.23 | 88.7% |
| SQ3 | 12.00 | $30 | $150<br>Equity Index: 2.11 | 91.3% |
| SQ4 | 12.00 | $35 | $150<br>Equity Index: 2.11 | 88.7% |
| SQ5 | 18.00 | $30 | $150<br>Equity Index: 3.30 | 91.3% |
| SQ6 | 18.00 | $35 | $150<br>Equity Index: 3.30 | 88.7% |

Source: Authors' calculations

A sample status quo budget scenario is presented in Table 13. A number of assumptions are contained in this budget:

- It is assumed that the long-run resale value of recyclables is $80 per ton (R. Meyers, personal communication, March 24, 2009). Of this amount, Milwaukee receives $40 in gross revenue. This amount is used in all budget scenarios.
- The state recycling grant is assumed to be the same as the FY2008 grant.
- "Overhead" excludes fringe benefits and depreciation expenses.
- Standard deviations of 6.00, 12.00, and 18.00 were used in calculating the equity index. The standard deviations were not relevant for price determination in the status quo.
- The tipping fee was set at $30 and $35 per ton as the client requested.

**Table 13:** Status Quo Sample Budget Scenario

| **Status Quo: Current Milwaukee System Estimated Budget**<br>Scenario 1: Standard Deviation = 6, MSW Tipping Fee = $30 | | | | |
|---|---|---|---|---|
| **INCOME/REVENUES** | | | | |
| **MSW Program** | | | | |
| Number of Households | 190,000 | x Base Price | $150 | $28,500,000 |
| Extra Collection | | | | |
| Large Pickups (>4 Yards$^3$) | 2,500 | x Charge per pickup | $50 | $125,000 |
| *Total MSW Income/Revenue* | | | | *$28,625,000* |
| **Recycling Collection** | | | | |
| Tons Collected | 26,000 | x Resale value per ton | $40 | $1,040,000 |
| Recycling state grants | | | | $3,500,000 |
| *Total Recycling Income/Revenue* | | | | *$4,540,000* |
| **Total Income/Revenue** | | | | **$33,165,000** |
| **EXPENSES/COSTS** | | | | |
| **MSW Program** | | | | |
| Labor | | | | $11,334,141 |
| ODWs Salaries (77 routes) | | | $9,507,027 | |
| OT (driver only) | | | $327,019 | |
| Field Clerks/Cart Techs | | | $208,934 | |
| San Workers | | | $493,630 | |
| Supervisors | | | $797,532 | |
| Fringe Benefit | | | | $4,646,998 |
| Trucks | | | | $3,779,577 |
| Maint/Repair/Fuel | | | $1,902,096 | |
| Depreciation | | | $1,877,481 | |
| Tonnage | 190,000 | x Tipping fee per ton | $30 | $5,700,000 |
| Other operating expenses | | | | $475,000 |
| Containers | | | | $645,000 |
| Overhead (13.38%) | | | | $2,683,525 |
| *MSW Total* | | | | *$29,264,241* |

*Continued on following page*

| **EXPENSES/COSTS *continued*** | | | | |
|---|---|---|---|---|
| **Recycling Program** | | | | |
| Labor | | | | $2,306,512 |
| ODWs Salaries (34 routes) | | | $2,098,954 | |
| OT | | | $144,398 | |
| Supervisors | | | $265,884 | |
| Recycling Manager | | | $63,160 | |
| Fringe Benefit | | | | $945,670 |
| Trucks | | | | $1,471,882 |
| Maint/Repair/Fuel | | | $839,664 | |
| Depreciation | | | $632,218 | |
| Tonnage | 26,000 | x Processing fee per ton | $40 | $1,040,000 |
| Other operating expenses | | | | $250,000 |
| Containers | | | | $400,000 |
| Overhead (13.38%) | | | | $647,080 |
| *Recycling Total* | | | | *$7,061,144* |
| **Total Expenses/Costs** | | | | **$36,325,385** |

| **COST RECOVERY** | |
|---|---|
| Total Income/Revenue | $33,165,000 |
| Total Expenses/Costs | $36,325,385 |
| Net Income/Loss | -$3,160,385 |
| **Percentage Cost Recovery** | **91.3%** |

| **EQUITY MEASURE** | | | | |
|---|---|---|---|---|
| **Resident** | **Charge** | | | **Price/pound** |
| 10th Percentile Household | $150 | ÷ Annual MSW Pounds | 1,735 | $0.086 |
| Median Household | $150 | ÷ Annual MSW Pounds | 2,158 | $0.070 |
| 90th Percentile Household | $150 | ÷ Annual MSW Pounds | 2,543 | $0.059 |
| **Equity Index** | **1.47** | Ratio of low-volume price to high-volume price | | |

**Alternative I Summary: Multiple Cart Sizes**

Alternative I required the construction of 18 scenarios. As in the status quo, the standard deviation was 6.00, 12.00, and 18.00, each with a landfill tipping fee of $30 and $35. We assumed that some level of MSW reduction will occur when customers are charged based on their MSW output. We constructed scenarios to reflect 10 percent or 20 percent total reductions in MSW in addition to the other variables.

Under Alternative I, the median household produces 38.75 gallons of MSW per week with no MSW reduction, 34.84 gallons with a 10 percent reduction, and 31 gallons with a 20 percent reduction. We assume that under all of these scenarios the median household will use a 64-gallon cart. In this case, the median household will pay between $164 and $184 per year for MSW and recycling collection depending on the variables. Table 14 displays these summary results as well as the equity index for each scenario.

**Table 14:** Alternative I: Multiple Carts Scenarios

| Scenario | Std. Dev. | Tipping Fee | 0% MSW Reduction Median Charge | 10% MSW Reduction Median Charge | 20% MSW Reduction Median Charge |
|---|---|---|---|---|---|
| MC1 | 6.00 | $30 | $171<br>Equity Index: 1.08 | $168<br>Equity Index: 1.07 | $164<br>Equity Index: 1.06 |
| MC2 | 6.00 | $35 | $177<br>Equity Index: 1.09 | $173<br>Equity Index: 1.08 | $169<br>Equity Index: 1.07 |
| MC3 | 12.00 | $30 | $178<br>Equity Index: 1.69 | $174<br>Equity Index: 1.68 | $171<br>Equity Index: 1.67 |
| MC4 | 12.00 | $35 | $184<br>Equity Index: 1.71 | $180<br>Equity Index: 1.70 | $176<br>Equity Index: 1.68 |
| MC5 | 18.00 | $30 | $178<br>Equity Index: 2.88 | $175<br>Equity Index: 2.86 | $171<br>Equity Index: 2.84 |
| MC6 | 18.00 | $35 | $184<br>Equity Index: 2.91 | $180<br>Equity Index: 2.89 | $176<br>Equity Index: 2.87 |

Source: Authors' calculations

A sample multiple cart budget scenario is presented in Table 15. A number of assumptions are contained in this budget:

- This alternative will require one new employee for billing, technical support and maintenance of the weighing system. This employee is budgeted at $40,000 annually, plus the associated fringe costs.
- Full price recovery was specified for the alternative.
- Cart charges were set at $48 per year for a 32-gallon cart, $96 per year for a 64-gallon cart, and $144 per year for a 95-gallon cart. Once these prices were established, a base charge could be set.

**Table 15:** Alternative I Sample Budget Scenario

| **Alternative I: Multiple Cart System Estimated Budget**<br>Scenario 1: Standard Deviation = 6, MSW Tipping Fee = $30, MSW Reduction = 0% | | | | |
|---|---|---|---|---|
| **INCOME/REVENUES** | | | | |
| **MSW Program** | | | | |
| Number of Households | 190,000 | x Base Price | $75 | $14,290,073 |
| Cart Charge | | | | |
| Number 32g Households | 24,759 | x Annual Charge | $48 | $1,188,432 |
| Number 64g Households | 165,239 | x Annual Charge | $96 | $15,862,944 |
| Number 95g Households | 2 | x Annual Charge | $144 | $288 |
| Number additional carts | 0 | x Annual Charge | $0 | $0 |
| Extra Collection | | | | |
| Additional 30g Bags | 190,000 | x Charge per bag | $2 | $380,000 |
| Large Pickups (>4 Yards$^3$) | 2,500 | x Charge per pickup | $50 | $125,000 |
| *Total MSW Income/Revenue* | | | | *$31,846,737* |
| **Recycling Collection** | | | | |
| Tons Collected | 26,000 | x Resale value per ton | $40 | $1,040,000 |
| Recycling state grants | | | | $3,500,000 |
| *Total Recycling Income/Revenue* | | | | *$4,540,000* |
| **Total Income/Revenue** | | | | **$36,386,737** |
| **EXPENSES/COSTS** | | | | |
| **MSW Program** | | | | |
| Labor | | | | $11,374,141 |
| ODWs Salaries (77 routes) | | | $9,507,027 | |
| OT (driver only) | | | $327,019 | |
| Field Clerks/Cart Techs | | | $208,934 | |
| San Workers | | | $493,630 | |
| Supervisors | | | $837,532 | |
| Fringe Benefit | | | | $4,662,998 |
| Trucks | | | | $3,779,577 |
| Maint/Repair/Fuel | | | $1,902,096 | |
| Depreciation | | | $1,877,481 | |
| Tonnage | 190,000 | x Tipping fee per ton | $30 | $5,700,000 |
| Other operating expenses | | | | $475,000 |
| Containers | | | | $645,000 |
| Overhead (13.38%) | | | | $2,688,877 |
| *MSW Total* | | | *$3,779,607* | *$29,325,593* |

*Continued on following page*

| **EXPENSES/COSTS *continued*** | | | | |
|---|---|---|---|---|
| **Recycling Program** | | | | |
| Labor | | | | $2,306,512 |
| ODWs Salaries (34 routes) | | | $2,098,954 | |
| OT | | | $144,398 | |
| Supervisors | | | $265,884 | |
| Recycling Manager | | | $63,160 | |
| Fringe Benefit | | | | $945,670 |
| Trucks | | | | $1,471,882 |
| Maint/Repair/Fuel | | | $839,664 | |
| Depreciation | | | $632,218 | |
| Tonnage | 26,000 | x Processing fee per ton | $40 | $1,040,000 |
| Other operating expenses | | | | $250,000 |
| Containers | | | | $400,000 |
| Overhead (13.38%) | | | | $647,080 |
| *Recycling Total* | | | | *$7,061,144* |
| **Total Expenses/Costs** | | | | **$36,386,737** |

| **COST RECOVERY** | |
|---|---|
| Total Income/Revenue | $36,386,737 |
| Total Expenses/Costs | $36,386,737 |
| Net Income/Loss | $0 |
| **Percentage Cost Recovery** | **100.0%** |

| **EQUITY MEASURE** | | | | |
|---|---|---|---|---|
| **Resident** | **Charge** | | | **Price/gallon** |
| 10th Percentile Household | $123 | ÷ Annual MSW Gallons | 1,553 | $0.079 |
| Median Household | $171 | ÷ Annual MSW Gallons | 1,937 | $0.088 |
| 90th Percentile Household | $171 | ÷ Annual MSW Gallons | 2,322 | $0.074 |
| **Equity Index** | **1.08** | Ratio of low-volume price to high-volume price | | |

**Alternative II Summary: Weight-Based Program**
Alternative II included the same 18 scenarios used in Alternative I.

Under Alternative II, the median household produces 43.16 pounds of MSW per week with no MSW reduction, 39.29 pounds with a 10 percent reduction, and 35.41 pounds with a 20 percent reduction. Given this, the median household will pay between $169 and $182 per year for MSW and recycling collection depending on the variables chosen. It is notable that this range is nearly identical to the range paid by the median household under Alternative I. Table 16 displays these summary results as well as the equity index for each scenario.

**Table 16:** Alternative II: Weight-Based Scenarios

| Scenario | Std. Dev. | Tipping Fee | 0% MSW Reduction Median Charge | 10% MSW Reduction Median Charge | 20% MSW Reduction Median Charge |
|---|---|---|---|---|---|
| W1 | 6.00 | $30 | $176<br>Equity Index: 1.11 | $172<br>Equity Index: 1.10 | $169<br>Equity Index: 1.10 |
| W2 | 6.00 | $35 | $182<br>Equity Index: 1.11 | $178<br>Equity Index: 1.10 | $174<br>Equity Index: 1.09 |
| W3 | 12.00 | $30 | $177<br>Equity Index: 1.25 | $172<br>Equity Index: 1.24 | $169<br>Equity Index: 1.22 |
| W4 | 12.00 | $35 | $182<br>Equity Index: 1.24 | $178<br>Equity Index: 1.23 | $174<br>Equity Index: 1.21 |
| W5 | 18.00 | $30 | $177<br>Equity Index: 1.47 | $172<br>Equity Index: 1.44 | $169<br>Equity Index: 1.41 |
| W6 | 18.00 | $35 | $182<br>Equity Index: 1.45 | $178<br>Equity Index: 1.43 | $174<br>Equity Index: 1.40 |

Source: Authors' calculations

A sample weight-based budget scenario is presented in Table 17. A number of assumptions are contained in this budget:

- This alternative will require two new employees for billing and technical support and maintenance of the weighing system. These employees are budgeted at $40,000 each annually, plus the associated fringe costs.
- Full price recovery was specified for the alternative.
- All customers pay a base fee of $50 per year, regardless of their actual MSW output. The base fee covers fixed costs borne by Milwaukee regardless of the amount of MSW generated by households for collection. Based on this base charge, the total amount of MSW generated and the expenses that had to be recovered, a charge per pound of MSW was established.

**Table 17:** Alternative II Sample Budget Scenario

| **Alternative II: Weight-Based System Estimated Budget**<br>Scenario 1: Standard Deviation = 6, MSW Tipping Fee = $30, MSW Reduction = 0% | | | | |
|---|---|---|---|---|
| **INCOME/REVENUES** | | | | |
| **MSW Program** | | | | |
| Collection Charge | 190,000 | x Base Price | $50 | $9,500,000 |
| Weight Charge | 190,000 | x Charge per ton | $117 | $22,283,089 |
| Extra Collection | | | | |
| Large Pickups (>4 Yards$^3$) | 2,500 | x Charge per pickup | $50 | $125,000 |
| *Total MSW Income/Revenue* | | | | *$31,908,089* |
| **Recycling Collection** | | | | |
| Tons Collected | 26,000 | x Resale value per ton | $40 | $1,040,000 |
| Recycling state grants | | | | $3,500,000 |
| *Total Recycling Income/Revenue* | | | | *$4,540,000* |
| **Total Income/Revenue** | | | | **$36,448,089** |
| **EXPENSES/COSTS** | | | | |
| **MSW Program** | | | | |
| Labor | | | | $11,414,141 |
| ODWs Salaries (77 routes) | | | $9,507,027 | |
| OT (driver only) | | | $327,019 | |
| Field Clerks/Cart Techs | | | $208,934 | |
| San Workers | | | $493,630 | |
| Supervisors | | | $877,532 | |
| Fringe Benefit | | | | $4,678,998 |
| Trucks | | | | $3,779,577 |
| Maint/Repair/Fuel | | | $1,902,096 | |
| Depreciation | | | $1,877,481 | |
| Tonnage | 190,000 | x Tipping fee per ton | $30 | $5,700,000 |
| Other operating expenses | | | | $475,000 |
| Containers | | | | $645,000 |
| Overhead (13.38%) | | | | $2,694,229 |
| *MSW Total* | | | *$3,779,607* | *$29,386,945* |

*Continued on following page*

| **EXPENSES/COSTS *continued*** | | | | |
|---|---|---|---|---|
| **Recycling Program** | | | | |
| Labor | | | | $2,306,512 |
| ODWs Salaries (34 routes) | | | $2,098,954 | |
| OT | | | $144,398 | |
| Supervisors | | | $265,884 | |
| Recycling Manager | | | $63,160 | |
| Fringe Benefit | | | | $945,670 |
| Trucks | | | | $1,471,882 |
| Maint/Repair/Fuel | | | $839,664 | |
| Depreciation | | | $632,218 | |
| Tonnage | 26,000 | x Processing fee per ton | $40 | $1,040,000 |
| Other operating expenses | | | | $250,000 |
| Containers | | | | $400,000 |
| Overhead (13.38%) | | | | $647,080 |
| *Recycling Total* | | | | *$7,061,144* |
| **Total Expenses/Costs** | | | | **$36,448,089** |

| **COST RECOVERY** | |
|---|---|
| Total Income/Revenue | $36,448,089 |
| Total Expenses/Costs | $36,448,089 |
| Net Income/Loss | $0 |
| **Percentage Cost Recovery** | **100.0%** |

| **EQUITY MEASURE** | | | | |
|---|---|---|---|---|
| **Resident** | **Charge** | | | **Price/pound** |
| 10th Percentile Household | $154 | ÷ Annual MSW Pounds | 1,773 | $0.087 |
| Median Household | $177 | ÷ Annual MSW Pounds | 2,158 | $0.082 |
| 90th Percentile Household | $199 | ÷ Annual MSW Pounds | 2,543 | $0.078 |
| **Equity Index** | **1.11** | Ratio of low-volume price to high-volume price | | |

## Appendix E: Development of Policy Analysis Criteria

We evaluated each policy option according to four criteria: efficiency, effectiveness, equity, and ease of implementation. These are summarized in the "Policy Criteria" section of this report. Our measurement and data collection methods for each are described here.

*Efficiency*
We measure efficiency through the percentage program cost recovery under each alternative. We calculate program using the following formula:

% Cost Recovery = Program Income and Revenue / Program Expenses and Costs

We used the spreadsheet template to total the income and expenses under a range of assumptions for six scenarios for each policy option. Additionally, each alternative scenario was run with 0 percent, 10 percent, and 20 percent MSW reductions, creating up to 18 scenarios for each alternative. Assumptions included the possibility of no reduction in the number of tons of MSW and, therefore, no expense reduction due to reduced tipping fees. To calculate the pricing structure needed for each scenario, we first determined the income needed to obtain full cost recovery. For PAYT options, this was weighted by the distribution of MSW per household given the base fees in each case.

In addition, we evaluate efficiency by the additional budget expenses each alternative requires. We calculated costs of new PAYT system inputs, public outreach and education expenses, and additional staffing expenses from the alternatives. We conducted telephone interviews with vendors and potential contractors, reviewed our comparable cities survey results and telephone contacts, and relied on estimates given by City of Milwaukee staff. Due to lack of detailed response, we must estimate some budget items such as education and outreach for the multiple cart and weight-based alternatives.

*Effectiveness*
Effectiveness is quantifiable by MSW tonnage reduction resulting from residents' disposal behavior under each alternative. Data in this category come from research studies and our comparable city survey responses. We also make relative comparisons of effectiveness regarding household acceptance of and compliance with the programs.

The spreadsheet calculations were based on the approach and assumptions about pricing and distributions of waste per household described in the methodology section (see page 7 and Appendix C).

We based these estimated tonnage inputs on three sources. First, the ranges of variation in tonnage found over time in Milwaukee prior to consideration of PAYT provided a magnitude of changes due to all non-PAYT factors.

Varying percentage reductions in solid waste from comparably sized PAYT municipalities act as a second benchmark. We also took into account averages from government and industry sources showing diversion rates and other impacts during the years following the introduction of PAYT. As most reductions in MSW following the introduction of PAYT came in the first year or two and then leveled off, our quantitative evaluations covered an entire single year and should be considered the long-run average.

City of Milwaukee staff provided recycling revenues and landfill fees per ton for the current budget cycle. These are not modified to account for long-term forecasts of variations in recycling prices in our analysis.

*Equity*

We defined an equity index to consistently measure the relative fairness of each policy alternative. The index shows the ratio of the prices paid between those that generate the most MSW and those that generate the least. Specifically, the index compares the price paid per pound or gallon of MSW by the individual household 10 percent from the bottom and 10 percent from the top of the MSW distribution range. This approach provides a single number to compare the equity of different systems and different scenarios. A score of 2.0 on the index indicates those generating the least MSW pay twice as much as those generating the most. An index of 1.0 indicates residents pay the same amount for MSW collection per unit, which we consider to be the most equitable system possible. In our calculations, we found 1.08 as the most equitable score in our alternatives, occurring under the weight-based system. The status quo scores the highest equity disparity at 4.8. This means that under one possible status quo scenario, households with the lowest amount of MSW pay nearly five times the rate per pound of households generating the most waste.

*Ease of Implementation*

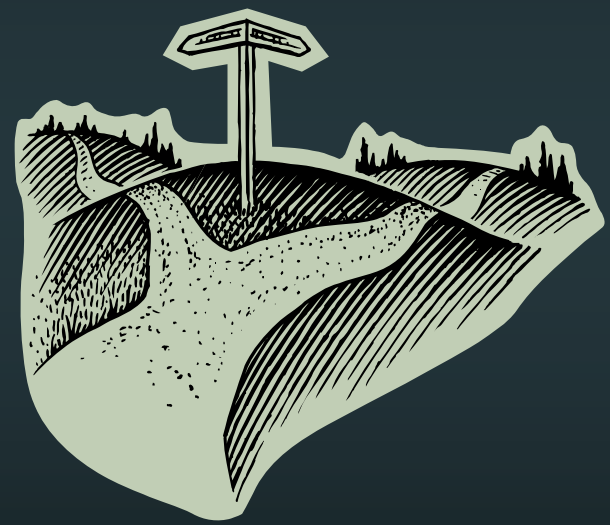
Assessment of ease of implementation was a relative comparison between alternatives and considered issues such as education and billing changes. We also considered availability of new equipment and maintenance services, and whether the alternative requires substantial re-training of collection workers. We obtained this information from interviews with City of Milwaukee employees, our comparable cities survey results, and telephone contacts with vendors. We also used research on published PAYT information.

# APPENDIX C

PowerPoint presentation on the Waukesha County Recycling System Study

# Waukesha County Recycling

## *Looking Ahead*



Perry Lindquist, Land Resources Manager

Waukesha County Dept. of Parks & Land Use

July 27, 2009

Milwaukee Recycling Task Force

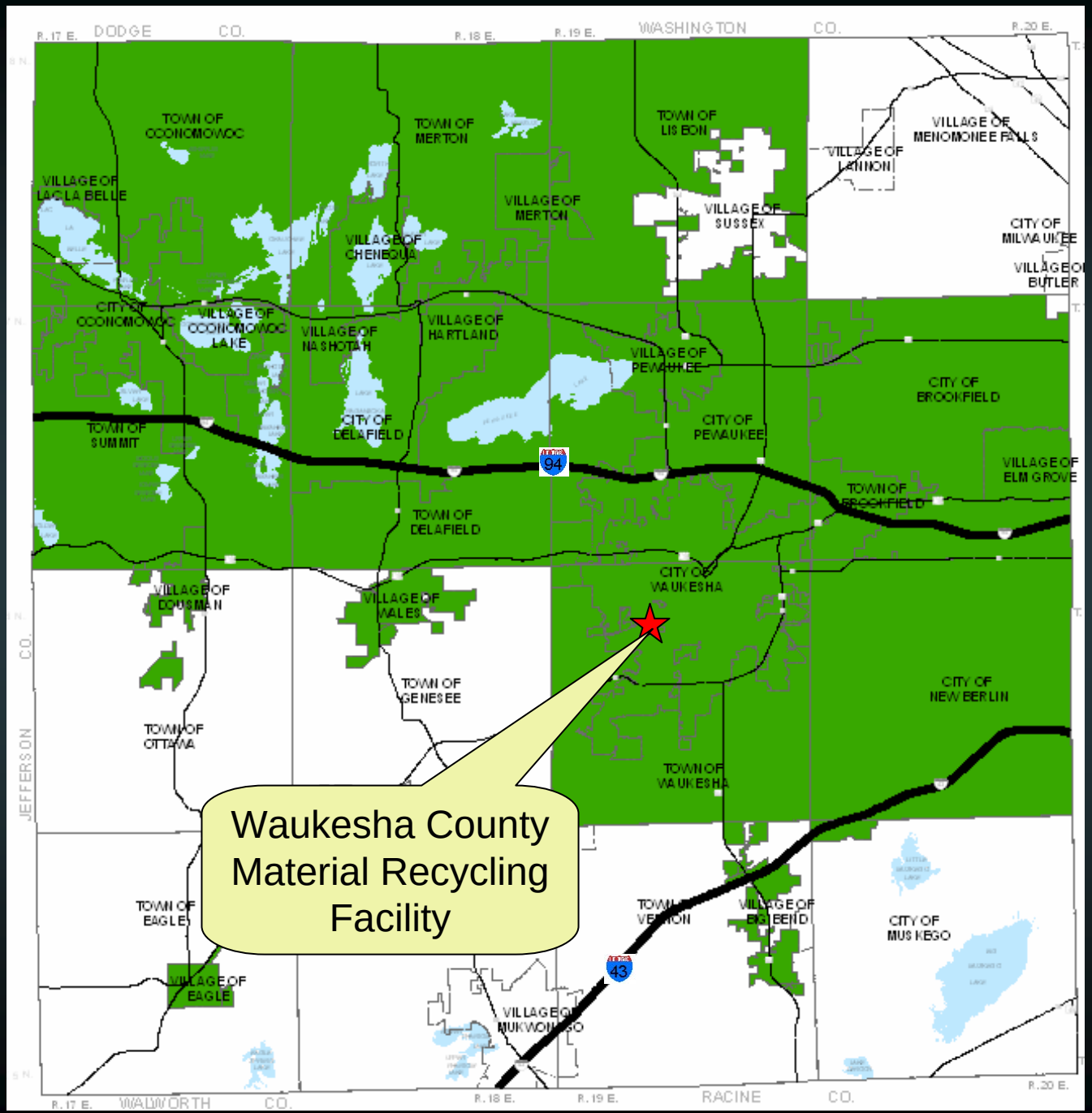
# Presentation Outline

- Background on county recycling program
- County MRF - Options for the future
  - 2007 study findings/recommendations
- Similarities to City of Milwaukee
  - How can we work together/next steps

# Background on County Program

- Waukesha County is “Responsible Unit” for 25 communities (since 1990)
  - Pool state grants ($1 million/yr)
  - Coordinate education program
  - Pay for blue recycle bins
  - MRF investment/risk, oversight, maintenance
- County-owned/privately operated MRF
  - Dual-stream system (paper & containers separate)
  - Average 23,000 tons/year of recyclables
  - Last expansion in 1995

# Participating Municipalities

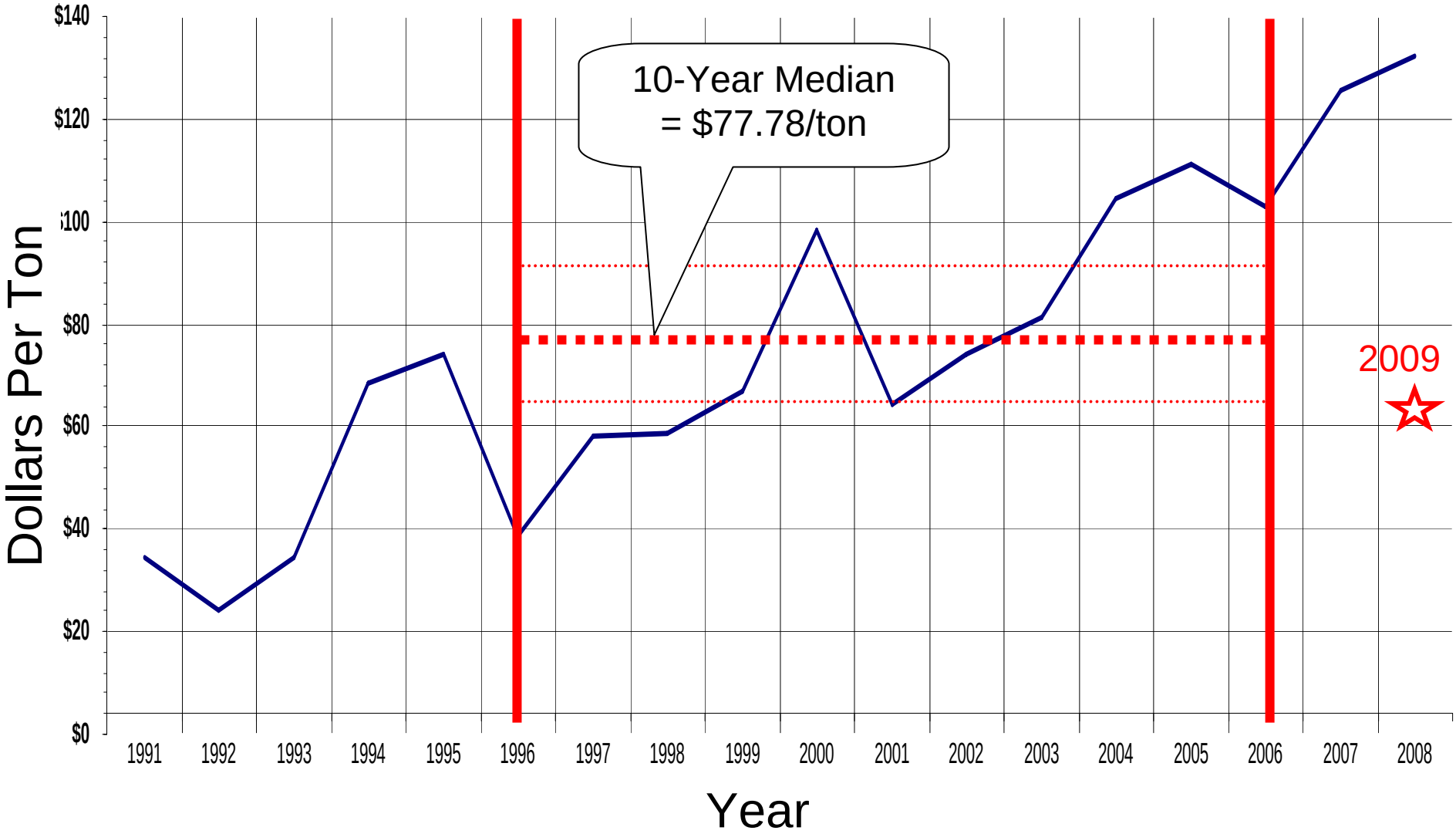


# Background on County Program
*(continued)*

- 25 Participating Communities must:
  - Collect dual stream recyclables
    - 88,000 households (pop. 270,000)
    - $12 million/yr. in private contracts ($3.5 mil. recycle)
  - Deliver recyclables to county MRF
  - Report program costs to county/annual grants

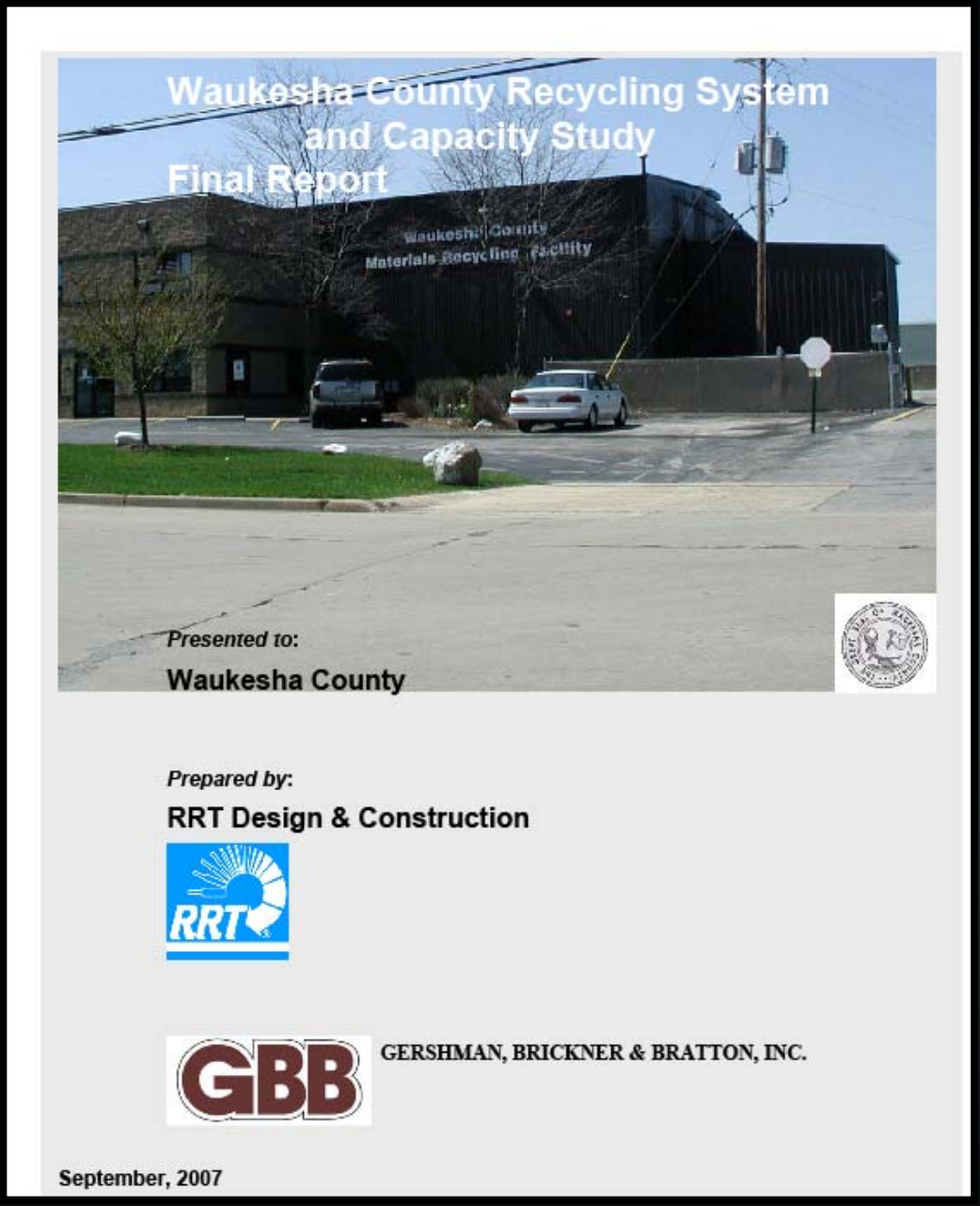
# Total Revenue Per Ton Shipped

*Waukesha Co. MRF 1991-2008*



# County MRF: “Enterprise Fund”

- Self-sustaining – no tax levy or processing fees to communities (up front County loan paid off)
- Revenues: material sales (50%), state grants & operator processing fees (up to $6.50/ton)
- Current fund balance = $11 million:
  - Good markets and competitive operating contracts
  - Distributions to communities of $6.2 million in the last 9 years + $1 million for 2010 (proposed)
  - 2012 Projected Fund Balance: $11-13 million
    - Assume continued state grants of $1 million/yr., material sales of $700K./yr. and community dividends of $1 million/yr.
  - Use to pay for future MRF investments




# 2007 Study

## Waukesha County Recycling System

# Study: Existing Dual Stream MRF Capacity

- Can handle future dual stream program for the short term
- However, some major issues need to be addressed:
  - Sort line
  - Tipping floor
  - Bale storage

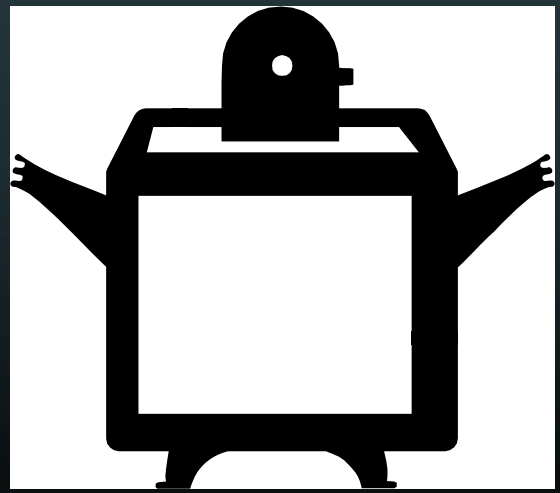
# Plastic Containers Overwhelming Sort System

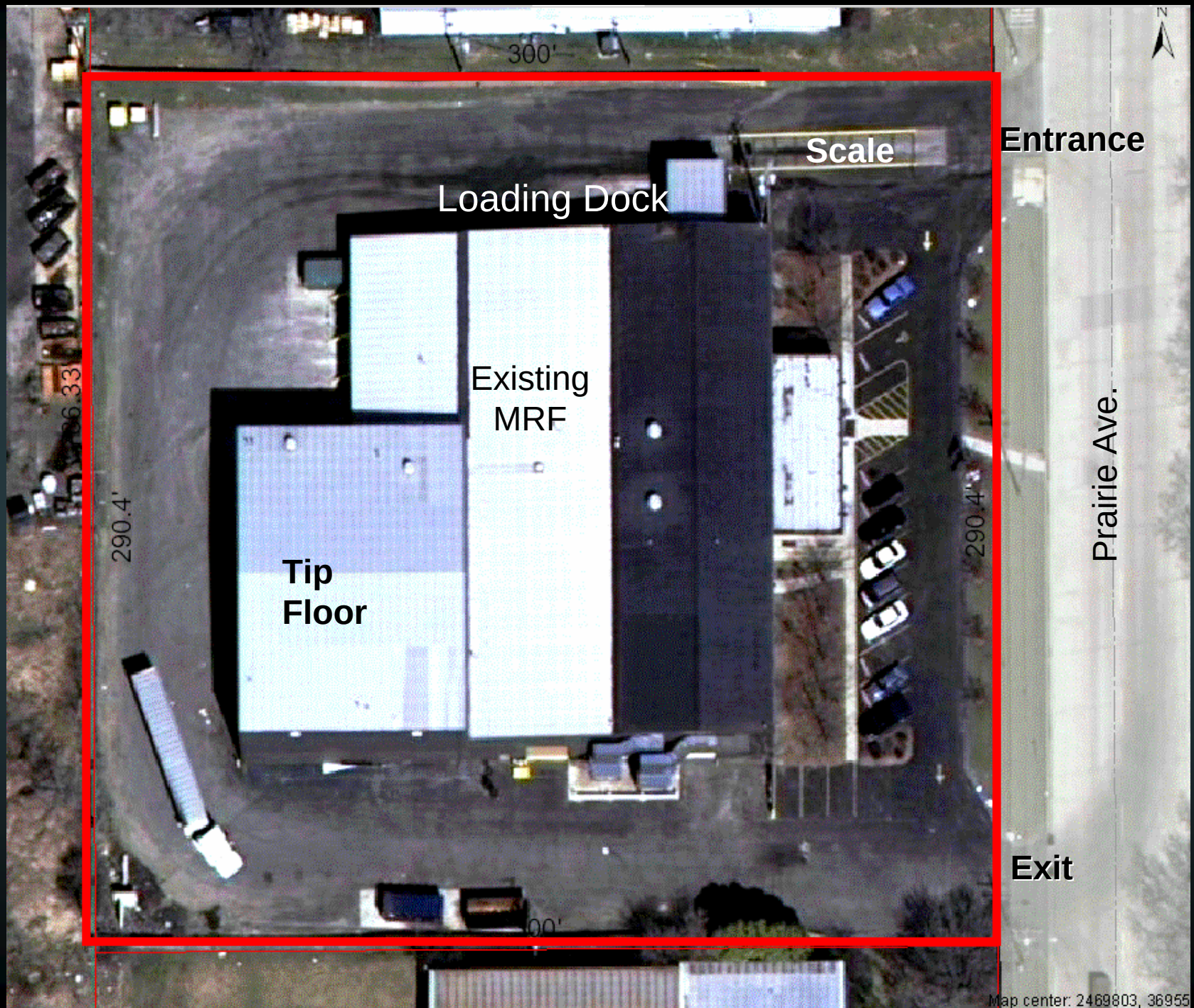
# Tipping Floor Space is Limited

# Bale Storage is Inadequate

# Study: Existing Dual Stream MRF Capacity (cont.)

- Must expand MRF or build new in future
- Cannot expand MRF on current 2-acre site, because…



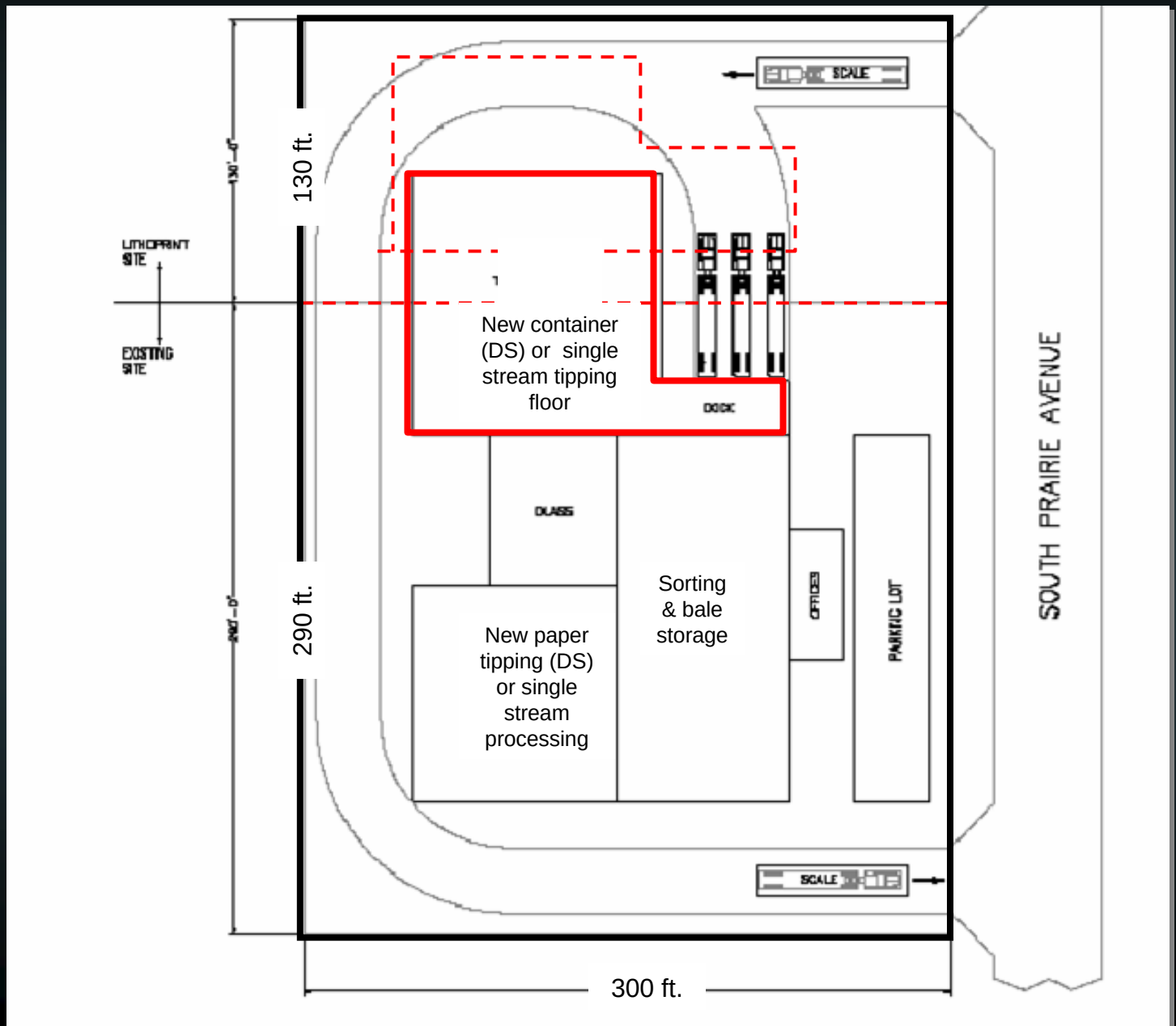

300'
Scale
Entrance
Loading Dock
Existing
MRF
Tip
Floor
290.4'
290.4'
Prairie Ave.
Exit
N
Map center: 2469803, 36955

# Possible MRF Expansion

- If 1 acre site to the north purchased, limited expansion is possible
  - Tipping/storage areas/new equipment
  - Could also convert to single stream
- Industry trends & community pressures to switch to Single Stream will influence future decisions

# Concept Drawing – North Expansion

*(single or dual stream)*



# Possible MRF Expansion (cont.)

- Estimated costs:
  - Dual stream: $6.5 million + property/business
  - Single stream: $7.0 million + property/business
- However, the expanded site could not handle a very large increase in tonnage

# Recyclables Collection

## *Dual Stream vs. Single Stream*

**Existing program (blue bin)**

(manual/paper & containers separated)

**Industry trend (cart)**

(automated/all recyclables mixed)

# SS Pros (Collection) vs. Cons (MRF Impacts)

| Single Stream Collection Cost Savings | Single Stream MRF Impacts |
| --- | --- |

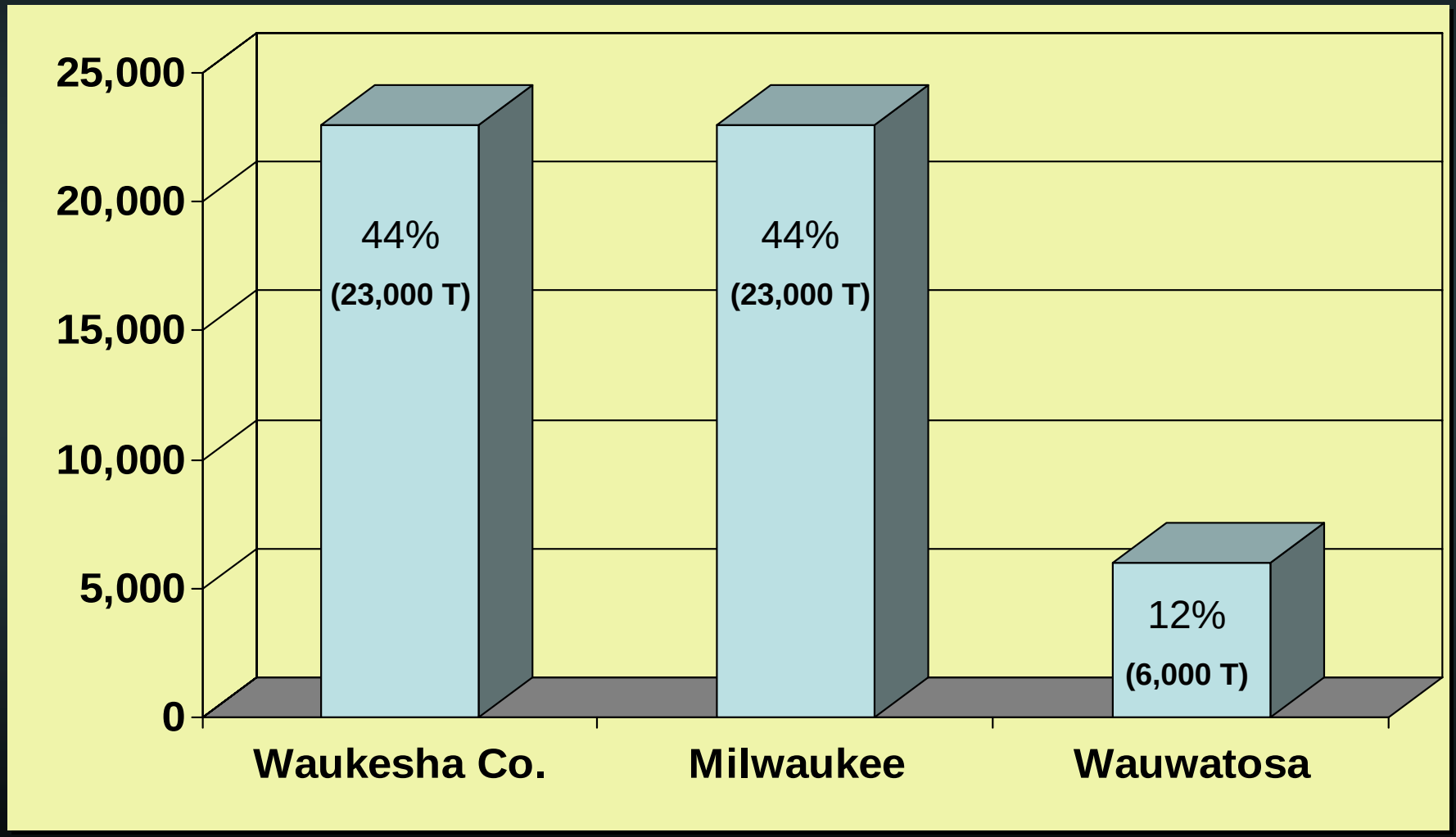
# Collection Trends/Pressures

- Private haulers are pushing for Single Stream collection to save money
  - Trend is playing out nationwide
    - >100 SS MRFs (25% in 2008)
  - Locally, only 1 of 3 private haulers (Veolia) still offers dual stream collection
    - Waste Mgt. and Johns already switched to SS
    - 3 participating communities without hauling contracts already switched to SS (problem)
- More communities want to switch to SS

# Scenarios for Future Projections:

- Tonnage
  - Participating county municipalities (25)
  - Adding non-participating communities (12)
  - Adding Milwaukee & Wauwatosa
- Single vs. Dual Stream

# Annual Tons Recycled (52,000 Tons)*




*Rounded from 2008 data (no other communities included with City of Milwaukee data)

# Key Study Findings & Recommendations

1. Switching to Single Stream is <u>strongly recommended</u>
   - Pros far outweigh the cons
   - Could save partic. communities >$700,000/year in collection & disposal costs
     - 10% or $12.36/HH/Year savings (minus cart $)
   - Needs all new MRF equipment/more space
2. Recycling tons increase considerably with a Single Stream system – assumed + 25%
   - In-county data shows 45% increase/capita

# Key Study Findings & Recommendations
*(continued)*

3. Doubling tonnage greatly improves the economics of a Single Stream MRF
   - 2 shifts = much faster return on investment
   - New site needed to double tonnage
4. National MRF data shows:
   - SS paper/fiber is equally marketable
   - Increased residue from SS depends on public education (projected increase from 3% to 10%)

# Single Stream Options

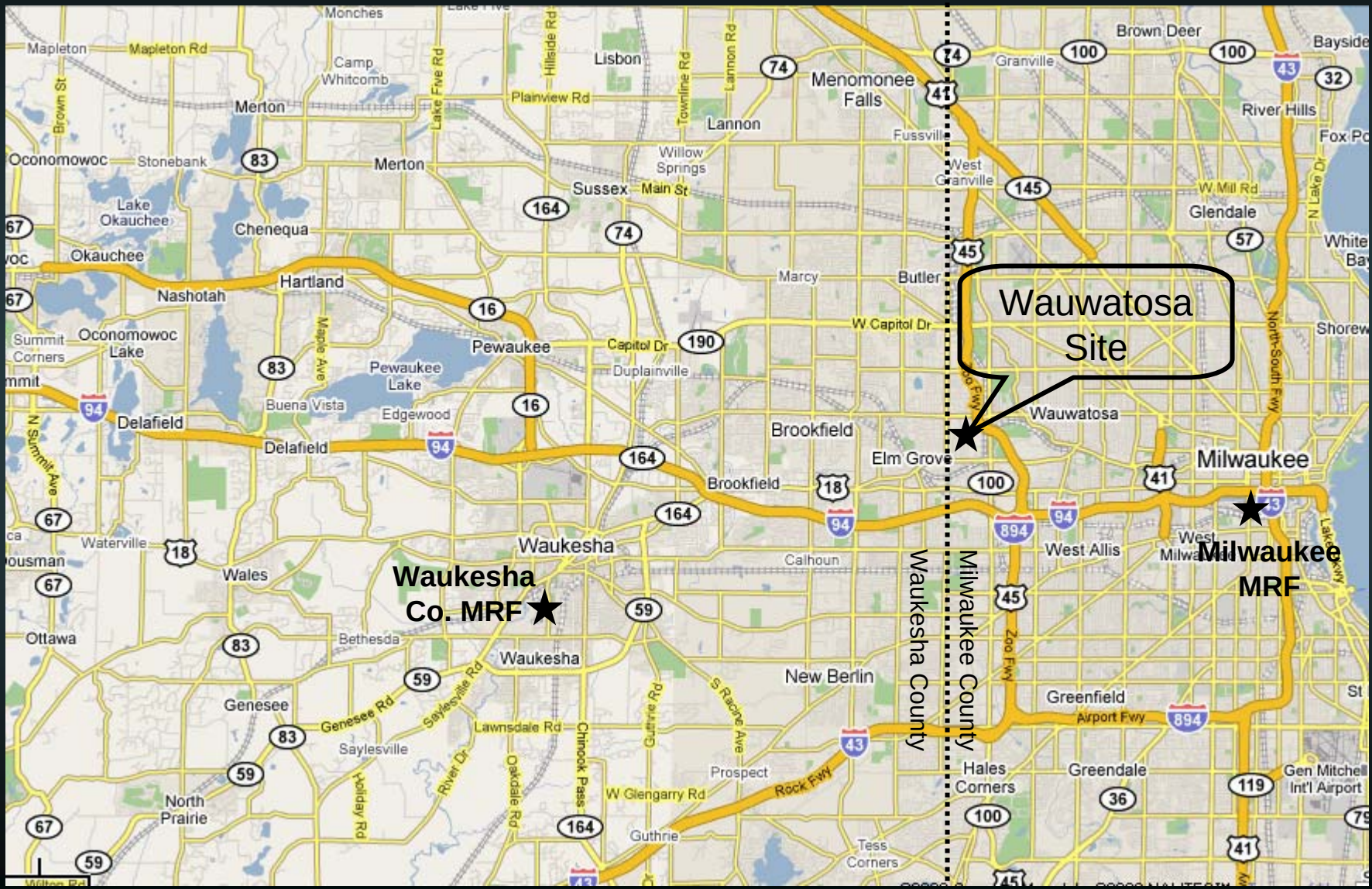
*(2007 Costs & 2010 Projected Tonnage)*

1. **Expand/Convert Current MRF:**
   - Participating Municipalities only (30,565 tons)
   - Acquire/relocate Lithoprint
   - Estimated bldg. costs = $7 million + Lithoprint costs
   - Projected annual net revenues = $0.12 million
2. **Build New Regional MRF (publicly-owned/privately operated)**:
   - Add tonnage for 2 shifts (76,066 tons - NP/Tosa/Milw)
   - Estimated building costs = $8.25 million + land
   - Projected annual net revenues = $1.7 million
3. **Send recyclables to privately-owned MRF**
   - Costs unknown (RFP process)

# County Response to Private MRF Option

- Existing County MRF is already privatized
  - Public ownership of the facility (40% nationally)
  - Private operation & marketing/good competition
- Public/private partnership has been very successful
- **Privately-owned MRF does not ensure long-term competition/price stability for communities**
- Having a publicly-owned/privately operated MRF in SE helps keep costs down for all communities

# Possible Regional MRF Location



# Single Stream Economic Summary

*(Revenues & expenses to be prorated to participating communities)*

- Projected 2010 NET revenues from a Regional Single Stream MRF are 14.5 times larger than converting county MRF to single stream
  - $1.7 million (regional/76,066 T) vs. $0.12 million (county/30,565 T)
  - 6 times larger for Waukesha Co./Milwaukee (44%)
- Payoff of capital costs ($8.25 million) for a new Regional Single Stream MRF = 5 years
- Payoff of capital costs ($7 million) for converting county MRF to single stream = 58+ years

# Summary Look at the SS System

- Collection: Savings in collection costs and landfill disposal costs (reduced trash)
  - >$700,000 per year for partic. municipalities

- MRF: **It's all about the tons!**
  - 2.5 times tonnage = 10 times faster return on investment

# Similarities:
## Waukesha Co. & City of Milwaukee

- Publicly-owned dual stream MRFs
- Tonnage processed (23,000/yr.)
- Aging facilities facing costly updates
- Pressures to improve program efficiencies
- Pressures to switch to Single Stream:
  - – Reduce collection & landfill disposal costs
  - + Increase recycling rate
- Concerns about future price stability
- 14-year history of coordinating education efforts

# Why Work Together?
## *(Regional Single Stream MRF)*

1. Lower costs/ton - capital and O & M
2. Better return on investments/reduced risk
3. Long-term price stability
4. Good example of regional cooperation
5. Both MRFs already publicly-owned and privately operated
   - no threat to private sector

# Next Steps, Issues & Timelines

- Commit to joint study (ASAP):
  - Milwaukee, Waukesha Co. & Wauwatosa
- Establish scope of study/write RFP (fall 2009):
  - Refine & update economic analysis
  - I.D. financial options (sharing costs & revenues)
  - Technical investigation of Tosa site
  - Transportation issues
  - Concept plan/budget
  - Institutional options (ownership, contracting, etc.)
  - Collection or other issues?
- Release RFP & hire consultant – early 2010
- Complete study by end of 2010

# Questions ?

Perry Lindquist, Land Resources Manager
Waukesha County - Dept. of Parks and Land Use
Room 260 Administration Center
515 W. Moreland Blvd., Waukesha WI 53188
plindquist@waukeshacounty.gov
262-548-7867

# SS Pros (Collection) vs. Cons (MRF Impacts)

| Single Stream Collection Cost Savings | Single Stream MRF Impacts |
|---|---|
| • Automation decreases personnel costs (workers comp claims, etc.) | • Increases MRF labor and capital costs |
| • Large cart allows Every Other Week collection of recyclables | • Increases residue level at MRF (non-recyclables) |
| • Flexibility: **Can use compaction vehicles to reduce capital & trips to the MRF**, more households per route – faster collection | • Potential for decreased quality of processed recyclables (glass/paper) |
| • Higher rates of recycling & **reduced landfill disposal costs** – easier for the general public to implement (no sorting) | • **Higher recyclable volumes to process**<br>• Increased net cost per ton processing |

All of these factors were built into the economic analysis

# APPENDIX D

Recycling Facility Alternatives Study

# Recycling Facility Alternatives Study
# City of Milwaukee, Wisconsin

**Site:**
Materials Recovery Facility
1313 West Mount Vernon Avenue
Milwaukee, WI 53233

**Prepared for:**
City of Milwaukee
Zeidler Municipal Building
841 North Broadway, Room 620
Milwaukee, WI 53202

**Prepared by:**
AECOM
4135 Technology Parkway
Sheboygan, WI 53083

November 2009

AECOM Project No. 114079

# Recycling Facility Alternatives Study
# City of Milwaukee, Wisconsin

**Site:**
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November 2009

AECOM Project No. 114079

Author: Donald F. Pirrung, P.E.

Title: Senior Engineer

Date: _____

Reviewer: Nancy K. Wright, P.E.

Title: Senior Engineer

Date: _____

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# EXECUTIVE SUMMARY

The City of Milwaukee is under contract with Waste Management Recycle America (WMRA) to operate the City's recycling facilities. The City's contract extended to June 30, 2009, plus the City has the sole option to renew the contract for up to five 1-year periods. The existing dual stream processing equipment is at the end of its useful life at the City's Material Recycling Facility (MRF) and the City is interested in evaluating recycling alternatives.

The following recycling alternatives were evaluated:

- Alternative A – Dual Stream at Existing City Facility
- Alternative B – Single Stream at Existing City Facility
- Alternative C – Two Transfer Stations to Third Party
- Alternative D – One Transfer Station at Existing City Facility
- Alternative E – Regional MRF at Wauwatosa
- Alternative F – Regional MRF at Existing City Facility

Alternative A involves a continuation of the current dual stream collection program. Under all the other alternatives, recycling collection for the City of Milwaukee would be upgraded to reflect single stream operation. One-person or two-person collection crews are possible. The collection fleet can be upgraded over time to increase efficiency. The existing 95-gallon carts can be reused and modified easily by removal of the divider within the cart.

Under all the alternatives, the study addresses recycling collection for the City of Milwaukee under monthly, 3-week, and 2-week collection scenarios.

The regional MRF would include the City of Milwaukee, Waukesha County, and City of Wauwatosa. In 2007, Waukesha County commissioned a study which included evaluating a regional MRF and the conclusion was that a regional MRF showed promise and should be further explored.

Recycling collection for Waukesha County and City of Wauwatosa and transport to the City of Milwaukee MRF are not part of this study, but are recommended to be evaluated by Waukesha County and the City of Wauwatosa to develop the most cost-effective approach if this alternative is further considered.

The six recycling facility alternatives are described as follows:

**Alternative A – Dual Stream at Existing City Facility**

Alternative A would consist of continuing the City's current dual stream processing at the existing MRF. The existing equipment would be replaced entirely due to the age and condition of the processing equipment. The structural aspects of the facility would remain basically the same. A cost allowance is included for some structural improvements to accommodate the new process equipment. Staffing is projected to remain about the same and operation would continue by a private party. There are options regarding implementing this alternative which include the City purchasing and installing the equipment, or having a third party design, build and operate the system. If the City purchased and installed the equipment, a third party could operate it.

Recycling collection would remain the same as the existing program. Recycling trucks would be parked at the existing City MRF. Separate cost estimates are prepared for monthly, every 3-week, and every 2-week collection scenarios.

**Alternative B – Single Stream at Existing City Facility (City Only)**

Alternative B would consider single stream processing instead of the current dual stream. Single stream processing means all the recyclables are collected in a single undivided cart and then sorted at the MRF. This approach is more user friendly and collection friendly resulting in more recyclables being placed at the curb by the public and more efficient collection by the recycling truck operation. Single stream collection is more user friendly because the public can simply consolidate all recyclables in the home and place them all in one cart without further sorting. The recycling industry is moving toward single stream recycling nationwide. Single stream can accommodate fully automated collection which improves efficiency by allowing carts to be serviced without the driver exiting the vehicle.

The existing recycling equipment would be removed and replaced with the new equipment. A cost allowance is included for some structural improvements to accommodate the new process equipment. Staffing is projected to remain about the same or less depending on the extent of automation as compared to the existing staff. There are two options regarding implementing this alternative which include the City purchasing and installing the equipment and using a third party to operate, or having a third party design, build and operate the system.

Recycling trucks would be parked at the existing City MRF. Separate cost estimates are prepared for monthly, every 3-week, and every 2-week collection scenarios.

**Alternative C – Two Transfer Stations to Third Party**

Alternative C pertains to constructing two new transfer stations for recyclables. One station would be located at 3879 West Lincoln Avenue, which is the location of the current self-help center and solid waste transfer station. The second transfer station would be located on the northwest side of the City. Multiple locations are under consideration.

Collection of recyclables would be taken to one of the transfer stations. The recyclables would be placed in a compactor to crush the materials to increase the density, thereby allowing more recyclables to be placed in a semi tractor trailer. This approach saves on the transportation cost for trucking recyclables to the MRF. For this evaluation, the collection trucks are assumed to be located at the respective transfer station. If this alternative is selected, parking accommodations for the recycling trucks need to be further confirmed regarding available space.

Operation and maintenance costs for the transfer stations are estimated and based on a private firm performing the work. Operation and maintenance costs for the hauling to the MRF and MRF operation are based on services performed by a third party.

Recycling trucks would be parked at the transfer locations. Recycling collection costs are identified for monthly, 3-week, and 2-week collection for single stream processing.

**Alternative D – One Transfer Station at Existing City Facility**

Alternative D would consist of converting the existing City MRF into a recycling transfer station. This alternative was addressed in the October 2008 Draft No. 2 Recycling Facilities Study report prepared by Earth Tech AECOM.

A compactor and related improvements would be added to the MRF. The transfer station would be operated by a third party which would transport the recyclables by semi truck to a processing facility. Transfer station capital equipment could be provided directly by the third party firm and are estimated for this study. For this evaluation, the WMRA MRF in Germantown was used for the cost evaluation.

Recycling collection addresses monthly, 3-week, and 2-week collection scenarios based on single stream collection.

**Alternative E – Regional MRF at Wauwatosa**

Alternative E is based on Waukesha County, City of Wauwatosa, and City of Milwaukee developing a new MRF located at West 116th Street and Walnut in Wauwatosa. The Waukesha County Study will serve as the basis for this alternative with some additional input from vendors for updated equipment costs. A single stream MRF is evaluated. The operation would be by a third party.

Recycling collection would be based on the City of Milwaukee recycling trucks being parked at the regional MRF. This assumption needs to be further verified with the City of Wauwatosa and Waukesha County. Another option is to park the City of Milwaukee recycling trucks at the existing City MRF though the collection costs would be somewhat higher, as discussed in the Earth Tech AECOM October 2008 Draft No. 2 Report. Preliminary discussions between the City of Milwaukee and City of Wauwatosa indicate there would be room for the City of Milwaukee trucks to be parked at the Wauwatosa site.

Recycling collection addresses monthly, three-week, and two-week collection scenarios based on single stream collection.

**Alternative F – Regional MRF at Existing City Facility**

Alternative F considers Waukesha County, City of Wauwatosa, and City of Milwaukee developing a MRF at the City's existing MRF on Mount Vernon. The City's current dual stream processing would be replaced with single stream processing equipment. The existing equipment would be replaced entirely due to its age, size, and condition. The structural aspects of the facility would remain basically the same. A cost allowance is included for some structural improvements to accommodate the new process equipment. Staffing is expected to increase from the current level based on additional recycling tonnage and is estimated based on the Waukesha County Report. The processing would be performed by a private firm as currently done.

**Cost Evaluation**

A present worth cost analysis was prepared to evaluate recycling facility alternatives and recycling collection alternatives. The estimated capital, operation and maintenance costs were determined for each recycling facility alternative. The estimated revenue from the sale of recyclables was determined. Four scenarios were evaluated:

- Low Recyclables Price, Low Recyclable Volume
- Low Recyclables Price, High Recyclable Volume
- High Recyclables Price, Low Recyclable Volume
- High Recyclables Price, High Recyclable Volume

The revenue is based on a 50:50 share with the processing contractor, as currently done under the City's contract. The benefit of avoided landfill tipping fees through increased recycling was also estimated.

Increased frequency for collecting recyclables and single stream collection can improve the volumes of recyclables collected.

The present worth analysis is based on a 15-year period. The salvage value of new equipment is estimated at zero after 15 years. The salvage value of structural facilities is estimated to be worth 50 percent of its original value after 15 years.

**Results of the Study**

- Collection Alternatives

Collection of recyclables is currently performed on a monthly basis. Some areas of the City collect recyclables by having City personnel walk up the driveway to collect the 95 gallon cart and then return the cart. This service adds to the collection cost. A more efficient approach is to have the cart placed by the resident at the curb to more efficiently serve the public and save the City on collection costs.

The most cost-effective method was to collect the recyclables on a three-week frequency with placement of the cart at the curb by the resident. Single stream collection is proposed using existing carts and trucks. A partition in the cart will be removed. Three week frequency is estimated to increase recyclables volume by ten percent.

As the City implements this collection program, the goal will be to continually improve collection and eventually initiate collection on a two-week frequency in the future for added public convenience and increased recyclables volume.

The recyclables collection would be accomplished by trucks with one person. The City could employ some fully-automated trucks to improve collection time and also reduce manpower injuries. Two person collection was found to increase recyclables collected but was offset by substantially greater labor costs and therefore was not cost-effective.

- Recycling Facility Alternatives

The most cost-effective alternative based on a present worth analysis was Alternative D - One Transfer Station at Existing City Facility. This alternative provides the City with the least risk and lowest capital investment. The transfer station would be operated by a third party. The recycling processing also would be performed by a third party. For this evaluation, the WMRA recycling facility in Germantown was considered.

- Pay as You Throw

There is increasing interest in managing municipal solid waste through "pay as you throw" (PAYT) programs. The most common approach is for the user to pay for a certain size garbage container(s) and the recycling cart is free. The PAYT program results in a decrease in the trash tonnage and increase in recycling tonnage. A 16 to 17 percent diversion from residential trash is the average, which is generally divided equally among recycling, yard waste and source reduction.

**Recommendations**

The following recommendations are made:

1. Implement Alternative D – One Transfer Station at Existing City Facility, based on the economics. It presents the least investment and least risk to the City of Milwaukee. Single stream collection offers the benefit of more efficient collection. It maximizes the cart volume and improves convenience for residents.

2. Negotiate with WMRA to implement Alternative D.

3. Implement three-week recycling collection to increase recycling volumes and revenues. Schedule recycling collection for the cart to be located at the curb (no walk up driveway) to improve collection efficiency. Make improvements to the routes based on the new software for routing trucks.

4. Implement Pay As You Throw features for garbage collection in conjunction with increased recycling collection service to optimize effectiveness of both programs.

# 1.0 INTRODUCTION

This study was commissioned by the City of Milwaukee to compare capital, operation and maintenance, and collections costs for recycling facility alternatives to serve the City of Milwaukee. The alternatives include upgrading the process equipment at the City's existing recycling facility; developing one or two recycling transfer stations and transporting the materials to a third-party recycling center; and a regional recycling facility in Wauwatosa or at the City's existing facility.

# 2.0 BACKGROUND

## 2.1 City-Owned Recycling Facilities

The City of Milwaukee is under contract with Waste Management Recycle America LLC (WMRA) to operate the City's recycling facilities at South 13th Street and West Mount Vernon Avenue in the Menomonee River Valley. The City's contract was awarded in July 2004 and extends to June 30, 2009. The City has the sole option to renew the contract for up to five 1-year periods. This option shall be exercised by the City in writing and delivered to the Contractor a minimum of 6 months prior to the contract end date. If the City does not notify the Contractor during this notification period, the contract is automatically extended for 1 year. Currently, WMRA is operating the City's recycling facilities under the first 1-year renewal period.

The bidding of recycling services in January 2004 was a very competitive process. There were five bidders which included FCR, Allied Waste, Newark Group, Onyx now known as Veolia, and Recycle America Alliance, now known as WMRA. There were three bid options as follows:

- Bid Option 1: Operation of City-Owned Material Recovery Facility (MRF)
- Bid Option 2: Processing of Recyclables at an Alternate Location
- Bid Option 3: Processing of Recyclables at Two Alternate Locations

All the bidders submitted prices for Bid Option 1. Onyx and WMRA submitted on Bid Option 2, WMRA also submitted on Bid Option 3, and their pricing was the same for all three Bid Options. Their proposed approach for alternate MRF locations was to use the A-1 Recycling Center located at 2101 West Morgan Avenue for the southern sector and use a proposed Milwaukee North MRF located at 9601 North Wausaukee Road in Germantown for the northern sector. If these alternate MRF locations were selected, the bidder would have needed to submit an Operating Plan for the City review, input and approval within 10 days after the Bid date. The result was the City accepted Bid Option 1 and continued to use the City-owned MRF.

The bid provided by WMRA was a very competitive price resulting in long-term savings to the City for recycling. Cost sharing of the recycling revenue is at 50 percent for the City and the Contractor, and recycling revenues have been increasing over the years due to a global demand for recyclable materials.

Appendix A contains a draft letter to the bidders summarizing the MRF bid results. In addition, excerpts from WMRA's bid regarding potential use of alternate MRF locations is also included in this Appendix.

## 2.2 Existing and Proposed Regional Recycling Facilities

Waukesha County had a study conducted in 2007 which included evaluating the potential of a regional recycling facility to serve Waukesha County, City of Wauwatosa, and City of Milwaukee. The report entitled "Waukesha County Recycling System and Capacity Study, Final Report" was prepared by RRT Design and Construction and GBB (Waukesha County Study). The conclusion of the regional facility investigation was that the regional concept had merit and should be further explored. One of the main

advantages for this regional facility is to provide a long-term competitive situation for recycling services. The regional facility is based on the premise that it would be government-owned and operated by a private firm. After the Waukesha report, a preliminary MRF site was identified near West 116th Street and Walnut in Wauwatosa, and elected officials in Wauwatosa approved the site for consideration.

WMRA recently constructed a recycling facility in Germantown which has the capacity to handle the recyclables from the City of Milwaukee and provides the City with another option in the future. In this case, the City could convert the existing recycling facility into a transfer station or use other transfer sites.

The WMRA facility currently receives recyclables at their facility in Germantown from Waste Management customers as far away as Green Bay, Madison and Janesville in addition to southeastern Wisconsin.

## 3.0 EXISTING RECYCLING FACILITIES AND COLLECTION ROUTES

The City of Milwaukee has 34 recycling routes which are served by 34 trucks. In recent years, this number has been reduced to 31 crews during the seven months of the year from May through November, accomplished through eliminating up-the-driveway service in some routes. Each of the trucks has 1 driver on board who collects and dumps the recyclables as well as driving the truck. Most routes have carts to collect recyclables. Some routes have bins for recyclables. The recycling trucks are parked at the recycling facility, also referred to as the Materials Recovery Facility or MRF, and travel to the designated recycling route to collect recyclables. At the end of the day, the recycling truck brings the recyclables to the MRF for processing and the truck is parked.

Currently recyclables are picked-up from each household one time each month, with some exceptions. A pilot study by the City of Milwaukee and research from other cities has shown greater recycling rates when pick-up is more frequent than once per month. The following are believed to be some of the reasons why collection more frequent than once per month is preferred:

- The carts become full for many households before their next pickup, so they stop recycling until their cart is emptied, with overflow recyclables going in the garbage.
- The carts can become too heavy for some residents to safely move so they stop recycling for the month before their cart becomes too heavy.
- When collection is more frequent, it is more justifiable to require residents to roll out carts, allowing for considerable gains in collection efficiency versus up-the-drive service.

Data has shown more frequent collection of recyclables can increase recycling volumes by 10 to 20 percent. This study investigates the costs of increasing the frequency of collection based on efficient pilot studies conducted in Milwaukee and looks at the costs versus the benefits. It also looks at the costs of using two-person crews rather than one-person crews.

Currently, recycling in Milwaukee is dual stream, meaning that the paper products are separated from the cans and bottles by the consumer. The carts have a divider to keep the two streams separate. The carts are rolled to the rear of the split-body recycler truck where a lifting mechanism dumps the cart so that the two waste streams fall into their respective side of the truck. Although these split trucks are used today and are still being ordered, if single stream recycling is decided on for the future, the existing trucks and carts can still be utilized by removing the cart divider and tipping full carts into both sides of the truck. The tipping mechanism on the split packers allows for tipping carts on either side as well as in the middle as described above. Also, until single stream trucks and carts would be purchased in the future, the trucks could be modified to add another cart tipper arm if two-person crews are decided on.

The MRF's equipment is in poor condition due to many years of operation. Most of the equipment was installed in the early 1990s, and the manufacturer of the equipment is no longer in business. This

situation makes it difficult for the contractor to maintain the equipment and has resulted in the contractor needing to pay a premium for custom-made equipment parts to keep the equipment operating. WMRA recently shared a report with the City that was an assessment of the condition of the processing equipment in the existing City MRF. The report recommends no further investment in the existing equipment other than routine maintenance. This supports the conclusion that within the near future the City must either install a new system or have recyclables processed at another facility.
Technology changes in recycling have been dramatic over the past 10 to 20 years, resulting in substantially more cost-effective and efficient processing equipment. For example, modern processing equipment accommodates the prevalence of single serve plastic bottles that generally were not part of the recycling stream fifteen years ago, and thus are not efficiently sorted with older equipment. The result is the existing processing equipment is both outdated and nearing the end of its useful life.

## 4.0 RECYCLING FACILITY ALTERNATIVES

The City of Milwaukee has several opportunities to continue to serve the city with recycling collection and processing. Now is the time to assess these recycling options because the City's existing MRF equipment is near the end of its life, and the City's contract with WMRA can be extended for five 1-year periods allowing the City to plan and implement another recycling program if desired during this period.

The recycling facility alternatives are as follows:

Alternative A – Dual Stream at Existing City Facility
Alternative B – Single Stream at Existing City Facility (City Only)
Alternative C – Two Transfer Stations to Third Party
Alternative D – One Transfer Station at Existing City Facility
Alternative E – Regional MRF at Wauwatosa
Alternative F – Regional MRF at Existing City Facility

The description of each alternative is presented herein. Estimated costs for each alternative are presented later in this report. The cost estimates in this report assume that the "third party" is WMRA in Germantown. For all alternatives, recycling collection costs are identified for monthly, 3-week, and 2-week collection scenarios. Only alternative A would continue the current dual stream collection program. Under all other alternatives, the City of Milwaukee would employ single stream collection.

### 4.1 Alternative A – Dual Stream at Existing City Facility

Alternative A would consist of continuing the City's current dual stream processing at the existing MRF. The existing equipment would be replaced entirely due to the age and condition of the processing equipment. The structural aspects of the facility would remain basically the same. A cost allowance is included for some structural improvements to accommodate the new process equipment. Staffing is projected to remain about the same and operation would continue by a private party. There are options regarding implementing this alternative which include the City purchasing and installing the equipment, or having a third party design, build and operate the system. If the City purchased and installed the equipment, a third party could operate it.

Recycling collection would remain the same as the existing program. Recycling trucks would be parked at the existing City MRF. Separate cost estimates are prepared for monthly, every 3-week, and every 2-week collection scenarios.

### 4.2 Alternative B – Single Stream at Existing City Facility (City Only)

Alternative B would consider single stream processing instead of the current dual stream. Single stream processing means all the recyclables are collected in a single undivided cart and then sorted at the MRF. This approach is more user friendly and collection friendly resulting in more recyclables being placed at the curb by the public and more efficient collection by the recycling truck operation. Single stream collection is more user friendly because the public can simply consolidate all recyclables in the home and place them all in one cart without further sorting. The recycling industry is moving toward single stream recycling nationwide. Single stream can accommodate fully automated collection, which improves efficiency by allowing carts to be serviced without the driver exiting the vehicle.

The existing recycling equipment would be removed and replaced with the new equipment. A cost allowance is included for some structural improvements to accommodate the new process equipment. Staffing is projected to remain about the same or less staff depending on the extent of automation as compared to the existing staff. There are two options regarding implementing this alternative which include the City purchasing and installing the equipment and using a third party to operate, or having a third party design, build and operate the system.

Recycling collection would be upgraded to reflect single stream operations, as it would under all the remaining alternatives as well. One-person or two-person collection crews are possible. The collection fleet can be upgraded over time to increase efficiency. The existing 95-gallon carts can be reused and modified easily by removal of the divider within the cart.

### 4.3 Alternative C – Two Transfer Stations to Third Party

Alternative C pertains to constructing two new transfer stations for recyclables. One station would be located at 3879 West Lincoln Avenue, which is the location of the current self-help center and solid waste transfer station. The second transfer station would be located on the northwest side of the City. Multiple locations are under consideration.

Collection of recyclables would be taken to one of the transfer stations. The recyclables would be placed in a compactor to crush the materials to increase the density, thereby allowing more recyclables to be placed in a semi tractor trailer. This approach saves on the transportation cost for trucking recyclables to the MRF. For this evaluation, the collection trucks are assumed to be located at the respective transfer station. If this alternative is selected, parking accommodations for the recycling trucks need to be further confirmed regarding available space.

Operation and maintenance costs for the transfer stations are estimated and based on a private firm performing the work. Operation and maintenance costs for the hauling to the MRF and MRF operation are based on services performed by a third party.

Recycling collection costs are identified for monthly, 3-week, and 2-week collection for single stream processing.

### 4.4 Alternative D – One Transfer Station at Existing City Facility

Alternative D would consist of converting the existing City MRF into a recycling transfer station. This alternative was addressed in the October 2008 Draft No. 2 Recycling Facilities Study report prepared by Earth Tech AECOM.

A compactor and related improvements would be added to the MRF. The transfer station would be operated by a third party which would transport the recyclables by semi truck to a processing facility.

Transfer station capital equipment could be provided directly by the third party firm and are estimated for this study.

Recycling collection addresses monthly, 3-week, and 2-week collection scenarios based on single stream collection.

### 4.5 Alternative E – Regional MRF at Wauwatosa

Alternative E is based on Waukesha County, City of Wauwatosa, and City of Milwaukee developing a new MRF located at West 116th Street and Walnut in Wauwatosa. The Waukesha County Study will serve as the basis for this alternative with some additional input from vendors for updated equipment costs. A single stream MRF is evaluated. The operation would be by a third party.

Recycling collection would be based on the City of Milwaukee recycling trucks being parked at the regional MRF. This assumption needs to be further verified with the City of Wauwatosa and Waukesha County. Another option is to park the City of Milwaukee recycling trucks at the existing City MRF though the collection costs would be somewhat higher, as discussed in the Earth Tech AECOM October 2008 Draft No. 2 Report. Preliminary discussions between the City of Milwaukee and City of Wauwatosa indicate there would be room for the City of Milwaukee trucks to be parked at the Wauwatosa site.

Recycling collection addresses monthly, three-week, and two-week collection scenarios based on single stream collection.

### 4.6 Alternative F – Regional MRF at Existing City Facility

Alternative F considers Waukesha County, City of Wauwatosa, and City of Milwaukee developing a MRF at the City's existing MRF on Mount Vernon. The City's current dual stream processing would be replaced with single stream processing equipment. The existing equipment would be replaced entirely due to its age, size, and condition. The structural aspects of the facility would remain basically the same. A cost allowance is included for some structural improvements to accommodate the new process equipment. Staffing is expected to increase from the current level based on additional recycling tonnage and is estimated based on the Waukesha County Report. The processing would be performed by a private firm as currently done.

Recycling collection for Waukesha County and City of Wauwatosa and transport to the City of Milwaukee MRF are not part of this study, but are recommended to be evaluated by Waukesha County and the City of Wauwatosa to develop the most cost-effective approach if this alternative is further considered.

Recycling collection for the City of Milwaukee addresses monthly, 3-week, and 2-week collection scenarios based on single stream collection.

# 5.0 COST ANALYSIS CONSIDERATIONS

## 5.1 Sources for Cost Information

AECOM attempted to obtain actual cost data when developing the budget costs. The source of the cost data is noted when a cost is used for the first time. When the data was well researched in a previous report and updating this data was not possible due to time constraints, or in the opinion of AECOM updating the data would not yield a different result, the previous report data was used. If information was not available from either of the previously discussed sources, AECOM estimated these costs using their experience with historical data for similar projects. A summary of references (footnotes) and additional detail about some of the cost data can be found in Appendix J.

In all cases it is important to note that these are budget costs. As budget costs they are based on many different assumptions. The basis of these costs and the key assumptions are documented in this section.

## 5.2 Common Assumptions and Cost Components

There are several global assumptions and costs that will be used when determining the particular cost of each alternative. This information is presented in this section.

### 5.2.1 Volume of Recyclables

The Waukesha County Study presented data which projected the volume of recyclable materials that would be generated by City of Milwaukee. The Waukesha County Study also presents data projecting the volume of recyclable materials that would be generated by various communities within Waukesha County that are likely to use the services of a new MRF.[1] In July of 2009, Perry Lindquist from Waukesha County updated these figures in his presentation to the City of Milwaukee.[2]

The volume of recyclables for these two scenarios is presented in the following table:

| Scenario | Waukesha Study[1] (tons/year) | Perry Lindquist Presentation[2] (tons/year) | Projected Volumes (tons/year)* |
|---|---|---|---|
| City of Milwaukee only | 28,354 – 29,015 | 23,000 | 23,000 - 27,000 |
| City of Milwaukee, City of Wauwatosa, Waukesha County (County) | 76,000 – 80,817 | 52,000 | 52,000 - 60,000 |
| NOTES:<br>* Projected volumes used in this report's cost analysis | | | |

Mr. Lindquist explained during his presentation to the City of Milwaukee that some Waukesha County communities will probably not be part of a regional plan based on discussions with these parties. Therefore, Mr. Lindquist's tonnage estimates are viewed as more reasonable projections and therefore are incorporated into this report.

### 5.2.2 Collection Frequency and Projected Volumes

The Projected Volumes presented in the table above are based on the monthly collection schedule that the City is currently following.

If the City were to switch to single stream processing/collection a modest increase in the recycling volume will also be realized due simply to the fact that recycling is easier. For purposes of the cost analysis a 4% increase will be added to the Projected Volume for those scenarios that utilize single stream processing/collection.

As part of this report, AECOM will also evaluate the impact of increasing the collection to every three weeks, and every two weeks. The various collection schedules and all the impacts are discussed later in Section 5 in this report. The net result however is that increasing the frequency of the collection schedule should result in an increase in the Projected Volume of recyclable material.

For purposes of the cost analysis, AECOM increased the total Projected Volume by 10% (of the monthly collection volume) for a three week collection schedule, and by 20% (of the monthly collection volume) for a two week collection schedule.

### 5.2.3 Dual Stream Recycling

Current trends in the recycled waste industry continue to move away from Dual Stream Recycling. This is happening for a variety of reasons which have been well documented in previous reports.

The Waukesha County Study concludes that:

> *"The body of evidence indicates that single stream recycling is here to stay and should be considered the state of the art when properly designed and operated. This conclusion is reached because of its obvious advantages to the user, the increase in collected tons, and that collection cost savings can be significant."*[3]

This conclusion is well supported in various studies and trade journals. As such, AECOM is using the cost information for Dual Stream Recycling and the associated equipment provided in the Waukesha Study, and applying an escalation factor.

**Dual Stream Recycling Capital Equipment Costs**

The Waukesha County Study estimates the cost of Dual Stream Equipment and Systems to be $3,500,000.[4]

This cost is assumed to be for Dual Stream Equipment capable of processing 30,000 tons per year. These costs are presented in 2007 dollars. Adjusting these costs for inflation, the installed cost of Dual Stream Equipment and Systems in 2009 dollars is $3,600,000.[5]

As stated above AECOM did not research the cost of Dual Stream processing equipment. The $3,600,000 figure above is still suspected to be low. In order to come up with a more realistic number for the cost of dual stream equipment, AECOM estimated the cost using the following method:

The cost for Single Stream equipment was researched (see section 5.2.4). Using the Waukesha County Study, the ratio of dual stream equipment cost/single stream equipment cost was calculated to be 88% ($3,500,000/$4,000,000)[4]. This ratio was multiplied by the Single Stream Equipment Cost derived by AECOM (88% x $5,200,000) which resulted in a cost of $4,576,000. This is the figure that AECOM used for the Dual Stream Equipment cost.

The cost for equipment capable of processing 60,000 tons per year is not presented. It is assumed that if the City were to build a facility to process more than their own recyclables that they would install a single stream system.

The estimated costs for Dual Stream Equipment are presented in the following table.

| Cost Item | Estimated Cost | Notes |
|---|---|---|
| Dual Stream Equipment (30,000 tons/year) | $4,576,000 | |
| Engineering/Design and Constructions Services | $549,000 | 12% of cost* |
| Contingency | $686,000 | 15% of cost |
| Subtotal | $5,811,000 | |
| City Administrative Costs | $174,000 | Estimated at 3% of Subtotal |
| **Total** | **$5,985,000** | |

NOTES:

* This percentage is based on AECOM historical data for engineering, development of bid documentation, and construction/start-up oversight.

### 5.2.4 Single Stream Recycling Capital Equipment Costs

In order to estimate the equipment cost of a single stream system, AECOM contacted several of the industry leading MRF equipment manufacturers for current budget numbers (see Appendix J for additional information). In addition to soliciting information from equipment manufacturers, AECOM also obtained information from the public records about two recently installed systems that are approximately the same size.

A brief summary of the information collected is presented in the table below:

| Information Source | System Size | Cost |
|---|---|---|
| RRT Design and Construction<br>Waukesha County Study<br>Prices adjusted for inflation and presented in 2009 dollars. [5,6] | 30,000 TPY | $4,161,000 |
| Van Dyk Baler Corporation<br>Van Dyk Baler is the distributor for Bollegraff turnkey systems. | 30,000 TPY<br><br>80,000 TPY* | did not respond |
| Bulk Handling Systems<br>Bulk Handling Systems provides turnkey systems | 30,000 TPY<br><br>80,000 TPY* | did not respond |
| JWR Incorporated<br>JWR Inc.<br>Jerry Flickinger<br>Equipment Sales Manager | 30,000 TPY<br><br><br>80,000 TPY* | <br><br><br>$6,000,000 – $7,000,000 |
| Kent County, Michigan<br>Calvin Brinks<br>Purchasing Supervisor<br>Kent County Purchasing Division<br>provided public information about their recently awarded contracts for construction. The facilities' equipment was designed and installed by RRT Design and Construction | 15 -18 TPH or<br>30,000 - 36,000 TPY | $5,205,000 |
| Outagamie County, Wisconsin<br>Jill Haygood<br>Outagamie County provided public information | 25 TPH or<br>50,000 TPY | $7,700,000 |

| Information Source | System Size | Cost |
|---|---|---|
| about their recently constructed facility. The facilities' equipment was designed and installed by Bulk Handling Systems | | |
| NOTES:<br><br>* At the time the information was solicited 80,000 tons per year was still being considered. | | |

For purposes of this report, AECOM will use the figures presented in the table below for estimating the cost of an installed single stream processing system:

| Commodity | 30,000 tons/year | 80,000 tons/year |
|---|---|---|
| Process Equipment | $5,200,000 | $7,700,000 |
| Engineering Design and Construction Services (12%) | $624,000 | $924,000 |
| Contingency (15%) | $780,000 | $1,155,000 |
| Subtotal | $6,604,000 | $9,799,000 |
| City Administrative Costs (3%) | $198,000 | $293,000 |
| **Total** | **$6,802,000** | **$10,092,000** |

An 80,000 ton per year system would not be required. If the City were to purchase equipment for processing their recyclables the 30,000 ton per year system would be selected. This system can be operated at a rate of 15 to 18 tons per hour therefore:

15 tons/hour x 40 hours/week x 52 weeks/year = 31,200 tons per year
18 tons/hour x 40 hours/week x 52 weeks/year = 37,440 tons per year

If the City were to partner with Waukesha County, a 30,000 ton per year system would also be selected and a second shift would be added to achieve the 60,000 TPY processing rate.

For purposes of the cost analysis, it is assumed that all costs and revenue related to operation of the MRF would be split on a percentage based on the total tonnage provided by each entity. The City's split percentage would be 44% of the cost and revenues. Waukesha County and City of Wauwatosa would be 44% and 12% respectively, for their share.

If the City were to partner with Waukesha County and build a MRF somewhere other than at the existing City MRF then the additional cost of a building and the cost of site improvements would be required. The cost of land is not considered because the Waukesha Study did not use a land cost in their analysis. The Waukesha County Study estimates the cost of the building to be $3,500,000 and the cost of site improvements to be $750,000.[6] When these two numbers are added and adjusted for 2009 dollars the total cost for a facility's building and site improvements is $4,427,000. As discussed in section 5.2.3, the Waukesha Study numbers are assumed to be on the low side. Using the same scale up factor as in section 5.2.3 (88%) a cost of $5,000,000 is more realistic ($4,427,000/0.88). As a final check this figure is compared to the building costs for the similarly sized facility that was constructed in Kent County Michigan that was discussed in the previous section. The costs for the building and site improvements for that Kent County Michigan facility were $6,388,000 (see Appendix J).

Taking all of these different numbers into consideration, and factoring in their own historical data AECOM will use a cost of $6,000,000 for the building and site improvements for the cost analysis. This is aside from the process equipment costs listed in the table above.

### 5.2.5 MRF Operation and Maintenance

**Operation and Maintenance of a Dual Stream Recycling Facility**

The Waukesha Study estimates the annual cost of operation and maintenance of a Dual Stream Facility to be $42.96/ton[7] (2010 dollars) for a 30,000 ton per year system.

**Operation and Maintenance of a Single Stream Recycling Facility**

The Waukesha County Study estimates the annual cost of operation and maintenance of a single stream facility to be $44.02/ton (2010 dollars) for a 30,000 ton per year system and $36.70 (2010 dollars) for an 80,000 ton per year system.[7]

There is limited detail in the Waukesha County Study as to what went into the development of these costs. General rules of thumb suggest that it costs approximately $50.00/ton to operate a large volume single stream facility which is also in the same range of costs. A third party contract can be quite variable in its processing fee depending upon if they also receive a portion of the recyclables revenue.

**City Operation and Maintenance Costs**

The O&M cost is largely dependent on the system selected (the level of automation), the cost of local labor and a variety of other factors. The City has historically contracted all of the Operation and Maintenance of their existing MRF to a third party for a negotiated rate per ton. For purposes of the Cost analysis in this report, AECOM will assume that the City will continue to contract this service.

The O&M cost that AECOM used for each particular cost scenario is presented in the table below:

| Cost Scenario | O&M Rate ($/ton) | Source |
|---|---|---|
| Dual Stream Processing | $43.00 | Waukesha County Study |
| Single Stream Processing | $46.00 | AECOM scaled up factor from current City rate of $41.94/ ton* |
| NOTES:<br><br>* Phone conversation with Rick Meyers on 8-17-09. AECOM assumes more people/equipment are required to operate a Single Stream MRF resulting in a higher O&M cost per ton. | | |

AECOM's estimates for O&M are in line with data presented in the AECOM Recycling Facility Study that was presented in October of 2008. The Waukesha County Study and the City's own data confirm that these are reasonable estimates.

The O&M Data is used in Costs analysis as part of the Revenue calculation.

### 5.2.6 MRF Revenue

The City's contract with WMRA for processing recyclables is based on the current market rate for the processed material, and the current negotiated O&M cost. There is also an adjustment to deduct the volume of mixed residue waste but for purposes of this report the mixed residue waste is assumed to be factored out in the recovery rate.

The simplified formula for calculating the recycling revenue for MRF in the cost analysis is as follows:

[(Recycled Material Market Price per ton) / 2 - (MRF O&M Cost per ton)] x (Pick-Up Schedule Volume in tons)

The avoided disposal costs can be added in order to provide a total net benefit per ton. For scenarios that increase recovery of recyclables, this is used to calculate the full benefit of that scenario by applying the avoided disposal costs to any resulting additional recycling tons. The avoided disposal cost formula is calculated as follows:

(Trash Reduction Volume in tons) x (Trash Disposal Price per ton)

Where:

- Recycled Material Market Price = Current market price per ton for sellable materials recovered at the MRF
- Pick-Up Schedule Volume = Volume of Recyclables picked up and brought to the facility for each collection scenario
- MRF O&M Cost = Operation and Maintenance Cost of the MRF (see section 5.2.5)
- Trash Reduction Volume = the volume of recyclable material that would otherwise go in the trash for landfill disposal (used in two and three week collection schedules only)
- Trash Disposal Price = the City's cost to dispose of trash ($35.00/ton)

A positive result in this revenue formula represents an income to the City and a negative result in this formula represents a cost to the City.

**Recycled Material Market Price**

The Waukesha County Study estimates median net revenue of $77.78 per ton. This number is based on data compiled by the County over 10 years from 1991 to 2006.[8] It should be noted that this data is several years old and market conditions are constantly changing.

In order to determine the Recycled Material Market Price, AECOM will use a figure that is based on revenues listed in the monthly contract reports from WMRA to the City. The determination of this figure is based on data presented in the table below:

| Year | Revenue Per Ton[9] ($/ton) | Average Revenue Per Ton* ($/ton) |
|---|---|---|
| 2003 | $74.97 | $74.97 |
| 2004 | $95.43 | $85.20 |
| 2005 | $96.80 | $89.07 |
| 2006 | $88.61 | $88.95 |
| 2007 | $108.56 | $92.87 |
| 2008 | $116.58 | $96.82 |
| 2009 | $46.69 | $89.66 |
| NOTES:<br>* Sum of the current + previous year(s) revenue / total number of years | | |

The recycling market is based on a global economy. The recent down turn in the economy directly impacts the recycling revenue. The long-term forecast is for an improved economy and a return to higher values for recyclables.

$90.00 per ton will be used as the Recycled Material Market Price for the "LOW Cost" scenarios.

$110.00 per ton will be used as the Recycled Material Market Price for the "HIGH Cost" scenarios.

### 5.2.7 Modifications to Existing MRF

**Existing City MRF Demolition**

The existing City MRF dual stream processing equipment would be removed if the existing MRF is used in a particular cost scenario. Some of the equipment may have some salvage value, and the equipment does have a scrap value, however the current price of scrap steel is relatively low. A cost of $250,000 is included for the demolition of the equipment. This cost assumes that any salvage/scrap value for the equipment will go to the demolition contractor as part of the $250,000 estimate. If there is salvageable equipment (with a salvage value associated with it) this could lower the $250,000 cost estimate. A cost of $100,000 is also included for some facility upgrades if the existing MRF structure is continued to be used. These are assumed to be the cost of some minor structural, floor, utility, and miscellaneous repairs following demolition.

Some alternatives consider no longer using the City MRF. In these cases the existing MRF may also be demolished. The demolition cost of the MRF is not included in any of the alternatives because the future use of the existing MRF in these scenarios has not been determined.

Using the existing MRF as a transfer station or as the location for the new recycling facility has several advantages:

- There is sufficient space at the existing facility for either application.
- The City currently owns this asset; new land acquisition is not an issue.
- The use of the facility essentially remains unchanged ("not in my back yard" issues are avoided).
- The City recently spent $320,000 on roof repairs that will be taken advantage of and building/facility costs will be minimized.
- The haul routes to the facility are known and can be calculated.
- The geographic location is easily accessible to/from major highways.

AECOM estimates that it will cost $250,000 to demolish the equipment at the existing City MRF.
The estimated costs to modify the existing MRF are presented in the table below. The useful life of the new facility is estimated to be 15 years before major upgrades would need to be made (see section 5.2.11).

Although there are several advantages to utilizing the existing location, it is recognized that the existing MRF is located in an area where real estate values are on the rise, and as such this property is a valuable asset to the City for future planning.

### 5.2.8 Waste Transfer Station Equipment

For purposes of this report, AECOM will use the figures presented in the table below for estimating the cost of an installed/delivered piece of equipment.

| Commodity* | Cost/unit | Source |
|---|---|---|
| Compactor | $150,000 | Stepp Equipment Corporation |
| Transfer Trailers | $110,000 | Stepp Equipment Corporation |
| Semi Tractor | $100,000 | AECOM Recycling Facility Study |
| Yard Truck | $100,000 | AECOM Recycling Facility Study |
| Front-End Loader | $350,000 | AECOM Recycling Facility Study |

NOTES:

* The City is not likely to purchase this equipment. There is the option that all of the equipment will be provided by a third party as part of a design/build/operate scenario.

### 5.2.9 Transfer Facility Cost

In developing an estimate for the costs associated with constructing a new Transfer Facility (TF), three separate scenarios were considered:

- Constructing two new Transfer Facilities including the cost of two new buildings. This is referred to the New North TF Scenario, and New South TF Scenario.

- Constructing a new Transfer Facility at the existing MRF which includes the cost of modifying the existing building. This is referred to as the Existing MRF Transfer Facility Scenario.

The following assumptions were made about all three scenarios:

- The cost of land was not considered. All new Transfer Facilities are presumed to be located on property that the City already owns.

- Each facility will need to have the following features:

    - Site improvements (paving, drainage, fencing, etc.)
    - Building with tipping floor and 3 truck bays (80'x80'x30')
    - 1 compactor
    - 1 scale
    - 1 fuel station
    - Parking for a portion of the recycle truck fleet (including electrical stations for winter)
    - 1 yard truck
    - 1 end-loader
    - 1 semi tractor
    - Parking for 3 compacted waste hauling trailers and semi tractor

Some of these features already exist at the assumed locations. If this alternative is deemed feasible, additional evaluation should be performed to refine the costs such as relocating the scale to serve the New North TF, or use of the existing trash scale to serve the New South TF. The current cost estimate is meant to be on the conservative side. A cost for this feature will be included if the feature does not exist.

Neither the cost of relocation of the satellite recycle drop off centers (Self Help Center on the Northwest side), or the cost of relocation of any waste processing equipment/operations have been included in these cost scenarios.

AECOM will use the figures presented in the table below for estimating the construction costs of the New North Transfer Facility.

| Commodity | Cost | Source |
|---|---|---|
| Site Improvements and new building | $1,100,000 | AECOM historical data (Fayette County Landfill – Iowa) |
| Scale | $ 100,000 | AECOM Estimate |
| Fuel Station (underground tank assumed) | $ 100,000 | AECOM Estimate |
| Parking for a portion of the recycle truck fleet (10,000 square feet for 12 trucks and electrical outlets) | $ 75,000 | AECOM Estimate |
| Subtotal | $1,375,000 | |
| Engineering/Design and Construction Services | $ 165,000 | 12% of cost |
| Contingency | $ 206,000 | 15% |
| Facility and Equipment Subtotal | $1,746,000 | |
| City Administrative Costs | $ 52,000 | Estimated at 3% |

| Commodity | Cost | Source |
|---|---|---|
| **Total** | **$1,798,000** | |

AECOM will use the figures presented in the table below for estimating the construction costs of the New South Transfer Facility.

| Commodity | Cost | Source |
|---|---|---|
| Site Improvements and new building | $1,100,000 | AECOM historical data (Fayette County Landfill – Iowa) |
| Scale | $ 100,000 | AECOM Estimate |
| Fuel Station (underground tank assumed) | $ 100,000 | AECOM Estimate |
| Parking for a portion of the recycle truck fleet (20,000 square feet for 24 trucks and electrical outlets) | $ 150,000 | AECOM Estimate |
| Subtotal | $1,450,000 | |
| Engineering/Design and Construction Services | $ 174,000 | 12% of cost |
| Contingency | $ 218,000 | 15% |
| Facility and Equipment Subtotal | $1,842 ,000 | |
| City Administrative Costs | $ 55,000 | Estimated at 3% |
| **Total** | **$1,897,000** | |

AECOM will use the figures presented in the table below for estimating the construction costs of a new Transfer facility located at the existing City MRF location.

| Commodity | Cost | Source |
|---|---|---|
| Site Improvements for compactor installation | $100,000 | AECOM Estimate |
| Engineering /Design and Construction Services | $ 12,000 | 12% of cost |
| Contingency | $ 15,000 | 15% |
| Subtotal | $ 127,000 | |
| City Administrative Costs | $ 4,000 | estimated at 3% |
| **Total** | **$ 131,000** | |

### 5.2.10 Recyclables Transfer Facility Operation and Maintenance

The City currently contracts the O&M of their waste transfer facilities to a third party, so it is assumed that they would do the same for a new Recyclables Transfer Facility. It is also assumed that the O&M cost would include the processing fee at a third party MRF, and the cost of transportation to the MRF.

The current industry trend is to include the non-subsidized processing cost in the fee along with some revenue sharing component. This allows the third party MRF to cover their operating costs no mater what the market for recyclables is doing.

The O&M cost that AECOM used for the Transfer Facility Scenarios are presented in the table below

| Cost Scenario | O&M Rate ($/ton) | Source |
|---|---|---|
| Two Transfer Facility Operations | $60.00 | $42.00/ton for O&M + $18.00/ton ($9x2) for transportation to MRF |
| Single Transfer Facility Operations | $52.00 | $42.00/ton for O&M + $10.00/ton for transportation to MRF |

AECOM's estimates for O&M are in line with data presented in the AECOM Recycling Facility Study that was presented in October of 2008.

The O&M Data is used in Costs analysis as part of the Revenue calculation.

### 5.2.11 Transfer Facility Net Revenue

The City currently does not have a contract for transferring Recyclables to a third party MRF for processing to use as a model. As stated above, the current trend is for the third party MRF to ensure that their processing costs are covered. It is also reasonable to assume that the third party fee would also have some element of revenue sharing to it. This provides financial incentive for the processor to try and obtain the best rate for the recyclables, and to operate as efficiently as possible.

The formula for calculating the Net Revenue in the cost analysis for the Transfer Facility is as follows:

[(Recycled Material Market Price per ton) / 2 - (Third Party O&M Cost per ton)] x (Pick-Up Schedule Product Volume in tons)

The avoided disposal costs can be added in order to provide a total net benefit per ton. For scenarios that increase recovery of recyclables, this is used to calculate the full benefit of that scenario by applying the avoided disposal costs to any resulting additional recycling tons. The avoided disposal cost formula is calculated as follows:

(Trash Reduction Volume) x (Trash Disposal Price)

Where:

- Recycled Material Market Price = Current market price per ton for sellable materials recovered at the Third Party MRF
- Pick-Up Schedule Volume = Volume of Recyclables picked up and brought to the Transfer Facility for each collection scenario
- Third Party O&M Cost = O&M Cost (see section 5.2.10)
- Trash Reduction Volume = the volume of recyclable material that would otherwise go in the trash (used in two and three week collection schedules only)
- Trash Disposal Price = the City's cost to dispose of trash ($35.00/ton)

A positive result in this revenue formula represents an income to the City and a negative result in this formula represents a cost to the City.

### 5.2.12 Facility and Equipment Life Expectancy

Buildings and grounds are generally expected to last 40 to 50 years.[9]

Process equipment with routine maintenance and service can last for many years. The waste recycling industry relies heavily on material handling equipment. A reasonable estimate for the life expectancy of material handling equipment is 10 to 15 years. This is also true for motors, controls, starters, and most electrical equipment.[9, 10]

Recycling commodities may change due to packaging, consumer trends, etc., it is reasonable to assume that in 15 years there will also be the need to change most of the equipment to adapt to the changing times. This assumption holds true when looking at the City's dual stream recycling equipment which is no longer considered optimal even though it was purchased and installed in the mid 1990's.

The equipment and building at the transfer facility is subjected to more severe service as such it has a shorter life expectancy.

AECOM will use the figures presented in the table below for estimating the useful life of a particular piece of equipment.

| Commodity | Life Expectancy | Source |
|---|---|---|
| Buildings and Grounds | 30 years | EPA publication EPA 816-R-03-016 September 2003 |
| Single Stream Process Equipment | 10 to 15 years | AECOM/ Waukesha Study/JWR Incorporated |
| Compactor | 10 years | Stepp Equipment Corporation |
| Yard Truck | 15 years | AECOM / Stepp Equipment Corporation |
| Front End Loader | 15 years | AECOM / Stepp Equipment Corporation |

Based on all of the information presented above, the life cycle of a transfer station or a MRF will be evaluated for no longer than 15 years. This coincides with the assumptions in the Waukesha County Study.[11] The salvage value of a new building (if required) will be assumed to be 50% if its original cost.

### 5.2.13 Transportation Cost Estimates

The transportation costs consist of collection and transport of recyclables. Transport costs are included for taking compacted loads of recyclables from the two new transfer stations or from the downtown transfer station to the WMRA Germantown (third party) recycling center. If the existing MRF is improved and used as a processing center or if the regional Wauwatosa recycling center is used there are no transport costs to the City because end-users pick up the sorted recyclables at the MRF.

Collection of recyclables is based on 34 dual stream recycling trucks, each with a one-man crew, collecting within the 34 collection routes, or sectors. In the summer there are typically 31 collection routes, and the City is considering going to 31 collection routes year round. For simplicity, this study assumes 31 collection routes for the monthly collection alternative and 34 collection routes for the three and two week alternatives. Costs associated with driving the collection trucks to the sectors in the morning from either of the MRFs or from the two Transfer Stations and back at the end of the day are included in the cost estimates. This drive is assumed to occur only once per day per sector. Driving within each of the 34 sectors is assumed to be common to all options so it is not evaluated as a separate cost item.

Additional costs will be added to the collection options if additional personnel and additional trucks are required to carry out the scenario described. For example, additional drivers and trucks are required to accomplish the scenario of one driver pickup up every 2 weeks (approximately 13 drivers and 13 trucks). Approximately 13 more employees are needed to staff the 2-person crew for pickup up every 3 weeks, while 2 trucks and 35 employees are needed for 2-person crew to pick up every 2 weeks. Costs for single compartment trucks are assumed to be capital expenditures of $198,000. Costs for the additional employees are included at their full cost including benefits for the full, 52-week year ($96,885). Costs for all scenarios are shown on Tables 1 through 4.

The City of Milwaukee performed a pilot study in which they collected data to determine what the crew requirements would be if they want to change from picking up recyclables once per month through up-the-drive service to once every 3 weeks or once every 2 weeks with carts placed at the collection location by the resident. They found that, on average, a typical one-person crew can service 350 households each day for dual stream recycling when the carts are set out at the collection location once per month. We assume the rate is the same for single stream, although it might be a little better. A summer 2009 analysis of the twice per month recycling pilot program showed that more frequent pickup results in more households per day served. The main reason for this is probably because not as many carts are out every time when pickup is more frequent. For twice per month pickup, on average, the 1-person crews pick up 372 households per day. By dividing the total number of households that need recycling pick-up

each month by the pickup rate (number of HH/day) and by the number of pick-up days in the cycle, the number of crews needed to pick-up on that cycle can be determined. This data and resultant information is shown on the spreadsheet included in Appendix K. The costs are included in Tables 1 through 4.

The City of Milwaukee collects recyclables from carts located either up the driveways, in alleys, or at the curb depending on the areas. Some areas are also served using bins. Retrieving carts up the driveway is time consuming. The current rate of collection is about 270 households per day. Based on a City of Milwaukee pilot study, the recycling collection rate was 350 households per day when the carts are placed at the curb, or are in the alley. It is in the City's best interest to avoid as much as possible walking up driveways to retrieve carts for collection. This time adds to the City's cost for recycling collection. Some cities charge a fee for those households that request the additional service of the City to going up the driveway to get the cart.

The City of Milwaukee is also interested in determining what effect single stream recycling and two-person crews would have on the recycling rates and collection costs. The data available for garbage collection crews can be used to estimate the crew requirements if two-person crews are used on cycles of once per month, once every 3 weeks, or once every 2 weeks. On average, a typical two-person crew can service 500 households each day. By dividing the total number of households that need recycling pick-up each month by 500 HH/day and by the number of pick-up days in the cycle, the number of crews needed to pick-up on that cycle can be determined. This data and resultant information is shown on the spreadsheet included in Appendix F. The costs are included in Tables 1 through 4.

Recyclable collection one time per month is not desirable for several reasons based on the City's survey of users. Many users collect more recyclables than the 95-gallon cart can handle in a one month period so the surplus recyclables end up in the trash thereby reducing the City's recycling revenue and increasing the solid waste cost to the City. Secondly, elderly people have complained about the weight of a filled cart after one month of collection. More frequent collection would reduce the content weight in the cart. Other users commented that monthly collection was too infrequent resulting in users forgetting to put out the cart and compounding the problem of an overfilled cart. Studies performed by others also indicate more frequent collection improves recycling participation and increases tonnage.

### 5.3 Present Worth Analysis

A present worth analysis was performed to determine the project costs for the recycling alternatives. The present worth is the theoretical amount of money needed to cover capital, operations and maintenance, and transportation costs over the term of the project. It is based on investing the money today at a certain interest rate to cover all costs over the project term.

For this project, a 15-year term is proposed to reflect the useful life of new processing equipment at the MRF. An annual interest of seven percent is used.

**Present Worth Analysis:**

- Capital cost will be figured at the beginning of the period.
- Annual costs will be calculated using uniform present worth calculation.
- The “Salvage Value Cost” portion of the equation will only be used in scenarios where a new facility is required

$$P = (Capital\ Cost) + \left[ A\ x\ \frac{(1+i)^n - 1}{i\,(1+i)^n} \right] + D\,(1+i)^{-n}$$

Where:

| | | |
|---|---|---|
| P | = | Present worth |
| Capital Cost | = | Sum of the capital cost |

| | | |
|---|---|---|
| A | = | Sum of the annual Income and annual costs |
| D | = | Sum of the salvage values at the end of the period |
| i | = | Annual interest rate (7%) or (.07) |
| n | = | Period (15 years) |

Therefore, for all equations, the uniform present worth factor for annual costs will be the same.

$$\frac{(1 + (.07))^{15} - 1}{(0.7)\ (1 + (.07))^{15}} = 9.11$$

For those equations that use depreciation, the present worth factor for the depreciation will be the same.

$$(1+(.07))^{-15} = 0.3624$$

## 6.0 COST ANALYSIS

The cost analysis for the respective alternatives is included in these Appendices:

| Alternative | Appendix |
|---|---|
| A - Dual Stream at Existing City Facility (City Only) | D |
| B - Single Stream at Existing City Facility (City Only) | E |
| C - Two Transfer Stations to Third Party | F |
| D - One Transfer Station at Existing City Facility | G |
| E - Regional MRF at Wauwatosa | H |
| F - Regional MRF at City Facility | I |

## 7.0 DISCUSSION OF RESULTS

### 7.1 Discussion of Recycling Facility Alternatives Cost Comparison

Tables 1 through 4 are a cost comparison of recycling facility alternatives addressing four scenarios of recycling tonnage and recycling revenue. The table includes capital, operation and maintenance, transportation, and total present worth costs. The following is a discussion of the alternatives addressing monetary and non-monetary considerations. A discussion on the transportation options is presented later in this section for all the alternatives.

As previously mentioned, City costs are shown as a negative number such as the annual O&M cost. Revenue to the City such as the revenue from recyclables is a positive number. Therefore, the alternative with the largest positive number or least negative number is the most-cost effective solution for the City. Alternative D - One Transfer Station at the Existing City Facility with single stream collection every three weeks using one person per truck is the most cost-effective solution and results in a total present worth revenue of approximately $-3,546,000 based on Table 1 - Low Volume, Low Price scenario, and $-892,000 based on Table 2 - Low Volume, High Price scenario. Salvage values of new

facilities were incorporated into the analysis for scenarios C and E. Salvage values are the worth of a structure or process equipment at the end of a cost analysis period and converted to a present worth. Based on a 15-year life processing equipment would have nearly zero salvage value. Structures would have about 50 percent value based on a 30-year life. Based on a general review of the alternatives, Alternative D is the most cost-effective because it has the least capital cost.

The analysis considers revenue sharing at 50:50 between the third party and the City based on the City's current agreement.

**Alternative A – Dual Stream at Existing City Facility**

Dual stream processing is currently being performed by the City. This alternative replaces the existing equipment with new equipment. The MRF would only serve the City. The industry trends are definitely moving away from dual stream processing because single stream collection of recyclables is more cost-effective, and recycling volumes are higher with single stream collection because it is easier for the public to place all recyclables in one cart without presorting of materials.

**Alternative B – Single Stream at Existing City Facility (City Only)**

Single stream processing at the existing City MRF was evaluated and would only serve the City. The existing equipment would be replaced with single stream equipment. Industry trends are toward single stream collection and processing. Based on the present worth analysis, Alternative B was not the most cost-effective alternative.

**Alternative C – Two Transfer Stations to Third Party**

Two transfer stations servicing the City of Milwaukee, one on the south side and one on the northwest side of the City would need to be constructed. Collection trucks would need to be parked at the transfer stations and parking space for these trucks may not be available. If parking space is not available at the transfer station(s), either one or more properties would need to be obtained or continue to park the trucks at the existing City MRF. The cost assessment considered parking at the two transfer stations.

Recyclables would be transported to a third party. For this evaluation, transport to WMRA's new MRF in Germantown was considered. The costs to construct two transfer stations are significant. These costs do not include the capital cost for the self-help center relocation for the northwest side of Milwaukee or the solid waste transfer station relocation. Based on the present worth analysis, Alternative C was not the most cost-effective alternative.

**Alternative D – One Transfer Station at Existing City Facility**

The alternative considers converting the City's MRF on Mount Vernon Avenue into a recycling transfer station. The improvements could be provided by WMRA or another third party in the future, who would operate the facility. Recyclables would be transported to a third party processor, such as WMRA's MRF in Germantown, for example.

This alternative was addressed in the Earth Tech AECOM October 2008 recycling report with input from WMRA. This approach would increase the City's cost due to transporting the recyclables to Germantown by about $250 per semi truckload according to WMRA preliminary 2008 proposal. Closing the City's MRF and sending Milwaukee recyclables to the Germantown MRF would reduce WMRA labor costs associated with processing the City's recyclables. This situation may result in more savings passed on to the City, potentially offsetting the additional transportation costs. These matters can be further negotiated with WMRA in the future.

Based on the present worth analysis, Alternative D was the most cost-effective alternative. Alternative D results in the least capital investment to the City. It also is the least risk to the City. The City keeps the option available in the future, say 5 to 15 years from now, to relocate the transfer station if the City deems the property too valuable for operation as a transfer station. Alternatively, the City also would also retain the option under Alternative D to install new recycling processing equipment in the building in the future if development of a new MRF becomes advantageous. This study provides the City with estimated costs for transfer stations to better assess the economics of a new transfer station.

In the future, the key to the City's success is to have a strong, favorable, and fair contract with a third party to continue to meet the City's needs in the years ahead. Market volatility directly impacts the recycling pricing, and now is not a good time to obtain favorable rates for recycling. The City's current contract is very fair to all parties, but more recent contracts for other communities such as Waukesha County and City of Wauwatosa have been more favorable, but were developed when the value of recyclables was substantially better.

**Alternative E – Regional MRF at Wauwatosa**

This alternative was originally evaluated in the Waukesha County Study, though not specific to the Wauwatosa site later identified and then considered in this study. AECOM has since gathered additional capital cost information on similar single stream MRFs constructed in 2008-2009. The newly constructed MRFs tend to have higher construction costs than originally projected in the Waukesha County Study. For these reasons, AECOM's projected capital costs for a regional MRF at Wauwatosa are significantly higher than indicated in the Waukesha Study.

Implementing a regional MRF involving Waukesha County, City of Wauwatosa, and City of Milwaukee can be a political and administrative challenge. Winnebago, Outagamie, and Brown Counties successfully implemented joint landfill and single stream recycling MRF construction and operations.

A government owned MRF which is privately operated does provide the communities with additional control because the operating contract can be bid out every 5 to 10 years to maintain competition. On the other hand, Alternative D involving a transfer station and a third party for processing minimizes your capital investment. In the future, if the communities no longer feel the contract is fair, the matter of building a new MRF can be re-evaluated at that time. The business aspects of recycling are rapidly changing depending on the market for goods. If recycling prices improve, other private businesses may move into the area providing more competition. Secondly, recycling prices are dictated by a global economy. Therefore, the pricing of a third party business in Wisconsin is primarily influenced by the global market. The competitive nature of the recycling business should keep third party businesses providing fair, competitive services.

The current third party contracts with the City of Milwaukee, Waukesha County, City of Wauwatosa and other communities throughout southern Wisconsin present competitive fair rates for recycling services.

The regional MRF would require additional discussions and negotiations by the affected governments to determine the contract requirements and allocation of capital, operation and maintenance costs, as well as recycling revenues.

Alternative E Costs to the City are based on the City providing 44 percent of the recyclable tonnage. Capital costs likewise reflect the City's share. Based on the present worth analysis, Alternative E is not the most cost-effective option.

**Alternate F – Regional MRF at Existing City Facility.**

This alternative would replace the existing dual stream equipment with single stream equipment. For regional operation including Waukesha County, City of Wauwatosa, and City of Milwaukee, a two-shift operation is proposed to reduce the capital cost for the equipment.

The capital cost for this alternative is less than a regional MRF at Wauwatosa because the City of Milwaukee MRF already has the structure, scale, and parking facilities. Highway access off of Interstate I-94 is very good using the 13th Street exit.

The transportation costs from Waukesha County and City of Waukesha would need to be addressed. There may need to be a transfer station at Waukesha County, or possibly converting their existing MRF into a transfer station if feasible.

Governmental coordination, negotiations, and contracts would need to be resolved by the affected parties similar to Alternative E, Regional MRF at Wauwatosa.

The regional MRF would be operated by a third party such as WMRA. Alternative F costs to the City are based on the City providing 44 percent of the recyclable tonnage. Capital costs likewise reflect the City's share. Based on the present worth analysis, Alternative F is not the most cost-effective option.

### 7.2 Single Stream Recycling Benefits

Single stream recycling is recommended for the following reasons:

- Increased public participation is documented nationwide resulting in more recyclables processed.
- The estimated increase in recyclables for the City of Milwaukee, estimated at 4% in this study, could reach 10 percent based on the Waukesha County Study.
- Industry trends nationwide are toward single stream because of more efficient collection and improved public participation.
- Maximize full cart volume without divider restricting contents of each side’s respective materials.
- Existing City carts can be reused with a minor modification, and purchasing undivided carts in the future saves approximately 15-20% compared to the cost of split carts.
- Existing packer trucks can be used, and purchasing single body recycling packers in the future saves approximately 15% compared to the cost of split-body trucks.

### 7.3 Labor Impacts

The most cost-effective alternative is Alternative D – One Transfer Station at Existing City Facility. There would be no change in travel time for City collection trucks, and only modest labor savings can be achieved by tipping at two transfer sites instead of one. A third party such as WMRA would operate the transfer station and transport the recyclables to Germantown where their MRF is a state-of-the-art single stream processing facility. WMRA has offered to employ the existing WMRA staff from the City MRF for positions at the Germantown MRF. The same labor contractor would be involved and the City’s contractual requirements for employment would still be enforced. The proposed Alternative D would result in less WMRA employees than the current MRF. There is the possibility that WMRA could offer a bus service to take the current Milwaukee MRF staff to Germantown.

### 7.4 Transportation and Collection Alternatives

The collection of recyclables addressed one person and two person crews, and monthly, every three weeks, and every two weeks pick up. Monthly collection and every three week collection can be cost-effectively accomplished. Collection every three weeks has the potential for more recyclables being collected based on a City survey, a City pilot program, and similar studies by others. An estimated increase in recyclables of ten percent is projected with three week pickup as compared to monthly. For three week pickup to be cost effective, the carts need to be placed at the curb. The City would no longer provide walk up the driveway service, unless reimbursed by the customer for this extra effort. This is based on a one person crew. DPW research shows that Milwaukee residents would consider it a service improvement to have scheduled, more frequent, and guaranteed dates of collection requiring them to set out carts versus having driveway service on unknown dates about once per month.

Two week pickup was evaluated and an increase of about 20 percent in recyclables is estimated over monthly pickup. The two week frequency required additional personnel and trucks which cost more than the direct financial benefit of receiving more recyclables. Therefore, this approach does not appear cost-effective at this time.

Two-person crews were not cost-effective. The analysis showed that two-person crews collected from approximately 40 percent more households per day than one-person crews. This increase is not enough to justify the cost of additional personnel. Also, the trucks might fill up in less than one day, meaning they would travel more distance in order to empty the load during the day and return to collecting.

An expanded pilot program could be implemented for three week collection to further refine the collection program. The City also plans to either purchase or develop software to evaluate collection routes for potentially better collection efficiency.

However, every other week collection is a goal worth pursuing in future years because it provides a greater customer service level that is more comparable to that of other communities, both regionally and throughout the country. The increased recovery of recyclables that comes with more collection also provides the public with greater environmental benefits. Furthermore, anticipated City efforts to reduce residential garbage disposal will likely result in increased demand for more recycling collection capacity. While it may not be deemed cost-effective to move to every other week collection presently, it is clear that once per month collection will not be sufficient for a large percentage of households served. AECOM strongly recommends increasing recycling collection to at least every third week collection at this time.

## 8.0 OTHER RECYCLING CONSIDERATIONS

### 8.1 Measures to Reduce Tonnage to Landfill and Benefits

There are a number of measures the City can do to reduce tonnage to the landfill. These items include the following:

- Public Education

  Public education in the form of news releases, media events, flyers and related information can inform the public regarding measures to be taken to reduce solid waste and increase recycling revenue. Waste diverted from landfills is equally beneficial to the user and City. DPW's *Recycle For Good* promotion campaign is a prudent investment in public outreach and education.

- Recycling Collection Frequency

  The City's pilot study in addition to other studies throughout the nation show a positive trend toward increased recyclables when the collection frequency increases. For the City of Milwaukee, this study indicates three week frequency collection is possible with existing staff and

trucks if the carts are placed at the curb and staff no longer needs to walk up the driveway to obtain the cart. Some of the cities have added a surcharge to users where staff needs to walk up the driveway to obtain a cart.

- Pay as You Throw

  There is increasing interest nationwide in a "pay as you throw" (PAYT) program. The most common approach is for the user to pay for a certain size garbage container(s) and the recycling cart is free. The more items recycled the less garbage which benefits the user as well as the City. Lisa Skumatz of Skumatz Economic Research Associates, Inc. (SERA) has studied PAYT and surveyed over 700 communities about recycling and PAYT. The results are very positive in favor of PAYT.

  Appendix L of this report contains technical literature from SERA summarizing the results of their findings. About 25 percent of the communities nationwide have PAYT. The PAYT program results in a decrease in the trash tonnage and increase in the recycling tonnage. They found PAYT has the single biggest impact on diversion and can result in 16 to 17 percent diversion from residential trash which is generally divided equally among recycling, yard waste and source reduction. Additional information is contained in Appendix L.

## 9.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

### 9.1 Summary

The City of Milwaukee is under contract with WMRA to operate the City's recycling facilities. The City's contract extended to June 30, 2009, plus the City has the sole option to renew the contract for up to five 1-year periods. The existing dual stream processing equipment is at the end of its useful life and the City is interested in evaluating recycling alternatives.

The following recycling alternatives were evaluated:

- Alternative A – Dual Stream at Existing City Facility
- Alternative B – Single Stream at Existing City Facility
- Alternative C – Two Transfer Stations to Third Party
- Alternative D – One Transfer Station at Existing City Facility
- Alternative E – Regional MRF at Wauwatosa
- Alternative F – Regional MRF at Existing City Facility

The regional MRF would include the City of Milwaukee, Waukesha County, and City of Wauwatosa. In 2007, Waukesha County commissioned a study which included evaluating a regional MRF and the conclusion was a regional MRF showed promise and should be further explored.

The following recycling collection options were evaluated for the City of Milwaukee:

- Dual Stream – one-person crew
- Single Stream
  - One-person operation
  - Two-person crew

Other recycling considerations addressed in the study included potential measures to reduce tonnage going to landfills. Single stream collection is viewed as one way to increase public participation in recycling programs. With single stream, it is easier to recycle because there is only one cart and no

required sorting between different types of recyclables. In the case of the City of Milwaukee, an estimated 4 percent increase in recyclables is expected and as high as a 10 percent increase may be possible using single stream collection. Pay as you throw is an approach which has increased recyclables and decreased waste tonnage based on results from other communities. PAYT has been shown to be the single most effective method of diverting materials from the waste stream.

Recycling collection frequency was evaluated to address the capital and operating expenses for the following:

- Monthly
- 3 Weeks
- 2 Weeks

## 9.2 Conclusions

Based on the findings in this study, the following conclusions are made:

1. Alternative D – One Transfer Station At Existing City Facility, is the most cost-effective approach. Processing would be performed by a third party such as WMRA at their new MRF in Germantown. For the sake of discussion, in the fall of 2008 WMRA suggested the same per ton billing rates as the current plus the additional cost to operate the transfer station and transport the recyclables. The additional cost is about $250 per semi truckload. Less staff would be needed, but WMRA indicated they would offer jobs at the Germantown MRF to their employees currently working at the City's MRF.

2. Single stream collection offers the benefit of more efficient collection. It maximizes the cart volume and improves convenience for residents. One-person crews are more cost-effective at this time. While the City currently employs a semi-automated collection program with cart lifters on the back of trucks, single stream allows the possibility of using fully-automated vehicles where the driver does not have to exit the truck. A one person operation with a collection truck with arm attachments to pick up a cart results in an efficient operation and less workmen compensation claims because the heavy lifting is performed entirely with mechanical means.

3. Recycling collection frequency can have an effect on the amount of recyclables obtained. Two-week collection frequency is ideal as compared to the current monthly pick-up, but was not cost-effective. Three-week collection is the most cost-effective while also expected to increase recycling volume. Recycling collection scheduled with a set out date at the collection point (no driveway walk up) is the most cost-effective and efficient operation. Public information and refrigerator magnets with a calendar may help improve participation. Two-week collection results in higher collection costs due to more recycling trucks and more staff. The benefits of additional recycling revenue must be balanced against the added collection cost.

4. Pay As You Throw has been successfully implemented throughout the nation and has been proven to increase the recycling tonnage as well as to reduce waste.

## 9.3 Recommendations

The following recommendations are made:

1. Implement Alternative D – One Transfer Station at Existing City Facility, based on the economics. It presents the least investment and least risk to the City of Milwaukee.

2. Negotiate with WMRA to implement Alternative D.

3. Implement three-week recycling collection to increase recycling volumes and revenues. Schedule recycling collection for the cart to be located at the curb or alley line (no walk up driveway) to improve collection efficiency. Make improvements to the routes based on new software for routing trucks.

4. Implement Pay As You Throw features for garbage collection in conjunction with increased recycling collection service to optimize effectiveness of both programs.

# TABLES

# TABLE 1
# COST COMPARISON OF RECYCLING ALTERNATIVES LOW VOLUME - LOW PRICE

**LOW Volume (23,000 TPY) - LOW Recycled Material Price ($90.00/Ton)**

| Collection | System | Schedule | Cost / Income | Processing: Alternative A – Dual Stream at Existing City Facility | Alternative B – Single Stream at Existing City Facility (City Only) | Alternative C – Two Transfer Stations to Third Party | Alternative D – One Transfer Station at Existing City Facility | Alternative E – Regional MRF at Wauwatosa | Alternative F – Regional MRF at Existing City Facility |
|---|---|---|---|---|---|---|---|---|---|
| | Dual Stream | Monthly* | Capital ($) | -$6,235,000 | | | | | |
| | | | Trash Reduction Income ($/Yr) | $0 | | | | | |
| | | | Recyclable Income ($/Yr) | $46,000 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | $0 | | | | | |
| | | | Total Pres. Worth ($) | -$5,816,037 | | | | | |
| | | 3 Weeks (1 person / truck) | Capital ($) | -$6,235,000 | | | | | |
| | | | Trash Reduction Income ($/Yr) | $80,500 | | | | | |
| | | | Recyclable Income ($/Yr) | $50,600 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | -$271,000 | | | | | |
| | | | Total Pres. Worth ($) | -$7,509,195 | | | | | |
| | | 3 Weeks (2 persons / truck) | Capital ($) | | | | | | |
| | | | Trash Reduction Income ($/Yr) | | | | | | |
| | | | Recyclable Income ($/Yr) | Not Analyzed | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | | | | | | |
| | | | Total Pres. Worth ($) | | | | | | |
| | | 2 Weeks (1 person / truck) | Capital ($) | -$9,141,000 | | | | | |
| | | | Trash Reduction Income ($/Yr) | $161,000 | | | | | |
| | | | Recyclable Income ($/Yr) | $55,200 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | -$1,395,912 | | | | | |
| | | | Total Pres. Worth ($) | -$19,885,699 | | | | | |
| | | 2 Weeks (2 persons / truck) | Capital ($) | | | | | | |
| | | | Trash Reduction Income ($/Yr) | | | | | | |
| | | | Recyclable Income ($/Yr) | Not Analyzed | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | | | | | | |
| | | | Total Pres. Worth ($) | | | | | | |
| | Single Stream | Monthly* | Capital ($) | | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 |
| | | | Trash Reduction Income ($/Yr) | | $0 | $0 | $0 | $0 | $0 |
| | | | Recyclable Income ($/Yr) | Not Applicable | -$23,920 | -$358,800 | -$167,440 | -$22,880 | -$22,880 |
| | | | Collection Costs ($/Yr) | | -$247,088 | -$188,735 | -$247,088 | -$306,353 | -$247,088 |
| | | | Total Pres. Worth ($) | | -$9,520,316 | -$8,078,873 | -$4,156,482 | -$8,200,653 | -$5,701,724 |
| | | 3 Weeks (1 person / truck) | Capital ($) | | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 |
| | | | Trash Reduction Income ($/Yr) | | $83,720 | $83,720 | $83,720 | $80,080 | $80,080 |
| | | | Recyclable Income ($/Yr) | Not Applicable | -$26,312 | -$358,800 | -$184,184 | -$26,058 | -$26,058 |
| | | | Collection Costs ($/Yr) | | -$271,000 | -$207,000 | -$271,000 | -$336,000 | -$271,000 |
| | | | Total Pres. Worth ($) | | -$8,997,375 | -$7,809,504 | -$3,764,257 | -$7,770,262 | -$5,219,096 |
| | | 3 Weeks (2 persons / truck) | Capital ($) | | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 |
| | | | Trash Reduction Income ($/Yr) | | $83,720 | $83,720 | $83,720 | $80,080 | $80,080 |
| | | | Recyclable Income ($/Yr) | Not Applicable | -$26,312 | -$394,680 | -$184,184 | -$26,058 | -$26,058 |
| | | | Collection Costs ($/Yr) | | -$1,531,000 | -$1,467,000 | -$1,531,000 | -$1,596,000 | -$1,531,000 |
| | | | Total Pres. Worth ($) | | -$20,473,329 | -$19,285,458 | -$15,240,211 | -$19,246,216 | -$16,695,050 |
| | | 2 Weeks (1 person / truck) | Capital ($) | | -$9,958,000 | -$6,601,000 | -$3,287,000 | -$8,538,880 | -$6,148,880 |
| | | | Trash Reduction Income ($/Yr) | | $167,440 | $167,440 | $167,440 | $80,080 | $160,160 |
| | | | Recyclable Income ($/Yr) | Not Applicable | -$28,704 | -$430,560 | -$200,928 | -$29,420 | -$29,420 |
| | | | Collection Costs ($/Yr) | | -$1,531,000 | -$1,467,000 | -$1,531,000 | -$1,596,000 | -$1,531,000 |
| | | | Total Pres. Worth ($) | | -$22,638,601 | -$21,755,736 | -$17,536,200 | -$21,453,469 | -$18,902,304 |
| | | 2 Weeks (2 persons / truck) | Capital ($) | | -$7,499,000 | -$4,142,000 | -$828,000 | -$6,079,880 | -$3,689,880 |
| | | | Trash Reduction Income ($/Yr) | | $167,440 | $167,440 | $167,440 | $160,160 | $160,160 |
| | | | Recyclable Income ($/Yr) | Not Applicable | -$28,704 | -$430,560 | -$200,928 | -$29,420 | -$29,420 |
| | | | Collection Costs ($/Yr) | | -$3,662,000 | -$3,598,000 | -$3,662,000 | -$3,727,000 | -$3,662,000 |
| | | | Total Pres. Worth ($) | | -$39,588,536 | -$38,705,671 | -$34,486,135 | -$38,403,404 | -$35,852,239 |

* Monthly refers to the schedule of the current program, mostly non-guaranteed with up-the-driveway service for households not on alleys.

# TABLE 2
# COST COMPARISON OF RECYCLING ALTERNATIVES HIGH VOLUME - LOW PRICE

**HIGH Volume (27,000 TPY) - LOW Recycled Material Price ($90.00/Ton)**

| Collection | System | Schedule | Cost / Income | Processing: Alternative A – Dual Stream at Existing City Facility | Alternative B – Single Stream at Existing City Facility (City Only) | Alternative C – Two Transfer Stations to Third Party | Alternative D – One Transfer Station at Existing City Facility | Alternative E – Regional MRF at Wauwatosa | Alternative F – Regional MRF at Existing City Facility |
|---|---|---|---|---|---|---|---|---|---|
| | Dual Stream | Monthly* | Capital ($) | -$6,235,000 | | | | | |
| | | | Trash Reduction Income ($/Yr) | $0 | | | | | |
| | | | Recyclable Income ($/Yr) | $54,000 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | $0 | | | | | |
| | | | Total Pres. Worth ($) | -$5,743,173 | | | | | |
| | | 3 Weeks (1 person / truck) | Capital ($) | -$6,235,000 | | | | | |
| | | | Trash Reduction Income ($/Yr) | $94,500 | | | | | |
| | | | Recyclable Income ($/Yr) | $59,400 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | -$271,000 | | | | | |
| | | | Total Pres. Worth ($) | -$7,301,535 | | | | | |
| | | 3 Weeks (2 persons / truck) | Capital ($) | | | | | | |
| | | | Trash Reduction Income ($/Yr) | | | | | | |
| | | | Recyclable Income ($/Yr) | Not Analyzed | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | | | | | | |
| | | | Total Pres. Worth ($) | | | | | | |
| | | 2 Weeks (1 person / truck) | Capital ($) | -$9,141,000 | | | | | |
| | | | Trash Reduction Income ($/Yr) | $189,000 | | | | | |
| | | | Recyclable Income ($/Yr) | $64,800 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | -$1,395,912 | | | | | |
| | | | Total Pres. Worth ($) | -$19,543,242 | | | | | |
| | | 2 Weeks (2 persons / truck) | Capital ($) | | | | | | |
| | | | Trash Reduction Income ($/Yr) | | | | | | |
| | | | Recyclable Income ($/Yr) | Not Analyzed | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | | | | | | |
| | | | Total Pres. Worth ($) | | | | | | |
| | Single Stream | Monthly* | Capital ($) | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 | |
| | | | Trash Reduction Income ($/Yr) | $0 | $0 | $0 | $0 | $0 | |
| | | | Recyclable Income ($/Yr) | -$28,080 | -$421,200 | -$196,560 | -$2,640 | -$2,640 | |
| | | | Collection Costs ($/Yr) | -$247,088 | -$188,735 | -$247,088 | -$306,353 | -$247,088 | |
| | | | Total Pres. Worth ($) | -$9,558,205 | -$8,647,206 | -$4,421,704 | -$8,016,309 | -$5,517,380 | |
| | | 3 Weeks (1 person / truck) | Capital ($) | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 | |
| | | | Trash Reduction Income ($/Yr) | $98,280 | $98,280 | $98,280 | $92,400 | $92,400 | |
| | | | Recyclable Income ($/Yr) | -$30,888 | -$421,200 | -$216,216 | -$30,067 | -$30,067 | |
| | | | Collection Costs ($/Yr) | -$271,000 | -$207,000 | -$271,000 | -$336,000 | -$271,000 | |
| | | | Total Pres. Worth ($) | -$8,906,441 | -$8,302,059 | -$3,923,390 | -$7,694,565 | -$5,143,400 | |
| | | 3 Weeks (2 persons / truck) | Capital ($) | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 | |
| | | | Trash Reduction Income ($/Yr) | $98,280 | $98,280 | $98,280 | $92,400 | $92,400 | |
| | | | Recyclable Income ($/Yr) | -$30,888 | -$463,320 | -$216,216 | -$30,067 | -$30,067 | |
| | | | Collection Costs ($/Yr) | -$1,531,000 | -$1,467,000 | -$1,531,000 | -$1,596,000 | -$1,531,000 | |
| | | | Total Pres. Worth ($) | -$20,382,395 | -$19,778,013 | -$15,399,344 | -$19,170,519 | -$16,619,354 | |
| | | 2 Weeks (1 person / truck) | Capital ($) | -$9,958,000 | -$6,601,000 | -$3,287,000 | -$8,538,880 | -$6,148,880 | |
| | | | Trash Reduction Income ($/Yr) | $196,560 | $196,560 | $196,560 | $92,400 | $184,800 | |
| | | | Recyclable Income ($/Yr) | -$33,696 | -$505,440 | -$235,872 | -$33,946 | -$33,946 | |
| | | | Collection Costs ($/Yr) | -$1,531,000 | -$1,467,000 | -$1,531,000 | -$1,596,000 | -$1,531,000 | |
| | | | Total Pres. Worth ($) | -$22,418,846 | -$22,172,513 | -$17,589,245 | -$21,270,274 | -$18,719,108 | |
| | | 2 Weeks (2 persons / truck) | Capital ($) | -$7,499,000 | -$4,142,000 | -$828,000 | -$6,079,880 | -$3,689,880 | |
| | | | Trash Reduction Income ($/Yr) | $196,560 | $196,560 | $196,560 | $184,800 | $184,800 | |
| | | | Recyclable Income ($/Yr) | -$33,696 | -$505,440 | -$235,872 | -$33,946 | -$33,946 | |
| | | | Collection Costs ($/Yr) | -$3,662,000 | -$3,598,000 | -$3,662,000 | -$3,727,000 | -$3,662,000 | |
| | | | Total Pres. Worth ($) | -$39,368,781 | -$39,122,448 | -$34,539,180 | -$38,220,209 | -$35,669,043 | |

* Monthly refers to the schedule of the current program, mostly non-guaranteed with up-the-driveway service for households not on alleys.

# TABLE 3
# COST COMPARISON OF RECYCLING ALTERNATIVES LOW VOLUME - HIGH PRICE

**LOW Volume (23,000 TPY) - HIGH Recycled Material Price ($110.00/Ton)**

| | | | | Processing | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Collection** | **System** | **Schedule** | **Cost / Income** | **Alternative A – Dual Stream at Existing City Facility** | **Alternative B – Single Stream at Existing City Facility (City Only)** | **Alternative C – Two Transfer Stations to Third Party** | **Alternative D – One Transfer Station at Existing City Facility** | **Alternative E – Regional MRF at Wauwatosa** | **Alternative F – Regional MRF at Existing City Facility** |
| | Dual Stream | **Monthly*** | **Capital ($)** | -$6,235,000 | | | | | |
| | | | **Trash Reduction Income ($/Yr)** | $0 | | | | | |
| | | | **Recyclable Income ($/Yr)** | $276,000 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | **Collection Costs ($/Yr)** | $0 | | | | | |
| | | | **Total Pres. Worth ($)** | -$3,721,220 | | | | | |
| | | **3 Weeks (1 person / truck)** | **Capital ($)** | -$6,235,000 | | | | | |
| | | | **Trash Reduction Income ($/Yr)** | $80,500 | | | | | |
| | | | **Recyclable Income ($/Yr)** | $303,600 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | **Collection Costs ($/Yr)** | -$271,000 | | | | | |
| | | | **Total Pres. Worth ($)** | -$5,204,897 | | | | | |
| | | **3 Weeks (2 persons / truck)** | **Capital ($)** | | | | | | |
| | | | **Trash Reduction Income ($/Yr)** | | | | | | |
| | | | **Recyclable Income ($/Yr)** | Not Analyzed | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | **Collection Costs ($/Yr)** | | | | | | |
| | | | **Total Pres. Worth ($)** | | | | | | |
| | | **2 Weeks (1 person / truck)** | **Capital ($)** | -$9,141,000 | | | | | |
| | | | **Trash Reduction Income ($/Yr)** | $161,000 | | | | | |
| | | | **Recyclable Income ($/Yr)** | $331,200 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | **Collection Costs ($/Yr)** | -$1,395,912 | | | | | |
| | | | **Total Pres. Worth ($)** | -$17,371,919 | | | | | |
| | | **2 Weeks (2 persons / truck)** | **Capital ($)** | | | | | | |
| | | | **Trash Reduction Income ($/Yr)** | | | | | | |
| | | | **Recyclable Income ($/Yr)** | Not Analyzed | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | **Collection Costs ($/Yr)** | | | | | | |
| | | | **Total Pres. Worth ($)** | | | | | | |
| | Single Stream | **Monthly*** | **Capital ($)** | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 | |
| | | | **Trash Reduction Income ($/Yr)** | $0 | $0 | $0 | $0 | $0 | |
| | | | **Recyclable Income ($/Yr)** | Not Applicable | $215,280 | -$119,600 | $71,760 | $205,920 | $205,920 |
| | | | **Collection Costs ($/Yr)** | | -$247,088 | -$188,735 | -$247,088 | -$306,353 | -$247,088 |
| | | | **Total Pres. Worth ($)** | | -$7,341,706 | -$5,900,263 | -$1,977,872 | -$6,116,765 | -$3,617,836 |
| | | **3 Weeks (1 person / truck)** | **Capital ($)** | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 | |
| | | | **Trash Reduction Income ($/Yr)** | $83,720 | $83,720 | $83,720 | $80,080 | $80,080 | |
| | | | **Recyclable Income ($/Yr)** | Not Applicable | $236,808 | -$131,560 | $78,936 | $234,524 | $234,524 |
| | | | **Collection Costs ($/Yr)** | | -$271,000 | -$207,000 | -$271,000 | -$336,000 | -$271,000 |
| | | | **Total Pres. Worth ($)** | | -$6,600,904 | -$5,413,033 | -$1,367,786 | -$5,396,903 | -$2,845,738 |
| | | **3 Weeks (2 persons / truck)** | **Capital ($)** | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 | |
| | | | **Trash Reduction Income ($/Yr)** | $83,720 | $83,720 | $83,720 | $80,080 | $80,080 | |
| | | | **Recyclable Income ($/Yr)** | Not Applicable | $236,808 | -$131,560 | $78,936 | $234,524 | $234,524 |
| | | | **Collection Costs ($/Yr)** | | -$1,531,000 | -$1,467,000 | -$1,531,000 | -$1,596,000 | -$1,531,000 |
| | | | **Total Pres. Worth ($)** | | -$18,076,858 | -$16,888,987 | -$12,843,740 | -$16,872,857 | -$14,321,692 |
| | | **2 Weeks (1 person / truck)** | **Capital ($)** | -$9,958,000 | -$6,601,000 | -$3,287,000 | -$8,538,880 | -$6,148,880 | |
| | | | **Trash Reduction Income ($/Yr)** | $167,440 | $167,440 | $167,440 | $160,160 | $160,160 | |
| | | | **Recyclable Income ($/Yr)** | Not Applicable | $258,336 | -$143,520 | $86,112 | $264,776 | $264,776 |
| | | | **Collection Costs ($/Yr)** | | -$1,531,000 | -$1,467,000 | -$1,531,000 | -$1,596,000 | -$1,531,000 |
| | | | **Total Pres. Worth ($)** | | -$20,024,270 | -$19,141,404 | -$14,921,869 | -$18,773,969 | -$16,222,803 |
| | | **2 Weeks (2 persons / truck)** | **Capital ($)** | -$7,499,000 | -$4,142,000 | -$828,000 | -$6,079,880 | -$3,689,880 | |
| | | | **Trash Reduction Income ($/Yr)** | $167,440 | $167,440 | $167,440 | $160,160 | $160,160 | |
| | | | **Recyclable Income ($/Yr)** | Not Applicable | $258,336 | -$143,520 | $86,112 | $264,776 | $264,776 |
| | | | **Collection Costs ($/Yr)** | | -$3,662,000 | -$3,598,000 | -$3,662,000 | -$3,727,000 | -$3,662,000 |
| | | | **Total Pres. Worth ($)** | | -$36,974,205 | -$36,091,339 | -$31,871,804 | -$35,723,904 | -$33,172,738 |

* Monthly refers to the schedule of the current program, mostly non-guaranteed with up-the-driveway service for households not on alleys.

# TABLE 4
# COST COMPARISON OF RECYCLING ALTERNATIVES HIGH VOLUME - HIGH PRICE

**HIGH Volume (27,000 TPY) - HIGH Recycled Material Price ($110.00/Ton)**

| | | | | Processing | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | System | Schedule | Cost / Income | Alternative A – Dual Stream at Existing City Facility | Alternative B – Single Stream at Existing City Facility (City Only) | Alternative C – Two Transfer Stations to Third Party | Alternative D – One Transfer Station at Existing City Facility | Alternative E – Regional MRF at Wauwatosa | Alternative F – Regional MRF at Existing City Facility |
| Collection | Dual Stream | Monthly* | Capital ($) | -$6,235,000 | | | | | |
| | | | Trash Reduction Income ($/Yr) | $0 | | | | | |
| | | | Recyclable Income ($/Yr) | $324,000 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | $0 | | | | | |
| | | | Total Pres. Worth ($) | -$3,284,040 | | | | | |
| | | 3 Weeks (1 person / truck) | Capital ($) | -$6,235,000 | | | | | |
| | | | Trash Reduction Income ($/Yr) | $94,500 | | | | | |
| | | | Recyclable Income ($/Yr) | $356,400 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | -$271,000 | | | | | |
| | | | Total Pres. Worth ($) | -$4,596,489 | | | | | |
| | | 3 Weeks (2 persons / truck) | Capital ($) | | | | | | |
| | | | Trash Reduction Income ($/Yr) | | | | | | |
| | | | Recyclable Income ($/Yr) | Not Analyzed | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | | | | | | |
| | | | Total Pres. Worth ($) | | | | | | |
| | | 2 Weeks (1 person / truck) | Capital ($) | -$9,141,000 | | | | | |
| | | | Trash Reduction Income ($/Yr) | $189,000 | | | | | |
| | | | Recyclable Income ($/Yr) | $388,800 | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | -$1,395,912 | | | | | |
| | | | Total Pres. Worth ($) | -$16,592,282 | | | | | |
| | | 2 Weeks (2 persons / truck) | Capital ($) | | | | | | |
| | | | Trash Reduction Income ($/Yr) | | | | | | |
| | | | Recyclable Income ($/Yr) | Not Analyzed | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | | | Collection Costs ($/Yr) | | | | | | |
| | | | Total Pres. Worth ($) | | | | | | |
| | Single Stream | Monthly* | Capital ($) | | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 |
| | | | Trash Reduction Income ($/Yr) | | $0 | $0 | $0 | $0 | $0 |
| | | | Recyclable Income ($/Yr) | Not Applicable | $252,720 | -$140,400 | $84,240 | $237,600 | $237,600 |
| | | | Collection Costs ($/Yr) | | -$247,088 | -$188,735 | -$247,088 | -$306,353 | -$247,088 |
| | | | Total Pres. Worth ($) | | -$7,000,706 | -$6,089,707 | -$1,864,205 | -$5,828,227 | -$3,329,298 |
| | | 3 Weeks (1 person / truck) | Capital ($) | | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 |
| | | | Trash Reduction Income ($/Yr) | | $98,280 | $98,280 | $98,280 | $92,400 | $92,400 |
| | | | Recyclable Income ($/Yr) | Not Applicable | $277,992 | -$154,440 | $92,664 | $270,605 | $270,605 |
| | | | Collection Costs ($/Yr) | | -$271,000 | -$207,000 | -$271,000 | -$336,000 | -$271,000 |
| | | | Total Pres. Worth ($) | | -$6,093,193 | -$5,488,811 | -$1,110,142 | -$4,956,075 | -$2,404,909 |
| | | 3 Weeks (2 persons / truck) | Capital ($) | | -$7,052,000 | -$3,695,000 | -$381,000 | -$5,632,880 | -$3,242,880 |
| | | | Trash Reduction Income ($/Yr) | | $98,280 | $98,280 | $98,280 | $92,400 | $92,400 |
| | | | Recyclable Income ($/Yr) | Not Applicable | $277,992 | -$154,440 | $92,664 | $270,605 | $270,605 |
| | | | Collection Costs ($/Yr) | | -$1,531,000 | -$1,467,000 | -$1,531,000 | -$1,596,000 | -$1,531,000 |
| | | | Total Pres. Worth ($) | | -$17,569,147 | -$16,964,765 | -$12,586,096 | -$16,432,029 | -$13,880,863 |
| | | 2 Weeks (1 person / truck) | Capital ($) | | -$9,958,000 | -$6,601,000 | -$3,287,000 | -$8,538,880 | -$6,148,880 |
| | | | Trash Reduction Income ($/Yr) | | $196,560 | $196,560 | $196,560 | $184,800 | $184,800 |
| | | | Recyclable Income ($/Yr) | Not Applicable | $303,264 | -$168,480 | $101,088 | $305,510 | $305,510 |
| | | | Collection Costs ($/Yr) | | -$1,531,000 | -$1,467,000 | -$1,531,000 | -$1,596,000 | -$1,531,000 |
| | | | Total Pres. Worth ($) | | -$19,349,848 | -$19,103,515 | -$14,520,247 | -$18,178,542 | -$15,627,377 |
| | | 2 Weeks (2 persons / truck) | Capital ($) | | -$7,499,000 | -$4,142,000 | -$828,000 | -$6,079,880 | -$3,689,880 |
| | | | Trash Reduction Income ($/Yr) | | $196,560 | $196,560 | $196,560 | $184,800 | $184,800 |
| | | | Recyclable Income ($/Yr) | Not Applicable | $303,264 | -$2,021,760 | -$1,752,192 | $305,510 | $305,510 |
| | | | Collection Costs ($/Yr) | | -$3,662,000 | -$3,598,000 | -$3,662,000 | -$3,727,000 | -$3,662,000 |
| | | | Total Pres. Worth ($) | | -$36,299,783 | -$52,932,939 | -$48,349,670 | -$35,128,477 | -$32,577,312 |

* Monthly refers to the schedule of the current program, mostly non-guaranteed with up-the-driveway service for households not on alleys.

# APPENDICES

# APPENDIX A

## 2004 BID SUMMARY FOR RECYCLING AND EXCERPTS FOR RECYCLE AMERICA ALLIANCE BID

January 30, 2004

Mr. Chris Rooney
Onyx Waste Services Midwest, Inc.
W144 S6350 College Court
P.O. Box 456
Muskego, WI 53150

Mr. Ray Carter
Lee County Landfill
Allied Waste
1214 South Bataan Road
Dixon, IL 61021

Mr. William Theado
Recycled Fibers Division
Newark Group
2601 E. River Road
Moraine, OH 45439

Mr. Bill Leonidas
FCR, Inc.
809 W. Hill Street
Charlotte, NC 28208

Mr. Harry Peltz
Recycle America Alliance
4600 N. Port Washington Road
Milwaukee, WI 53212

Subject: **Bid Tabulation**
**City of Milwaukee**
**MRF Services**
**Official Notice No. 166**

Dear Bidders:

Pursuant to the Official Notice to Bidders, sealed bids for the above referenced project were received in Room 507, Municipal Building on January 22, 2004, until 10:30 a.m. and publicly opened and read aloud at 10:45 a.m. We have reviewed all of the bids received for the project. Enclosed is the Bid Tabulation. In addition, we have reviewed the Qualifications Statements of the Bidders for conformance to the Bid Specifications. The results are as follows.

**Provision of Materials Recovery Facility (MRF) and Recyclables Receiving, Processing, and Marketing Official Notice No. 166**

Five sealed bids were received. The low bid was submitted by Recycle America Alliance LLC in the amount of $ - 3,370,500. This amount is the Net Processing Fee for the first year and the negative value represents a revenue to the City. This bid amount was the same for Bid Options 1, 2, and 3. The second low bid was submitted by the Newark Group Recycled Fibers Division in the amount of $ - 500,000 for Bid Option 1, Operation of City-Owned Material Recovery Facility.

The Qualifications Statement from Recycle America Alliance, LLC meets the Bid Specifications requirements. The forms accompanying their bid were complete.

The City has determined Recycle America Alliance LLC is the Apparent Low Bidder for this project. We wish to thank all the Bidders for their interest and for submitting a Bid.

If you have any questions regarding these matters, please contact Mike Engelbart of my staff at (414) 286-2355.

Very truly yours,

City of Milwaukee

Mariano A. Schifalacqua
Commissioner of Public Works

Enclosure: Bid Tabulation

L:\work\71436\ADMIN\TRANS\LETTERS\166 Bid Tabulation Letter.doc

## Bid Tab Summary

Material Recovery Facility (MRF) and Recyclables Receiving, Processsing, and Marketing

Official Notice Number: 166

| Bidder | | FCR | Allied | Newark | Onyx | Recycle America | Current Contract |
|---|---|---|---|---|---|---|---|
| Bid Option 1: Operation of City Owned Material Recover Facility | | | | | | | |
| A. | Tipping Fee (per ton) | 35 | 47 | 10 | | 37.50 | 17 |
| | Tipping Fee (per year) | 1,750,000 | 2,350,000 | 500,000 | 0 | 1,875,000 | 850,000 |
| B. | Guaranteed year 1 Recyclables Sale Revenue per ton | 40 | 20 | 20 | | 104.91 | |
| | Guaranteed year 1 Recyclables Sale Revenue per year | 2,000,000 | 1,000,000 | 1,000,000 | 0 | 5,245,500 | 0 |
| C | Net Processing Fee (A-B) per year | -250,000 | 1,350,000 | -500,000 | 0 | -3,370,500 | 850,000 |
| Bid Option 2: Processing of Recyclables at an Alternate Location | | | | | | | |
| A. | Tipping Fee (per ton) | | | | 58 | 37.50 | |
| | Tipping Fee (per year) | 0 | 0 | 0 | 2,900,000 | 1,875,000 | 0 |
| B. | Guaranteed year 1 Recyclables Sale Revenue per ton | | | | 2 | 104.91 | |
| | Guaranteed year 1 Recyclables Sale Revenue per year | 0 | 0 | 0 | 100,000 | 5,245,500 | 0 |
| C | Net Processing Fee (A-B) per year | 0 | 0 | 0 | 2,800,000 | -3,370,500 | 0 |
| D | Total Additional Cost to City due to alternate MRF | | | | | | |
| | Total City Cost (C+D) | | | | | | |
| Bid Option 3: Processing of Recyclables at Two Alternate Locations | | | | | | | |
| A. | Tipping Fee (per ton) | | | | | 37.50 | |
| | Tipping Fee (per year) | 0 | 0 | 0 | 0 | 1,875,000 | 0 |
| B. | Guaranteed year 1 Recyclables Sale Revenue per ton | | | | | 104.91 | |
| | Guaranteed year 1 Recyclables Sale Revenue per year | 0 | 0 | 0 | 0 | 5,245,500 | 0 |
| C | Net Processing Fee (A-B) per year | 0 | 0 | 0 | 0 | -3,370,500 | 0 |
| D | Total Additional Cost to City due to alternate MRFs | | | | | | |
| | Total City Cost (C+D) | | | | | | |
| Required Forms (Indicate with Y/N if present) | | | | | | | |
| | Sworn Statement of Bidder | Y | Y | Y | Y | Y | |
| | Bid Bond Form and Affidavit | Y | Y | Y | Y | Y | |
| | Non-Collusion Affidavit | Y | Y | Y | Y | Y | |
| | Disclosure of Ownership[1] | Y, NA | Y, NA | Y | Y, NA | Y, NA | |
| | Designation of Confidential and Proprietary Information | Y | Y, NA | Y | Y | Y | |
| | Parental Guarantee- Material Recovery Facility[1] | Y, NA | Y, NA | Y | Y | Y, NA | |
| | Parental Guarantee- Financial Qualifications[1] | Y, NA | Y, NA | Y | Y | Y, NA | |
| | Acknowledgement of Addendums 1, 2, & 3 | Y | Y | Y | Y | Y | |

Notes:

1. Must be included but may be marked as not applicable.
2. NA means Not Applicable as noted by Bidder.

# City of Milwaukee

## Official Notice - #166

# Material Recovery Facility and Recyclables Receiving, Processing, and Marketing

**Submitted By:**

**Recycle America Alliance, L.L.C.**
**4600 N. Port Washington Road**
**Milwaukee, WI 53212**

**Dated: January 22, 2004**

## II-3 Location and Description of Alternate MRF(s) (if applicable)

3.2.3 Location and Operating Plan of Alternate MRF(s) (if applicable)

The Bidder shall provide a map showing the location of the alternate MRF(s). The Apparent Low Bidder shall submit an Operating Plan for City review, input, and approval within 10 days after the Bid date. This information shall consist of a detailed description of the proposed operations to be employed at the MRF(s) in order to comply with the specifications. The description shall include the following:

- Anticipated traffic flow management procedures for City collection vehicles, including collection vehicle maneuvering, tipping, and weighing procedures.
- Procedures and preliminary schedule for maintaining MRF processing equipment, scales, and mobile equipment.
- Discussion of mobile equipment repair and replacement policies and protocols.
- Operating hours.
- Staffing (number of employees, job classifications, and job descriptions).
- Dust, litter, vector, odor control, and snow and ice control procedures.
- A facility layout that specifies traffic flow and materials receiving areas.

**RAA Statement:**

***This response is in addition to the previous RAA statement as noted in the RFQ.***

As another option, Recycle America Alliance is proposing two alternate processing and drop off locations located in the City of Milwaukee. The Recycle America Alliance location in the southern sector is the A-1 Recycling Center located at 2101 West Morgan Ave. and the Recycle America Alliance site in the northern sector is the Milwaukee North MRF located at 9601 N. Wasaukee Road.

The trucks will enter the property at the identified entrance gate and proceed to the inbound scale to be weighed. Once the inbound gross weight has been recorded, the trucks will be directed to the tipping area for residential fiber. When the tipping floor is available, the driver will be directed to back into the building by the loader operator and drop off the residential fiber stream on his truck.

Once the fiber stream has been tipped and the fiber compartment on the truck is empty the driver will be directed to the drop off area for mixed rigid containers. When the tipping area for mixed containers is available the driver will be directed to the area to drop off the mixed rigid containers from the container compartment of the truck.

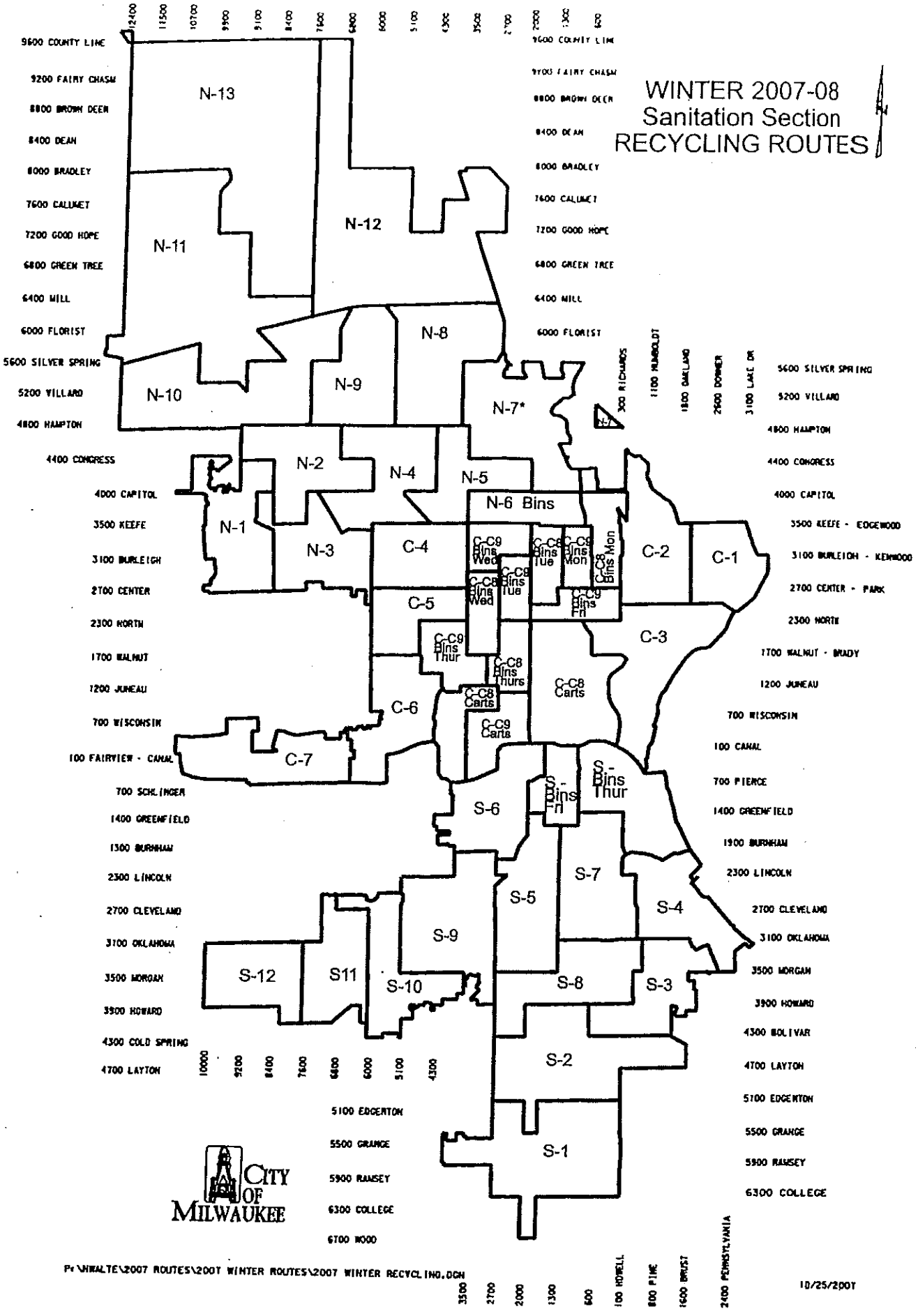
When the driver has completed dropping off the mixed containers the driver will proceed to the outbound scale to be weighed. Once the weighing process is complete, the driver will exit the property by the assigned exit gate.

The residential mixed fiber will be processed at either site and shipped to market. All mixed rigid mixed container will be loaded on company equipment and transferred to one of Recycle America Alliance processing locations in the greater Milwaukee Area for processing and marketing.

All scale information will be sent to the City as required by the contract. While on the Recycle America Alliance property all City of Milwaukee personnel will be required to follow the Recycle America Alliance safety plan and tipping floor policy including the wearing of high visibility PPE. The receiving hours at both Recycle America Alliance Milwaukee plants is 7:00am to 4:00pm M – F and 7am to 12 noon on Sat.

## APPENDIX B

## WINTER 2007-08 SANITATION SECTION RECYCLING ROUTES MAP


WINTER 2007-08
Sanitation Section
RECYCLING ROUTES
N-13
N-12
N-11
N-10
N-9
N-8
N-7*
N-6 Bins
N-5
N-4
N-3
N-2
N-1
C-1
C-2
C-3
C-4
C-5
C-6
C-7
S-1
S-2
S-3
S-4
S-5
S-6
S-7
S-8
S-9
S-10
S11
S-12
C-C9 Bins Wed
C-C8 Bins Tue
C-C9 Bins Mon
C-C8 Bins Mon
C-C8 Bins Wed
C-C8 Bins Tue
C-C9 Bins Fri
C-C9 Bins Thur
C-C8 Bins Thurs
C-C8 Carts
C-C9 Carts
S- Bins Thur
S- Bins Fri
9600 COUNTY LINE
9200 FAIRY CHASM
8800 BROWN DEER
8400 DEAN
8000 BRADLEY
7600 CALUMET
7200 GOOD HOPE
6800 GREEN TREE
6400 MILL
6000 FLORIST
5600 SILVER SPRING
5200 VILLARD
4800 HAMPTON
4400 CONGRESS
4000 CAPITOL
3500 KEEFE
3100 BURLEIGH
2700 CENTER
2300 NORTH
1700 WALNUT
1200 JUNEAU
700 WISCONSIN
100 FAIRVIEW - CANAL
700 SCHLINGER
1400 GREENFIELD
1300 BURNHAM
2300 LINCOLN
2700 CLEVELAND
3100 OKLAHOMA
3500 MORGAN
3900 HOWARD
4300 COLD SPRING
4700 LAYTON
5100 EDGERTON
5500 GRANGE
5900 RAMSEY
6300 COLLEGE
6700 WOOD
9600 COUNTY LINE
9200 FAIRY CHASM
8800 BROWN DEER
8400 DEAN
8000 BRADLEY
7600 CALUMET
7200 GOOD HOPE
6800 GREEN TREE
6400 MILL
6000 FLORIST
5600 SILVER SPRING
5200 VILLARD
4800 HAMPTON
4400 CONGRESS
4000 CAPITOL
3500 KEEFE - EDGEWOOD
3100 BURLEIGH - KENWOOD
2700 CENTER - PARK
2300 NORTH
1700 WALNUT - BRADY
1200 JUNEAU
700 WISCONSIN
100 CANAL
700 PIERCE
1400 GREENFIELD
1900 BURNHAM
2300 LINCOLN
2700 CLEVELAND
3100 OKLAHOMA
3500 MORGAN
3900 HOWARD
4300 BOLIVAR
4700 LAYTON
5100 EDGERTON
5500 GRANGE
5900 RAMSEY
6300 COLLEGE
300 RICHARDS
1100 HUMBOLDT
1800 OAKLAND
2600 DOWNER
3100 LAKE DR
100 HOWELL
800 PINE
1600 BRUST
2400 PENNSYLVANIA
CITY OF MILWAUKEE
P:\NWALTE\2007 ROUTES\2007 WINTER ROUTES\2007 WINTER RECYCLING.DGN
10/25/2007

## Pirrung, Don

**From:** Meyers, Rick [rick.meyers@milwaukee.gov]
**Sent:** Thursday, August 14, 2008 10:22 AM
**To:** Pirrung, Don
**Cc:** Booker, Wanda
**Subject:** RE: Recycling Proposal
**Attachments:** 2007-08 Recycling routes.pdf

Don,
Attached is our route map for winter recycling routes. We have 34 recycling routes. In 2006 and 2008 budget cuts reduced the summer route number to 31. Here is how the routes break down:

North: N-1 through N-5 and N-7 through N-13 = 12 cart routes, + 1/2 bin route (N-6) = 12.5 routes/trucks
Central: C-1 through C-7 = 7 cart routes, + 2 bin/cart combo routes* (C-8 and C-9) = 9 routes/trucks
South: S-1 through S12 = 12 cart routes, + 1/2 bin route (S bins Thurs & S bins Fri) = 12.5 routes/trucks
Total = 34 routes (31 cart routes and 3 bin routes)

*For C-8 and C-9 routes, after those trucks have collected their bin route area for the day they collect a portion of the areas on the map that are labeled "C-8 carts" and "C-9 carts," keeping those areas on roughly a once per month schedule.

In summer 2008 right now we have 31 total trucks each day, with 28 cart and 3 bin. The summer route map is basically the same except consolidating a couple of routes in each Sanitation area. I can provide that map as well if needed.

Winter routes are December through March each year and summer routes are April through November.
We have the data on total tons collected in each route, households per route, lbs/HH, etc., that can be provided if/when needed. Let me know if you have any more questions or information needs at this point. We look forward to your proposal!

-Rick

## APPENDIX C

## LABOR AND MAINTENANCE/FUEL COSTS FROM THE CITY OF MILWAUKEE

## Pirrung, Don

**From:** Booker, Wanda [Wanda.Booker@milwaukee.gov]
**Sent:** Wednesday, August 13, 2008 3:13 PM
**To:** Pirrung, Don
**Cc:** Meyers, Rick; Purko, James
**Subject:** FW: Recycling Proposal
**Attachments:** rates_recycling study_earthtech.xls

Don -

See rates you requested attached. I need a copy of your proposal to attach to the service order. Let me know what othe information you need.

Booker, Wanda

Operations Driver Worker

| | |
|---|---|
| hourly rate (adjusted to 2008) | 22.90 |
| Indirect Salary (2008) | 6.86 |
| Fringe Benefit (2008) | 13.75 |
| Overhead (2008) | 3.06 |
| **Total Hourly Rate** | **46.58** |

Recycling Packer

| | |
|---|---|
| annual maintenance | 10,714.56 |
| annual fuel (13 gal/day, $4/gal) | 12,896.00 |
| **hourly maint/fuel** | **11.20** |

| | |
|---|---|
| purchase price | 223,500.00 |
| expected life (years) | 11 |

# APPENDIX D

# ALTERNATIVE A – DUAL STREAM AT EXISTING CITY FACILITY

# D - Cost Analysis Alternative A - Dual Stream at Existing City Facility (City Only)

**Assumptions Common To Scenario A**

| | |
|---|---|
| Dual Stream Collection Volume of Recyclables (data - Section 5.2.1) | |
| LOW Recyclable Volume (TPY) = | 23,000 |
| HIGH Recyclable Volume (TPY) = | 27,000 |
| Pick-Up Schedule Volume (Monthly Set-Out Collection*) | |
| Assume a Dual Stream volume is starting basis | |
| LOW Product Volume (TPY) = | 23,000 |
| HIGH Product Volume (TPY) = | 27,000 |
| Pick-Up Schedule Volume (Three Week Collection) | |
| Assume a 10% increase in volume over monthly volume | |
| LOW Recyclable Volume (TPY) = | 25,300 |
| HIGH Recyclable Volume (TPY) = | 29,700 |
| Volume of Recyclables not put in Trash (Three Week Collection) | |
| Recyclable Volume (3 wk) - Recyclables Volume (monthly) | |
| LOW Trash Reduction Volume (TPY) = | 2,300 |
| HIGH Trash Reduction Volume (TPY) = | 2,700 |
| Pick-Up Schedule Volume (Two Week Collection) | |
| Assume a 20% increase in volume over monthly volume | |
| LOW Recyclable Volume (TPY) = | 27,600 |
| HIGH Recyclable Volume (TPY) = | 32,400 |
| Volume of Recyclables not put in Trash (Two Week Collection) | |
| Recyclables Volume (2 wk) - Recyclables Volume (monthly) | |
| LOW Trash Reduction Volume (TPY) = | 4,600 |
| HIGH Trash Reduction Volume (TPY) = | 5,400 |

**Capital Costs**

| | |
|---|---|
| Cost to demolish equipment and modify existing MRF = | $250,000 |
| Dual Stream Processing Equipment = | $5,985,000 |

**Annual Costs**

| | |
|---|---|
| MRF Operating and Maintenance Costs ($/ton) = | $43 |
| Trash Disposal Price ($/ton) = | $35 |

**Annual Recyclable Income**

Income from Recyclables

| | |
|---|---|
| LOW Volume Price Income = | [(LOW or HIGH Recycled Material Market Price) / 2 - (MRF O&M Cost)] x (Pick-up Schedule LOW Recyclable Volume) |
| HIGH Volume Price Income = | [(LOW or HIGH Recycled Material Market Price) / 2 - (MRF O&M Cost)] x (Pick-up Schedule HIGH Recyclable Volume) |

* Monthly refers to the schedule of the current program, mostly non-guaranteed with up-the-driveway service for households not on alleys.

# D - Cost Analysis Alternative A - Dual Stream at Existing City Facility (City Only)

Trash Reduction Income = (LOW or HIGH Trash Reduction Volume) x (Trash Disposal Price)

**Present Worth Analysis**

See Calculation Page for Uniform Present Worth Factor (UPWF)

UPWF = 9.1079

Present Worth = (Sum of Capital Costs) + [(UPWF) * (Sum of Annual Income + Annual Costs)]

**Alternative A - Capital Costs**

| | |
|---|---|
| Cost to demolish equipment and modify existing MRF = | -$250,000 |
| Dual Stream Processing Equipment = | -$5,985,000 |
| Two Week Collection Additional Equipment = | -$2,906,000 |

**Alternative A - Annual Costs**

| | |
|---|---|
| LOW Volume O&M Costs = | In Annual Recyclable Income Formula |
| HIGH Volume O&M Costs = | In Annual Recyclable Income Formula |
| Three Week Collection (1 person/truck) | -$271,000 |

# D - Cost Analysis Alternative A - Dual Stream at Existing City Facility (City Only)

Two Week Collection (1 person/truck) -$1,395,912

## LOW Recycled Material Price

| Variables for LOW Recycled Material Price | |
|---|---|
| LOW Recycled Material Price ($/ton) = | $90 |

Alternative A - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$6,235,000 | -$6,235,000 |
| Three Week Collection (1 person/truck) | -$6,235,000 | -$6,235,000 |
| Two Week Collection (1 person/truck) | -$9,141,000 | -$9,141,000 |

Alternative A - Annual Recycleable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $46,000 | $54,000 |
| Three Week Collection (1 person/truck) | $50,600 | $59,400 |
| Two Week Collection (1 person/truck) | $55,200 | $64,800 |

Alternative A - Annual Trash Reduction Revenue

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $80,500 | $94,500 |
| Two Week Collection (1 person/truck) | $161,000 | $189,000 |

Alternative A - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | -$271,000 | -$271,000 |
| Two Week Collection (1 person/truck) | -$1,395,912 | -$1,395,912 |

Alternative A - Present Worth Analysis

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$5,816,037 | -$5,743,173 |
| Three Week Collection (1 person/truck) | -$7,509,195 | -$7,301,535 |

# D - Cost Analysis Alternative A - Dual Stream at Existing City Facility (City Only)

| | | |
|---|---|---|
| Two Week Collection (1 person/truck) | -$19,885,699 | -$19,543,242 |

## HIGH Recycled Material Price

| Variables for HIGH Recycled Material Price | |
|---|---|
| HIGH Recycled Material Price ($/ton) = | $110 |

Alternative A - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$6,235,000 | -$6,235,000 |
| Three Week Collection (1 person/truck) | -$6,235,000 | -$6,235,000 |
| Two Week Collection (1 person/truck) | -$9,141,000 | -$9,141,000 |

Alternative A - Annual Recycleable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $276,000 | $324,000 |
| Three Week Collection (1 person/truck) | $303,600 | $356,400 |
| Two Week Collection (1 person/truck) | $331,200 | $388,800 |

Alternative A - Annual Trash Reduction Revenue

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $80,500 | $94,500 |
| Two Week Collection (1 person/truck) | $161,000 | $189,000 |

Alternative A - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | -$271,000 | -$271,000 |
| Two Week Collection (1 person/truck) | -$1,395,912 | -$1,395,912 |

Alternative A - Present Worth Analysis

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$3,721,220 | -$3,284,040 |
| Three Week Collection (1 person/truck) | -$5,204,897 | -$4,596,489 |
| Two Week Collection (1 person/truck) | -$17,371,919 | -$16,592,282 |

# APPENDIX E

# ALTERNATIVE B – SINGLE STREAM AT EXISTING CITY FACILITY (CITY ONLY)

# E - Cost Analysis Alternative B - Single Stream at Existing City Facility (City Only)

## Assumptions Common To Scenario B

| | |
|---|---|
| Dual Stream Collection Volume of Recyclables (data - Section 5.2.1) | |
| LOW Recyclable Volume (TPY) = | 23,000 |
| HIGH Recyclable Volume (TPY) = | 27,000 |
| Pick-Up Schedule Volume (Monthly Set-Out Collection*) | |
| Assume a 4% increase in Dual Stream volume | |
| LOW Product Volume (TPY) = | 23,920 |
| HIGH Product Volume (TPY) = | 28,080 |
| Pick-Up Schedule Volume (Three Week Collection) | |
| Assume a 10% increase in volume over monthly volume | |
| LOW Recyclable Volume (TPY) = | 26,312 |
| HIGH Recyclable Volume (TPY) = | 30,888 |
| Volume of Recyclables not put in Trash (Three Week Collection) | |
| Recyclable Volume (3 wk) - Recyclables Volume (monthly) | |
| LOW Trash Reduction Volume (TPY) = | 2,392 |
| HIGH Trash Reduction Volume (TPY) = | 2,808 |
| Pick-Up Schedule Volume (Two Week Collection) | |
| Assume a 20% increase in volume over monthly volume | |
| LOW Recyclable Volume (TPY) = | 28,704 |
| HIGH Recyclable Volume (TPY) = | 33,696 |
| Volume of Recyclables not put in Trash (Two Week Collection) | |
| Recyclables Volume (2 wk) - Recyclables Volume (monthly) | |
| LOW Trash Reduction Volume (TPY) = | 4,784 |
| HIGH Trash Reduction Volume (TPY) = | 5,616 |

## Capital Costs

| | |
|---|---|
| Cost to demolish equipment and modify existing MRF = | $250,000 |
| Single Stream Processing Equipment | $6,802,000 |

## Annual Costs

| | |
|---|---|
| MRF Operating and Maintenance Costs ($/ton) = | $46 |
| Trash Disposal Price ($/ton) = | $35 |

* Monthly refers to the schedule of the current program, mostly non-guaranteed with up-the-driveway service for households not on alleys.

# E - Cost Analysis Alternative B - Single Stream at Existing City Facility (City Only)

## Annual Recyclable Income

### Income from Recyclables

LOW Volume Price Income = [(LOW or HIGH Recycled Material Market Price) / 2 - (MRF O&M Cost)] x (Pick-up Schedule LOW Recyclable Volume)

HIGH Volume Price Income = [(LOW or HIGH Recycled Material Market Price) / 2 - (MRF O&M Cost)] x (Pick-up Schedule HIGH Recyclable Volume)

## Trash Reduction Income

Trash Reduction Income = (LOW or HIGH Trash Reduction Volume) x (Trash Disposal Price)

## Present Worth Analysis

See Calculation Page for Uniform Present Worth Factor (UPWF)

UPWF = 9.1079

Present Worth = (Sum of Capital Costs) + [(UPWF) * (Sum of Annual Income + Annual Costs)]

## Alternative B - Capital Costs

| | |
|---|---|
| Cost to demolish equipment and modify existing MRF = | -$250,000 |
| Single Stream Processing Equipment = | -$6,802,000 |
| Two Week (1 person/truck) Equipment = | -$2,906,000 |
| Two Week (2 people/truck) Equipment = | -$447,000 |

## Alternative B - Annual Costs

| | |
|---|---|
| LOW Volume O&M Costs = | In Annual Recyclable Income Formula |
| HIGH Volume O&M Costs = | In Annual Recyclable Income Formula |
| Monthly Collection (1 person/truck) | -$247,088 |
| Three Week Collection (1 person/truck) | -$271,000 |
| Three Week Collection (2 people/truck) | -$1,531,000 |
| Two Week Collection (1 person/truck) | -$1,531,000 |
| Two Week Collection (2 people/truck) | -$3,662,000 |

# E - Cost Analysis Alternative B - Single Stream at Existing City Facility (City Only)

## LOW Recycled Material Price

| Variables for LOW Recycled Material Price | |
|---|---|
| LOW Recycled Material Price ($/ton) = | $90 |

Alternative B - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$7,052,000 | -$7,052,000 |
| Three Week Collection (1 person/truck) | -$7,052,000 | -$7,052,000 |
| Three Week Collection (2 people/truck) | -$7,052,000 | -$7,052,000 |
| Two Week Collection (1 person/truck) | -$9,958,000 | -$9,958,000 |
| Two Week Collection (2 people/truck) | -$7,499,000 | -$7,499,000 |

Alternative B - Annual Recycleable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$23,920 | -$28,080 |
| Three Week Collection (1 person/truck) | -$26,312 | -$30,888 |
| Three Week Collection (2 people/truck) | -$26,312 | -$30,888 |
| Two Week Collection (1 person/truck) | -$28,704 | -$33,696 |
| Two Week Collection (2 people/truck) | -$28,704 | -$33,696 |

Alternative B - Annual Trash Reduction Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $83,720 | $98,280 |
| Three Week Collection (2 people/truck) | $83,720 | $98,280 |
| Two Week Collection (1 person/truck) | $167,440 | $196,560 |
| Two Week Collection (2 people/truck) | $167,440 | $196,560 |

Alternative B - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$247,088 | -$247,088 |
| Three Week Collection (1 person/truck) | -$271,000 | -$271,000 |
| Three Week Collection (2 people/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (1 person/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (2 people/truck) | -$3,662,000 | -$3,662,000 |

Alternative B - Present Worth Analysis

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$9,520,316 | -$9,558,205 |
| Three Week Collection (1 person/truck) | -$8,997,375 | -$8,906,441 |
| Three Week Collection (2 people/truck) | -$20,473,329 | -$20,382,395 |
| Two Week Collection (1 person/truck) | -$22,638,601 | -$22,418,846 |
| Two Week Collection (2 people/truck) | -$39,588,536 | -$39,368,781 |

# E - Cost Analysis Alternative B - Single Stream at Existing City Facility (City Only)

## HIGH Recycled Material Price

| Variables for HIGH Recycled Material Price | |
|---|---|
| HIGH Recycled Material Price ($/ton) = | $110 |

### Alternative B - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$7,052,000 | -$7,052,000 |
| Three Week Collection (1 person/truck) | -$7,052,000 | -$7,052,000 |
| Three Week Collection (2 people/truck) | -$7,052,000 | -$7,052,000 |
| Two Week Collection (1 person/truck) | -$9,958,000 | -$9,958,000 |
| Two Week Collection (2 people/truck) | -$7,499,000 | -$7,499,000 |

### Alternative B - Annual Recycleable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $215,280 | $252,720 |
| Three Week Collection (1 person/truck) | $236,808 | $277,992 |
| Three Week Collection (2 people/truck) | $236,808 | $277,992 |
| Two Week Collection (1 person/truck) | $258,336 | $303,264 |
| Two Week Collection (2 people/truck) | $258,336 | $303,264 |

### Alternative B - Annual Trash Reduction Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $83,720 | $98,280 |
| Three Week Collection (2 people/truck) | $83,720 | $98,280 |
| Two Week Collection (1 person/truck) | $167,440 | $196,560 |
| Two Week Collection (2 people/truck) | $167,440 | $196,560 |

### Alternative B - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$247,088 | -$247,088 |
| Three Week Collection (1 person/truck) | -$271,000 | -$271,000 |
| Three Week Collection (2 people/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (1 person/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (2 people/truck) | -$3,662,000 | -$3,662,000 |

### Alternative B - Present Worth Analysis

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$7,341,706 | -$7,000,706 |
| Three Week Collection (1 person/truck) | -$6,600,904 | -$6,093,193 |
| Three Week Collection (2 people/truck) | -$18,076,858 | -$17,569,147 |
| Two Week Collection (1 person/truck) | -$20,024,270 | -$19,349,848 |
| Two Week Collection (2 people/truck) | -$36,974,205 | -$36,299,783 |

# APPENDIX F

# ALTERNATIVE C – TWO TRANSFER STATIONS TO THIRD PARTY

# F - Cost Analysis Alternative C - Two New Transfer Stations Recyclables To Third Party

## Assumptions Common To Scenarios C & D

| | |
|---|---|
| Dual Stream Collection Volume of Recyclables (data - Section 5.2.1) | |
| LOW Recyclable Volume (TPY) = | 23,000 |
| HIGH Recyclable Volume (TPY) = | 27,000 |
| Pick-Up Schedule Volume (Monthly Set-Out Collection*) | |
| Assume a 4% increase in Dual Stream volume | |
| LOW Product Volume (TPY) = | 23,920 |
| HIGH Product Volume (TPY) = | 28,080 |
| Pick-Up Schedule Volume (Three Week Collection) | |
| Assume a 10% increase in volume over monthly volume | |
| LOW Recyclable Volume (TPY) = | 26,312 |
| HIGH Recyclable Volume (TPY) = | 30,888 |
| Volume of Recyclables not put in Trash (Three Week Collection) | |
| Recyclable Volume (3 wk) - Recyclables Volume (monthly) | |
| LOW Trash Reduction Volume (TPY) = | 2,392 |
| HIGH Trash Reduction Volume (TPY) = | 2,808 |
| Pick-Up Schedule Volume (Two Week Collection) | |
| Assume a 20% increase in volume over monthly volume | |
| LOW Recyclable Volume (TPY) = | 28,704 |
| HIGH Recyclable Volume (TPY) = | 33,696 |
| Volume of Recyclables not put in Trash (Two Week Collection) | |
| Recyclables Volume (2 wk) - Recyclables Volume (monthly) | |
| LOW Trash Reduction Volume (TPY) = | 4,784 |
| HIGH Trash Reduction Volume (TPY) = | 5,616 |

## Capital Costs

| | |
|---|---|
| New North Transfer Facility = | $1,798,000 |
| New South Transfer Facility = | $1,897,000 |

## Annual Costs

| | |
|---|---|
| Transfer Facility Operating and Maintenance Costs ($/ton) = | $60 |
| Trash Disposal Price ($/ton) = | $35 |

* Monthly refers to the schedule of the current program, mostly non-guaranteed with up-the-driveway service for households not on alleys.

## F - Cost Analysis Alternative C - Two New Transfer Stations Recyclables To Third Party

Annual Recyclable Income

Income from Recyclables

LOW Volume Price Income = [(LOW or HIGH Recycled Material Market Price) / 2 - (TF O&M Cost)] x (Pick-up Schedule LOW Recyclable Volume)

HIGH Volume Price Income = [(LOW or HIGH Recycled Material Market Price) / 2 - (TF O&M Cost)] x (Pick-up Schedule HIGH Recyclable Volume)

Trash Reduction Income

Trash Reduction Income = (LOW or HIGH Trash Reduction Volume) x (Trash Disposal Price)

Present Worth Analysis

See Calculation Page for Uniform Present Worth Factor (UPWF) and Single Payment Present Worth Factor (SPPWF)

UPWF = 9.1079

SPPWF = 0.3264

Present Worth = (Sum of Capital Costs) + [(UPWF) * (Sum of Annual Income + Annual Costs)]
+ [(SPPWF)* (Sum of the Salvage Values)]

Alternative C - Capital Costs

| | |
|---|---|
| New North Transfer Facility = | -$1,798,000 |
| Salvage Value of North Transfer Facility after 15 years | $899,000 |
| New South Transfer Facility = | -$1,897,000 |
| Salvage Value of South Transfer Facility after 15 years | $948,500 |
| Two Week (1 person/truck) Equipment = | -$2,906,000 |
| Two Week (2 people/truck) Equipment = | -$447,000 |

Alternative C - Annual Costs

| | |
|---|---|
| LOW Volume O&M Costs = | In Annual Recyclable Income Formula |
| HIGH Volume O&M Costs = | In Annual Recyclable Income Formula |
| Monthly Collection (1 person/truck) | -$188,735 |
| Three Week Collection (1 person/truck) | -$207,000 |
| Three Week Collection (2 people/truck) | -$1,467,000 |
| Two Week Collection (1 person/truck) | -$1,467,000 |
| Two Week Collection (2 people/truck) | -$3,598,000 |

## LOW Recycled Material Price

| Variables for LOW Recycled Material Price | |
|---|---|
| LOW Recycled Material Price ($/ton) = | $90 |

Alternative C - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$3,695,000 | -$3,695,000 |
| Three Week Collection (1 person/truck) | -$3,695,000 | -$3,695,000 |
| Three Week Collection (2 people/truck) | -$3,695,000 | -$3,695,000 |
| Two Week Collection (1 person/truck) | -$6,601,000 | -$6,601,000 |
| Two Week Collection (2 people/truck) | -$4,142,000 | -$4,142,000 |

Alternative C - Annual Recyclable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$358,800 | -$421,200 |
| Three Week Collection (1 person/truck) | -$394,680 | -$463,320 |
| Three Week Collection (2 people/truck) | -$394,680 | -$463,320 |
| Two Week Collection (1 person/truck) | -$430,560 | -$505,440 |
| Two Week Collection (2 people/truck) | -$430,560 | -$505,440 |

Alternative C - Annual Trash Reduction Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $83,720 | $98,280 |
| Three Week Collection (2 people/truck) | $83,720 | $98,280 |
| Two Week Collection (1 person/truck) | $167,440 | $196,560 |
| Two Week Collection (2 people/truck) | $167,440 | $196,560 |

Alternative C - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$188,735 | -$188,735 |
| Three Week Collection (1 person/truck) | -$207,000 | -$207,000 |
| Three Week Collection (2 people/truck) | -$1,467,000 | -$1,467,000 |
| Two Week Collection (1 person/truck) | -$1,467,000 | -$1,467,000 |
| Two Week Collection (2 people/truck) | -$3,598,000 | -$3,598,000 |

Alternative C - Present Worth Analysis

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$8,078,873 | -$8,647,206 |
| Three Week Collection (1 person/truck) | -$7,809,504 | -$8,302,059 |
| Three Week Collection (2 people/truck) | -$19,285,458 | -$19,778,013 |
| Two Week Collection (1 person/truck) | -$21,755,736 | -$22,172,513 |
| Two Week Collection (2 people/truck) | -$38,705,671 | -$39,122,448 |

## F - Cost Analysis Alternative C - Two New Transfer Stations Recyclables To Third Party

## HIGH Recycled Material Price

| Variables for HIGH Recycled Material Price | |
|---|---|
| HIGH Recycled Material Price ($/ton) = | $110 |

Alternative C - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$3,695,000 | -$3,695,000 |
| Three Week Collection (1 person/truck) | -$3,695,000 | -$3,695,000 |
| Three Week Collection (2 people/truck) | -$3,695,000 | -$3,695,000 |
| Two Week Collection (1 person/truck) | -$6,601,000 | -$6,601,000 |
| Two Week Collection (2 people/truck) | -$4,142,000 | -$4,142,000 |

Alternative C - Annual Recyclable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$119,600 | -$140,400 |
| Three Week Collection (1 person/truck) | -$131,560 | -$154,440 |
| Three Week Collection (2 people/truck) | -$131,560 | -$154,440 |
| Two Week Collection (1 person/truck) | -$143,520 | -$168,480 |
| Two Week Collection (2 people/truck) | -$143,520 | -$2,021,760 |

Alternative C - Annual Trash Reduction Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $83,720 | $98,280 |
| Three Week Collection (2 people/truck) | $83,720 | $98,280 |
| Two Week Collection (1 person/truck) | $167,440 | $196,560 |
| Two Week Collection (2 people/truck) | $167,440 | $196,560 |

Alternative C - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$188,735 | -$188,735 |
| Three Week Collection (1 person/truck) | -$207,000 | -$207,000 |
| Three Week Collection (2 people/truck) | -$1,467,000 | -$1,467,000 |
| Two Week Collection (1 person/truck) | -$1,467,000 | -$1,467,000 |
| Two Week Collection (2 people/truck) | -$3,598,000 | -$3,598,000 |

Alternative C - Present Worth Analysis

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$5,900,263 | -$6,089,707 |
| Three Week Collection (1 person/truck) | -$5,413,033 | -$5,488,811 |
| Three Week Collection (2 people/truck) | -$16,888,987 | -$16,964,765 |
| Two Week Collection (1 person/truck) | -$19,141,404 | -$19,103,515 |
| Two Week Collection (2 people/truck) | -$36,091,339 | -$52,932,939 |

# APPENDIX G

# ALTERNATIVE D – ONE TRANSFER STATION AT EXISTING FACILITY

# G - Cost Analysis Alternative D - One Transfer Station At Existing City Facility

**Assumptions Common To Scenarios C & D**

| | |
|---|---|
| Dual Stream Collection Volume of Recyclables (data - Section 5.2.1) | |
| LOW Recyclable Volume (TPY) = | 23,000 |
| HIGH Recyclable Volume (TPY) = | 27,000 |
| Pick-Up Schedule Volume (Monthly Set-Out Collection*) | |
| Assume a 4% increase in Dual Stream volume | |
| LOW Product Volume (TPY) = | 23,920 |
| HIGH Product Volume (TPY) = | 28,080 |
| Pick-Up Schedule Volume (Three Week Collection) | |
| Assume a 10% increase in volume over monthly volume | |
| LOW Recyclable Volume (TPY) = | 26,312 |
| HIGH Recyclable Volume (TPY) = | 30,888 |
| Volume of Recyclables not put in Trash (Three Week Collection) | |
| Recyclable Volume (3 wk) - Recyclables Volume (monthly) | |
| LOW Trash Reduction Volume (TPY) = | 2,392 |
| HIGH Trash Reduction Volume (TPY) = | 2,808 |
| Pick-Up Schedule Volume (Two Week Collection) | |
| Assume a 20% increase in volume over monthly volume | |
| LOW Recyclable Volume (TPY) = | 28,704 |
| HIGH Recyclable Volume (TPY) = | 33,696 |
| Volume of Recyclables not put in Trash (Two Week Collection) | |
| Recyclables Volume (2 wk) - Recyclables Volume (monthly) | |
| LOW Trash Reduction Volume (TPY) = | 4,784 |
| HIGH Trash Reduction Volume (TPY) = | 5,616 |

**Capital Costs**

| | |
|---|---|
| Cost to demolish equipment and modify existing MRF = | $250,000 |
| New Transfer Facility Equipment | $131,000 |

**Annual Costs**

| | |
|---|---|
| Transfer Facility Operating and Maintenance Costs ($/ton) = | $52 |
| Trash Disposal Price ($/ton) = | $35 |

* Monthly refers to the schedule of the current program, mostly non-guaranteed with up-the-driveway service for households not on alleys.

# G - Cost Analysis Alternative D - One Transfer Station At Existing City Facility

## Annual Recyclable Income

### Income from Recyclables

LOW Volume Price Income = [(LOW or HIGH Recycled Material Market Price) / 2 - (TF O&M Cost)] x (Pick-up Schedule LOW Recyclable Volume)

HIGH Volume Price Income = [(LOW or HIGH Recycled Material Market Price) / 2 - (TF O&M Cost)] x (Pick-up Schedule HIGH Recyclable Volume)

## Trash Reduction Income

Trash Reduction Income = (LOW or HIGH Trash Reduction Volume) x (Trash Disposal Price)

## Present Worth Analysis

See Calculation Page for Uniform Present Worth Factor (UPWF)

UPWF = 9.1079

Present Worth = (Sum of Capital Costs) + [(UPWF) * (Sum of Annual Income + Annual Costs)]

## Alternative D - Capital Costs

| | |
|---|---|
| Cost to demolish equipment and modify existing MRF = | -$250,000 |
| New Transfer Facility Equipment | -$131,000 |
| Two Week (1 person/truck) Equipment = | -$2,906,000 |
| Two Week (2 people/truck) Equipment = | -$447,000 |

## Alternative D - Annual Costs

| | |
|---|---|
| LOW Volume O&M Costs = | In Annual Recyclable Income Formula |
| HIGH Volume O&M Costs = | In Annual Recyclable Income Formula |
| Monthly Collection (1 person/truck) | -$247,088 |
| Three Week Collection (1 person/truck) | -$271,000 |
| Three Week Collection (2 people/truck) | -$1,531,000 |
| Two Week Collection (1 person/truck) | -$1,531,000 |
| Two Week Collection (2 people/truck) | -$3,662,000 |

# G - Cost Analysis Alternative D - One Transfer Station At Existing City Facility

## LOW Recycled Material Price

| Variables for LOW Recycled Material Price | |
|---|---|
| LOW Recycled Material Price ($/ton) = | $90 |

### Alternative D - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$381,000 | -$381,000 |
| Three Week Collection (1 person/truck) | -$381,000 | -$381,000 |
| Three Week Collection (2 people/truck) | -$381,000 | -$381,000 |
| Two Week Collection (1 person/truck) | -$3,287,000 | -$3,287,000 |
| Two Week Collection (2 people/truck) | -$828,000 | -$828,000 |

### Alternative D - Annual Recyclable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$167,440 | -$196,560 |
| Three Week Collection (1 person/truck) | -$184,184 | -$216,216 |
| Three Week Collection (2 people/truck) | -$184,184 | -$216,216 |
| Two Week Collection (1 person/truck) | -$200,928 | -$235,872 |
| Two Week Collection (2 people/truck) | -$200,928 | -$235,872 |

### Alternative D - Annual Trash Reduction Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $83,720 | $98,280 |
| Three Week Collection (2 people/truck) | $83,720 | $98,280 |
| Two Week Collection (1 person/truck) | $167,440 | $196,560 |
| Two Week Collection (2 people/truck) | $167,440 | $196,560 |

### Alternative D - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$247,088 | -$247,088 |
| Three Week Collection (1 person/truck) | -$271,000 | -$271,000 |
| Three Week Collection (2 people/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (1 person/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (2 people/truck) | -$3,662,000 | -$3,662,000 |

### Alternative D - Present Worth Analysis

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$4,156,482 | -$4,421,704 |
| Three Week Collection (1 person/truck) | -$3,764,257 | -$3,923,390 |
| Three Week Collection (2 people/truck) | -$15,240,211 | -$15,399,344 |
| Two Week Collection (1 person/truck) | -$17,536,200 | -$17,589,245 |
| Two Week Collection (2 people/truck) | -$34,486,135 | -$34,539,180 |

# G - Cost Analysis Alternative D - One Transfer Station At Existing City Facility

## HIGH Recycled Material Price

| Variables for HIGH Recycled Material Price | |
|---|---|
| HIGH Recycled Material Price ($/ton) = | $110 |

**Alternative D - Capital Costs**

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$381,000 | -$381,000 |
| Three Week Collection (1 person/truck) | -$381,000 | -$381,000 |
| Three Week Collection (2 people/truck) | -$381,000 | -$381,000 |
| Two Week Collection (1 person/truck) | -$3,287,000 | -$3,287,000 |
| Two Week Collection (2 people/truck) | -$828,000 | -$828,000 |

**Alternative D - Annual Recyclable Income**

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $71,760 | $84,240 |
| Three Week Collection (1 person/truck) | $78,936 | $92,664 |
| Three Week Collection (2 people/truck) | $78,936 | $92,664 |
| Two Week Collection (1 person/truck) | $86,112 | $101,088 |
| Two Week Collection (2 people/truck) | $86,112 | -$1,752,192 |

**Alternative D - Annual Trash Reduction Income**

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $83,720 | $98,280 |
| Three Week Collection (2 people/truck) | $83,720 | $98,280 |
| Two Week Collection (1 person/truck) | $167,440 | $196,560 |
| Two Week Collection (2 people/truck) | $167,440 | $196,560 |

**Alternative D - Annual Collection Costs**

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$247,088 | -$247,088 |
| Three Week Collection (1 person/truck) | -$271,000 | -$271,000 |
| Three Week Collection (2 people/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (1 person/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (2 people/truck) | -$3,662,000 | -$3,662,000 |

**Alternative D - Present Worth Analysis**

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$1,977,872 | -$1,864,205 |
| Three Week Collection (1 person/truck) | -$1,367,786 | -$1,110,142 |
| Three Week Collection (2 people/truck) | -$12,843,740 | -$12,586,096 |
| Two Week Collection (1 person/truck) | -$14,921,869 | -$14,520,247 |
| Two Week Collection (2 people/truck) | -$31,871,804 | -$48,349,670 |

# APPENDIX H

# ALTERNATIVE E – REGIONAL MRF AT WAUWATOSA

# H - Cost Analysis Alternative E - Single Stream at Wauwatosa Facility (Regional MRF)

Assumptions Common To Scenarios E & F

Pick-Up Schedule Volume (Monthly Set-Out Collection)

| | |
|---|---|
| LOW Recyclable Volume (TPY) = | 52,000 |
| HIGH Recyclable Volume (TPY) = | 60,000 |

Pick-Up Schedule Volume (3 Weeek Set-Out Collection*)

| | |
|---|---|
| Assume a 10% increase in volume for Milwaukee's portion (44%) | |
| LOW Recyclable Volume (TPY) = | 54,288 |
| HIGH Recyclable Volume (TPY) = | 62,640 |

Volume of Recyclables not put in City Trash (Three Week Collection)

| | |
|---|---|
| Recyclables Volume (3 wk) - Recyclables Volume (monthly)* | |
| LOW City Trash Reduction Volume (TPY) = | 2,288 |
| HIGH City Trash Reduction Volume (TPY) = | 2,640 |

Volume of Recyclables* (Two Week Collection)

| | |
|---|---|
| Assume a 20% increase in volume for Milwaukee's portion (44%) | |
| LOW Recyclable Volume (TPY) = | 56,576 |
| HIGH Recyclable Volume (TPY) = | 65,280 |

Volume of Recyclables not put in City Trash (Two Week Collection)

| | |
|---|---|
| Recyclables Volume (2 wk) - Recyclables Volume (monthly)** | |
| LOW City Trash Reduction Volume (TPY) = | 4,576 |
| HIGH City Trash Reduction Volume (TPY) = | 5,280 |

* The increase is all attributed to a change in Milwaukee collection changing percentage to 48%
** The increase is all attributed to a change in Milwaukee collection changing percentage to 52%

Capital Costs

| | |
|---|---|
| Estimated City Share (44%) for Building and Property | $2,640,000 |
| Assume $6,000,000 for building andsite improvements | |
| City Share of Single Stream Processing Equipment = | $2,992,880 |
| Assume 44% of $6,802,000 equipment | |

Annual Costs

| | |
|---|---|
| MRF Operating and Maintenance Costs ($/ton) = | $46 |
| Trash Disposal Price ($/ton) = | $35 |

* Monthly refers to the schedule of the current program, mostly non-guaranteed with up-the-driveway service for households not on alleys.

# H - Cost Analysis Alternative E - Single Stream at Wauwatosa Facility (Regional MRF)

## Annual Recyclable Income

### Income from Recyclables

LOW Volume Price Income = {[(LOW or HIGH Recycled Material Market Price) / 2 - (MRF O&M Cost)] x (Pick-up Schedule LOW Recyclable Volume)} x (City Percentage)

HIGH Volume Price Income = {[(LOW or HIGH Recycled Material Market Price) / 2 - (MRF O&M Cost)] x (Pick-up Schedule HIGH Recyclable Volume)} x (City Percentage)

### Trash Reduction Income

Trash Reduction Income = (LOW or HIGH Trash Reduction Volume) x (Trash Disposal Price)

## Present Worth Analysis

See Calculation Page for Uniform Present Worth Factor (UPWF) and Single Payment Present Worth Factor (SPPWF)

UPWF = 9.1079

SPPWF = 0.3264

Present Worth = (Sum of Capital Costs) + [(UPWF) * (Sum of Annual Income + Annual Costs)]
+ [(SPPWF)* (Sum of the Salvage Values)]

## Alternative E - Capital Costs

| | |
|---|---|
| Estimated City Share for Building and Property | -$2,640,000 |
| Salvage Value for City Share for Building and Property | $1,320,000 |
| City Share of Single Stream Processing Equipment = | -$2,992,880 |
| Two Week (1 person/truck) Equipment = | -$2,906,000 |
| Two Week (2 people/truck) Equipment = | -$447,000 |

## Alternative E - Annual Costs

| | |
|---|---|
| LOW Volume O&M Costs = | In Annual Recyclable Income Formula |
| HIGH Volume O&M Costs = | In Annual Recyclable Income Formula |
| Monthly Collection (1 person/truck) | -$306,353 |
| Three Week Collection (1 person/truck) | -$336,000 |
| Three Week Collection (2 people/truck) | -$1,596,000 |
| Two Week Collection (1 person/truck) | -$1,596,000 |
| Two Week Collection (2 people/truck) | -$3,727,000 |

# H - Cost Analysis Alternative E - Single Stream at Wauwatosa Facility (Regional MRF)

## LOW Recycled Material Price

| Variables for LOW Recycled Material Price | |
|---|---|
| LOW Recycled Material Price ($/ton) = | $90 |

Alternative E - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$5,632,880 | -$5,632,880 |
| Three Week Collection (1 person/truck) | -$5,632,880 | -$5,632,880 |
| Three Week Collection (2 people/truck) | -$5,632,880 | -$5,632,880 |
| Two Week Collection (1 person/truck) | -$8,538,880 | -$8,538,880 |
| Two Week Collection (2 people/truck) | -$6,079,880 | -$6,079,880 |

Alternative E - Annual Recyclable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$22,880 | -$2,640 |
| Three Week Collection (1 person/truck) | -$26,058 | -$30,067 |
| Three Week Collection (2 people/truck) | -$26,058 | -$30,067 |
| Two Week Collection (1 person/truck) | -$29,420 | -$33,946 |
| Two Week Collection (2 people/truck) | -$29,420 | -$33,946 |

Alternative E - Annual Trash Reduction Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $80,080 | $92,400 |
| Three Week Collection (2 people/truck) | $80,080 | $92,400 |
| Two Week Collection (1 person/truck) | $160,160 | $184,800 |
| Two Week Collection (2 people/truck) | $160,160 | $184,800 |

Alternative E - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$306,353 | -$306,353 |
| Three Week Collection (1 person/truck) | -$336,000 | -$336,000 |
| Three Week Collection (2 people/truck) | -$1,596,000 | -$1,596,000 |
| Two Week Collection (1 person/truck) | -$1,596,000 | -$1,596,000 |
| Two Week Collection (2 people/truck) | -$3,727,000 | -$3,727,000 |

Alternative E - Present Worth Analysis

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$8,200,653 | -$8,016,309 |
| Three Week Collection (1 person/truck) | -$7,770,262 | -$7,694,565 |
| Three Week Collection (2 people/truck) | -$19,246,216 | -$19,170,519 |
| Two Week Collection (1 person/truck) | -$21,453,469 | -$21,270,274 |
| Two Week Collection (2 people/truck) | -$38,403,404 | -$38,220,209 |

# H - Cost Analysis Alternative E - Single Stream at Wauwatosa Facility (Regional MRF)

## HIGH Recycled Material Price

| Variables for HIGH Recycled Material Price | |
|---|---|
| HIGH Recycled Material Price ($/ton) = | $110 |

Alternative E - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$5,632,880 | -$5,632,880 |
| Three Week Collection (1 person/truck) | -$5,632,880 | -$5,632,880 |
| Three Week Collection (2 people/truck) | -$5,632,880 | -$5,632,880 |
| Two Week Collection (1 person/truck) | -$8,538,880 | -$8,538,880 |
| Two Week Collection (2 people/truck) | -$6,079,880 | -$6,079,880 |

Alternative E - Annual Recyclable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $205,920 | $237,600 |
| Three Week Collection (1 person/truck) | $234,524 | $270,605 |
| Three Week Collection (2 people/truck) | $234,524 | $270,605 |
| Two Week Collection (1 person/truck) | $264,776 | $305,510 |
| Two Week Collection (2 people/truck) | $264,776 | $305,510 |

Alternative E - Annual Trash Reduction Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $80,080 | $92,400 |
| Three Week Collection (2 people/truck) | $80,080 | $92,400 |
| Two Week Collection (1 person/truck) | $160,160 | $184,800 |
| Two Week Collection (2 people/truck) | $160,160 | $184,800 |

Alternative E - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$306,353 | -$306,353 |
| Three Week Collection (1 person/truck) | -$336,000 | -$336,000 |
| Three Week Collection (2 people/truck) | -$1,596,000 | -$1,596,000 |
| Two Week Collection (1 person/truck) | -$1,596,000 | -$1,596,000 |
| Two Week Collection (2 people/truck) | -$3,727,000 | -$3,727,000 |

Alternative E - Present Worth Analysis

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$6,116,765 | -$5,828,227 |
| Three Week Collection (1 person/truck) | -$5,396,903 | -$4,956,075 |
| Three Week Collection (2 people/truck) | -$16,872,857 | -$16,432,029 |
| Two Week Collection (1 person/truck) | -$18,773,969 | -$18,178,542 |
| Two Week Collection (2 people/truck) | -$35,723,904 | -$35,128,477 |

# APPENDIX I

# ALTERNATIVE F – REGIONAL MRF AT EXISTING FACILITY

# I - Cost Analysis Alternative F - Regional MRF Existing City Facility

## Assumptions Common To Scenarios E & F

Pick-Up Schedule Volume (Monthly Set-Out Collection*)

| | |
|---|---|
| LOW Recyclable Volume (TPY) = | 52,000 |
| HIGH Recyclable Volume (TPY) = | 60,000 |

Pick-Up Schedule Volume (3 Weeek Set-Out Collection)

Assume a 10% increase in volume for Milwaukee's portion (44%)

| | |
|---|---|
| LOW Recyclable Volume (TPY) = | 54,288 |
| HIGH Recyclable Volume (TPY) = | 62,640 |

Volume of Recyclables not put in City Trash (Three Week Collection)

Recyclables Volume (3 wk) - Recyclables Volume (monthly)*

| | |
|---|---|
| LOW City Trash Reduction Volume (TPY) = | 2,288 |
| HIGH City Trash Reduction Volume (TPY) = | 2,640 |

Volume of Recyclables* (Two Week Collection)

Assume a 20% increase in volume for Milwaukee's portion (44%)

| | |
|---|---|
| LOW Recyclable Volume (TPY) = | 56,576 |
| HIGH Recyclable Volume (TPY) = | 65,280 |

Volume of Recyclables not put in City Trash (Two Week Collection)

Recyclables Volume (2 wk) - Recyclables Volume (monthly)**

| | |
|---|---|
| LOW City Trash Reduction Volume (TPY) = | 4,576 |
| HIGH City Trash Reduction Volume (TPY) = | 5,280 |

* The increase is all attributed to a change in Milwaukee collection changing percentage to 48%

** The increase is all attributed to a change in Milwaukee collection changing percentage to 52%

## Capital Costs

| | |
|---|---|
| Cost to demolish equipment and modify existing MRF = | $250,000 |
| City Share of Single Stream Processing Equipment = Assume 44% of $6,802,000 equipment | $2,992,880 |

## Annual Costs

| | |
|---|---|
| MRF Operating and Maintenance Costs ($/ton) = | $46 |
| Trash Disposal Price ($/ton) = | $35 |

* Monthly refers to the schedule of the current program, mostly non-guaranteed with up-the-driveway service for households not on alleys.

# I - Cost Analysis Alternative F - Regional MRF Existing City Facility

Annual Recyclable Income

Income from Recyclables

| | |
|---|---|
| LOW Volume Price Income = | {[(LOW or HIGH Recycled Material Market Price) / 2 - (MRF O&M Cost)] x (Pick-up Schedule LOW Recyclable Volume)} x (City Percentage) |
| HIGH Volume Price Income = | {[(LOW or HIGH Recycled Material Market Price) / 2 - (MRF O&M Cost)] x (Pick-up Schedule HIGH Recyclable Volume)} x (City Percentage) |

Trash Reduction Income

| | |
|---|---|
| Trash Reduction Income = | (LOW or HIGH Trash Reduction Volume) x (Trash Disposal Price) |

Present Worth Analysis

See Calculation Page for Uniform Present Worth Factor (UPWF)

UPWF = 9.1079

Present Worth = (Sum of Capital Costs) + [(UPWF) * (Sum of Annual Income + Annual Costs)]

Alternative F - Capital Costs

| | |
|---|---|
| Estimated City Share for Building and Property | -$250,000 |
| City Share of Single Stream Processing Equipment = | -$2,992,880 |
| Two Week (1 person/truck) Equipment = | -$2,906,000 |
| Two Week (2 people/truck) Equipment = | -$447,000 |

Alternative F - Annual Costs

| | |
|---|---|
| LOW Volume O&M Costs = | In Annual Recyclable Income Formula |
| HIGH Volume O&M Costs = | In Annual Recyclable Income Formula |
| Monthly Collection (1 person/truck) | -$247,088 |
| Three Week Collection (1 person/truck) | -$271,000 |
| Three Week Collection (2 people/truck) | -$1,531,000 |
| Two Week Collection (1 person/truck) | -$1,531,000 |
| Two Week Collection (2 people/truck) | -$3,662,000 |

# I - Cost Analysis Alternative F - Regional MRF Existing City Facility

| Variables for LOW Recycled Material Price | |
|---|---|
| LOW Recycled Material Price ($/ton) = | $90 |

Alternative F - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$3,242,880 | -$3,242,880 |
| Three Week Collection (1 person/truck) | -$3,242,880 | -$3,242,880 |
| Three Week Collection (2 people/truck) | -$3,242,880 | -$3,242,880 |
| Two Week Collection (1 person/truck) | -$6,148,880 | -$6,148,880 |
| Two Week Collection (2 people/truck) | -$3,689,880 | -$3,689,880 |

Alternative F - Annual Recyclable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$22,880 | -$2,640 |
| Three Week Collection (1 person/truck) | -$26,058 | -$30,067 |
| Three Week Collection (2 people/truck) | -$26,058 | -$30,067 |
| Two Week Collection (1 person/truck) | -$29,420 | -$33,946 |
| Two Week Collection (2 people/truck) | -$29,420 | -$33,946 |

Alternative F - Annual Trash Reduction Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $80,080 | $92,400 |
| Three Week Collection (2 people/truck) | $80,080 | $92,400 |
| Two Week Collection (1 person/truck) | $160,160 | $184,800 |
| Two Week Collection (2 people/truck) | $160,160 | $184,800 |

Alternative F - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$247,088 | -$247,088 |
| Three Week Collection (1 person/truck) | -$271,000 | -$271,000 |
| Three Week Collection (2 people/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (1 person/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (2 people/truck) | -$3,662,000 | -$3,662,000 |

Alternative F - Present Worth Analysis

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$5,701,724 | -$5,517,380 |
| Three Week Collection (1 person/truck) | -$5,219,096 | -$5,143,400 |
| Three Week Collection (2 people/truck) | -$16,695,050 | -$16,619,354 |
| Two Week Collection (1 person/truck) | -$18,902,304 | -$18,719,108 |
| Two Week Collection (2 people/truck) | -$35,852,239 | -$35,669,043 |

# I - Cost Analysis Alternative F - Regional MRF Existing City Facility

## HIGH Recycled Material Price

| Variables for HIGH Recycled Material Price | |
|---|---|
| HIGH Recycled Material Price ($/ton) = | $110 |

Alternative F - Capital Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$3,242,880 | -$3,242,880 |
| Three Week Collection (1 person/truck) | -$3,242,880 | -$3,242,880 |
| Three Week Collection (2 people/truck) | -$3,242,880 | -$3,242,880 |
| Two Week Collection (1 person/truck) | -$6,148,880 | -$6,148,880 |
| Two Week Collection (2 people/truck) | -$3,689,880 | -$3,689,880 |

Alternative F - Annual Recyclable Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $205,920 | $237,600 |
| Three Week Collection (1 person/truck) | $234,524 | $270,605 |
| Three Week Collection (2 people/truck) | $234,524 | $270,605 |
| Two Week Collection (1 person/truck) | $264,776 | $305,510 |
| Two Week Collection (2 people/truck) | $264,776 | $305,510 |

Alternative F - Annual Trash Reduction Income

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | $0 | $0 |
| Three Week Collection (1 person/truck) | $80,080 | $92,400 |
| Three Week Collection (2 people/truck) | $80,080 | $92,400 |
| Two Week Collection (1 person/truck) | $160,160 | $184,800 |
| Two Week Collection (2 people/truck) | $160,160 | $184,800 |

Alternative F - Annual Collection Costs

| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$247,088 | -$247,088 |
| Three Week Collection (1 person/truck) | -$271,000 | -$271,000 |
| Three Week Collection (2 people/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (1 person/truck) | -$1,531,000 | -$1,531,000 |
| Two Week Collection (2 people/truck) | -$3,662,000 | -$3,662,000 |

Alternative F - Present Worth Analysis

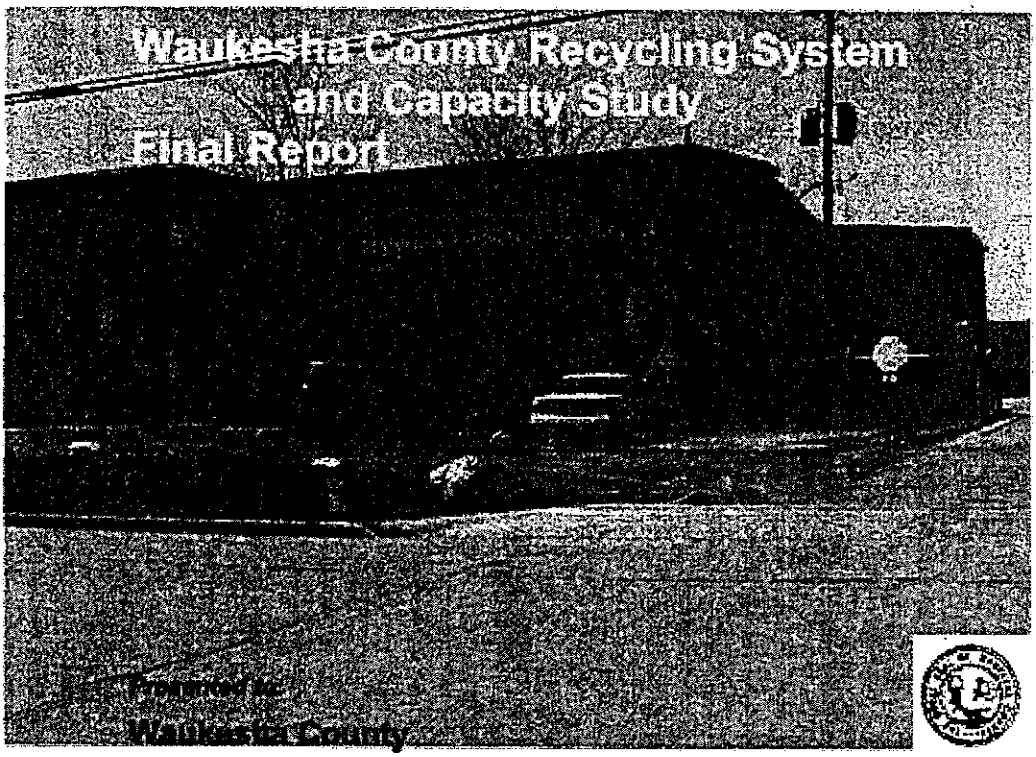
| Schedule | Low Volume | High Volume |
|---|---|---|
| Monthly Collection (1 person/truck) | -$3,617,836 | -$3,329,298 |
| Three Week Collection (1 person/truck) | -$2,845,738 | -$2,404,909 |
| Three Week Collection (2 people/truck) | -$14,321,692 | -$13,880,863 |
| Two Week Collection (1 person/truck) | -$16,222,803 | -$15,627,377 |
| Two Week Collection (2 people/truck) | -$33,172,738 | -$32,577,312 |

# APPENDIX J

# REFERENCES AND RELATED INFORMATION ON COST ESTIMATING

## Waukesha Study

Waukesha Study = Waukesha County Recycling System and Capacity Study Final Report – September 2007




*Prepared by:*

**RRT Design & Construction**

GERSHMAN, BRICKNER & BRATTON, INC.

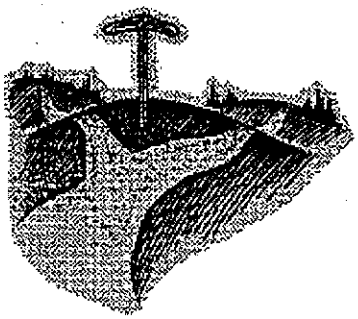
**September, 2007**

Innovation • Performance • Leadership

Waukesha Presentation

# Waukesha County Recycling

## *Looking Ahead*



Perry Lindquist, Land Resources Manager
Waukesha County Dept. of Parks & Land Use

July 27, 2009
Milwaukee Recycling Task Force

AECOM Report

EARTH TECH | AECOM

# Recycling Facility Study
# City of Milwaukee, Wisconsin
# Draft No. 2

CITY OF MILWAUKEE

**Site:**
Materials Recovery Facility
1313 West Mount Vernon Avenue
Milwaukee, WI 53233

**Prepared for:**
City of Milwaukee
Zeidler Municipal Building
841 North Broadway, Room 620
Milwaukee, WI 53202

**Prepared by:**
Earth Tech AECOM
4135 Technology Parkway
Sheboygan, WI 53083

October 2008

Earth Tech AECOM Project No. 106140

FOOTNOTE #1

## Table 1-9: Summary of Projected Recyclables for Processing, 2010-2025

| Municipal Group | Tonnages Projected for 2010 (tpy) | Tonnages Projected for 2015 (tpy) | Tonnages Projected for 2020 (tpy) | Tonnages Projected for 2025 (tpy) |
|---|---|---|---|---|
| **Dual-Stream Project Requirements:** | | | | |
| Waukesha Co. Participating Municipalities(1) | 24,452 | 25,080 | 25,724 | 26,575 |
| **Single-Stream Project Requirements:** | | | | |
| Waukesha Co. Participating Municipalities (2) | 30,565 | 31,350 | 32,155 | 33,219 |
| Waukesha Co. Non-Participating Municipalities (2) | 12,197 | 12,642 | 13,089 | 13,638 |
| City of Milwaukee (3) | 28,354 | 28,723 | 29,056 | 29,015 |
| City of Wauwatosa (3) | 4,944 | 4,971 | 4,992 | 4,945 |
| Total - All Entities as Regional Single-Stream MRF | 76,060 | 77,686 | 79,292 | 80,817 |
| Total w/o Non-Participating Municipalities | 63,863 | 65,044 | 66,203 | 67,179 |

(1) From Table 1-5
(2) From Table 1-6
(3) From Table 1-8

**FOOTNOTE #2**

## SS Pros (Collection) vs. Cons (MRF Impacts)

| Single Stream Collection Cost Savings | Single Stream MRF Impacts |
|---|---|
| • Automation decreases personnel costs (workers comp claims, etc.) | • Increases MRF labor and capital costs |
| • Large cart allows Every Other Week collection of recyclables | • Increases residue level at MRF (non-recyclables) |
| • Flexibility: Can use compaction vehicles to reduce capital & trips to the MRF, more households per route – faster collection | • Potential for decreased quality of processed recyclables (glass/paper) |
| • Higher rates of recycling & reduced landfill disposal costs – easier for the general public to implement (no sorting) | • Higher recyclable volumes to process<br>• Increased net cost per ton processing |

All of these factors were built into the economic analysis

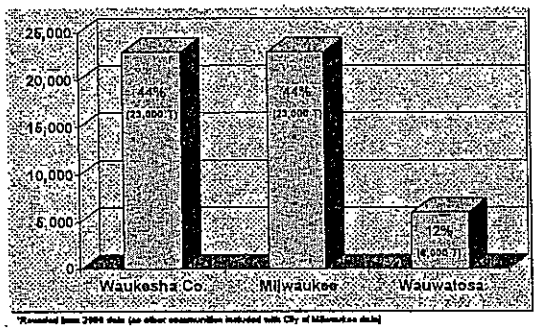
## Collection Trends/Pressures

- Private haulers are pushing for Single Stream collection to save money
  - Trend is playing out nationwide
    - >100 SS MRFs (25% in 2008)
  - Locally, only 1 of 3 private haulers (Veolia) still offers dual stream collection
    - Waste Mgt. and Johns already switched to SS
    - 3 participating communities without hauling contracts already switched to SS (problem)
- More communities want to switch to SS

## Scenarios for Future Projections:

- Tonnage
  - Participating county municipalities (25)
  - Adding non-participating communities (12)
  - Adding Milwaukee & Wauwatosa
- Single vs. Dual Stream

## Annual Tons Recycled (52,000 Tons)*




*Assumed from 2008 data (as other communities included with City of Milwaukee data)

## Key Study Findings & Recommendations

1. Switching to Single Stream is strongly recommended
   - Pros far outweigh the cons
   - Could save partic. communities >$700,000/year in collection & disposal costs
     - 10% or $12.36/HH/Year savings (minus cart $)
   - Needs all new MRF equipment/more space
2. Recycling tons increase considerably with a Single Stream system – assumed + 25%
   - In-county data shows 45% increase/capita

## Key Study Findings & Recommendations *(continued)*

3. Doubling tonnage greatly improves the economics of a Single Stream MRF
   - 2 shifts = much faster return on investment
   - New site needed to double tonnage
4. National MRF data shows:
   - SS paper/fiber is equally marketable
   - Increased residue from SS depends on public education (projected increase from 3% to 10%)

Mil. would see about 10% increase because

FOOTNOTE #3

The body of evidence indicates that single stream recycling is here to stay and should be considered the state of the art when properly designed and operated. This conclusion is reached because of its obvious advantages to the user, the increase in collected tons, and that collection cost savings can be significant.

## Section 2.h - Basis for Future MRF Sizing

For purposes of modeling projections required in Section 3 of the Project Report the following assumptions will be used:

- If municipalities switch to a single stream system, and institute state of the art collection systems along with appropriate public education, the amount of materials collected can increase by 20% to 30%. For purposes of modeling 25% will be used for Waukesha County participating municipalities and for the City of Wauwatosa. For the City of Milwaukee, 10% will be used as the city is already using a large cart for collection of dual stream recyclables (split cart) and therefore tonnages would not be expected to grow by 25%.

- In recent years the Waukesha MRF has been generating between 3 and 3.5% residue. The evidence suggests that a state of the art well managed single stream collection and public education program can result in total residue levels of well under 10%. For purposes of modeling, 10% will be used.

FOOTNOTE #4

Such an expansion would cost approximately $3.0 million for the building and site work in both cases, not including cost of additional property. Adding higher capacity Dual Stream processing capability along with an OCC screen would cost approximately $3.5 million, bringing the total cost to an estimated $6.5 million. Adding Single Stream capability and reconfiguring the current process lines would cost approximately $4.0 million, bringing the total to an estimated $7.0 million. These options would serve the needs of the Participating Municipalities as well as, potentially, the Non-Participating Municipalities.

Due to space and site limitations, neither of these options could serve as a full regional MRF with the projected tonnages of all Participating and Non-Participating Municipalities, in addition to those from Wauwatosa and Milwaukee.

The following tables 3.a.3-1 and 3.a.3-2 present the capital costs and a cost benefit matrix for the expansion of the existing facility:

**Table 3.a.3-1: Expansion of Existing Facility Estimated Capital Costs (2007 Dollars)**

| | Equipment and Systems | Building Costs | Total Costs |
|---|---|---|---|
| **Dual Stream** | $3,500,000 | $3,000,000 | $6,500,000 |
| **Single Stream** | $4,000,000 | $3,000,000 | $7,000,000 |

**Table 3.a.3-2 : Expanded MRF Cost Benefit Matrix-Median Revenues**

| Operating Scenario | Year | Annual Capital Cost (1) | Annual Operating Costs (2) | Net Materials Sales Revenue Projection (3) | Est. Yearly Income (Deficit) | Per Ton Income (Deficit) (4) |
|---|---|---|---|---|---|---|
| | | Ref. "A" | Ref. "B" | Ref. "C" | Total C-(A+B) | |
| Dual Stream Participating Only | 2010 | $626,225 | $1,050,351 | $1,806,783 | $130,207 | $5.32 |
| Single Stream Participating Only | 2010 | $674,396 | $1,345,614 | $2,139,611 | $119,601 | $3.91 |

(1) Based on a Table 3.a.3-1 with a 15 year financing @ 5% interest rate
(2) Based on Table 3-5
(3) Based on Table 3-8 Materials Net Revenue Projection
(4) Based on Est. Yearly Income divided by the MRF tonnage estimates presented in Table 3-3 and 3-4

# US Inflation Calculator

FOOTNOTE #5

Easily find how the buying power of the US dollar has changed from 1913-2009; get inflation rates, charts and inflation news.

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  - Consumer Price Index Data from 1913 to 2009
  - Consumer Price Index Release Schedule
  - Current Inflation Rates: 2000-2009
  - Historical Inflation Rates: 1914-2009
  - Annual Averages for Rate of Inflation
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**The US Inflation Calculator measures the buying power of the dollar over time. To begin, just enter any two dates between 1913 and 2009, an amount, and click 'Calculate'.**

## Inflation Calculator

If in 2007 (enter year)

I purchased an item for $ 3,500,000.00

then in 2009 (enter year)

that same item would cost: $3,640,967.58

Rate of inflation change: 4.0%

Calculate Print

*How calculator works. Always uses latest available CPI data!*

# Consumer prices up 0.7% in June, inflation falls 1.4% in year

July 15, 2009 · Filed Under Inflation, Inflation Rates · Comment

**U.S. consumer prices jumped in June** as higher energy costs — gasoline prices in particular — drove up the

FOOTNOTE 6

### 3.b.3 New Facility Dual and Single Stream Capital Costs

For purposes of modeling and projections, Table 3-9 summarizes the estimated capital costs for the recommended dual and single stream facility.

**Table 3-9: Estimated Capital Costs (2007 Dollars)**

| | Equipment and Systems | Building Costs | Site Improvement Costs | Total Costs |
|---|---|---|---|---|
| **Dual Stream** | $3,500,000 | $3,500,000 | $750,000 | $7,750,000 |
| **Single Stream** | $4,000,000 | $3,500,000 | $750,000 | $8,250,000 |

Note: These costs include engineering on a green field site not requiring extensive site work or foundation piling, excluding land purchase.

### 3.b.4 New Facility Dual and Single Stream Cost Benefit Analysis

Tables 3-10 and 3-11 on the following page summarizes the economics of developing either a dual or single stream MRF in Waukesha County for the six different operating scenarios in years 2010, 2015, 2020 and 2025. Cases are presented for low, high, and median material revenues to illustrate the effect of material prices on the economics.

These numbers do not include any revenue share or service fee payments to or from a potential third party operator. They represent the projected costs and revenues associated with building, paying for and operating a dual or single stream MRF in Waukesha County at various tonnage levels over a 15-year period ending in 2025. Clearly, the assumption that all costs will escalate at an annual 3% rate combined with the further assumption that secondary materials revenues will, over time, have a non escalating average strongly affects the results of this analysis. It causes the MRF in lower tonnage operating scenarios to be in a net deficit operating mode during the later years of its life. Of course, higher tonnages, as expected, raise the overall return of any MRF. No profits for a third party operator are included in costs and payments to or from a potential operator and/or sharing of revenue is not calculated. The analysis above, however, provides the County a framework to evaluate its options and select the contract structure most in its advantage.

What is most important under any scenario of MRF development is for the County to determine what tonnages would be made available by local municipalities. The Project Team's recommendations are included in Section 5 of this Report.

FOOTNOTE # 7

**Table 3-5 : Projected MRF Operating Costs - Dual Stream vs. Single Stream**

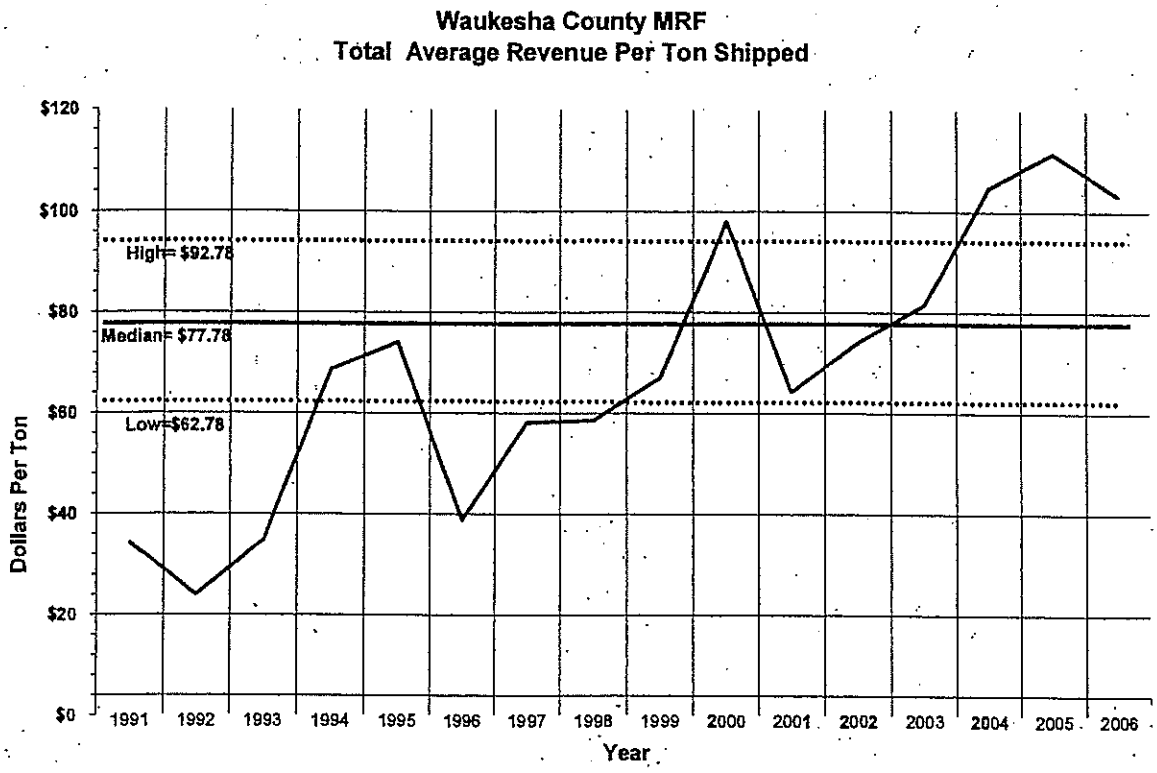
| DUAL STREAM MRF | | | | SINGLE STREAM MRF | | | |
|---|---|---|---|---|---|---|---|
| Operating Scenario | Year | Annual O&M Cost | Per Ton Operating Cost | Operating Scenario | Year | Annual O&M Cost | Per Ton Operating Cost |
| Participating | | | | Participating | | | |
| | 2010 | $ 1,050,351 | $ 42.96 | | 2010 | $ 1,345,614 | $ 44.02 |
| | 2015 | $ 1,206,698 | $ 48.11 | | 2015 | $ 1,539,199 | $ 49.10 |
| | 2020 | $ 1,396,262 | $ 54.28 | | 2020 | $ 1,782,981 | $ 55.45 |
| | 2025 | $ 1,617,853 | $ 60.88 | | 2025 | $ 2,068,875 | $ 62.28 |
| Participating & Non-Participating | | | | Participating & Non-Participating | | | |
| | 2010 | $ 1,272,078 | $ 34.71 | | 2010 | $ 1,620,057 | $ 37.89 |
| | 2015 | $ 1,462,762 | $ 38.78 | | 2015 | $ 1,863,500 | $ 42.36 |
| | 2020 | $ 1,695,903 | $ 43.69 | | 2020 | $ 2,162,426 | $ 47.79 |
| | 2025 | $ 1,969,541 | $ 48.98 | | 2025 | $ 2,514,158 | $ 53.66 |
| Participating, Non-Participating, Wauwatosa, Milwaukee | | | | Participating, Non-Participating, Wauwatosa, Milwaukee | | | |
| | 2010 | $ 2,140,086 | $ 32.24 | | 2010 | $ 2,791,624 | $ 36.70 |
| | 2015 | $ 2,457,636 | $ 36.24 | | 2015 | $ 3,206,164 | $ 41.27 |
| | 2020 | $ 2,850,166 | $ 41.17 | | 2020 | $ 3,713,494 | $ 46.83 |
| | 2025 | $ 3,293,953 | $ 46.69 | | 2025 | $ 4,300,199 | $ 53.21 |

FOOTNOTE #8

### 3.b.2 New Facility Dual and Single Stream Expected Revenues

Figure 3-1 depicts the actual average dollars per ton received from the sale of all commodities from the Waukesha County MRF 1991-2006.

**Figure 3-1**




Over this period of time, 292,559 tons of various commodities have been sold resulting in total revenues of $21,372,917. This equates to an average per ton value of $73.06 and a median value of $77.78 per ton. The high and low figures used in modeling potential revenue scenarios represent a generalized market range (+/- $15/ton) for recyclable materials experienced by the county program during the past 10 years. The median, the high and low generalized market ranges are used to illustrate the effect of market prices upon facility operating parameters. The following table 3-6 summarizes these values.

FOOTNOTE #9

# Table 1: Typical Equipment Life Expectancy

| Equipment | Life Expectancy in Years |
|---|---|
| **Source of supply** | |
| Intake Structures | 35 – 45 |
| Wells and Springs | 25 – 35 |
| Galleries and Tunnels | 30 – 40 |
| Transmission mains | 35 – 40 |
| **Pumping Plants** | |
| Structures | 30 – 60 |
| Pumping Equipment | 10 – 15 |
| **Treatment Plants** | |
| Structures | 30 – 60 |
| Equipment | 10 – 15 |
| Chlorination Equipment | 10 – 15 |
| **Transmission/Distribution** | |
| Structures | 30 – 60 |
| Reservoirs and Tanks | 30 – 60 |
| Mains & Distribution Pipes | 35 – 40 |
| Services | 30 – 50 |
| Valves | 35 – 40 |
| Backflow Prevention Valves | 35 – 40 |
| Blow-off valves | 35 – 40 |
| Meters | 10 – 15 |
| Hydrants | 40 – 60 |
| **General Plant** | |
| Structures | 30 – 40 |
| Electrical Systems | 7 – 10 |
| Equipment | 10 – 15 |
| Transportation Equipment | 10 |
| Computers | 5 |
| Stores equipment | 10 |
| Lab/Monitoring Equipment | 5 – 7 |
| Tools and Shop Equipment | 10 – 15 |
| Landscaping/Grading | 40 – 60 |
| Power operated equipment | 10 – 15 |
| Communications equipment | 10 |

FOOTNOTE #10

The highest tonnage scenarios modeled here for both a single and dual stream tonnage would be the participating plus the non-participating municipalities in a single shift. In the year 2025 the dual stream facility would need to be able to process, just over 14 tons per hour of fiber and just over 5 tons per hour of commingled containers. The Single Stream facility would need to process approximately 23 tons per hour of total material with almost 17 being fiber and almost 6 being commingled. Based upon these calculations, we recommend that the design basis for a Dual Stream MRF be 17.5 tons per hour of fiber and 7.5 tons per hour of commingled containers. The design basis for a Single Stream MRF should be 25 tons per hour total materials, with 17.5 tons being fiber and 7.5 tons being commingled. Note that "tons per hour" design is the same for both systems. It is assumed that additional materials captured by Single Stream collection would be processed during a second shift.

Because either of the Regional MRF scenarios requires two-shift processing, any design must provide a tipping floor capable of storing materials received during normal collection hours and processed during a second shift. If the County expects the facility to operate as a regional MRF, up to 500 tons of tipping floor storage could be required by the year 2025.

### 3.b.1 New Facility Dual and Single Stream Operating Costs

For each of the six operating scenarios, the primary factor to operating costs over time is inflation. All operating costs have been modeled using an inflation factor of 3% per year. Over the 15-year life of the projected new MRF, this has a very measurable effect. We believe this is probably the worst case. A secondary effect on operating costs is tonnage. Per Section 1, the tonnage levels of each operating scenario changes as a result of projected population changes over time.

Single Stream operating costs are higher than Dual Stream costs. This is primarily due to the increased levels of residue in the single stream material resulting in additional labor to pre-screen incoming recyclables. Also, additional quality control personnel are needed to sort any fiber or containers that the screens do not automatically sort into the proper screen. Because of the additional screening systems required to sort fiber from containers, Single Stream Systems are more costly resulting in higher amortization costs. Single Stream systems affect labor needs in different ways; they create the need for additional labor for quality control while reducing labor relative to a Dual Stream system by automating the removal of both mixed broken glass and residue. The net effect is generally that Single Stream systems require additional personnel when compared to technologically comparable Dual Stream Systems.

While the capital costs associated with various hourly throughputs within a fairly narrow range are mostly constant, operating costs are not. Per ton Operations and Maintenance costs vary substantially in the same facility at different throughput levels. Similarly, dual and single stream operating costs also vary. Attached to this report as Appendix F are the detailed operating cost worksheets for the proposed MRF for the six operating scenarios and years, 2010, 2015, 2020, and 2025. These costs are summarized in the attached table 3-5.

# MRF Equipment Pricing Data

## Pirrung, Don

**From:** Meyers, Rick [rick.meyers@milwaukee.gov]
**Sent:** Thursday, August 13, 2009 12:33 PM
**To:** Haygood, Jill E.
**Cc:** Pirrung, Don
**Subject:** RE: Single Stream equipment cost numbers

Thanks, Jill. I have copied Don on this.
Don, if you don't get what you need, let me or Jill know. Thanks.
-Rick

---

**From:** Haygood, Jill E. [mailto:HaygooJE@co.outagamie.wi.us]
**Sent:** Thursday, August 13, 2009 11:46 AM
**To:** Meyers, Rick
**Subject:** Single Stream equipment cost numbers

Rick
FYI—Phil Stecker my supervisor is working with Don Piurring, a consultant I assumed you hired to get info. on pricing of single stream equipment. I hope you get all the info. you need in a timely manner, if not give me a call.

The basics of our system

BHS (Bulk Handling Systems)
Equipment Cost approximately 7.7 Million
Building Expansion 2.2 Million
25 Tons/Hour System

Process 50,000 tons annually (Residential Material from Brown, Outagamie, Winnebago), one shift 7:00am-3:30pm.

Hope this helps.

Jill Haygood
Outagamie County Recycling Coordinator
(920) 832-4710
Haygooje@co.outagamie.wi.us
*"Live simple so others may simply live"*

News & Events

Subscribe

**New BHS Single Stream System Installed at Wisconsin MRF**

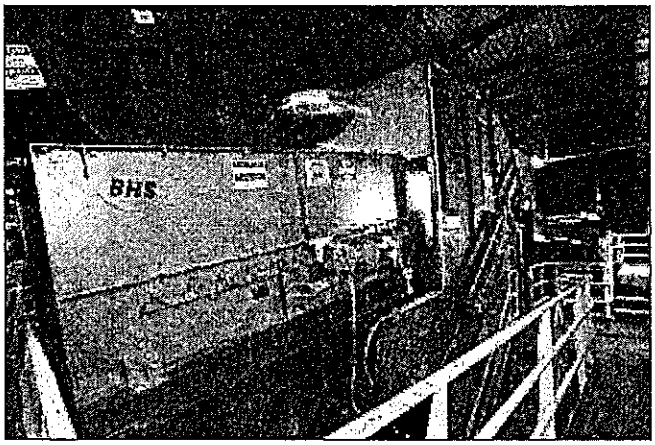
**BHS has completed the installation of a state-of-the-art 25 tph single stream sorting system** at the new Material Recovery Facility (MRF) in Outagamie County, Wisconsin. The MRF is a joint effort of three counties – Brown, Outagamie, and Winnebago – and was built to process material from the new single stream program developed by the three counties. The program is expected to generate greater volumes of recyclable materials and divert these materials from landfill.

The three county single stream program combines paper with plastic, glass and metal recyclables. Phil Stecker, Director of Solid Waste for Outagamie County, said the new MRF launches a new era of recycling for 500,000 people in more than 60 Brown-Outagamie-Winnebago communities. He hopes the new program will reduce complications for residents and encourage greater community participation in recycling.

The Outagamie County MRF sets the new standard for single stream processing, incorporating the latest in screening, optical, and air separation technologies. The BHS single stream system is designed to maximize the recovery of marketable commodities, yielding minimal residual material and reducing disposal costs. Designed, manufactured and installed by BHS, the system focuses on the reduction of operating costs by optimizing integrated processes to emphasize mechanization and the extraction of recoverable materials on the first "pass". As a result, the products produced by the system are high in quality, the cost to process material is low, and the capture rate of high value materials is virtually 100% with extremely low residue values.

As reported by the Appleton Post Crescent, the approval of the facility by the Outagamie County Board of Supervisors will allow the cost of the new facility to be shared between Brown, Outagamie and Winnebago Counties, all of which currently participate in a tri-county agreement for solid waste and recycling processing. Moving recycling from the dual stream system, in which paper is collected separately, to a single stream collection is another way the tri-county agreement best meets the needs of the region.

BHS designs, manufactures and installs processing systems to efficiently extract recoverable materials from waste streams, thus minimizing residual volumes sent to landfills and preserving precious natural resources through demonstrated carbon footprint reduction capabilities. The Eugene, Oregon USA based company is the leading supplier of processing systems for the solid waste, recycling, forest products and power generation industries and continues to develop new generation products and systems, while adding to an extensive list of patented technologies.







1040 Arrowsmi
Tel: 541.485.0999 866.68

# Purchasing Division

County Administration Building
300 Monroe Avenue NW
Grand Rapids, MI 49503-2289, USA
Phone: (616) 632-7720
Fax: (616) 632-7715
e-mail: purchasing@kentcountymi.gov

Kent County Purchasing is a division of the Fiscal Services Department. The Purchasing Division's primary responsibility is tc departments of Kent County in a timely, efficient, and cost-effective manner while complying with the federal, state and local Commissioners.

The Division operates with the best interest of the tax paying public in mind and is held to the highest professional standard a Purchasing Managers (NAPM) lists 12 principles or standards that purchasing professionals should follow. The Kent County standards as well as the policies established by the Board of Commissioners.

The Division encourages broad-based participation through a fair and open competitive process.

**From:** Dennis Kmiecik
**To:** Brinks, Calvin
**Date:** 8/7/2009 11:54 AM
**Subject:** Cal,

Cal,

Here is the breakdown for the new MRF:

Building: $6,388,296.50
Equipment: $4,727,185.00
Baler: $478,250.00
Construction Management: $303,144.27
Land: (5 acres) na

Total$11,896,875.77

Dennis

Dennis Kmiecik, P.E.
Dept. of Public Works - Kent County, MI
PH 616-336-4369 FX 616-336-3338
**********

**MRF Equipment Vendor and Trade References**

Jerry Flickinger
Equipment Sales Manager
JWR Inc.
PO box 356
Johnson Creek WI 53038
Cell Phone: 920-988-0538
Office Phone: 888-699-2848
Office Fax: 920-699-2847
Website: www.jwrinc.net

Jerry Flickinger provided cost information on Single Stream processing equipment.

## Matz, Paul

**From:** Jerry Flickinger [jerry@jwrinc.net]
**Sent:** Friday, August 14, 2009 9:23 AM
**To:** Matz, Paul
**Subject:** RE: Automation Question

Hi Paul,

Sorry for the delay in getting back to you on this. Here is what I have.

Estimated cost for the following equipment that will process 20 tons per hour would be $6,000,000 to $7,000,000. This would require a second shift if they achieve the 80,000 ton level.

Infeed metering hopper for bulk loading of materials.
Main infeed conveyor.
Pre-sort station.
Trommell screen for glass and fines.
OCC screen.
Three Ballistic Separators. (These units are used to separate paper, containers, and fines.) Optical sort for both fiber and plastic.
Shaker conveyor for additional removal of fines and broken glass.
Magnet for removal of steel cans and other metals.
Eddy current separator for aluminum.
All related platforms, railings, stairs, and sorting station conveyors.

In addition to this, estimated mechanical installation costs will be right at 15% of the final total equipment cost. Estimated electrical installation costs will run right at 10% of the equipment total.

At this volume, I would recommend a 2 baler system, one for fiber, and one for containers. Both machines would be able to crossover and process the other materials in emergencies so this gives you a back up if one baler is down, and would not cost a lot more than the one huge baler it would take to handle this volume. The balers will add an additional $800,000 including installation.

Estimated staffing for this system is 26 on the sorting stations, plus another 5 to 7 on rolling stock.

Estimated minimum building size to accommodate this equipment is 200' by 300'.

As for life span, that is a VERY tricky question. It is so dependent on the volume and cleanliness of the incoming material, and the quality of maintenance that is done that it's hard to estimate. IF it is maintained properly, 10 to 12 years is not out of the question, but in those 10 to 12 years you would need to figure on replacing some conveyor belts and drives, relining balers, and rebuilding cylinders.

I hope this gives you what you need. Call me if you have any questions.

-----Original Message-----
From: Matz, Paul [mailto:Paul.Matz@aecom.com]
Sent: Wednesday, August 12, 2009 1:23 PM
To: Jerry Flickinger
Subject: RE: Automation Question

Jerry,
Just checking in...Do you plan to send me any type of budget costs?
One additional question:
If you were to put a time estimate on the life span of the MRF equipment what would it be? If I had to make a educated guess I would say that it is 10-15 years.

## Matz, Paul

**From:** Matz, Paul
**Sent:** Friday, August 07, 2009 9:35 AM
**To:** 'Jerry Flickinger'
**Cc:** Pirrung, Don
**Subject:** RE: Compactor Information

Jerry:

Thanks for the follow-up phone call.

As we discussed, I am currently working on a project for the City of Milwaukee.

The city is in the process of evaluating their current recycling capabilities and their future options. AECOM has been hired to develop a report that summarizes their options.

The report that we are writing is not intended to be a detailed cost study. The cost data that we will document in the report will provide the city with budget numbers, so that they can evaluate which options they should pursue in more detail. This is not a formal Request for Quote. Without going into great detail, their options are:

1. Build a new Single Stream MRF for their recyclables only
2. Partner with some of the surrounding communities and build a new Single Stream MRF for a larger volume of recyclables
3. Build a new Transfer Facility and continue to send their recyclables to a privately owned MRF

To that end I would like to request your assistance with "budget numbers" for the first two options. The figures presented should be for the installed cost of all of the "process equipment". These numbers can be presented in a range, a unit price, or whatever format makes you the most comfortable to convey this type of data. I recognize that there are a lot of variables so let me bracket your estimate with some assumptions.

Assumptions

- Assume current "state of the art" for a single stream system. This would include all of the latest optical sorting for plastics, material detection, etc.
- Assume that a new facility would be constructed in the existing facility but all the necessary modifications would be made so that necessary space, grading, building, utilities, etc. would be available, and your firm would participate in the design of the facility.
- Use current pricing. We reorganize that these prices are time, and material cost sensitive.
- The design capacity of the facility shall be as follows:

| | |
|---|---|
| Option 1 | 30,000 tons/year |
| Option 2 | 81,000 tons/year |

- The make up of the recyclable materials is:

| Commodity | Composition % |
|---|---|
| Newspaper #8 (including phone books and magazines) | 61.17 |
| Corrugated | 7.58 |
| Office Mix Paper | 0.59 |
| FE / Tin | 2.58 |
| Aluminum | 1.49 |
| HDPE Natural | 1.81 |
| HDPE Colored | 1.52 |
| PET | 4.70 |
| Green Glass | 2.13 |

| | |
|---|---|
| Amber Glass | 0.78 |
| Flint Glass | 1.4 |
| Mixed Glass | 14.17 |
| Scrap Metal | .04 |

- The recyclables will come in either compacted in transfer vehicles or in the collection trucks themselves.

Any additional information that you can provide like brochures, generic drawings, material lists, building/site layout requirements, operating cost data, etc. would be greatly appreciated. It is my intention to include this letter and a copy of all documentation that you provide in an Appendix to the report.

I will be compiling the data that over the next week so I would like to have you numbers no later the COB in Wednesday August 12.

Please feel free to contact me if you have any questions.

Thank you in advance for your assistance.

**Paul Matz**
Project Engineer
AECOM Environment
D: 920.451.2751 C: 920.698.2444



---

**From:** Jerry Flickinger [mailto:jerry@jwrinc.net]
**Sent:** Thursday, August 06, 2009 4:12 PM
**To:** Matz, Paul; Mike Shawgo
**Cc:** David Wolf
**Subject:** RE: Compactor Information

Hello Paul,

As Mike has mentioned, JWR offers service and sales of all types of recycling equipment including balers, conveyors, shredders, and sorting equipment. If the new project may involve any of these types of equipment, we would greatly appreciate the opportunity to speak with you. I have been selling recycling equipment for over 10 years and JWR has been servicing this kind of equipment for over 25 years.

Please let me know if there is anything we can help you with.

Jerry Flickinger
Sales Manager
JWR Inc.

You can visit us on the web at www.jwrinc.net

---

**From:** Matz, Paul [mailto:Paul.Matz@aecom.com]
**Sent:** Thursday, August 06, 2009 10:14 AM
**To:** Mike Shawgo
**Cc:** Jerry Flickinger; David Wolf
**Subject:** Compactor Information

Mike,
Got your e-mail.
Thanks for the information and the follow-up.
I will use $150K as an installed budget price for a compactor.

I look forward to receiving the Sebright information.

**Paul Matz**
Project Engineer
AECOM Environment
D: 920.451.2751 C: 920.698.2444



---

**From:** Mike Shawgo [mailto:mshawgo@steppequipment.com]
**Sent:** Thursday, August 06, 2009 9:52 AM
**To:** Matz, Paul
**Cc:** Jerry Flickinger; David Wolf
**Subject:** City of MIlwaukee

Paul...I will get you some info from Sebright, Jerry and Dave at JWR are my expert resources on the baler and conveyor end. Please stay in touch...Mike

Sincerely,

**Mike Shawgo**
*General Manager*
Stepp Equipment Company
N58 W14810 Shawn Circle
Menomonee Falls WI 53051
262-252-5500 p
262-252-5519 f
414-881-0336 c

Visit our recently updated website @ www.steppequipment.com!

# Transfer Facility Equipment Pricing Data

## Transfer Facility Vendor and Trade References

Mike Shawgo
General Manager
Stepp Equipment Company
N58 W14810 Shawn Circle
Menomonee Falls WI 53051
Cell Phone: 414-881-0336
Office Phone: 262-252-5500
Office Fax: 262-252-5519
Website: milwaukee@steppequipment.com

Mike Shawgo provided cost information on Transfer Station equipment, and equipment life expectancies.

## Matz, Paul

**From:** Mike Shawgo [mshawgo@steppequipment.com]
**Sent:** Wednesday, August 12, 2009 5:52 PM
**To:** Matz, Paul
**Subject:** RE: Compactor Information

Paul...These are hypothetical, but should give you a starting point ..Mike

---

**From:** Matz, Paul [mailto:Paul.Matz@aecom.com]
**Sent:** Wednesday, August 12, 2009 4:49 PM
**To:** Mike Shawgo
**Subject:** RE: Compactor Information

Good information Mike.

Thanks again!!

If you have some knowledge of a particular piece of equipment, please let me know your opinion where I have ??

| Commodity | Life Expectancy |
|---|---|
| Buildings and Grounds | 40 years |
| Single Stream Process Equipment | 20 years |
| Compactor | 10-15 years |
| Transfer Trailers | 10-15 |
| Semi Tractor | 10 -15 |
| Yard Truck | 15 years |
| Front End Loader | 15 years |

**Paul Matz**
Project Engineer
AECOM Environment
D: 920.451.2751 C: 920.698.2444



---

**From:** Mike Shawgo [mailto:mshawgo@steppequipment.com]
**Sent:** Wednesday, August 12, 2009 4:42 PM
**To:** Matz, Paul
**Subject:** RE: Compactor Information

10-15 years, depending on tonnage processed and the type of material.

---

**From:** Matz, Paul [mailto:Paul.Matz@aecom.com]
**Sent:** Wednesday, August 12, 2009 4:29 PM
**To:** Mike Shawgo
**Subject:** RE: Compactor Information

Mike:
What is the life expectancy of a compactor assuming proper maintenance?
Same question for a trailer?

**Paul Matz**
Project Engineer
AECOM Environment
D: 920.451.2751 C: 920.698.2444



---

**From:** Mike Shawgo [mailto:mshawgo@steppequipment.com]
**Sent:** Friday, August 07, 2009 8:50 AM
**To:** Matz, Paul
**Subject:** RE: Compactor Information

Paul....Pricing on the transfer trailers, which must be steel and compactor compatible, will range from $90,000-110,000. Also, there is a state law which allows more payload if the hauler is hauling compacted waste. That is the reason transfer compactors are so popular in Wisconsin. It is a permitted allowance, Wisconsin Statute 348.27, any Wisconsin DOT office can get you the info. ...Mike

---

**From:** Matz, Paul [mailto:Paul.Matz@aecom.com]
**Sent:** Thursday, August 06, 2009 3:09 PM
**To:** Mike Shawgo
**Subject:** RE: Compactor Information

Mike:

When we talked this morning you mentioned that you had some knowledge of the price of a trailer that would work with the compactor.

You and I both agree that it is probably best for the city contract this service, but they have requested that we estimate the cost of trailers, so if you can provide any insight to these costs it would also be appreciated.

Thanks,

**Paul Matz**
Project Engineer
AECOM Environment
D: 920.451.2751 C: 920.698.2444



---

**From:** Matz, Paul
**Sent:** Thursday, August 06, 2009 10:14 AM
**To:** 'Mike Shawgo'
**Cc:** Jerry Flickinger; David Wolf
**Subject:** Compactor Information

Mike,
Got your e-mail.
Thanks for the information and the follow-up.
I will use $150K as an installed budget price for a compactor.
I look forward to receiving the Sebright information.

**Paul Matz**
Project Engineer
AECOM Environment
D: 920.451.2751 C: 920.698.2444



---

**From:** Mike Shawgo [mailto:mshawgo@steppequipment.com]
**Sent:** Thursday, August 06, 2009 9:52 AM
**To:** Matz, Paul
**Cc:** Jerry Flickinger; David Wolf
**Subject:** City of MIlwaukee

Paul...I will get you some info from Sebright, Jerry and Dave at JWR are my expert resources on the baler and conveyor end. Please stay in touch...Mike

Sincerely,

**Mike Shawgo**
*General Manager*
Stepp Equipment Company
N58 W14810 Shawn Circle
Menomonee Falls WI 53051
262-252-5500 p
262-252-5519 f
414-881-0336 c

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INDUSTRIAL MATERIAL HANDLING & TRANSPORTATION EQUIPMENT

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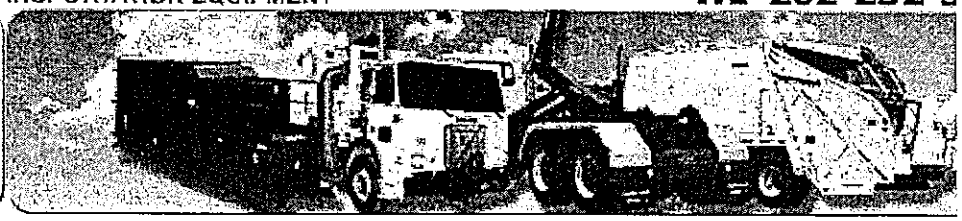
STEPP Equipment Company





## Welcome to Stepp Equipment

Online Parts Store

Stepp Equipment provides superior service for both refuse bodies and stationary refuse compactors. We specialize in 24-hour service for our refuse compactor customers. In addition, Stepp Equipment stocks parts for most major manufacturers of refuse compactors, refuse bodies, and roll-off equipment. We specialize in fast and efficient delivery of refuse parts throughout the Midwest.

Stepp Equipment is an authorized distributor for manufacturers such as East, Galbreath, Labrie, Leach, Pioneer, Sebright and many others.

Stepp Equipment has two convenient locations to serve you – Chicago, IL and Menomonee Falls, WI.

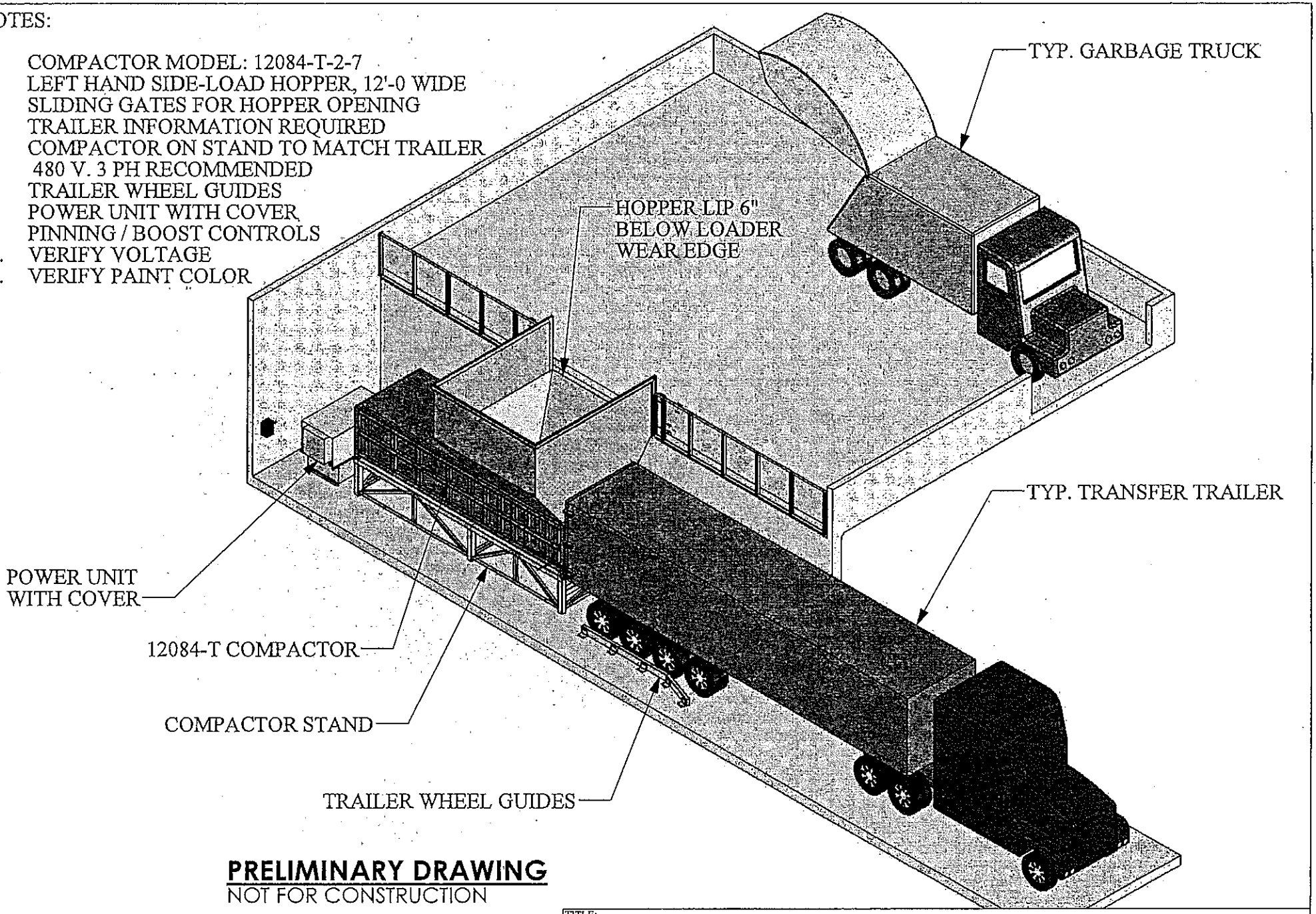


**Illinois Location**
5400 Stepp Drive
Summit, IL 60501
Phone: 708-458-7800
Fax: 708-458-1031
chicago@steppequipment.com
View Map For This Location

**Wisconsin Location**
N58 W14810 Shawn Circle
Menomonee Falls, WI 53051
Phone: 262-252-5500
Fax: 262-252-5519
milwaukee@steppequipment.com
View Map For This Location

NOTES:

1. COMPACTOR MODEL: 12084-T-2-7
2. LEFT HAND SIDE-LOAD HOPPER, 12'-0 WIDE
3. SLIDING GATES FOR HOPPER OPENING
4. TRAILER INFORMATION REQUIRED
5. COMPACTOR ON STAND TO MATCH TRAILER
6. 480 V. 3 PH RECOMMENDED
7. TRAILER WHEEL GUIDES
8. POWER UNIT WITH COVER
9. PINNING / BOOST CONTROLS
10. VERIFY VOLTAGE
11. VERIFY PAINT COLOR




**PRELIMINARY DRAWING**
NOT FOR CONSTRUCTION

| DATE: 9-10-07 | REVISION: | DRAWN BY: BB | SHEET 1 OF 5 |
|---|---|---|---|

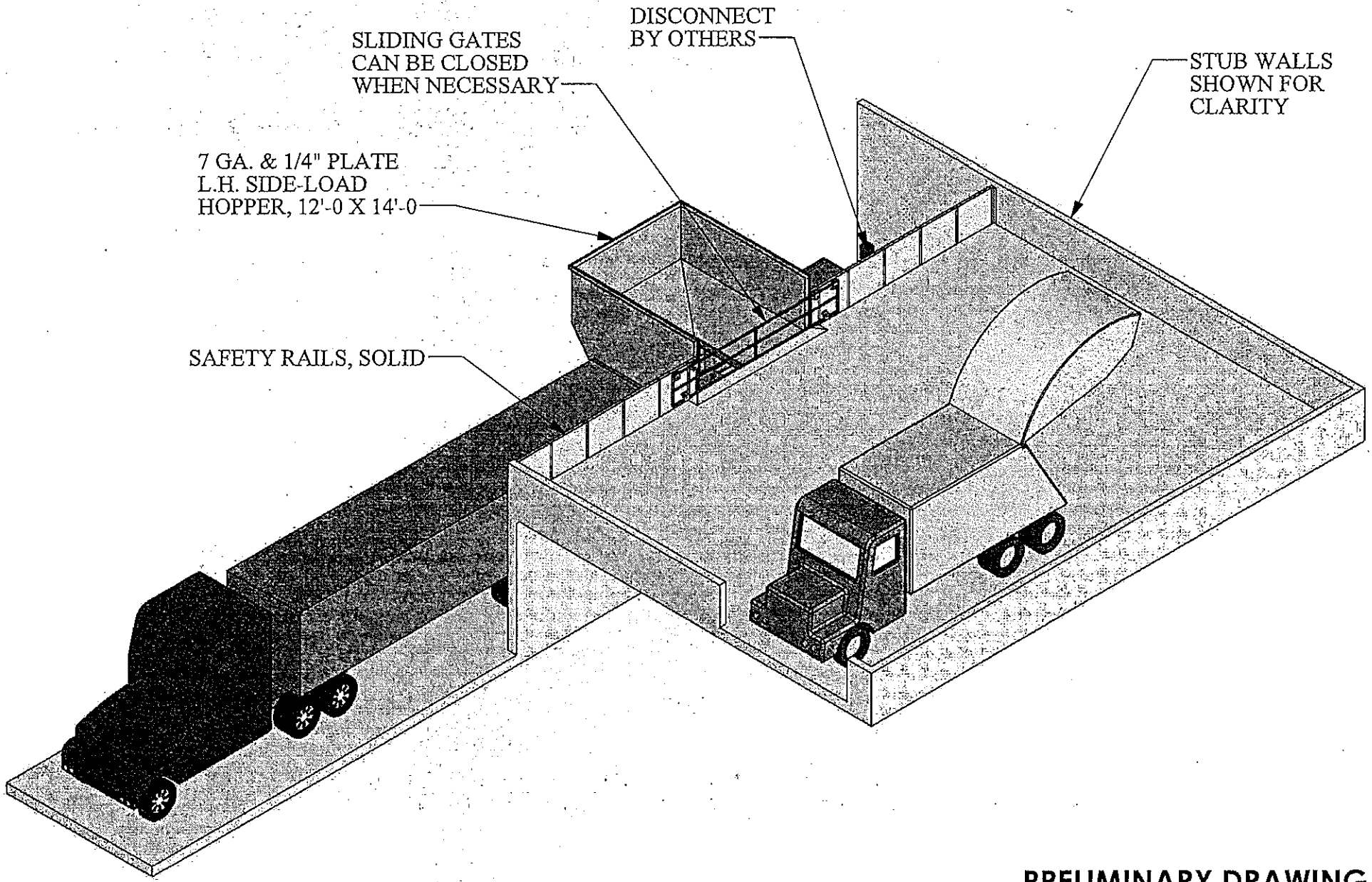
TITLE: **GENERIC TRANSFER STATION LAYOUT USING A 12084 COMPACTOR**



| TOLERANCE (UNLESS SPECIFIED) | |
|---|---|
| FRACTIONS | ±1/16" |
| .XXXX | ±.0625" |
| ANGLES | ±0°30' |

*SEBRIGHT PRODUCTS INC.*
127 N. WATER ST. HOPKINS, MI 49328
PH 269-793-7183 / www.sebrightproducts.com

| CUSTOMER NAME: DYNAMIC TRUCK & EQUIPMENT CO. | | | |
|---|---|---|---|
| WEIGHT (LBS): N/A | SCALE: 1:128 | SHEET SIZE: A | DWG #: 0561 |
| MATERIAL: | SER. NO.: N/A | | |




**PRELIMINARY DRAWING**
NOT FOR CONSTRUCTION

DATE: 9-10-07 | REVISION: | DRAWN BY: BB | SHEET 2 OF 5

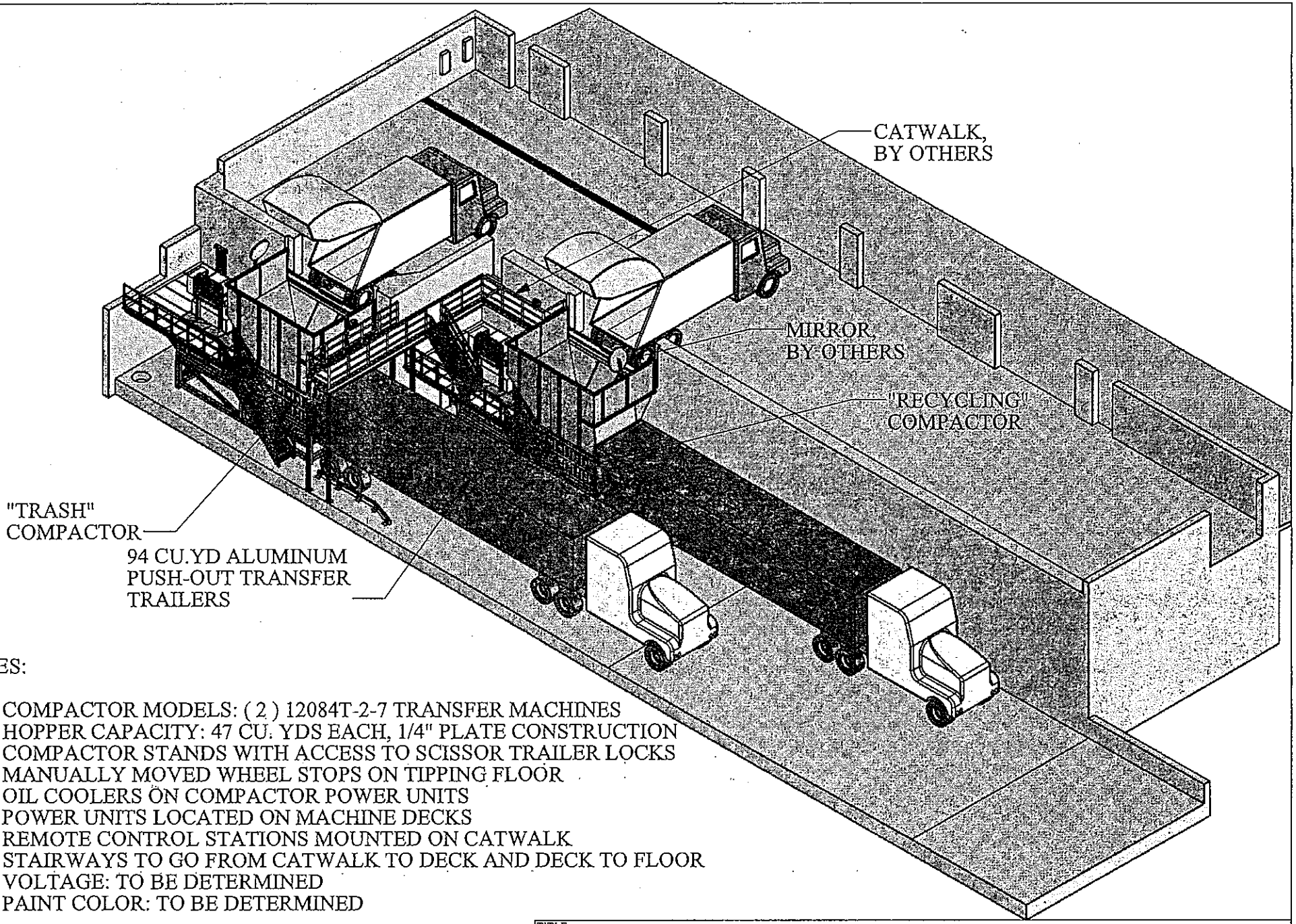
TITLE: **GENERIC TRANSFER STATION LAYOUT USING A 12084 COMPACTOR**



TOLERANCE (UNLESS SPECIFIED)
FRACTIONS ±1/16"
.XXXX ±.0625"
ANGLES ±0°30'

*SEBRIGHT PRODUCTS INC.*
127 N. WATER ST. HOPKINS, MI 49328
PH 269-793-7183 / www.sebrightproducts.com

CUSTOMER NAME: DYNAMIC TRUCK & EQUIPMENT CO.
WEIGHT (LBS): N/A | SCALE: 1:128 | SHEET SIZE: A | DWG #: 0561
MATERIAL: | SER. NO.: N/A




NOTES:

1. COMPACTOR MODELS: ( 2 ) 12084T-2-7 TRANSFER MACHINES
2. HOPPER CAPACITY: 47 CU. YDS EACH, 1/4" PLATE CONSTRUCTION
3. COMPACTOR STANDS WITH ACCESS TO SCISSOR TRAILER LOCKS
4. MANUALLY MOVED WHEEL STOPS ON TIPPING FLOOR
5. OIL COOLERS ON COMPACTOR POWER UNITS
6. POWER UNITS LOCATED ON MACHINE DECKS
7. REMOTE CONTROL STATIONS MOUNTED ON CATWALK
8. STAIRWAYS TO GO FROM CATWALK TO DECK AND DECK TO FLOOR
9. VOLTAGE: TO BE DETERMINED
10. PAINT COLOR: TO BE DETERMINED

| DATE: 8/7/2009 | REVISION: | DRAWN BY: JL | SHEET 1 OF 13 |
|---|---|---|---|

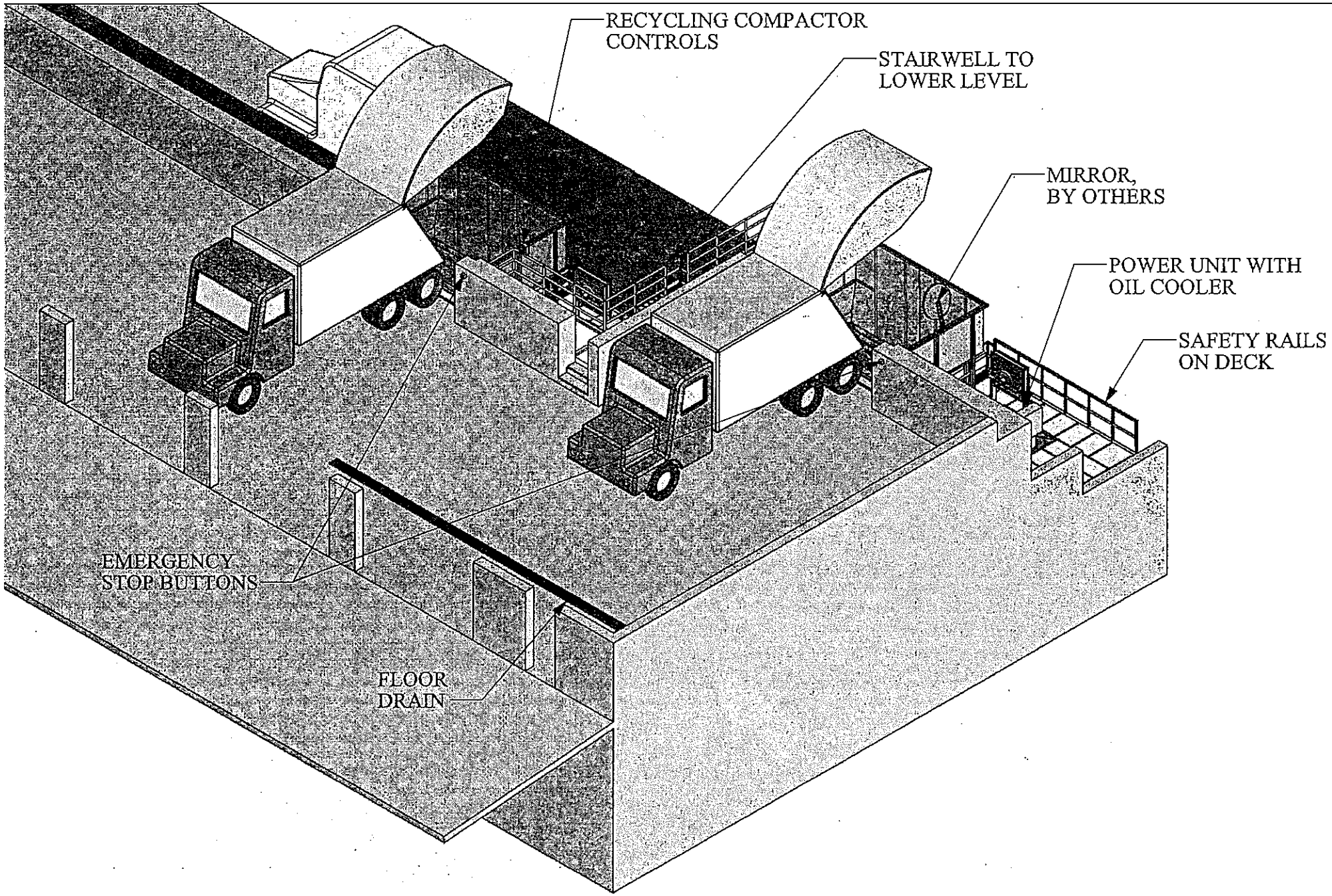
TITLE: **GENERIC SALES LAYOUT**



| TOLERANCE (UNLESS SPECIFIED) | |
|---|---|
| FRACTIONS | ±1/16" |
| .XXX | ±.0625" |
| ANGLES | ±0°30' |

*SEBRIGHT PRODUCTS INC.*
127 N. WATER ST. HOPKINS, MI 49328
PH 269-793-7183 / www.sebrightproducts.com

| CUSTOMER NAME: | | | |
|---|---|---|---|
| WEIGHT (LBS): | SCALE: 1:192 | SHEET SIZE: A | DWG #: 8497 |
| MATERIAL: | SER. NO.: | | |




DATE 8/7/2009 | REVISION: | DRAWN BY: JL | SHEET 2 OF 13

TITLE:
# GENERIC SALES LAYOUT



TOLERANCE (UNLESS SPECIFIED)
FRACTIONS ±1/16"
.XXXX ±.0625"
ANGLES ±0°30'

*SEBRIGHT PRODUCTS INC.*
127 N. WATER ST. HOPKINS, MI 49328
PH 269-793-7183 / www.sebrightproducts.com

CUSTOMER NAME:
WEIGHT (LBS): | SCALE: 1:128 | SHEET SIZE: A | DWG #: 8497
MATERIAL: | SER. NO.:

# APPENDIX K

# TRANSPORTATION COST ESTIMATE

# Detailed Cost Analysis

| Sector | # of Trips per Month[1] | Sector Centroid Cross-Streets | | To and From Proposed North Side Transfer Station (7301 W Mill Rd) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Distance (miles) | | Time (minutes) | | | Cost | | | | |
| | | East-West | North-South | One-way | Roundtrip | One-way | Roundtrip | 20% Inflated Truck Time | Labor per Trip: $0.78/min | Maint/Fuel per Trip: $0.19/min | Total Cost per Trip | Monthly Cost | Annual Cost[2] |
| N-1 | 20 | Keefe Avenue | 95th Street | 5.1 | 10.2 | 16 | 32 | 38.4 | $29.95 | $7.30 | $37.25 | $744.96 | $8,940 |
| N-2 | 20 | Lynmar Court | 78th Street | 4.4 | 8.8 | 12 | 24 | 28.8 | $22.46 | $5.47 | $27.94 | $558.72 | $6,705 |
| N-3 | 20 | Burleigh Street | 75th Street | 5.8 | 11.6 | 15 | 30 | 36 | $28.08 | $6.84 | $34.92 | $698.40 | $8,381 |
| N-4 | 20 | Capital Drive | 56th Street | 4.0 | 8.0 | 9 | 18 | 21.6 | $16.85 | $4.10 | $20.95 | $419.04 | $5,028 |
| N-5 | 20 | Hope Avenue | 36th Street | 5.1 | 10.2 | 11 | 22 | 26.4 | $20.59 | $5.02 | $25.61 | $512.16 | $6,146 |
| N-6 | 12 | Vienna Avenue | 24th Street | 6.4 | 12.8 | 13 | 26 | 31.2 | $24.34 | $5.93 | $30.26 | $363.17 | $4,358 |
| N-7 | 20 | Linwal Lane | 24th Street | 5.2 | 10.4 | 12 | 24 | 28.8 | $22.46 | $5.47 | $27.94 | $558.72 | $6,705 |
| N-8 | 20 | Custer Avenue | 42nd Street | 3.3 | 6.6 | 7 | 14 | 16.8 | $13.10 | $3.19 | $16.30 | $325.92 | $3,911 |
| N-9 | 20 | Custer Avenue | 64th Street | 1.8 | 3.6 | 5 | 10 | 12 | $9.36 | $2.28 | $11.64 | $232.80 | $2,794 |
| N-10 | 20 | Villard Avenue | 84th Street | 3.3 | 6.6 | 9 | 18 | 21.6 | $16.85 | $4.10 | $20.95 | $419.04 | $5,028 |
| N-11 | 20 | Daphne Street | 106th Street | 2.5 | 5.0 | 8 | 16 | 19.2 | $14.98 | $3.65 | $18.62 | $372.48 | $4,470 |
| N-12 | 20 | Hemlock Street | 60th Street | 2.1 | 4.2 | 6 | 12 | 14.4 | $11.23 | $2.74 | $13.97 | $279.36 | $3,352 |
| N-13 | 20 | Fairlane Court | 93rd Street | 4.6 | 9.2 | 14 | 28 | 33.6 | $26.21 | $6.38 | $32.59 | $651.84 | $7,822 |
| | | | | | | | | | | | | | $73,639 |
| | | | | | | | | | | | | Approximately | $73,700 |

[1] Assuming 1 Trip per Day

[2] Annual Cost rounded to the nearest dollar

# Detailed Cost Analysis

| Sector | # of Trips per Month[1] | Sector Centroid Cross-Streets | | To and From Proposed South Side Transfer Station (3879 W Lincoln Av.) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Distance (miles) | | Time (minutes) | | | Cost | | | | |
| | | East-West | North-South | One-way | Roundtrip | One-way | Roundtrip | 20% Inflated Truck Time | Labor per Trip: $0.78/min | Maint/Fuel per Trip: $0.19/min | Total Cost per Trip | Monthly Cost | Annual Cost[2] |
| C-1 | 20 | Linnwood Avenue | Stowell Avenue | 8.6 | 17.2 | 18 | 36 | 43.2 | $33.70 | $8.21 | $41.90 | $838.08 | $10,057 |
| C-2 | 20 | Auer Avenue | Pierce Street | 7.6 | 15.2 | 16 | 32 | 38.4 | $29.95 | $7.30 | $37.25 | $744.96 | $8,940 |
| C-3 | 20 | Kewaunee Street | Marshall Street | 6.6 | 13.2 | 16 | 32 | 38.4 | $29.95 | $7.30 | $37.25 | $744.96 | $8,940 |
| C-4 | 20 | Chambers Street | 48th Street | 5.3 | 10.6 | 12 | 24 | 28.8 | $22.46 | $5.47 | $27.94 | $558.72 | $6,705 |
| C-5 | 20 | Lisbon Avenue | 49th Street | 4.5 | 9.0 | 9 | 18 | 21.6 | $16.85 | $4.10 | $20.95 | $419.04 | $5,028 |
| C-6 | 20 | Woodlawn Court | 50th Street | 3.3 | 6.6 | 8 | 16 | 19.2 | $14.98 | $3.65 | $18.62 | $372.48 | $4,470 |
| C-7 | 20 | Fairview Avenue | 80th Street | 4.8 | 9.6 | 12 | 24 | 28.8 | $22.46 | $5.47 | $27.94 | $558.72 | $6,705 |
| C-8 | 20 | Hopkins Street | 15th Street | 7.1 | 14.2 | 14 | 28 | 33.6 | $26.21 | $6.38 | $32.59 | $651.84 | $7,822 |
| C-9 | 20 | Center Street | 23rd Street | 6.4 | 12.8 | 16 | 32 | 38.4 | $29.95 | $7.30 | $37.25 | $744.96 | $8,940 |
| S-1 | 20 | Goldcrest Avenue | 18th Street | 5.8 | 11.6 | 17 | 34 | 40.8 | $31.82 | $7.75 | $39.58 | $791.52 | $9,498 |
| S-2 | 20 | Bardnard Avenue | 14th Street | 4.9 | 9.8 | 15 | 30 | 36 | $28.08 | $6.84 | $34.92 | $698.40 | $8,381 |
| S-3 | 20 | Saveland Avenue | Herman Street | 5.0 | 10.0 | 16 | 32 | 38.4 | $29.95 | $7.30 | $37.25 | $744.96 | $8,940 |
| S-4 | 20 | Pryor Avenue | Fulton Street | 3.8 | 7.6 | 14 | 28 | 33.6 | $26.21 | $6.38 | $32.59 | $651.84 | $7,822 |
| S-5 | 20 | Arthur Avenue | 19th Street | 1.5 | 3.0 | 5 | 10 | 12 | $9.36 | $2.28 | $11.64 | $232.80 | $2,794 |
| S-6 | 20 | Greenfield Avenue | 29th Street | 1.5 | 3.0 | 4 | 8 | 9.6 | $7.49 | $1.82 | $9.31 | $186.24 | $2,235 |
| S-7 | 20 | Hayes Avenue | 8th Street | 2.2 | 4.4 | 7 | 14 | 16.8 | $13.10 | $3.19 | $16.30 | $325.92 | $3,911 |
| S-8 | 20 | Morgan Avenue | 13th Street | 3.2 | 6.4 | 9 | 18 | 21.6 | $16.85 | $4.10 | $20.95 | $419.04 | $5,028 |
| S-9 | 20 | Manitobu Street | 39th Street | 1.2 | 2.4 | 3 | 6 | 7.2 | $5.62 | $1.37 | $6.98 | $139.68 | $1,676 |
| S-10 | 20 | Nebraska Avenue | 54th Street | 2.2 | 4.4 | 5 | 10 | 12 | $9.36 | $2.28 | $11.64 | $232.80 | $2,794 |
| S-11 | 20 | Ohio Avenue | 68th Street | 3.1 | 6.2 | 8 | 16 | 19.2 | $14.98 | $3.65 | $18.62 | $372.48 | $4,470 |
| S-12 | 20 | Morgan Avenue | 86th Street | 4.2 | 8.4 | 9 | 18 | 21.6 | $16.85 | $4.10 | $20.95 | $419.04 | $5,028 |
| S-13 | 8 | Elgin Lane | 14th Street | 3.2 | 6.4 | 10.5 | 21 | 25.2 | $19.66 | $4.79 | $24.44 | $195.55 | $2,347 |
| | | | | | | | | | | | | | **$132,528** |

[1] Assuming 1 Trip per Day

[2] Annual Cost rounded to the nearest dollar

Approximately **$133,000**

# Detailed Cost Analysis

| Sector | # of Trips per Month[1] | Sector Centroid Cross-Streets | | Existing Milwaukee Facility | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Distance (miles) | | Time (minutes) | | | Cost | | | | |
| | | East-West | North-South | One-way | Roundtrip | One-way | Roundtrip | 20% Inflated Truck Time | Labor per Trip: $0.78/min | Maint/Fuel per Trip: $0.19/min | Total Cost per Trip | Monthly Cost | Annual Cost[2] |
| N-1 | 20 | Keefe Avenue | 95th Street | 7.7 | 15.4 | 18 | 36 | 43.2 | $33.70 | $8.21 | $41.90 | $838.08 | $10,057 |
| N-2 | 20 | Lynmar Court | 78th Street | 7.3 | 14.6 | 17 | 34 | 40.8 | $31.82 | $7.75 | $39.58 | $791.52 | $9,498 |
| N-3 | 20 | Burleigh Street | 75th Street | 6.1 | 12.2 | 14 | 28 | 33.6 | $26.21 | $6.38 | $32.59 | $651.84 | $7,822 |
| N-4 | 20 | Capital Drive | 56th Street | 7.7 | 15.4 | 17 | 34 | 40.8 | $31.82 | $7.75 | $39.58 | $791.52 | $9,498 |
| N-5 | 20 | Hope Avenue | 36th Street | 8.0 | 16.0 | 15 | 30 | 36 | $28.08 | $6.84 | $34.92 | $698.40 | $8,381 |
| N-6 | 12 | Vienna Avenue | 24th Street | 6.4 | 12.8 | 14 | 28 | 33.6 | $26.21 | $6.38 | $32.59 | $391.10 | $4,693 |
| N-7 | 20 | Linwal Lane | 24th Street | 7.5 | 15.0 | 12 | 24 | 28.8 | $22.46 | $5.47 | $27.94 | $558.72 | $6,705 |
| N-8 | 20 | Custer Avenue | 42nd Street | 10.5 | 21.0 | 17 | 34 | 40.8 | $31.82 | $7.75 | $39.58 | $791.52 | $9,498 |
| N-9 | 20 | Custer Avenue | 64th Street | 11.8 | 23.6 | 20 | 40 | 48 | $37.44 | $9.12 | $46.56 | $931.20 | $11,174 |
| N-10 | 20 | Villard Avenue | 84th Street | 8.5 | 17.0 | 20 | 40 | 48 | $37.44 | $9.12 | $46.56 | $931.20 | $11,174 |
| N-11 | 20 | Daphne Street | 106th Street | 15.5 | 31.0 | 24 | 48 | 57.6 | $44.93 | $10.94 | $55.87 | $1,117.44 | $13,409 |
| N-12 | 20 | Hemlock Street | 60th Street | 13.5 | 27.0 | 22 | 44 | 52.8 | $41.18 | $10.03 | $51.22 | $1,024.32 | $12,292 |
| N-13 | 20 | Fairlane Court | 93rd Street | 17.2 | 34.4 | 28 | 56 | 67.2 | $52.42 | $12.77 | $65.18 | $1,303.68 | $15,644 |
| C-1 | 20 | Linnwood Avenue | Stowell Avenue | 6.5 | 13.0 | 13 | 26 | 31.2 | $24.34 | $5.93 | $30.26 | $605.28 | $7,263 |
| C-2 | 20 | Auer Avenue | Pierce Street | 5.5 | 11.0 | 11 | 22 | 26.4 | $20.59 | $5.02 | $25.61 | $512.16 | $6,146 |
| C-3 | 20 | Kewaunee Street | Marshall Street | 2.8 | 5.6 | 11 | 22 | 26.4 | $20.59 | $5.02 | $25.61 | $512.16 | $6,146 |
| C-4 | 20 | Chambers Street | 48th Street | 5.0 | 10.0 | 12 | 24 | 28.8 | $22.46 | $5.47 | $27.94 | $558.72 | $6,705 |
| C-5 | 20 | Lisbon Avenue | 49th Street | 4.2 | 8.4 | 9 | 18 | 21.6 | $16.85 | $4.10 | $20.95 | $419.04 | $5,028 |
| C-6 | 20 | Woodlawn Court | 50th Street | 3.1 | 6.2 | 8 | 16 | 19.2 | $14.98 | $3.65 | $18.62 | $372.48 | $4,470 |
| C-7 | 20 | Fairview Avenue | 80th Street | 4.6 | 9.2 | 11 | 22 | 26.4 | $20.59 | $5.02 | $25.61 | $512.16 | $6,146 |
| C-8 | 20 | Hopkins Street | 15th Street | 4.9 | 9.8 | 9 | 18 | 21.6 | $16.85 | $4.10 | $20.95 | $419.04 | $5,028 |
| C-9 | 20 | Center Street | 23rd Street | 4.3 | 8.6 | 12 | 24 | 28.8 | $22.46 | $5.47 | $27.94 | $558.72 | $6,705 |
| S-1 | 20 | Goldcrest Avenue | 18th Street | 10.7 | 21.4 | 15 | 30 | 36 | $28.08 | $6.84 | $34.92 | $698.40 | $8,381 |
| S-2 | 20 | Bardnard Avenue | 14th Street | 8.8 | 17.6 | 13 | 26 | 31.2 | $24.34 | $5.93 | $30.26 | $605.28 | $7,263 |
| S-3 | 20 | Saveland Avenue | Herman Street | 8.3 | 16.6 | 13 | 26 | 31.2 | $24.34 | $5.93 | $30.26 | $605.28 | $7,263 |
| S-4 | 20 | Pryor Avenue | Fulton Street | 6.2 | 12.4 | 11 | 22 | 26.4 | $20.59 | $5.02 | $25.61 | $512.16 | $6,146 |
| S-5 | 20 | Arthur Avenue | 19th Street | 2.9 | 5.8 | 10 | 20 | 24 | $18.72 | $4.56 | $23.28 | $465.60 | $5,587 |
| S-6 | 20 | Greenfield Avenue | 29th Street | 2.3 | 4.6 | 7 | 14 | 16.8 | $13.10 | $3.19 | $16.30 | $325.92 | $3,911 |
| S-7 | 20 | Hayes Avenue | 8th Street | 3.1 | 6.2 | 10 | 20 | 24 | $18.72 | $4.56 | $23.28 | $465.60 | $5,587 |
| S-8 | 20 | Morgan Avenue | 13th Street | 6.2 | 12.4 | 9 | 18 | 21.6 | $16.85 | $4.10 | $20.95 | $419.04 | $5,028 |
| S-9 | 20 | Manitobu Street | 39th Street | 4.4 | 8.8 | 14 | 28 | 33.6 | $26.21 | $6.38 | $32.59 | $651.84 | $7,822 |
| S-10 | 20 | Nebraska Avenue | 54th Street | 5.4 | 10.8 | 15 | 30 | 36 | $28.08 | $6.84 | $34.92 | $698.40 | $8,381 |
| S-11 | 20 | Ohio Avenue | 68th Street | 6.3 | 12.6 | 17 | 34 | 40.8 | $31.82 | $7.75 | $39.58 | $791.52 | $9,498 |
| S-12 | 20 | Morgan Avenue | 86th Street | 7.4 | 14.8 | 19 | 38 | 45.6 | $35.57 | $8.66 | $44.23 | $884.64 | $10,616 |
| S-13 | 8 | Elgin Lane | 14th Street | 1.5 | 3.0 | 5 | 10 | 12 | $9.36 | $2.28 | $11.64 | $93.12 | $1,117 |
| | | | | | | | | | | | | | $270,085 |
| | | | | | | | | | | | | Approximately | **$271,000** |

[1] Assuming 1 Trip per Day

[2] Annual Cost rounded to the nearest dollar

Rick Meyers, Recycling Specialist, City of Milwaukee DPW

# Whole City Recycling Setout Planning

August 4, 20009

| Households | summer | winter |
|---|---|---|
| carts | 163000 | 163000 |
| bins | 27000 | 27000 |
| total | 190000 | 190000 |

| Cart costs per unit, 95-gal size | | |
|---|---|---|
| regular -single stream | $ | 51.41 |
| split - dual stream | $ | 63.41 |

Assumptions:
No change in weekly bin route service (disregard in calculations)
20 work days per month

| Collection place | |
|---|---|
| fronts | alleys |
| 43% | 57% |

| **Currently** | | summer | winter |
|---|---|---|---|
| Crew # | total | 31 | 34 |
| | carts | 28 | 31 |
| | bins | 3 | 3 |

*Up the drive service for most summer and all winter routes

**2009 summer setout averaging 350 HH/crew per day**
**How many cart crews needed if routes built on 350 HH per day?**

| setout | |
|---|---|
| once/mo. | 23.3 |
| **every 3rd week** | **31.0** |
| every 2nd week | 46.6 |

**2009 Twice per month summer setout is averaging 372 HH/day**
(Greater frequency yields fewer setting out every time)

**How many cart crews needed if all routes twice per month?**

| HH per day | crews needed |
|---|---|
| 350 | 46.6 |
| **375** | **43.5** |
| 400 | 40.8 |

**Two-person garbage crews average servicing 490 HH per day***
**If single stream recycling with 2 person crews, 500 HH/day****:

| setout | crews needed |
|---|---|
| once/mo. | 16.3 |
| every 3rd week | 21.7 |
| every 2nd week | 32.6 |

***Garbage routes designed for time to collect bulky items as well as tip carts.**
****500 is conservative because of # of HH's with multiple garbage carts; few for recycling**

**If single stream recycling, 2 person crews, 500 HH/day, AND include current bin routes:**

| setout | total crews needed |
|---|---|
| once/mo. | 19.0 |
| every 3rd week | 25.3 |
| every 2nd week | 38.0 |

**Summer recycling fleet: 31 (28 cart & 3 bin)**

| | BINS | CARTS | TOTAL |
|---|---|---|---|
| C | 18991 | 42397 | 61388 |
| N | 4218 | 58866 | 63084 |
| S | 3846 | 62187 | 66033 |
| Total | 27055 | 163450 | 190505 |
| Percent | 14.20% | 85.80% | 100% |

**Cart Setout Programs**

| **Monthly** | trucks | HH | HH/truck | HH/truck/mo | HH/day |
|---|---|---|---|---|---|
| C | 1 | 6578 | 6578 | 6578 | 329 |
| N | 2 | 14073 | 7037 | 7037 | 352 |
| S | 1 | 7350 | 7350 | 7350 | 368 |
| total | 4 | 28001 | 7000 | 7000 | 350 |

| **Twice/Mo.** | trucks | HH | HH/truck | HH/truck/mo | HH/day |
|---|---|---|---|---|---|
| C | 1 | 3500 | 3500 | 7000 | 350 |
| S | 1 | 3933 | 3933 | 7866 | 393 |
| total | 2 | 7433 | 3717 | 7433 | 372 |

**NON-Setout Program**

| **~monthly** | trucks | HH | HH/truck | HH/truck/mo | HH/day | |
|---|---|---|---|---|---|---|
| C* | 4 | 28270 | 7068 | 7068 | 353 | (lot of alleys in Central) |
| N* | 9 | 44793 | 4977 | 4977 | 249 | |
| S | 9 | 50904 | 5656 | 5656 | 283 | |
| total | 22 | 123967 | 5635 | 5635 | 282 | |

*excluding routes that pick up **both** bins and carts

# Garbage cart collection crews, summer 2009

**77 garbage trucks operating as 2-person crews**

**Weekly garbage cart setout program**

| | | HOUSEHOLDS SERVED | | | |
|---|---|---|---|---|---|
| Area | # crews | # | % of total | Per crew | Per crew/day |
| C | 26 | 60577 | 32.11% | 2330 | 466 |
| N | 25 | 62703 | 33.24% | 2508 | 502 |
| S | 26 | 65355 | 34.65% | 2514 | 503 |
| TOTAL | 77 | 188635 | 100.00% | 2450 | **490** |

Garbage routes designed for time to pick up bulky items outside of carts as well as dump the carts.

APPENDIX K

Recycling Collection Analysis

| | Setout Schedule | Proposed Set-Out Households Per Day[1] | Crews Needed | | Current Number of Crews/Trucks (Carts) | Additional Employees Needed | Additional Trucks Needed |
|---|---|---|---|---|---|---|---|
| | | | Employees | Trucks | | | |
| One Person Crews | 1 time per month | 350 | 23 | 23 | 31 | 0 | 0 |
| | Every 3rd Week | 350 | 31 | 31 | 31 | 0 | 0 |
| | Every 2nd Week | 375 | 44 | 44 | 31 | 13 | 13 |
| | | | | | | | |
| Two Person Crews | 1 time per month | 500 | 32 | 16 | 31 | 1 | 0 |
| | Every 3rd Week | 500 | 44 | 22 | 31 | 13 | 0 |
| | Every 2nd Week | 500 | 66 | 33 | 31 | 35 | 2 |

Notes:

1. Proposed Setout Household's per day assumes curb-side pickup. Currently, the City provides up-the-drive service for all winter routes and most summer routes.

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# APPENDIX L

# PAY AS YOU THROW LITERATURE

Consulting to Government & Utilities

SERA

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# *Summary of Key Results from SERA's 2008 Solid Waste and Recycling Survey*

*2008 REPORT*

*Prepared by:*

*Lisa Skumatz and Juri Freeman*
*Skumatz Economic Research Associates, Inc.*
*762 Eldorado Drive, Superior, CO 80027*
*303/494-1178 skumatz@serainc.com; www.serainc.com* 

*Prepared for:*

*Communities that responded to the 2008 survey!*

# ORGANIZATION OF REPORT


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3.0 Collection Arrangements ..... 2
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***Acknowledgements:***
*Thank you to Jerry Powell, Resource Recycling Magazine, and the communities that responded to the survey!!*


*About the Authors:*

*DR. LISA SKUMATZ is a "hands-on" economist with the research and consulting firm Skumatz Economic Research Associates, Inc. (SERA) (www.serainc.com). For almost 20 years, Lisa has helped communities across the US analyze practical economic and policy issues in solid waste. Her work concentrates on integrated planning, program evaluation, benchmarking, cost-effectiveness and rates for the variety of solid waste programs. She has published extensively, and is best known for her work in incentive-based rates (Pay as you Throw and "Garbage by the Pound") and for her detailed analyses of single stream recycling, source reduction, education programs, and commercial diversion options*

*Lisa has a strong "numbers" orientation – focusing on "what do real-world, operating programs tell us". She maintains a database of recycling in more than 1,300 communities across North America, and has analyzed programmatic features that increase diversion and cost-effectiveness in different situations. SERA maintains databases on the 100 largest communities in the US, and all PAYT communities in North America.*

*In 2007, Dr. Skumatz received SWANA's Distinguished Service Lifetime Achievement Award. She was previously named "Recycler of the Year – Lifetime Achievement" in 2001 by the National Recycling Coalition, and in 2007 received the same award from the Colorado Association for Recycling (CAFR). She served as a board member of NRC for 10 years and a member of SWANA and numerous other state and regional recycling associations. Lisa attended the University of Wisconsin for her undergraduate economics degree and her Ph.D. in Economics is from The Johns Hopkins University.*

*DAVID "JURI" FREEMAN is an environmental analyst with SERA, Inc. He has collected data on the wide variety of recycling and solid waste programs across the US – including recycling, yard waste, source reduction, electronics, single stream recycling, education / outreach programs, and others – to provide information for benchmarking, program potential and performance, costs, and other planning and evaluation purposes. These data have been used to identify cutting edge programs and provide key data on the factors affecting program performance. His strengths include an understanding of how the information will be used, which helps make sure he conducts appropriate follow-up on complex analytical issues. He has conducted detailed analyses for solid waste clients in Colorado, California, Wyoming, Washington, North Carolina, British Columbia, and other locations.*

*Dr. Skumatz has published more than 75 articles and published (non-project) reports in solid waste and recycling planning, evaluation, measurement, and rates. The majority of journal articles are in Resource Recycling.*

*SERA, established in 1990, has offices in Boulder and Seattle. We have conducted projects for large and small clients in 35 states, 5 Canadian provinces, and 6 foreign countries.*



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# *Summary of Key Results from SERA's 2008 Solid Waste and Recycling Survey*

## 1.0 Introduction

SERA sent a survey to counties and cities across the US and Canada. We received more than 700 responses to our survey. The following is a high-level summary of the survey results, prepared for those communities responding to the survey.

We provide a succinct summary of the responses received, which were not necessarily random and thus, not statistical. However, they do provide some information on what is going on in communities, and whether certain policies or arrangements are generally uncommon or not. The data also provide a valid resource for case studies and for multivariate statistical analysis, which can work without strictly random samples (that is the basis of most of our studies that you may have seen in the past).

## 2.0 About the Communities

Of the responses we received:

- 60% responded as a city, 40% as a county, and 2% as hauler (multiple responses were allowed).
- 18% urban, 21% suburban, 25% rural, 26% rural/suburban, and 11% urban/suburban.

The distribution of population for the respondents follows:

- Average city size was 158,000
- Median was 55,000 (half larger, half smaller than this population)
- Populations ranged from 378-8.5 million.
- 23% smaller than 20,000
- 23% between 20,000 and 50,000
- 19% between 50,000 and 100,000
- 11% between 100,000 and 150,000
- 10% between 150,000 and 250,000
- 8% between 250,000 and 500,000
- 4% between 500,000 and 1,000,000, and 2% over 1,000,000.

Again, the fact that the responses were not random is illustrated by the distribution across states. California represented 17% of the respondents, but about 4% of census places nationwide. Others are less disproportional. Similar comparisons have not been conducted based on population.


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Table 2.1 Percent of respondents by state (or province)

| State | Pct of Survey Responses | Pct Towns in US | State | Pct of Survey Responses | Pct Towns in US | State | Pct of Survey Responses | Pct Towns in US |
|---|---|---|---|---|---|---|---|---|
| AK | 0.1% | 1.3% | KS | 0.6% | 2.4% | OH | 3.0% | 3.9% |
| AL | 0.3% | 1.8% | KY | 1.7% | 1.7% | OK | 0.3% | 2.6% |
| AR | 1.7% | 1.9% | LA | 0.0% | 1.5% | OR | 2.0% | 1.3% |
| AZ | 1.8% | 0.9% | MA | 3.7% | 0.9% | PA | 4.0% | 5.2% |
| CA | 17.0% | 4.0% | MD | 0.1% | 1.4% | RI | 0.1% | 0.1% |
| CAN-BC | 0.1% | | ME | 2.1% | 0.1% | SC | 1.7% | 1.4% |
| CAN-ON | 0.1% | | MI | 3.0% | 2.3% | SD | 0.3% | 1.3% |
| CO | 2.7% | 1.3% | MN | 4.1% | 6.9% | TN | 1.0% | 1.4% |
| CT | 1.8% | 0.4% | MO | 2.3% | 3.6% | TX | 5.8% | 5.6% |
| DC | 0.0% | 0.0% | MS | 0.4% | 1.1% | US-VI | 0.1% | |
| DE | 0.0% | 0.3% | MT | 0.4% | 1.0% | UT | 0.3% | 1.1% |
| FL | 4.1% | 3.3% | NC | 2.7% | 2.4% | VA | 3.0% | 1.4% |
| GA | 1.1% | 2.2% | ND | 0.0% | 1.4% | VT | 1.0% | 3.3% |
| GUAM | 0.3% | | NE | 0.3% | 2.0% | WA | 3.8% | 1.9% |
| HI | 0.4% | 0.3% | NH | 1.8% | 0.2% | WI | 2.4% | 2.3% |
| IA | 1.7% | 3.6% | NJ | 3.6% | 1.9% | WV | 0.6% | 1.1% |
| ID | 0.6% | 0.8% | NM | 0.6% | 0.9% | WY | 0.4% | 0.7% |
| IL | 4.1% | 4.9% | NV | 0.0% | 0.3% | | | |
| IN | 2.6% | 2.2% | NY | 2.0% | 3.9% | | | |

# 3.0 Collection Arrangements

We asked about collection arrangements for trash, recycling, and yard waste (where curbside programs existed. The following summarizes the responses on who collects, containers used, collection method, and whether the (private) haulers are national or not. Each table addresses the three services – trash, recycling, and yard waste.

Table 3.1 Who collects (for those with curbside service for the program)?

| Who Collects? | No program | Drop off program only | Municipality collect | One hauler via contract | Multiple haulers via contract | One hauler via franchise | Multiple haulers via franchise | One licensed/permitted hauler | Multiple licensed/permitted hauler | One private hauler | Multiple haulers with private competition |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Garbage | 2.1% | 1.9% | 28.6% | 19.8% | 6.1% | 9.6% | 4.6% | 1.5% | 8.2% | 1.9% | 15.0% |
| Recycling | 13.6% | 7.6% | 21.5% | 25.0% | 4.9% | 8.5% | 3.8% | 1.7% | 4.7% | 1.4% | 6.9% |
| Yard waste | 20.5% | 9.0% | 31.2% | 16.1% | 3.0% | 8.4% | 3.3% | 0.9% | 2.6% | 0.5% | 3.6% |


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**Table 3.2 What programs / container types are used? (for those with curbside service) (Excludes don't know & other)**

| Container Type? | No pro-gram | Drop off program only | Wheeled carts owned by city | Wheeled carts owned by the hauler | Wheeled carts owned by resident | Carts provided by residents | Bins/ Crates | Bun-dles | Yard waste piles at curb | Bags | Mul-tiple choice | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Garbage | 1.1% | 1.4% | 20.0% | 26.6% | 0.9% | 21.5% | 0.3% | 0.0% | 0.3% | 6.1% | 19.4% | 1.7% |
| Recycling | 6.2% | 5.5% | 9.3% | 20.0% | 0.2% | 2.7% | 37.5% | 0.3% | 0.0% | 4.0% | 11.2% | 2.7% |
| Yard waste | 11.5% | 5.6% | 5.9% | 18.2% | 0.7% | 3.6% | 0.2% | 2.3% | 16.0% | 13.2% | 17.3% | 3.6% |

**Table 3.3 Collection method?**

| Collection Method? | Don't know | Fully automated | Semi automated | Manual |
|---|---|---|---|---|
| Curbside Garbage | 3.9% | 32.2% | 25.2% | 38.6% |
| Curbside Recycling | 3.3% | 21.3% | 14.7% | 47.0% |
| Curbside Yard waste | 4.7% | 16.2% | 15.6% | 40.5% |

If the hauler was reported as "private", the respondent was asked to characterize the hauler.

**Table 3.4 Type of "private" hauler providing service**

| Type of Hauler? | National firm or affiliate | Regional firm | Small local independent | Other |
|---|---|---|---|---|
| Trash | 42.0% | 17.6% | 28.4% | 12.0% |
| Recycling | 38.6% | 17.7% | 26.6% | 17.1% |

About 1/3 of the communities responding do not require households to contract for trash.

# 4.0 Recycling Containers

Two-thirds of households receive 1 container, a quarter get 2 containers, and 9% receive 3 containers. A number of communities stated they provided "as many as the households need / want".

The distribution of container sizes, and the volumes (computed as size times volume) are provided below. However, note, that this does NOT control for whether collection is weekly, every other week, or some other frequency.

**Table 4.1 Size of containers and total volume of recycling service (not corrected for recycling collection frequency)**

| | Individual containers | Total volume (N times containers not including frequency) |
|---|---|---|
| 20 gallons or less | 49% | 26% |
| 33 gallons or less | 12% | 5% |
| 66 gallons or less | 17% | 9% |
| 99 gallons or less | 20% | 39% |
| 100 gallons or more | 1% | 21% |

**Table 4.2 Collection frequency by service**

| Frequency | No collection | Drop off only | Weekly | Twice a week | Every other week | Twice a month | Monthly | Seasonally |
|---|---|---|---|---|---|---|---|---|
| Garbage | 0.9% | 3.3% | 83.0% | 11.9% | 0.8% | 0.2% | 0.0% | 0.0% |
| Curbside recycling | 12.4% | 4.0% | 56.5% | 0.5% | 21.5% | 2.7% | 2.3% | 0.2% |
| Curbside yardwaste | 21.3% | 5.6% | 39.4% | 1.5% | 8.0% | 1.3% | 3.3% | 19.6% |

Most communities collect a large number of materials. They are summarized below.

**Table 4.3 Percent of communities that collect various recyclable materials (for those with service)**

| Percent that collect the material | Materials List |
|---|---|
| 90% or more | Aluminum, Newspaper |
| 75%-89% | Green Glass, Brown glass, Clear glass, Cardboard, Steel/tin cans, #1 PET, #2 HDPE |
| 50-75% | None |
| 40-50% | Other plastics, Chipboard/paperboard |
| Low frequency | Oil (16%), Batteries (11%), Electronics (9%), Food (5%), Textiles (5%) |

About two-thirds provide curbside recycling to complexes with up to 4 units. About 40% provide the service to small commercial establishments as well. Collection frequency statistics follow.

**Table 4.4 Collection frequency by service type**

| Collection frequency by service type | Weekly | Twice weekly | Every other Week or twice a month | Monthly | Seasonally |
|---|---|---|---|---|---|
| Trash | 83.0% | 11.9% | 1.05 | 0% | 0% |
| Curbside recycling | 56.5% | 0.5% | 24.2% | 2.3% | 0.2% |
| Curbside Yard waste | 39.4% | 1.5% | 9.3% | 3.3% | 19.6% |

# 5.0 Single Stream

Nearly half the respondents reported they have single stream collection – clearly not a random sample from all communities to which we sent surveys. About one-third were dual stream programs. When asked about the curbside recycling program prior to switching to single stream, we found more than one-third had no program previously, more than one-third switched from dual stream programs, and about one-quarter switched from programs collecting three or more streams. The majority did not switch collection frequencies with their move to single stream, about 40% added materials, and about 10% used the opportunity to add new yard waste collection. Fewer than 7% said they subtracted glass when they switched to single stream.

We asked about changes that resulted from the switch to single stream. We found:

- Almost three-quarters of the respondents with single stream said tonnage increased somewhat or a great deal compared to the program they had before.
- Most said they weren't sure if values for materials changed.
- The majority said costs to run the program increased somewhat or stayed the same.
- Almost 75% said recycling participation is somewhat or much better after single stream
- Half said illegal dumping was the same, and another 40% didn't know
- More than half said resident satisfaction was much better now


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- Most said collection efficiencies were much better now.

In a separate effort, we conducted an inventory of single stream programs across the US. While an imperfect list (there are new programs all the time, and we were unable to contact every community), the results provide an indication of the prevalence of single stream recycling programs.

- We identified more than 340 single stream programs in the US, covering perhaps 12-15% of the US population;
- We were able to identify the leading states for single stream penetration, using a ranking that combines both number of single stream programs and population covered by single stream programs. The results are included in Table 5.1.

**Table 5.1 Leading single stream states based on number of programs and population covered**

| | | |
|---|---|---|
| 1. California | 4. Ohio | 7. Arizona |
| 2. Texas | 5. Washington | 8. Minnesota |
| 3. Illinois | 6. Pennsylvania | 9. Oregon |

# 6.0 Billing and PAYT

Trash, recycling, and yard waste are most commonly billed monthly; however, a substantial number were billed quarterly, every other month, or annually. In the sample that responded to our survey, about 30% had PAYT (which is slightly higher than our national statistics, which indicate 25% with PAYT[1]). The overwhelming program is variable / subscribed can program, with more than 60% of PAYT communities reporting this program. The next most common was a bag program with a fixed fee or customer charge (about 30%). The rest were scattered among other PAYT systems, including 10% with drop-off programs (multiple responses were allowed).

# 7.0 Facilities and Ownership

Most communities do not have the following facilities available in the area:

- Compost area that accepts food waste
- Single stream MRF
- Low tech MRF
- "Dirty" MRF
- Hard to recycle materials facility
- Construction and demolition (C&D) sorting facility
- Construction and demolition landfill
- Landfill gas extraction infrastructure
- Reuse area
- Waste to energy facility
- Incinerator
- MSW composting facility

The two most common ownership and operation alternatives for each of the following facilities are listed below.

[1] *Skumatz, Lisa A., and David J. Freeman, "Pay as You Throw (PAYT) in the US: 2006 Update and Analyses", Skumatz Economic Research Associates, Inc., Superior, CO, for EPA Headquarters, Washington DC., December 2006.*

- Landfill: privately owned and operated; county owned and operated
- Compost area: city owned and operated; privately owned and operated,
- Single stream MRF: by far most commonly privately owned and operated
- Low tech MRF: by far most commonly privately owned and operated
- HHW facility: County owned and operated; city owned and operated
- C&D sorting facility: by far most commonly privately owned and operated
- C&D landfill, privately owned and operated; county owned and operated
- E-waste facility: privately owned and operated, county owned and operated
- Landfill gas extraction infrastructure: privately owned and operated, county owned and operated
- Transfer station: privately owned and operated, county owned and operated (city owned / operated close behind)

## 8.0 Funding Solid Waste Programs

The most common methods of funding residential programs are through user fees and property taxes (somewhat less than twice as many employ user fees). Tip fee surcharges are common sources of local funding for programs, and user fees are most common for local funding of local commercial programs. At the state level, tip fee surcharges were the most common source of funds.

## 9.0 Presence of Programs and Policies

Finally, we asked about the presence of an array of specific programs. The responses are summarized below.

**Table 9.1 Percent of communities with various programs and policies**

| Which of the following programs/policies do you have? | Yes | No | Other |
|---|---|---|---|
| Disposal bans at the landfill (local only, exclude state bans) | 34.3% | 52.5% | 13.2% |
| Disposal bans at the curb (local only, exclude state bans) | 35.1% | 54.6% | 10.3% |
| Advance Disposal Fees (ADFs) or deposits | 9.8% | 77.6% | 12.5% |
| Every-other-week garbage collection | 7.5% | 85.0% | 7.5% |
| Residential food waste collection | 8.0% | 84.1% | 8.0% |
| Innovative funding mechanisms | 11.3% | 77.6% | 11.1% |
| Multi Family Unit recycling programs | 47.3% | 43.6% | 9.1% |
| Single stream recycling | 44.0% | 47.7% | 8.3% |
| Re-use area | 24.8% | 63.0% | 12.2% |
| Materials exchange | 27.3% | 62.5% | 10.2% |
| E-waste programs | 75.3% | 16.3% | 8.4% |
| Mandatory recycled content standards | 19.0% | 72.7% | 8.3% |
| Plastic bag bans or surcharges | 3.9% | 89.1% | 7.0% |
| Multi Family recycling "champion" progam | 3.6% | 87.8% | 8.5% |
| Financial incentives for haulers who meet certain recycling goals | 6.5% | 87.5% | 6.0% |
| Environmental purchasing procedures | 39.3% | 50.8% | 9.9% |
| Mandatory residential recycling collection/participation | 34.0% | 61.9% | 4.0% |
| Mandatory residential recycling/payment (separate fee) | 10.7% | 85.6% | 3.7% |


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| Which of the following programs/policies do you have? | Yes | No | Other |
|---|---|---|---|
| Mandatory residential recycling/payment (fees embedded) | 29.9% | 65.4% | 4.7% |
| Residential source reduction/waste reduction | 33.3% | 58.6% | 8.1% |
| PAYT residential (A.K.A. variable rates, user fees, etc.) | 33.9% | 58.4% | 7.7% |

Thank you very much for your response to the survey. As this brief summary attempts to show, your responses were extremely helpful. We hope this summary is useful to you. Please feel free to contact us if you have questions or need additional information.

*Watch for upcoming analyses in Resource Recycling or other studies. These studies will use multivariate statistical analyses which are valid with samples of this kind.*


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# PAY AS YOU THROW IN THE CO

## PocketBook Incentives for Diversion and Recycling Success...

*December 11, 2008*

SERA EI

*---Assistance from ABA*

skumatz@serainc.com



*Assistance to communities on PAYT*

## AGENDA

| | | |
|---|---|---|
| Introduction to PAYT<br>☐Impacts, systems & prevalence<br>☐Ordinances/contracts/legislation<br>☐Pros/cons, summary | 45 min | Skumatz |
| Fort Collins, CO example<br>☐PAYT via ordinance | 20 min with quests | Gordon |
| Urban vs. Rural PAYT, Introduction for hauler issues | 5 min | Skumatz |
| Hauler Perspective on PAYT<br>☐Question driven | 20 min with questions | Horton |
| ☐Education / outreach on PAYT<br>☐Implementation | 5 min | Skumatz |
| Lafayette, CO example<br>☐PAYT via contract | 20 min + 10 min quests | Short |
| Wrap-up and Questions.<br>☐5 Key Steps to Diversion and PAYT | 25 min | Skumatz |

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## PANELISTS


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## WHAT IF SOMEONE TRIED TO SELL YOU A PROGRAM THAT...

- ☐ Almost doubles diversion?
- ☐ Leads to no increase in costs for 2/3 of towns?
- ☐ Significantly reduces greenhouse gas?
- ☐ Is demonstrated in thousands of towns nationwide in all types of communities?
- ☐ ... and is preferred after the fact by more than 90% of the residents where it is in place...?

➔*This is Pay As You Throw (PAYT)...*

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## PAYT – IMPACTS ON DIVERSION & COST

- Impacts – SERA estimates based on data from more than 1,000 communities
  - Controlled for community demographics
- PAYT is single biggest impact on diversion – curbside and drop-off recycling

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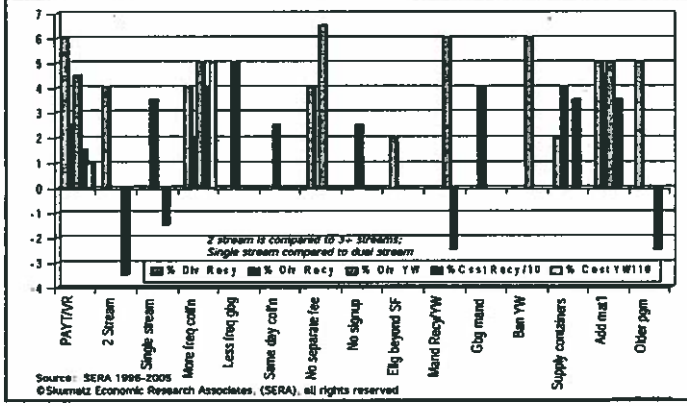
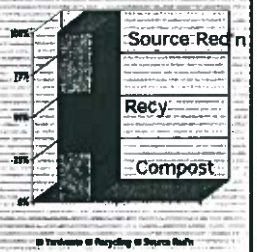
## BEST PRACTICES RESEARCH DIVERSION & COST ANALYSIS – RECYCLING & YARD WASTE




Source: SERA 1998-2005


## PAYT – IMPACTS ON DIVERSION & COST: RESULTS

- PAYT diverts 16-17% from residential trash
  - "Triple" impact - 1/3 each to recycling, yard waste, and source reduction
  - More powerful than programs that only encourage recycling (recycling incentives)

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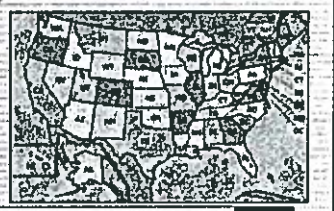
## PAYT AS STATE DIVERSION DRIVER

- Interviews with leading states (Source: SERA CDPHE study, 2007)
- Key diversion drivers mentioned include:
  - Legislation
  - Measurement/goal
  - Funding
  - PAYT
  - Other



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## COST, ACCEPTANCE OF PAYT

- Cost & workload impacts – 2/3 no increase (source: State surveys)
- Attitudes / Survey results
- Strengths / weaknesses

## STRONG ENVIRONMENTAL IMPACTS

- Millions of tons diverted
- Millions of Metric Tons Carbon Equiv
- Economic development impacts
  - Jobs, income

Source: Skumatz, PAYT in US: 2008 Update & Analysis, 2008;
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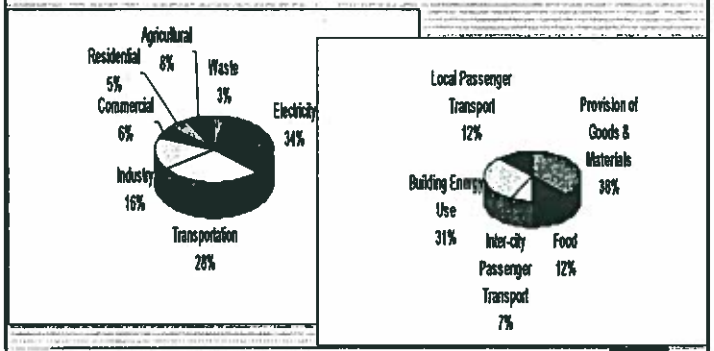
## US GREENHOUSE GAS EMISSIONS (2005) – CONVENTIONAL vs. UPDATE (2008)




Source: USEPA

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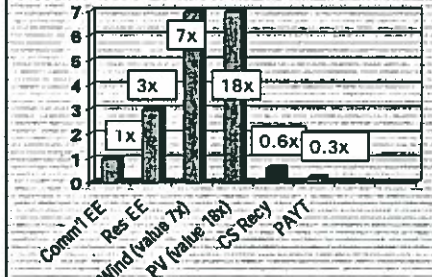
## PAYT CHEAPEST WAY TO REDUCE GHG EMISSIONS




Comparison to Energy Efficiency (EE) Programs – PAYT & recycling (SERA):

- **Cheaper per MTCE
- **Faster
- **Participation
- **Direct Authority
- **Retention

Results show MSW programs cheapest and fastest ways to reduce CO2 – better than energy programs! (Skumatz, Resource Recycling)

(Source: Skumatz Economics/SERA 2008©; see also *Resource Recycling* 10/08)

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## PAYT – HOW IT WORKS

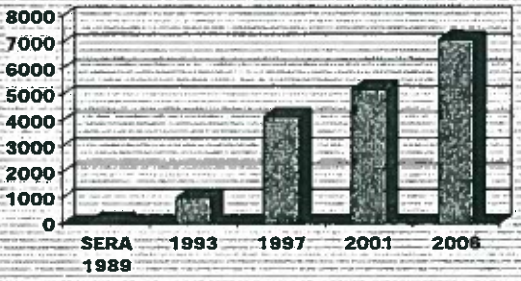
## PAYT – BIGGEST IMPACT – BASIC SYSTEM TYPES

- Variable cans/subscription
- Bags
- Tags/stickers
- Hybrid
- Weight-based
  (GBTP – technology adopted by RecycleBank℠)
- Drop-off variations

- Pros and cons –
  - Variations by region
  - Historical recycling "rebates" – less strong than PAYT / only recycling



## COUNTS OF PROGRAMS NATIONWIDE – 7,100+ (SERA)




Source: All collected via SERA studies, © SERA all rights reserved

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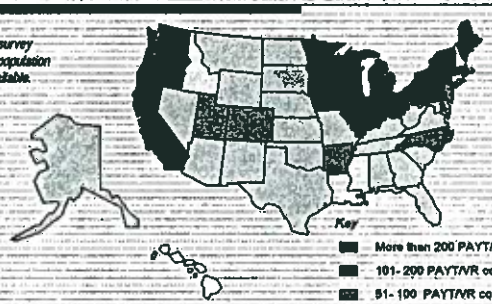
## PAY-AS-YOU-THROW (PAYT) / VARIABLE RATES COMMUNITIES

SERA's 2006 survey found almost 7,100 PAYT/VR communities and only 3 states without programs

SERA's 2006 survey found 25% of population with PAYT available.




Source: Skumatz Economic Research Associates Inc., Superior, CO, 2006 Survey © SERA, all rights reserved

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## PAYT WORKING ACROSS US IN ALL COMMUNITY SITUATIONS

- Large communities
  - 30 of largest 100
- Small, rural communities
  - WI, IA, other (thousands)
- Tourist / student / mountain
  - CO, CA, ON, FL, NW, MW
- Isolated / island / self-haul
  - Island communities, MA, VT, WA
  - Isolated AK, CO
- Multiple Coll'n actors
  - Multi hauler: CO, NY, oth
  - Muni: CA, WA, oth
  - Contract, franchise
- Coll'n method
  - Automated: NW, CA
  - Manual: MW, NE
  - Hauler & munis
- Ethnic diversity
  - CA, FL, TX
- Climate extremes
  - TX, FL...
  - Canada, MN, NY, CO
- Curbside and dropoff recycling
- All geographic regions of US
- SERA maintains inventory, detailed info, peer match capability

Source: SERA surveys © all rights reserved.

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## GETTING THE PROGRAMS IN PLACE

***State, County, Local Level...***
***Legislation, ordinance, contract, muni...***

## COLORADO STUDY – DRIVERS FROM LEADING STATES

- What led to programs?
  - NOT natural flow, economics
  - Not market development efforts
- Consistent drivers / enablers → convenient programs
  - Legislation
  - Measurement
  - Funding
  - PAYT
  - Subtitle D, "Ethic", Bottle Bill

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## KEY – GETTING PAYT IN PLACE →LOCAL ORDINANCE

- Ordinances at local or county level very do-able; other options include contracts – more political...
- Key elements of successful PAYT ordinance
  - Level playing field (haulers willing if...)
  - Recycling, service definition, embedded fee
  - PAYT with:
    - Small containers (32 gal) available
    - Significant variation in rates (80% for double)
  - Reporting, education, rights to audit
- → PAYT DO-ABLE AT LOCAL LEVEL

Sample Ordinances & case studies on web site www.paytwest.org, paytinfo.org

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## ANOTHER OPTION FOR LOCAL PAYT - CONTRACTING

- Request for proposals from haulers
  - Notice first, wide distribution, PAYT in conditions of service in RFP

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## KEY – GETTING PAYT IN PLACE ORDINANCE VS. CONTRACT...

| Ordinance Pros | Contract Pros (similar for muni) |
|---|---|
| Fewer Hauler ("Taking") & Citizen Complaints ("Choice") | Lower Cost / bills |
| Maintains competition | Fewer trucks, "cleaner" set outs, reduced wear/tear on streets |
| No need for "notice" | One hauler to contact if problems arise. |
| Quick | City "control" including control over rates/setting |
| Can specify rate "structure" | Can "designate" facility destinations for materials. |
| Minimal City effort (RFP, etc.) | |
| Retains "level playing field" for haulers – each implements the program and provides services knowing others will be operating under same rules. | |

*Sample language available for State legislation, and County/local ordinances*

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## STATE PAYT LEGISLATION OPTION

- Varies from mandates to encouragement – pros and cons
  - Viewed as key for diversion
  - Best: mandatory, mandatory IF, select from menu
- Essential elements same as ordinance (recycling, PAYT containers size, rate differences, etc.)
- Detailed analysis and sample language available...likelihood in your state?

***PAYT/VARIABLE RATES LEGISLATION AT THE STATE LEVEL***

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## STREETS WEAR AND TEAR

- Streets: depends on weight, axles, type of road (argued starts / stops)
  - 1 trash truck = (250), 830, 857, 1000, 1125, 1500, 1650 cars
  - 1 recycling truck=525 car trips
  - Some argue...extend street life 10 years; 5% of traffic but 95% of wear & tear; solid waste trucks responsible for 18% wear & tear; alley issues
  - Cost residents $60-$70/yr taxes; other; estimates vary
- Pollution impacts disproportionate (NY and other)

*(Source: SERA research)*

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## PAYT - LARGEST SINGLE IMPACT...

- Diversion – 17% decrease
- Cost – no increase for majority
- Attitudes – favorable, overwhelming after the fact
- Environmental – Greenhouse gas (GHG) and job creation – and cost-effectiveness!
- Do-able...
- →Barriers?...

***PAYT may not be right for community now, but almost ALWAYS worth investigating to see.***

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## NEGATIVE OUTCOMES & CONCERNS FROM PAYT?

## ILLEGAL DUMPING

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## ILLEGAL DUMPING - MAJORITY NOT RESIDENTIAL

- Exists in towns without PAYT
- SERA survey of 1,000
- Composition data
- Implications
  - Enforcement range
  - Burning ordinance
  - "Free/base unit"
  - Bulky / recycling MUST be available
  - Local consideration...


Source: SERA

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## ILLEGAL DUMPING STRATEGIES


- Education
  - Signs
  - Stickers on dumpsters
  - Community org
  - Public humiliation
- Physical barriers
  - Locks on dumpsters
- Ordinances
  - Fines
- Enforcement
  - Surveillance/stings
  - Fines / search
  - Bounty program
- Clean-ups
  - Pay cleanup (owner/ generator / dumper)

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## EQUITY / COVERAGE CONCERNS

- Low income
  - PAYT workable, strategies available
  - Control over bill... appreciated by fixed income
  - Special rates (avoid identifying colors)
    - Certification / recertification
- Large families
  - Parallel to Utility – use more, pay more
  - Options to recycle,reduce.
  - Non-PAYT unfair to small generators
- Compaction – weight limits
- Multifamily (MF)
  - Anonymity / signal difficulty
  - Building level strategies, technology solutions
  - Conclusion NOT to hold back single-family PAYT for MF

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## OTHER CONCERNS


- Confusion / resistance
  - Education, re-education
- Hauler concerns – level playing field
- Billing systems
- Workload
- Contamination
- Fears greater than reality (SERA surveys)
- All can be / have been worked out
  ...see FAQs (payt.org; paytwest.org)

- ***→Political will, acceptance, entrenchment the biggest barrier***

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## PROBLEMS: FEAR GREATER THAN REALITY

***Solvable... see faqs***

| Fear | Reality |
|---|---|
| Illegal dumping | Minimal / low, short-lived |
| Confusion, resistance to change | Continuing education (prior, free stickers) |
| Non-compliance | Minimal |
| Contamination | Minimal |
| Burning | Banned (60%, illegal, seasonal, warn once then remove, charge more) |
| Self-haul and by-pass | Base fee, mandatory (impacts on rates and setouts) |
| Revenues (esp. haulers) | Less volatile systems, work with haulers in design; pilot |
| Private/multiple haulers | Multiple colors, work with haulers |
| Local and regional economics | Depends on markets, LF ownership, processing, cost structure, prices |

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## IMPLEMENTATION OPPORTUNITIES

- Contracts, franchises, rates or billing system being changed
- Landfill or disposal problems
- New or modified programs
- Existing system perceived as unfair
- Need to free up tax authority

***PAYT may not be right for a community now, but almost ALWAYS worth investigating to see.***

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## PAYT CONCERNS & TIPS

- Technical issues rarely the problem
  - Pilot test / phase in
- *Politics, political will is the stumbling block*
  - Suggestions from communities; & champion

- Public process, public education. Good customer education / understanding crucial
  - *Education / why, how it works, how to make it work for me, packages for move-ins*

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## SUMMARY

## OVERALL PAYT SUMMARY

- Diversion
  - Low cost, speedy
    - Favorable attitudes
      - Environment
        - Retention
- Manageable "negatives" IF desire...
- Tested & Flexible:
  - 7100 towns, range of population, haulers & municipal, multiple types
- Encourages ALL types of diversion
  - 50%-doubling recycling: same tonnages for YW, SR
- Work with programs and education
- ***DO-able at local level....NOW!***

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*City of Fort Collins, CO*
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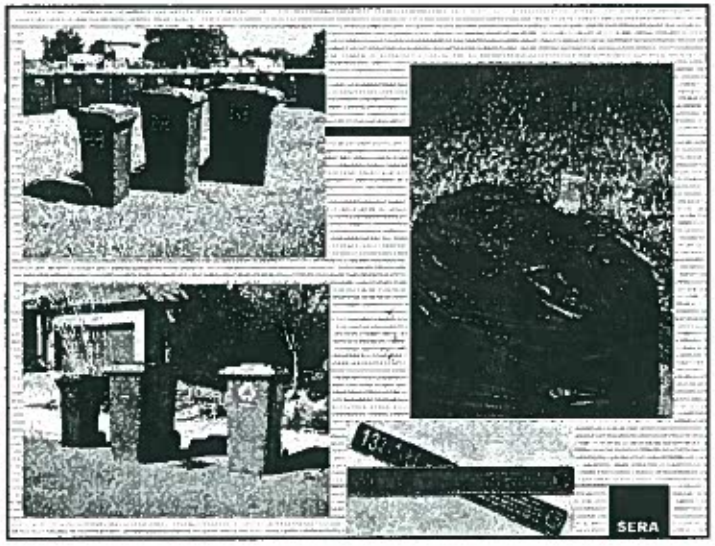
## RURAL VS. URBAN PAYT



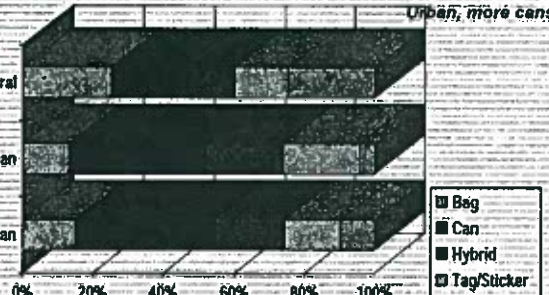

## PAYT IN RURAL AREAS

- In place in more than 1,200 rural locations in 32 states
  - 90% in NE/MW (NY, MN, VT, PA, IA, WI, IN and others)
  - 75% population less than 3,000
  - 1953 to present
- Designs include bag/tag for curb collection
- Drop-off options
  - Pay, punchcards, other
- Strong success in encouraging diversion

Source: All collected via SERA studies, © SERA all rights reserved SERA

## URBAN VS. RURAL TYPES

RURAL: MORE BAGS/ DROPOFF, FEWER CANS.
Urban, more cans




Source: Skumatz Economic Research Associates, Inc.
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## SELECTION OF PROGRAM TYPES

- Toward cans in urban
  - automated collection, containerization, billing
- Bags / hybrid in rural
  - Clean/fast collection, easy for customers, distribution, revenue options, billing, flexible / multiple haulers
- Some differences in impacts (bag vs. can)

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## HAULER ISSUES / CONCERNS

## HAULER ISSUES

- Revenues, uncertainty, cash flow
- Involving / incenting haulers
- Works with multiple haulers
- Hauler suggestions
- Level playing field

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## GARY HORTON

President, Western Disposal

**QUESTION-DRIVEN SESSION**

## EDUCATION / OUTREACH ISSUES

## EDUCATION STUDY

- Outreach expenditures research
  - Impacts / variations (after "controlling" for other program and demographic differences)
  - Impacts from dollars spent - $1 /hh / year addition increases diversion
    - By 3 percentage point if currently spending $0.30/hh/yr; by 1 percentage point if currently spending $1.40/hh/yr; add 1 percentage point for "doubling" annual expenditures.
    - Most gain in "underspending" communities
  - Media suitability
    - Differences for urban/ rural

(Source: - SERA / Iowa DNR 2002)

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## EDUCATION MATTERS!

- SERA research BEYOND dollars & demographics:
  - Attitudes / self-efficacy - deeply held beliefs / self-efficacy matters
  - Linked to 11% higher recycling



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## PUBLIC PROCESS

- ☐ Public process
- ☐ Outreach
  - ■ Rural: Civic organizations, radio stations / talk shows, newspapers, face-to-face
  - ■ Urban / suburban: articles, stuffers, brochures, etc.
- ☐ Education key...

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## DISCUSSION OF IMPLEMENTATION ISSUES

Discussion...

## STEPS TO IMPLEMENT PAY AS YOU THROW / VARIABLE RATES

- ■ Political support
- ■ Ordinances (fees; dumping, error tags, wgt limits)
- ■ Make sure legal alternatives available / changes to other programs
- ■ System configuration; planning/analysis
- ■ Order equipment; adjust staffing, training, establish procedures
- ■ Rate study/billing system
- ■ Outreach / education (& ongoing political support)
- ■ Implementation and enforcement
- ■ Monitor and refine

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## IMPLEMENTATION STEPS: CITY PERSPECTIVE (LAFAYETTE)

- ☐ Plant seed with citizen advisory & council 2005-6
- ☐ Council decisions spring 2006
- ☐ RFP elements / issuance
- ☐ Pre-bid meeting with haulers; proposals due 7/06
- ☐ Public meeting presenting results of lowest responsible bidder 8/06
- ☐ Council vote 8/06
- ☐ Contract hammered out
- ☐ Timing issues with BoCo facility going SS 5/07
- ☐ Implementation with containers (owned), meetings with County Council
- ☐ Pick roll-out date based on containers / hauler ability to start (9/07)
- ☐ May to Dec meetings with haulers to set up billing system and communication, software, reprogramming
- ☐ 2 mailings to HH's – bi-lingual, 2 open houses including translator
- ☐ Haulers told date to remove carts end of Sept.
- ☐ Cart delivery / rollout 10/1
- ☐ 2.5 months of calls
- ☐ Died down mid-December
- ☐ TIPS: Need a champion (not reluctant / ownership pride), need a capable hauler

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## IMPLEMENTATION STEPS (HAULER PERSPECTIVE)

- Affected addresses – hard to get accurate list
- Examine type of HH
- Rate setting
- Notification to residents (Newspaper, mail door-hangers, phone)
- Who will calculate bill & maintain customer records (& handle calls) – party with bill settles customer disputes
- Who will bill – interface? How bad debt handled?
- Who buys & delivers carts? How much choice for residents (not one size).
- Cart issues: ordering, receiving, staging for delivery, delivery of proper sizes, exchanging when HH changes mind, maintaining damaged carts, maintaining inventory
- Monitoring / reporting / recording of volumes, weights, set outs, tonnages
- TIPS:
  - Must order carts 3-4 months ahead (and can be backlog if big city ahead of you). Can order 1000 or so quickly
  - Printed materials lead time 3 months or less.

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## RATE DESIGN / POLICY CHOICES: EMBEDDED PROGRAM FEES & RATE DIFFERENTIALS

- Policy decision with impact on incentives - Recycling vs. yard waste programs
  - More participation if "free"/ no additional cost / embedded; however
    - Making yard waste "free" discourages back yard composting, and may have inequities for large vs. small yards
  - Line iteming makes apparent rates lower
  - Embedding supports higher "differentials"
  - →We usually recommend recycling with no separate fee; yard waste paid
- Research on needed level of differential to balance incentive vs. revenue risk
  - 80% compromise... Balances large difference to provide incentive vs. small difference to minimize risk of not recovering needed revenues. FLAT (small difference) isn't worth administrative headache.

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## RATES / ACCEPTABILITY

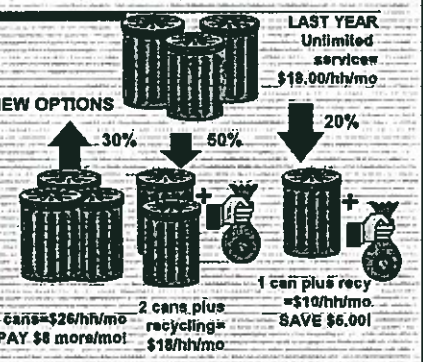
- In outreach, highlight winners (and losers)---% and $
- Rates vs. BILLS

For example:

*"70% pay same or less!"*

(vs. $/can increased)

(outcomes depend on structure, changes)

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## PLANNING NOT ALWAYS PERFECT

- Pilot test helpful
  - Example → phase in
- Ongoing monitoring – revision
- Frequently asked questions
- Peer Match at www.serainc.co
  www.paytwest.org

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## DOUG SHORT

Public Works Director,
City of Lafayette, CO

## WRAP-UP AND QUESTIONS

## FUNDING PROGRAMS...

- PAYT needs no separate funding...
  - Cost of curbside recycling program paid through PAYT
  - Recycling paid by all, so more cost-effective (fixed costs across more households)
  - Business opportunity for haulers
- Infrastructure and other programs
  - SERA study of 700 US communities and counties showed funding methods were: #1 user fees, #2 tip fee surcharge

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## "TOP 5" - WHAT A COMMUNITY OR COUNTY CAN DO TO INCREASE DIVERSION... NOW!

- #5 Citizen sustainability committee
- #4 Measurement and goal-setting
- #3 Basic programs & ordinances
- #2 Education
- #1 PAYT / Ordinance → Number 1 thing you can do!!

(Source: SERA 2007; handout available on web)

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## SUMMARY

- Strong positive impacts (tons, cost, equity, environment) with manageable negatives...
- Single biggest impact on recycling & diversion (50% to doubling)
  - Encourages all types of diversion / stronger than "recycling only" programs
- Tested and flexible – 7,100 examples
- Do-able locally and state level – worth examining in all communities

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## QUESTIONS

## Thank you for attending!

SERA Skumatz Economic Research Associates Inc.

EI ECONSERVATION INSTITUTE

*Research support from ABA*

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To help on statistical studies, consider filling out survey on:
www.serainc.com (national survey)

PAY AS YOU THROW (PAYT)

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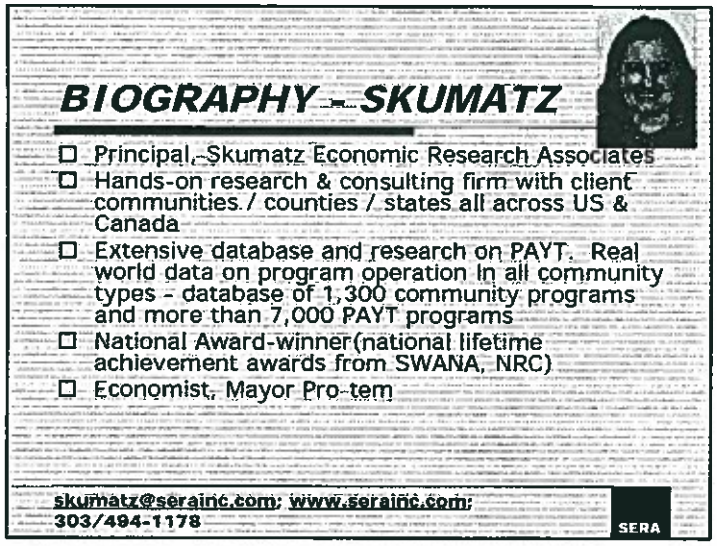

**About Earth Tech**
Earth Tech is a global provider of consulting, engineering, construction and operations services to the water/wastewater, environmental, transportation and facilities markets. Headquartered in Long Beach, CA, the company was acquired by AECOM Technology Corp. in July 2008. More information on Earth Tech can be found at www.earthtech.aecom.com.

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