HENNEPIN COUNTY
SUBURBAN RECYCLING RECOVERY RATE STUDY
FOR ST. LOUIS PARK AND MINNETONKA

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Table of Contents

EXECUTIVE SUMMARY 1

I. INTRODUCTION 6
- A. PROJECT GOAL 6
- B. COMMUNITY SELECTION AND CHARACTERISTICS 6

II. STUDY METHODOLOGY 8
- A. SAMPLE SIZE DETERMINATION 8
- B. MATERIAL SORTING CATEGORIES 8
- C. FIELD METHODOLOGY 9
  - 1. St. Louis Park Collection and Sorting Logistics 10
  - 2. Minnetonka Collection and Sorting Logistics 11
- D. LIMITATIONS OF METHODOLOGY 13

III. DATA REVIEW AND ANALYSIS 14
- A. ST. LOUIS PARK WASTE AND RECYCLING SORT DATA 14
- B. MINNETONKA WASTE AND RECYCLING SORT DATA 17
- C. COMPARISON OF ST. LOUIS PARK AND MINNETONKA SORT RESULTS 23

IV. CONCLUSIONS AND RECOMMENDATIONS 28
- A. CONCLUSIONS 28
- B. RECOMMENDATIONS 30

APPENDIX A: MATERIAL SORTING CATEGORIES 31

APPENDIX B: ST. LOUIS PARK SITE PLAN 35

APPENDIX C: ST. LOUIS PARK SORTING PHOTOS 36

APPENDIX D: MINNETONKA SITE PLAN 38

APPENDIX E: MINNETONKA SORTING PHOTOS 39

EXECUTIVE SUMMARY

In May 2009, recycling and waste sorts were conducted in two suburban communities in Hennepin County – St. Louis Park and Minnetonka. Each sort was one week long, with the primary objective of determining the recycling recovery rate of materials in curbside recycling programs and assessing the potential to increase it. The recycling recovery rate is the ratio of the amount of material recycled by the resident to the total recyclable material in both the waste cart and the recycling bin. The findings could then be used to target materials for future recycling education efforts.

Though these two communities are similar in many ways, there are several differences that had to be accounted for in designing and conducting the waste sort. These included:

- St. Louis Park has organized collection of both waste and recyclables. Organized collection involves one or more service providers contracted by the city. Minnetonka has organized collection for recyclables but not waste. In Minnetonka, waste collection service is contracted by individual households.
- St. Louis Park's recycling program is dual-stream, where material is sorted as either paper products or rigid containers (cans and bottles). Minnetonka's recycling program is single-stream, where all recyclable materials go into one bin.
- Some residents in Minnetonka also participate in a source-separated organics (SSO) collection program, sorting out their food scraps and non-recyclable paper. St. Louis Park residents currently do not have that option.

The sampling and sorting protocol involved collecting and sorting waste and curbside recyclables from a set number of households in each community. In Minnetonka, the residential waste sampling was further divided with households participating in the SSO collection program tracked separately from households not participating in this program. The number of households sampled provided a 95% confidence level and an approximate 5% confidence interval. Materials from the waste carts and curbside recycling were sorted into 16 categories in St. Louis Park and 14 categories in Minnetonka. Samples were weighed and the data entered into spreadsheets for further analysis.

Table ES-1 provides a comparison of the recycling recovery rates for the two communities. In most cases, St. Louis Park and Minnetonka appear to be achieving a high level of success in their recycling programs. The recovery rates for most materials are in excess of 75% with lower recovery rates for office paper/mail, boxboard, plastic bottles, and milk cartons/juice boxes seen in St. Louis Park, and magazines/catalogs, office paper/mail and boxboard seen in Minnetonka.

Table ES-1
Comparison of Recycling Recovery Rates for
St. Louis Park and Minnetonka

Category	St. Louis Park	Minnetonka	Category	St. Louis Park	Minnetonka
Newspapers/Inserts	89.8%	91.5%	Metal Cans	74.1%	75.2%
Magazines/Catalogs	78.5%	72.6%	Glass Bottles/Jars	89.1%	88.1%
Phone Books	79.6%	87.8%	Plastic Bottles	71.5%	77.8%
Office Paper/Mail	71.2%	60.5%	Milk Cartons/Juice Boxes	42.8%	-----
Boxboard	71.0%	66.1%	Clothes/Linens	0.5%	-----
Corrugated Cardboard	79.2%	83.9%			

Figures ES-1 and ES-2 show the breakdown of materials remaining in the waste carts for St. Louis Park and Minnetonka, respectively.

Figure ES-1
Breakdown of Materials in the St. Louis Park Waste Carts

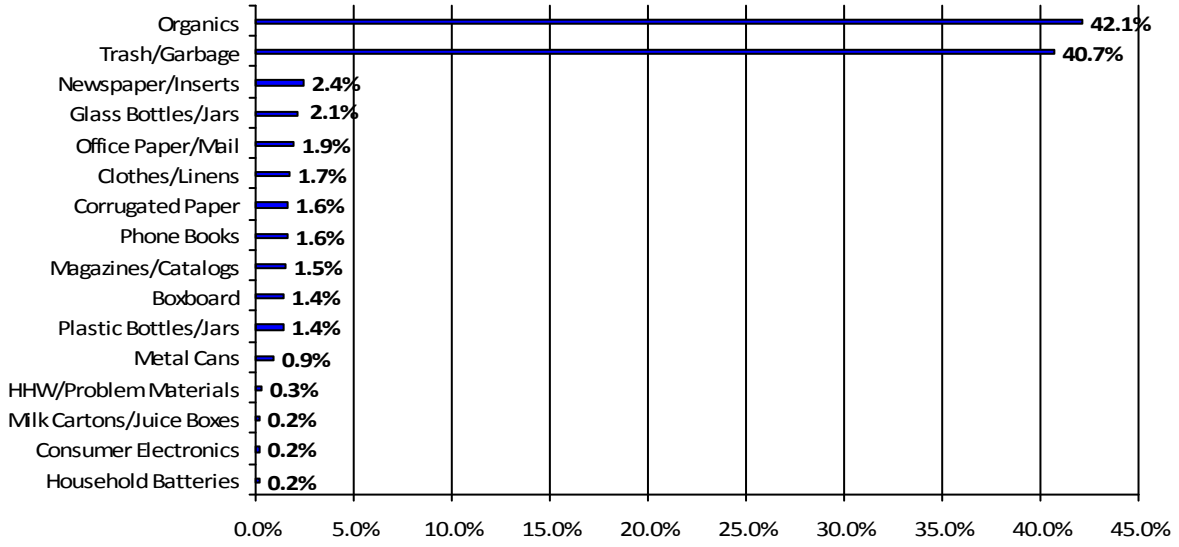
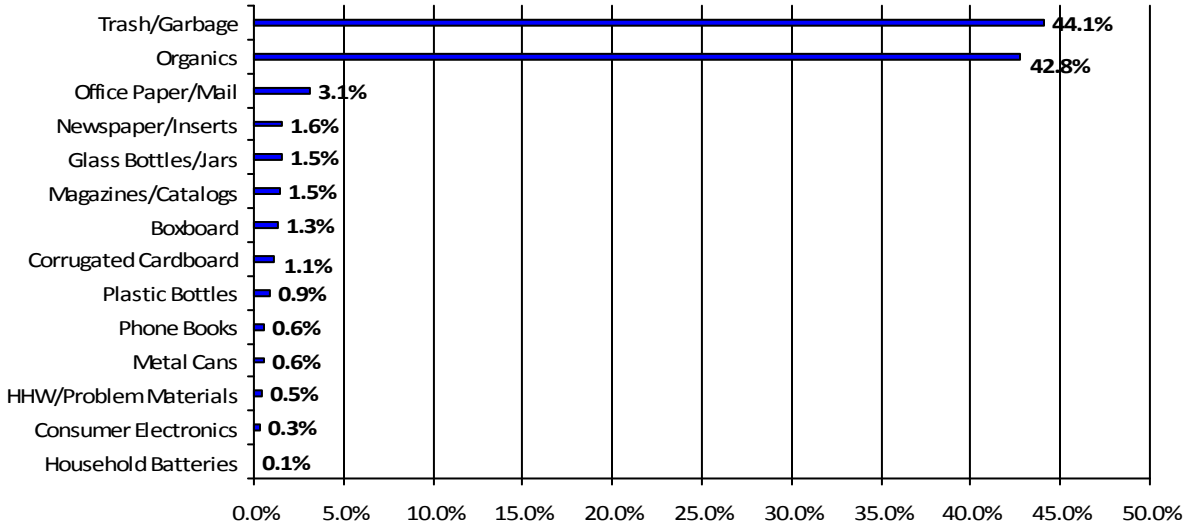


Figure ES-2
Breakdown of Materials in the Minnetonka Waste Carts



By balancing the recovery rates in Table ES-1 with the percent of recyclable materials remaining in the waste carts as shown in Figures ES-1 and ES-2, those materials that stand out for further recovery can be identified.

For example, despite the high recovery rate for newspapers, a significant amount of this material is still present in the waste cart. However, some portion of the newspaper remaining in the waste cart is not available for recovery due to contamination from secondary uses (i.e., cleaning, drop sheets for painting,

bedding in animal cages, wrapping/packaging applications, etc.). The same holds true for glass bottles/jars, used for holding cooking grease, paint, and other contaminants. In the case of glass, however, by value of its density (weight), modest increases in additional recovery could help raise overall recycling rates. This is the percentage of the total waste stream that was set out for recycling.

On the other hand, office paper/mail often goes straight from its intended use to the trash and has the potential to be recovered and recycled. Some of this paper in the waste cart may be due to residents' concern about identity theft from recycling the paper. With its lower recovery rate and relatively high presence in the waste cart, additional recovery of this material could only strengthen overall recycling rates.

As a result, in both communities the amount of fiber in the waste cart stands out for further recovery efforts. Within that broad category, office paper/mail and boxboard are likely to yield the largest increase due in part to the lower recovery rates (approximately 60% to 71%) currently being achieved for these materials and their relatively uncontaminated presence in the waste cart. Glass bottles and jars also stand out as a potential target for boosting recycling and the total weight recycled.

Table ES-2 shows on average that St. Louis Park households that recycle generate approximately 25 pounds/week of waste and 18 pounds/week of curbside recyclables. Of the contents of the waste carts, approximately 17% was recyclable material and 42% was organics. The overall recycling rate is about 42%.

Table ES-2
St. Louis Park Weekly Household Generation
from Waste Carts and Curbside Recyclables

Material Type	Total Pounds	Weekly Pounds Per Household[1]	Percent of Waste Carts	Percent of Grand Total
Trash	3,690.0	10.3	40.7%	
Organics	3,818.3	10.6	42.1%	
Recyclables	1,561.8	4.3	17.2%	
Waste Carts Total	**9,070.1**	**25.2**	**100%**	**58.1%**
Curbside Recyclables Total	**6,529.1**	**18.1**		**41.9%**
Grand Total	**15,599.2**			**100.0%**
			Recycling Rate	**41.9%**

[1] **Based on a sample population of 360 households.**

Table ES-3 shows the same information for Minnetonka but with a distinction between households receiving SSO collection and those that do not. Households without SSO collection on average generate nearly three times as much waste on a weekly basis as compared to those households that participate in SSO collection programs – 57 pounds/week as compared to 20 pounds/week. Waste generated in non-participating households contained over one and a half times as much organics (48%) as participating households (29%). There were also more recyclables remaining in the waste carts (14%) as compared to households participating in SSO collection programs (10%). The overall recycling rate is about 37%.

Table ES-3
Minnetonka Weekly Household Generation
from Waste Carts and Curbside Recyclables

Material Type		Total Pounds	Weekly Pounds Per Household[1]	Percent of Waste Carts	Percent of Grand Total
Waste Carts (Households without SSO collection service)	Trash	3,789.8	21.7	37.9%	
	Organics	4,770.5	27.3	47.8%	
	Recyclables	1,425.7	8.2	14.3%	
	Sub-total Waste Carts	**9,986.0**	**57.1**	**100.0%**	
Waste Carts (Households with SSO collection service)	Trash	2,240.7	11.9	61.0%	
	Organics	1,071.9	5.7	29.2%	
	Recyclables	361.0	1.9	9.8%	
	Sub-total Waste Carts	**3,673.6**	**19.5**	**100.0%**	
	Waste Carts Total	**13,659.6**	**37.6**		**62.7%**
	Curbside Recyclables Total	**8,125.3**	**22.4**		**37.3%**
	Grand Total	**21,784.9**			**100.0%**
				Recycling Rate	**37.3%**

[1] Based on a sample population of 363 households, with 175 not receiving SSO collection service and 188 receiving SSO collection service.

Other significant findings include:

- The amount of non-recyclable materials found in the Minnetonka curbside bins is significantly greater than what was observed in the St. Louis Park bins – 6.7% compared to 2.7%, respectively.
- Household batteries, consumer electronics, and HHW/problem materials were found at very low levels in the curbside recyclables and waste – about 0.9% of all materials sorted in St. Louis Park and 1.0% of all materials sorted in Minnetonka.
- Based on visual observations, much of the organics found in the Minnetonka waste carts appeared to be yard waste. As there was not any further breakdown of this category, the proportion of yard waste to other organics could not be determined.
- Waste generated by households participating in SSO collection programs was found to contain fewer recyclables. This suggests that SSO collection programs facilitate more recycling.

Based on the findings of the St. Louis Park and Minnetonka recycling recovery rate study recommendations include:

1. The focus of educational outreach for improving the recovery of materials from the waste cart should be targeted to paper and more specifically to office paper/mail and boxboard. Additionally, efforts to recover more glass bottles and jars from the waste cart could help increase community recycling rates.
2. In addition to educational outreach efforts for increasing recycling, educational activities should be undertaken to inform residents what materials should not go in their recycling containers.

3. With organics being over 40% of the contents of waste carts in both St. Louis Park and in those Minnetonka households not participating in the SSO collection program, efforts should be continued to implement residential SSO programs. Based on the study results, increased levels of recycling are likely to be seen with the implementation of SSO collection programs.
4. As time and funding permits, additional recycling recovery rate studies in suburban Hennepin County communities should be conducted to build up a database of program information. Further refinements to the sampling/sorting methodology are also recommended to fine-tune the sorting protocol. One such refinement would be a further breakdown of the organics fraction into yard waste and other organics.

I. INTRODUCTION

A. PROJECT GOAL

In 2006, Hennepin County and the City of Minneapolis undertook a study to assess how well Minneapolis residents were recovering recyclables, and to test the effectiveness of a social marketing method of delivering recycling and waste education. One recommendation from that study was that additional waste and recycling sorts in suburban Hennepin County should be considered but structured in a way to accommodate the different collection logistics of those communities. Furthermore, if a follow-up study in suburban communities is conducted, it should be a scaled-down version of the Minneapolis study consisting of a one week sort in each community and not include the recycling and waste education component of the previous project. Additionally, a consultant should be hired to coordinate the project and report on the findings.

Following up on these recommendations, Hennepin County secured the cooperation of two suburban communities – St. Louis Park and Minnetonka – in a recycling recovery rate study. The recycling recovery rate is the ratio of the amount of material recycled by the resident to the total amount of recyclable material in the both the waste cart and the recycling bin. The objective of this study is to determine the recycling recovery rate of materials in curbside recycling programs and assess the potential to increase it. The findings could then be used to target materials for future recycling education efforts.

B. COMMUNITY SELECTION AND CHARACTERISTICS

The communities of St. Louis Park and Minnetonka are nearby western suburbs of Minneapolis. The estimated 2007 population of these communities are 44,130 and 51,057, respectively. Select characteristics of the two residential waste and recycling collection systems are listed in Table 1.1.

Table 1.1
Characteristics of the Residential Waste and Recycling Collection Systems for St. Louis Park and Minnetonka

Characteristic	St. Louis Park	Minnetonka
Residential Waste Collection Service	Organized (Waste Management)	Subscription (Allied Waste Services, Inc., Randy's Environmental Services, Waste Management, Vintage Waste Systems)
	Provided weekly with each of five collection zones having a dedicated day (5-day collection week).	Two zones with one serviced on Monday and the other serviced on Tuesday (2-day collection week).
Residential Recycling Collection Service	Organized (Eureka Recycling)	Organized (Waste Management)
	Dual-stream collection program	Single-stream collection program
	Provided weekly with each of five collection zones having a dedicated day (5-day collection week).	Two zones with one serviced on Monday and the other serviced on Tuesday (2-day collection week).
Source-Separated Organics Collection	None	Subscription service for organics collection is offered by Randy's Environmental Services, Waste Management and Vintage Waste Systems.
Differences in Targeted Materials for Recycling	Includes two additional categories – milk cartons/juice boxes and clean textiles.	Does not include milk cartons/juice boxes or clean textiles.

Perhaps the three biggest differences in the waste and recycling collection programs in these two communities are the contractual arrangements for collection, the type of recycling separation system used for collection, and the availability of organics collection.

The City of St. Louis Park contracts with two collection vendors – one for the collection of waste (Waste Management) and one for the collection of recyclables (Eureka Recycling). Collection service is provided to all single-family residences as well as multifamily residential buildings of four units or less. The cost of collection is charged to the homeowner through a quarterly utility bill. Collection of waste and recyclables is provided weekly with the City divided into five sectors, each of which has a different designated collection day.

In Minnetonka, the City contracts with a single vendor (Waste Management) for the weekly collection of recyclables from single-family dwellings and townhomes but residents are free to contract with one of six hauling companies for the collection of their waste. The cost of recycling collection service is charged to the homeowner through a quarterly utility bill. For the collection of recyclables, Minnetonka is divided into two sectors – east and west – with one sector serviced weekly on Monday and the other serviced weekly on Tuesday.

In Minnetonka, the vast majority of residential waste is collected by three haulers – Allied Waste Services, Inc., Randy's Environmental Services, and Waste Management – with Allied Waste and Randy's having roughly equal shares of customers and accounting for over 80% of the residential waste collected in the City. Recent changes in how waste is collected now have most residential waste collected on either a Monday route or a Tuesday route.

The recycling separation system available in the two communities represents another significant difference. In St. Louis Park, the recycling program is a dual-stream system with fibers placed in one bin at curbside and rigid containers (bottles and cans) placed in another. The fibers and rigids are placed in separate compartments on the same collection vehicle and are treated as two different streams of materials to be processed at Eureka's recycling facility. In Minnetonka, all recyclable materials are placed in recycling containers or paper bags at the curb by the resident and are collected in the recycling truck as a commingled or single-stream product, which is mechanically separated at the Waste Management recycling facility. In addition to these differences, there is some variation in the materials that are collected for recycling. For example, in St. Louis Park, Eureka Recycling collects milk cartons and juice boxes, and clean textiles for recycling. In Minnetonka, the milk cartons go into the organics container and juice boxes into the waste cart. Textiles also go in the waste cart.

Currently, the City of St. Louis Park does not offer residential source-separated organics (SSO) collection. However, several haulers servicing residential accounts in Minnetonka do offer this option – Randy's Environmental Services, Waste Management and Vintage Waste Systems. Randy's SSO customer base is by far the largest in the City of Minnetonka whereas Waste Management and Vintage have only a small number of customers each at this time. Customers that sign up for Randy's SSO collection program can shift to a two-week waste collection schedule and save money on their trash service. The SSO service offered by Vintage allows collection of organics with yard waste and delivers the material directly to the composting facility at the Minnesota Landscape Arboretum.

II. STUDY METHODOLOGY

In alignment with the project goal, a sampling methodology was developed to collect, sort and record the types and weights of recyclables set out curbside and the types and amounts of recyclables remaining in the waste carts. The one-week sorting periods for each community were conducted back-to-back (the week of May 11th for St. Louis Park and the week of May 18th for Minnetonka) to compare similar timeframes. The sampling protocol, material sorting categories, and the field methodology are discussed below.

A. SAMPLE SIZE DETERMINATION

It was determined that the number of single-family units participating in waste and curbside recycling collection in St. Louis Park and Minnetonka was 12,200 and 15,000 households, respectively.

Targeting a 95% confidence level and a 5% confidence interval, it was further determined that the sample size for St. Louis Park should be approximately 370 households and approximately 375 households for Minnetonka. Utilizing these sample sizes, it was decided to collect from only households that set out recyclables on the designated sampling days to measure how well those households are separating materials for recycling.

In St. Louis Park, waste delivered for sorting represented 360 households (5.1% confidence interval). Due to a collection error on the part of Eureka Recycling, two additional loads of recyclables were delivered representing more households than the waste loads represented. After discussions with Eureka Recycling, a decision was made to disregard one-sixth of the total tons of recyclables collected and to adjust the data accordingly.

In Minnetonka, both waste and curbside recyclables delivered for sorting represented 363 households. This provided a confidence interval of 5.1%.

B. MATERIAL SORTING CATEGORIES

To maintain consistency with the sorting categories used in the 2006 Minneapolis recycling sort, the same general categories were used for both the St. Louis Park and the Minnetonka sorts. The only significant differences between the sorting categories used in all three communities were:

- Boxboard was included with the office paper/mail mix in Minneapolis. In St. Louis Park and Minnetonka it was broken out as a separate category;
- Milk cartons/juice boxes were broken out as a separate category in St. Louis Park. In both the previous Minneapolis sort and the Minnetonka sort, milk cartons went into the organics and juice boxes went into the trash; and
- Clean clothes and linens (including shoes) were broken out as a separate category in St. Louis Park. In both the previous Minneapolis sort and the Minnetonka sort, these materials were considered trash.

The material sorting categories for the St. Louis Park and Minnetonka sorts included:

- Newspaper/Inserts
- Magazines/Catalogs
- Phone Books
- Office Paper/Mail
- Boxboard
- Corrugated Cardboard

- Metal Cans
- Glass Bottles/Jars
- Plastic Bottles
- Milk Cartons/Juice Boxes (St. Louis Park only)
- Clothes/Linens (St. Louis Park only)
- Household Batteries
- Consumer Electronics
- Household Hazardous Waste (HHW)/Problem Materials
- Organics
- Trash/Garbage

To maintain consistency with the categories used in the Minneapolis sort, there was no further breakdown of materials (e.g., aluminum versus ferrous cans, PET plastics versus HDPE plastics, color separation of glass containers, etc.). A more detailed description of what materials comprise these categories can be found in Appendix A.

C. FIELD METHODOLOGY

The basic collection and sorting protocol used in each community was as follows:

- Route trucks for residential MSW and recyclables were asked to leave the routes after they collected a predetermined amount of setouts at the beginning of each route. These averaged approximately 25 to 30 households per route.
- Route trucks delivered their loads to the sorting locations and tipped them in designated areas. There were three designated areas for each sort.
    - St. Louis Park – MSW, recyclable paper, and recyclable containers.
    - Minnetonka – MSW from routes receiving SSO collection services, MSW from routes not receiving SSO collection services, and single-stream recyclables.
- Samples from the various piles were loaded into ½ cubic yard tilt trucks and taken to the scale to be weighed. Tare weights of the tilt trucks were predetermined.
- The samples in the tilt trucks were then wheeled to one of three (3) sorting tables where the sorting teams would pick through the samples, sorting them into the various categories. Most of the materials went into labeled, green recycling bins. Batteries went into smaller containers while organics and trash went into their own designated wheeled carts. Excess liquid from capped containers was emptied into 5-gallon pails for sewering.
- After a sample had been sorted into the appropriate categories, each material was weighed with the information recorded on a data sheet. The information on the data sheets was then entered into an Excel spreadsheet.
- Once the individual materials had been weighed, they were taken to designated dumpsters for appropriate management. These dumpsters were designated for the following:
    - St. Louis Park – Recyclable paper including clean paper sorted out of the trash, recyclable containers including containers sorted out of the trash, and trash/organics. Textiles went into the recyclable paper dumpster and milk cartons/juice boxes went into the recyclable containers dumpster.
    - Minnetonka – All recyclables including clean paper and containers sorted out of the trash, organics sorted out of the trash, and trash. The one exception is that the office paper/mixed mail materials went into special carts for confidential document shredding purposes.

- Household batteries, consumer electronics, HHW and other problem materials were set aside for inspection by Hennepin County staff. After this material was examined, it was managed through appropriate means.

The majority of the sorting was conducted by a crew (approximately 4 to 6 individuals) from the County's Adult Corrections Facility (ACF) and two crews (approximately 6 to 8 individuals) from PPL Industries. Additional assistance was provided by volunteers who worked side-by-side with the sorting crews to help maintain quality control. These volunteers were primarily county environmental staff, city recycling coordinators, and recycling industry staff. Several enthusiastic and knowledgeable citizen volunteers also assisted.

Due to differences in the collection programs, materials recycled, and sorting location characteristics, some adjustments were made to the protocol used in each community.

1. St. Louis Park Collection and Sorting Logistics

In St. Louis Park, the responsible parties for collecting the recyclables and waste are Eureka Recycling and Waste Management (WM), respectively. Due to cost reimbursement issues, WM did not participate in the study. Instead, samples of waste were collected by the City of St. Louis Park using a small rear-load packer truck typically used for collection of waste from the City's parks.

The St. Louis Park Municipal Service Center was used as the sort location. Specifically, the tipping and sorting area for the sort was an enclosed salt storage building, which had been emptied for the project (see Appendix B). The collection vehicles delivered the samples to the salt storage building where they were tipped inside along the back wall of the building. Three separate tipping areas were designated for tipping waste cart contents and dual-stream recyclables (one area for paper and another for rigid containers). Photographs from the St. Louis Park sort showing the field methodology can be found in Appendix C.

As noted previously, the City is divided into five collection districts with each district having three specified routes. Due to logistical and timing challenges, only the Monday thru Thursday collection districts/routes were sampled. The collection protocol entailed collecting the first 30 setouts on a route and delivering this material to the designated sorting area before the truck continued servicing that route. With four districts, each having three routes, the collection of waste from the first 30 setouts provided a sample population of 360 households. As noted previously, the samples of curbside recyclables collected came from these same routes (first 30 setouts) but two additional routes on Monday and Tuesday were also inadvertently delivered for sorting. To maintain the representative nature of the sample population, one sixth of the recycling data collected was factored out prior to conducting any comparative analysis.

Sorting of the collected materials was conducted Tuesday through Friday. The breakdown of materials that were sorted each day is listed in Table 2.1. In total, over 16,900 pounds of materials were sorted. Of this amount, approximately 53.5% was from waste carts and 46.4% was from the curbside recyclables collection.

Table 2.1
St. Louis Park Summary of Daily Amounts Sorted

Sort Date	Waste Carts	Recyclables - Containers	Recyclables - Paper	Total Pounds
Tuesday, May 12, 2009	2,115.8	973.0	1,124.4	4,213.2
Wednesday, May 13, 2009	3,897.4	582.3	1,121.5	5,601.2
Thursday, May 14, 2009	3,056.9	1,081.3	1,754.6	5,892.8
Friday, May 15, 2009	-----	-----	1,200.9	1,200.9
Total	**9,070.1**	**2,636.6**	**5,201.4**	**16,908.1**

2. Minnetonka Collection and Sorting Logistics

In Minnetonka, the responsible party for collecting residential recyclables is Waste Management. They are contracted by the City to provide this service. The majority of residential waste is collected by two companies – Allied Waste Services, Inc. and Randy's Environmental Services. Initially, both parties were contacted to solicit their participation in the study. Allied Waste declined the request so it was necessary to secure all waste samples from Randy's. As the waste collection system in Minnetonka is subscription-based (open), Randy's was able to provide samples of waste collected from across the city.

For comparison purposes, the study was designed to sample waste from households that have signed up for SSO collection service and from households that do not subscribe to this service. Carts of SSO were not sampled but Randy's provided the SSO amounts collected from those routes/households where waste samples were obtained.

The collection protocol entailed collecting the first 25 waste cart setouts from seven regular waste routes (175 setouts) and the first 100 stops and 88 stops from two waste routes that also have SSO collection service to obtain a waste sample size of 363 households. Recyclables were also collected from 363 households. The material was delivered to the Minnetonka Public Works facility where designated areas were set aside for the tipping of waste from routes receiving SSO collection services, waste from routes not receiving SSO collection services, and single-stream recyclables. An equipment storage building behind the main public works facility was used for sorting the materials (see Appendix D). Unlike the salt storage building in St. Louis Park, which had overhead door access on only one side of the building (east), the Minnetonka equipment storage building had overhead doors on both the east and west sides of the building. In this case, however, the equipment storage building did not have sufficient room to accommodate tipping of materials indoors. Photographs from the Minnetonka sort showing the field methodology can be found in Appendix E.

Recyclables were tipped just outside the west end of the building and corralled using free-standing, street hockey goals that were stored on-site. This allowed easy access to these materials as well as minimizing the potential for wind-blown litter and debris. The recyclables were also covered with a large tarp to protect the materials from inclement weather.

The waste cart contents was initially dumped in two separate piles in a bunkered area at the back of the property. This location, however, was problematic for several reasons. First, the piles were not protected enough from the wind and the first couple days of the sort saw wind gusts nearing 30 miles per hour. Even with the use of tarps to cover the piles, wind-blown litter became an issue.

Second, though the waste stockpile area was generally free of materials prior to dumping the waste, a small amount of sand was left in the area, which became incorporated into the waste piles as the material was

loaded into the tilt trucks. Additionally, the wind stirred up small amounts of sand from nearby areas, which was blown into the waste piles. The exact amount is unknown but it is unlikely it added any significant weight to the samples and any added sand/grit would likely fall within the 95% confidence level and 5% confidence interval. For example, if 200 to 300 pounds of sand had been blown into the stored waste piles, an unlikely amount, it would have represented less than 1.5% of the total waste sampled and sorted.

Finally, the area where the waste was stockpiled was well over 50 yards away from the sorting area. As a result, obtaining samples and transporting them back to the sorting area slowed down the sorting process significantly and created sorting crew downtime issues as they waited for the next sample to arrive for sorting.

This situation was rectified by loading the remaining waste from the non-SSO routes into a 30-yard roll-off container and moving it near the west door of the sorting area for easier access. Once this material had been sorted, the waste from routes receiving SSO collection services, which until this time had been tarped and stabilized, was loaded into the roll-off container and again placed near the west door of the sorting area. This change in procedure reduced the loss of materials due to wind, aided in minimizing further contamination of the waste with sand, and shortened the time required for moving samples to the sorting area.

Another change in the sorting protocol was how the recyclables were sampled and sorted. Instead of being loaded into the tilt trucks, weighed and wheeled over to the sorting tables, the material was sorted directly from the commingled recyclables pile. The tilt trucks were weighed empty to verify the tare weight of each as were a number of 60-gallon wheeled carts provided by Randy's Environmental Services. Each tilt truck and cart was labeled for a particular material. Once a tilt truck or cart was full of its designated material, it was wheeled to the scale to get a weight on the contents.

As noted previously, Randy's provided four locking confidential document containers as an added precaution so that sensitive materials (e.g., credit card statements, banking information, and old medical files) would be managed to prevent confidential information from becoming public. As it was not practical to separate these types of documents from the other office paper/mail mix, all paper sorted into this category was emptied into these containers for shredding.

Table 2.2 provides a breakdown of how much and what types of materials were sorted each day. In total, nearly 21,800 pounds of materials were sorted. Of this amount, approximately 62.7% was waste cart contents with curbside recyclables making up the remaining 37.3%. Of the waste loads, approximately 73.1% was from households not receiving SSO collection services and the remaining 26.9% from households that have this service.

Table 2.2
Minnetonka Summary of Daily Amounts Sorted

Sort Date	Waste Carts (Non -SSO Routes)	Waste Carts (SSO Routes)	Commingled Recyclables	Total Pounds
Monday, May 18, 2009	3,037.2	-----	-----	3,037.2
Tuesday, May 19, 2009	4,855.9	-----	-----	4,855.9
Wednesday. May 20, 2009	2,092.9	1,890.4	-----	3,983.3
Thursday, May 21, 2009	-----	1,783.2	4,227.6	6,010.8
Friday, May 22, 2009	-----	-----	3,897.7	3,897.7
Total	**9,986.0**	**3,673.6**	**8,125.3**	**21,784.9**

D. LIMITATIONS OF METHODOLOGY

Though the overall sampling and sorting methodology used in this study is valid and all attempts were made to obtain sufficient, representative samples at statistically accurate levels (95% confidence limit and 5% confidence interval), there were some factors inherent in the methodology that may have placed limitations on the data obtained. These factors include:

- The sampling and sorting events were one week in duration. This provides a snapshot of the waste generation and recycling efforts for the communities but represents only 1/52 of the annual picture;
- Only setouts were collected (i.e., only households setting out recyclables at the curb) so the data represents those households that are already recycling and does not include non-recycling households;
- Though all attempts were made to collect the waste and recyclables from the same households on a route, in some situations the households sampled for waste may have differed from the households sampled for recyclables. This is due, in part, to the fact that almost all the households on a given route will put out their trash weekly or bi-weekly depending on their pickup schedule. However, they may put out their recyclables only when their bins are full. As a result, some households may have had their trash sampled but not their recyclables, while others may have had their recyclables sampled but not their trash;
- The materials collected for recycling are often community-specific and can vary somewhat from community to community;
- Utilizing sorting personnel with limited knowledge of what materials are recyclable and in which categories they should be placed can impact the data. Even with on-site training, monitoring, and providing guidance to sorters, complete sorting accuracy is more a goal than an actual fact; and
- Working with less than ideal on-site conditions and logistics. This was more an issue in the Minnetonka sort with the outside dumping and storage of waste and recyclables.

With that said, it is believed that the data coming out of this study is valid and accurate to the degree that is needed for targeting educational campaigns toward various materials in the waste carts, and for planning future recycling recovery rate studies.

III. DATA REVIEW AND ANALYSIS

A. ST. LOUIS PARK WASTE AND RECYCLING SORT DATA

In St. Louis Park, a total of approximately 16,908 pounds of material was sorted. Approximately 54% of this material was from waste carts with the remaining 46% being curbside recyclables. However, it was discovered toward the end of the sort that Eureka Recycling inadvertently delivered recyclables from an additional 60 households creating the potential for skewed data. As noted in Section II, it was determined that by reducing the recycling tonnages by one-sixth prior to conducting the analysis, any significant data impacts could be minimized.

Based on the corrected number of households sampled (360) and the overall sample weights of the waste and the curbside recyclables (adjusted as stated above), Table 3.1 shows that St. Louis Park single-family residences generate on average approximately 25.2 pounds of waste on a weekly basis and set out approximately 18.1 pounds of recyclables on a weekly basis. Further, the breakdown of waste shows almost equal proportions of trash and organics – 40.7% and 42.1%, respectively – with approximately 17% recyclables remaining in the waste cart. Overall, sampled households are achieving a nearly 42% recycling rate. This is the percentage of the total waste stream that was set out for recycling.

Table 3.1
St. Louis Park Weekly Household Generation
from Waste Carts and Curbside Recyclables

Material Type	Total Pounds	Weekly Pounds Per Household[1]	Percent of Waste Carts	Percent of Grand Total
Trash	3,690.0	10.3	40.7%	
Organics	3,818.3	10.6	42.1%	
Recyclables	1,561.8	4.3	17.2%	
Waste Carts Total	**9,070.1**	**25.2**	**100%**	**58.1%**
Curbside Recyclables Total	**6,529.1**	**18.1**		**41.9%**
Grand Total	**15,599.2**			**100.0%**
			Recycling Rate	**41.9%**

[1] **Based on a sample population of 360 households.**

Table 3.2 gives a breakdown of the St. Louis Park curbside recyclables by material (15 in total). For the curbside recyclables sort, the trash and organics were combined. The largest component of the recycling set out for collection is newspapers/inserts at 29.3%. The paper category in total represents 64.8% of the material set out for recycling. Glass bottles/jars are the second largest component of the recycling set out for curbside collection (23.5%). The container category, including milk cartons/juice boxes, is 32.4% of the recyclables. Clothes/linens represent less than 0.1% of what is set out for recycling. As discussed later, more significant amounts of this material were found in the contents of the waste carts.

Trash and organics contamination combined is 2.7% of recycling bin contents with two-thirds of this being trash. The trash component consisted primarily of recyclable materials too contaminated to be recycled (e.g., aluminum foil contaminated with food, aluminum cans/plastic bottles containing cigarette butts or other contaminants inside), plastic film, other non-recyclable plastics and pieces of paper, plastics and glass pieces

too small to effectively recycle (likely broken during loading and unloading materials). Though some consumer electronics, HHW and problem materials were found, together they represented less than 0.1% of what was in the recycling bin. Figure 3.1 is a bar chart graphically depicting the information in Table 3.2.

Table 3.2
St. Louis Park Curbside Recyclables Sorting Results

Category	Pounds	Percent	Category	Pounds	Percent
Newspapers/Inserts	1,914.9	29.3%	Plastic Bottles	326.0	5.0%
Magazines/Catalogs	505.3	7.7%	Milk Cartons/Juice Boxes	11.3	0.2%
Phone Books	549.7	8.4%	Clothes/Linens	0.8	< 0.1%
Office Paper/Mail	422.0	6.5%	Household Batteries	0	0
Boxboard	309.8	4.7%	Consumer Electronics	0.4	< 0.1%
Corrugated Cardboard	536.5	8.2%	HHW/Problem Materials	0.3	< 0.1%
Metal Cans	243.7	3.7%	Trash/Garbage (incl. organics)	173.2	2.7%
Glass Bottles/Jars	1,535.2	23.5%			
Total Pounds of Curbside Recyclables – 6,529.1 Pounds					

Figure 3.1
Composition of St. Louis Park Curbside Recyclables

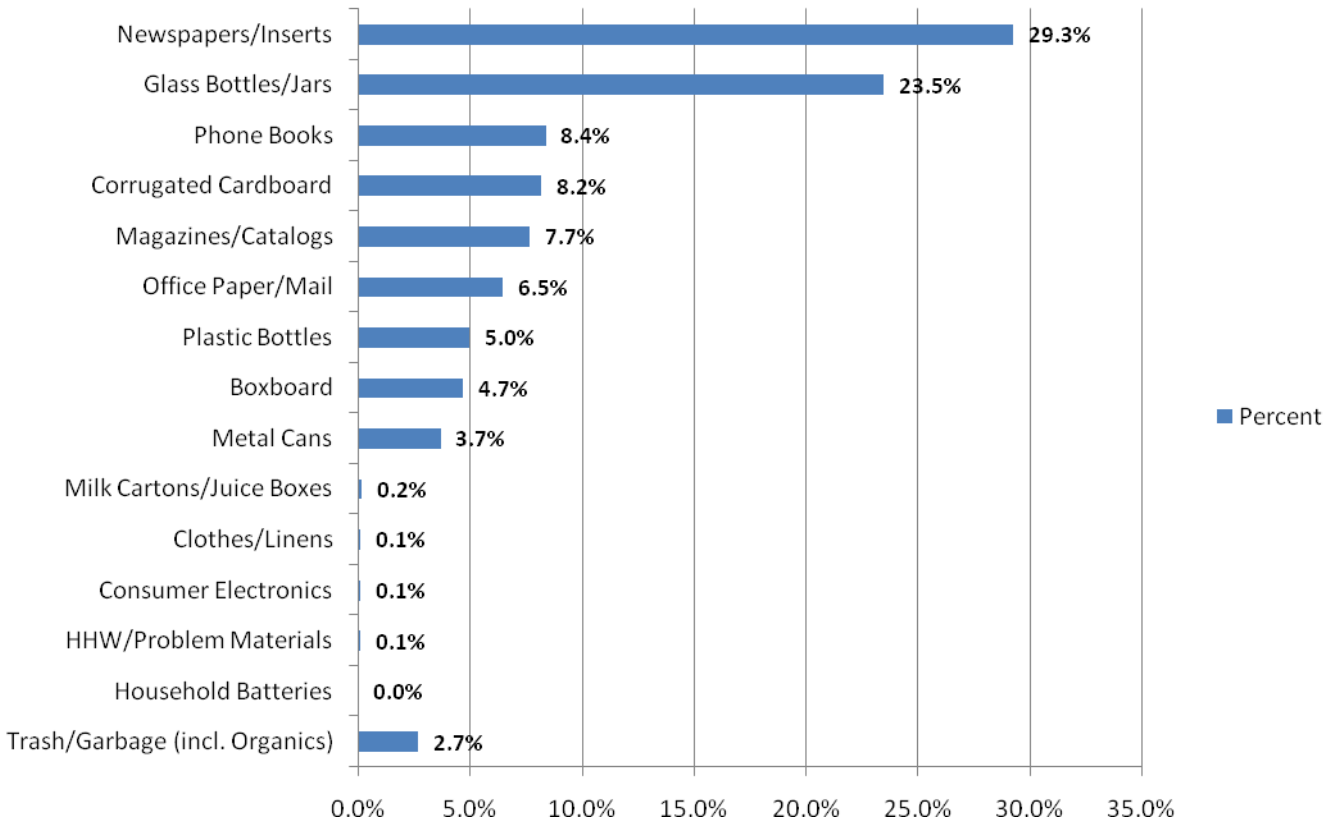


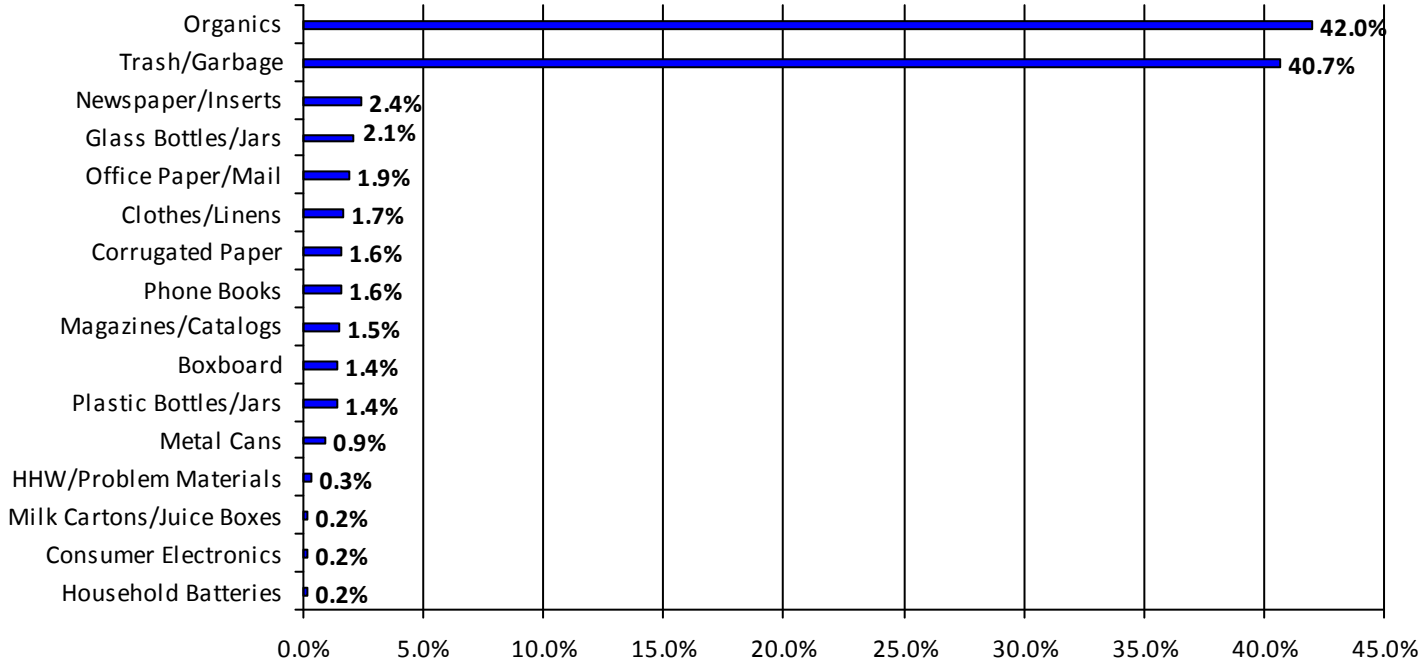
Table 3.3 gives a breakdown of the contents of the waste carts. The same categories were used for sorting the waste as were used in sorting the curbside recyclables. Of the 9,070 pounds of waste sorted, approximately 17% was material that could have been recycled. An additional 42% was organic material (yard/garden waste, food waste, and non-recyclable paper waste) that has the potential for being composted. Together, the recyclables remaining in the waste carts, along with the organics fraction of the waste carts, amount to nearly 59% of the material in the waste cart with the potential for diversion from landfilling or incineration.

Items that should not be placed in waste carts (batteries, electronics, HHW/problem materials) represent approximately 1% of the material in waste carts. Of the three categories of materials, HHW/problem materials represented nearly half of what was found. Batteries and consumer electronics were roughly split 25% each. Figure 3.2 is a bar chart graphically depicting the information in Table 3.3.

Table 3.3
St. Louis Park Waste Carts Sorting Results

Category	Pounds	Percent	Category	Pounds	Percent
Newspapers/Inserts	216.8	2.4%	Plastic Bottles	129.9	1.4%
Magazines/Catalogs	138.7	1.5%	Milk Cartons/Juice Boxes	15.1	0.2%
Phone Books	140.8	1.6%	Clothes/Linens	150.6	1.7%
Office Paper/Mail	170.6	1.8%	Household Batteries	16.2	0.2%
Boxboard	126.3	1.4%	Consumer Electronics	14.7	0.2%
Corrugated Cardboard	141.2	1.6%	HHW/Problem Materials	27.6	0.3%
Metal Cans	85.0	0.9%	Organics	3,818.3	42.0%
Glass Bottles/Jars	188.3	2.1%	Trash/Garbage	3,690.0	40.7%
Total Pounds from Waste Carts – 9,070.1 Pounds					

Figure 3.2
Breakdown of Materials in the St. Louis Park Waste Carts



According to the sorting results, the greatest amounts of recyclable materials remaining in the waste carts are newspapers/inserts, glass bottles/jars, office paper/mail, and clothes/linens. Though some of the clothes/linens found were clean or only slightly soiled, much of this material was heavily contaminated at the time of sorting. It is unknown whether this occurred during the collection process or if the material was dirty when it went into the trash.

Table 3.4 shows the St. Louis Park recycling recovery rates. Most of the materials listed in Table 3.4 have at least a 70% recovery rate with glass bottles/jars and newspapers/inserts having the highest recovery rates (89.6% and 89.1%, respectively). The items with the lowest recovery rates are milk cartons/juice boxes (42.8%) and clothes/linens (0.5%). These items are relatively new to the list of recyclables in St. Louis Park (less than eight months at the time of the sort). While milk cartons/juice boxes can simply be placed in the bin with all other containers, clothes/linens need to be put in a separate bag and placed at curbside for recycling collection. Since this is an added step for the resident, this may explain why so little of this material is recovered for recycling compared to what was found in the waste cart.

Table 3.4
St. Louis Park Recycling Recovery Rates

Material	Recycling lbs. from Recycling Bin	Recycling lbs. from Waste Cart	Total Recyclable Material lbs.	Recycling Recovery Rate
Newspapers/Inserts	1,914.9	216.8	2,131.7	89.8%
Magazines/Catalogs	505.3	138.7	644.0	78.5%
Phone Books	549.7	140.8	690.5	79.6%
Office Paper/Mail	422.0	170.6	592.6	71.2%
Boxboard	309.8	126.3	436.1	71.0%
Corrugated Cardboard	536.5	141.2	677.7	79.2%
Metal Cans	243.7	85.0	328.7	74.1%
Glass Bottles/Jars	1,535.2	188.3	1,723.5	89.1%
Plastic Bottles	326.0	129.9	455.9	71.5%
Milk Cartons/Juice Boxes	11.3	15.1	26.4	42.8%
Clothes/Linens	0.8	150.6	151.4	0.5%
Total	**6,355.2**	**1,503.2**	**7,858.50**	**80.9%**

B. MINNETONKA WASTE AND RECYCLING SORT DATA

In Minnetonka, a total of 21,785 pounds of material was sorted. Since Randy's Environmental Services offers curbside collection of SSO to their customers, sampled households included 175 that do not receive this service and 188 that do, resulting in a total of 363 households.

Table 3.5 shows that Minnetonka single-family households generate on average 37.6 pounds of waste per week and set out approximately 22.4 pounds of recyclables weekly.

However, the weekly contents of waste carts varies significantly between those households not receiving SSO collection service and those that do – 57.1 pounds/week and 19.5 pounds/week, respectively. Additionally, households receiving SSO collection services tend to have lower percentages of both recyclables and organics remaining in their waste carts (9.8% and 29.2%, respectively) when compared to those households not receiving SSO collection service (14.3% and 47.8%, respectively).

In total, 63% of the material sorted in Minnetonka was from waste carts, of which 13.1% was recyclable material. Overall, sampled households are achieving a recycling rate of approximately 37%. This is the percentage of the total waste stream that was set out for recycling and is shown in Table 3.5.

Comparing Minnetonka household waste generation rates to those in St. Louis Park shows a significant difference. It's not clear why the variation is so great but it may be related to demographic differences between the two communities (e.g., household incomes, age group stratification, etc.).

Table 3.5
Minnetonka Weekly Household Generation from Waste Carts and Curbside Recyclables

Material Type		Total Pounds	Weekly Pounds Per Household[1]	Percent of Waste Carts	Percent of Grand Total
Waste Carts (Households without SSO collection service)	Trash	3,789.8	21.7	37.9%	
	Organics	4,770.5	27.3	47.8%	
	Recyclables	1,425.7	8.2	14.3%	
	Sub-total Waste Carts	**9,986.0**	**57.1**	**100.0%**	
Waste Carts (Households with SSO collection service)	Trash	2,240.7	11.9	61.0%	
	Organics	1,071.9	5.7	29.2%	
	Recyclables	361.0	1.9	9.8%	
	Sub-total Waste Carts	**3,673.6**	**19.5**	**100.0%**	
	Waste Carts Total	**13,659.6**	**37.6**		**62.7%**
	Curbside Recyclables Total	**8,125.3**	**22.4**		**37.3%**
	Grand Total	**21,784.9**			**100.0%**
				Recycling Rate	**37.3%**

[1] Based on a sample population of 363 households, with 175 not receiving SSO collection service and 188 receiving SSO collection service.

With the exception of milk cartons/juice boxes and clothes/linens, the Minnetonka list of acceptable materials for recycling is similar to that of St. Louis Park. Table 3.6 breaks out the Minnetonka curbside recyclables by specific materials/categories (13 in total) designated for this sort.

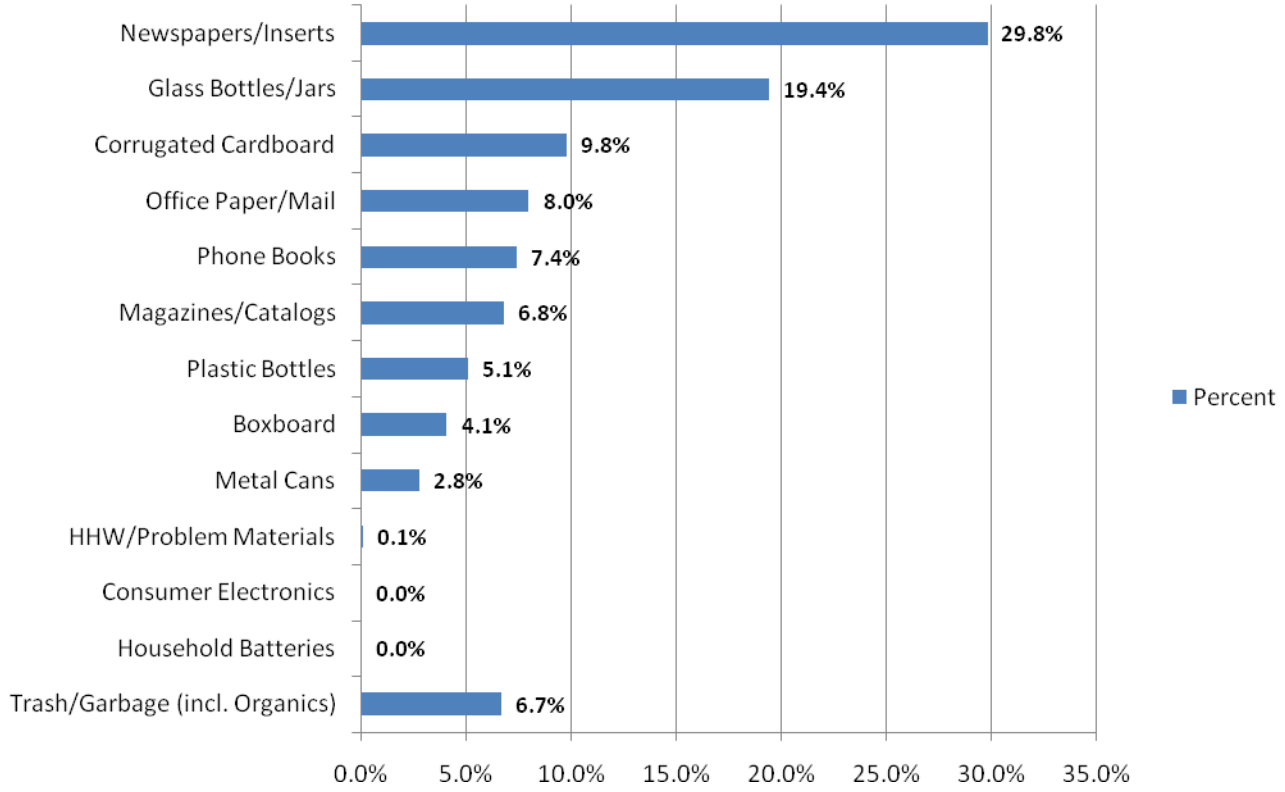
Table 3.6
Minnetonka Curbside Recyclables Sorting Results

Category	Pounds	Percent	Category	Pounds	Percent
Newspapers/Inserts	2,422.3	29.8%	Glass Bottles/Jars	1,575.5	19.4%
Magazines/Catalogs	551.4	6.8%	Plastic Bottles	412.9	5.1%
Phone Books	597.5	7.4%	Household Batteries	0	0
Office Paper/Mail	646.1	8.0%	Consumer Electronics	0	0
Boxboard	336.0	4.1%	HHW/Problem Materials	8.9	0.1%
Corrugated Cardboard	798.1	9.8%	Trash/Garbage (incl. organics)	547.9	6.7%
Metal Cans	228.7	2.8%			
Total Pounds of Curbside Recyclables – 8,125.3 Pounds					

As in the St. Louis Park sort, the largest component of the curbside recycling in Minnetonka is newspapers/inserts at 29.8%. The paper category represents nearly two-thirds of the material set out for recycling (65.9%). The container category makes up another 27.3% with most of this (over 19%) being glass bottles/jars.

With the exception of several household batteries (certain types which are acceptable to put into the trash), no other batteries or consumer electronics were found in the recyclables. HHW and problem materials accounted for 0.1% of the material sorted with almost all of this being plastic containers with product still in them. Unlike the St. Louis Park sort, a larger amount of trash and organics was found, for a total of 6.7% of the curbside recycling. Most of this material was trash consisting of food-contaminated aluminum foil, plastic film, non-recyclable plastics, refrigerated food carton packaging, and pieces of recyclable material too small to effectively recycle (broken glass from loading and unloading the recycling truck and moving/handling the materials on site). Figure 3.3 is a bar chart graphically depicting the information in Table 3.6.

Figure 3.3
Composition of Minnetonka Curbside Recyclables



The waste collected for the Minnetonka sort represents two types of households – those that subscribe to SSO collection service and those that do not. It is believed that making this distinction between the two groups would provide additional information on:

- How SSO collection impacts the amount of organics in the waste cart; and
- How SSO collection reinforces the amount of recycling taking place in households.

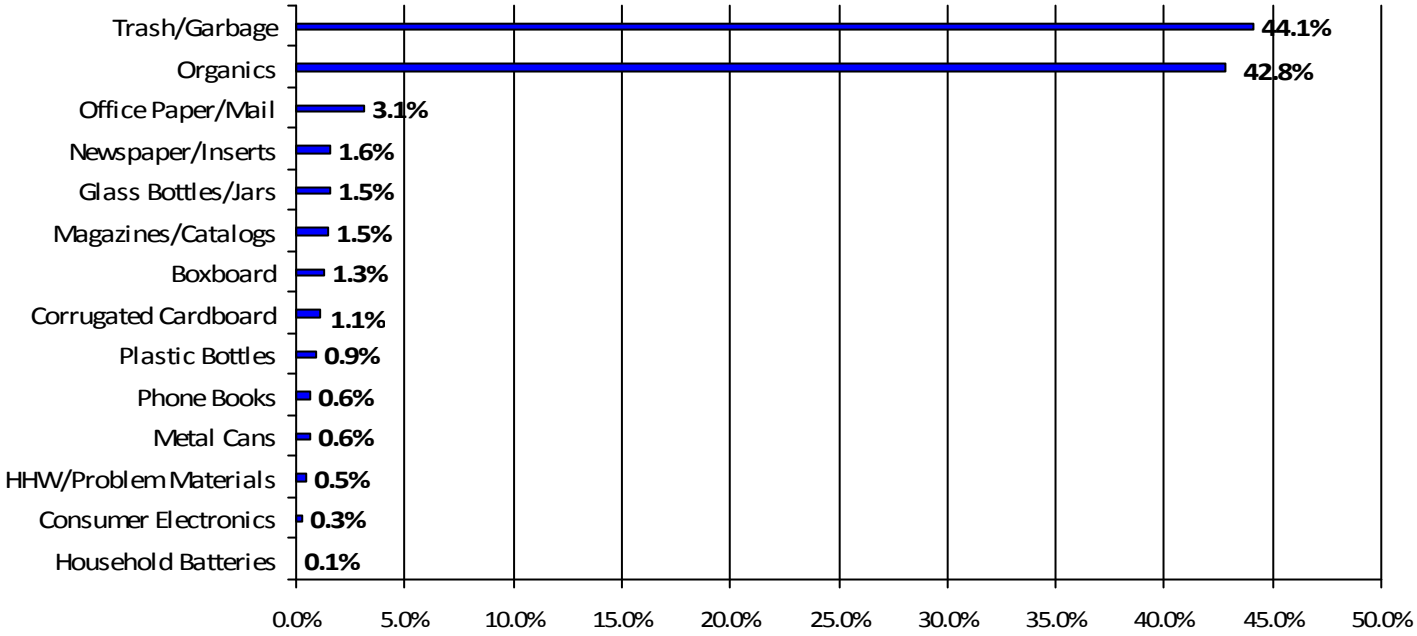
Table 3.7 shows the waste cart sorting results. As cited earlier, milk cartons went into the organics while juice boxes went into the trash category along with the clothes/linens. Overall, approximately 12% of the nearly

13,660 pounds of material from the waste carts consisted of recyclables while another 1% was problematic waste (e.g., batteries, consumer electronics, HHW and other problem materials). Nearly 87% of the sorted waste consisted of organics and trash/garbage with this split being approximately equal. Figure 3.4 is a bar chart graphically depicting the breakdown of the total waste – waste from households that receive SSO collection combined with waste from households not receiving this service.

Table 3.7
Minnetonka Waste Cart Sorting Results

Category	Combined Waste		Waste Without SSO Service		Waste With SSO Service	
	Pounds	Percent	Pounds	Percent	Pounds	Percent
Newspapers/Inserts	224.1	1.6%	172.5	1.7%	51.6	1.4%
Magazines/Catalogs	208.3	1.5%	179.0	1.8%	29.3	0.8%
Phone Books	83.0	0.6%	65.5	0.6%	17.5	0.5%
Office Paper/Mail	421.8	3.1%	321.0	3.2%	100.8	2.7%
Boxboard	172.3	1.3%	141.7	1.4%	30.6	0.8%
Corrugated Cardboard	153.5	1.1%	115.0	1.1%	38.5	1.0%
Metal Cans	75.6	0.6%	55.8	0.6%	19.8	0.5%
Glass Bottles/Jars	211.9	1.5%	189.5	1.9%	22.4	0.6%
Plastic Bottles	117.8	0.9%	89.2	0.9%	28.6	0.8%
Household Batteries	11.3	0.1%	6.5	0.1%	4.8	0.1%
Consumer Electronics	45.6	0.3%	41.7	0.4%	3.9	0.1%
HHW/Problem Materials	61.5	0.5%	48.3	0.5%	13.2	0.4%
Organics	5,842.4	42.8%	4,770.5	47.8%	1,071.9	29.2%
Trash/Garbage	6,030.5	44.1%	3,789.8	38.0%	2,240.7	61.0%
Total Pounds	**13,659.6**	**100.0%**	**9,986.0**	**100.0%**	**3,673.6**	**100.0%**

Figure 3.4
Breakdown of Materials in the Combined Minnetonka Waste Carts



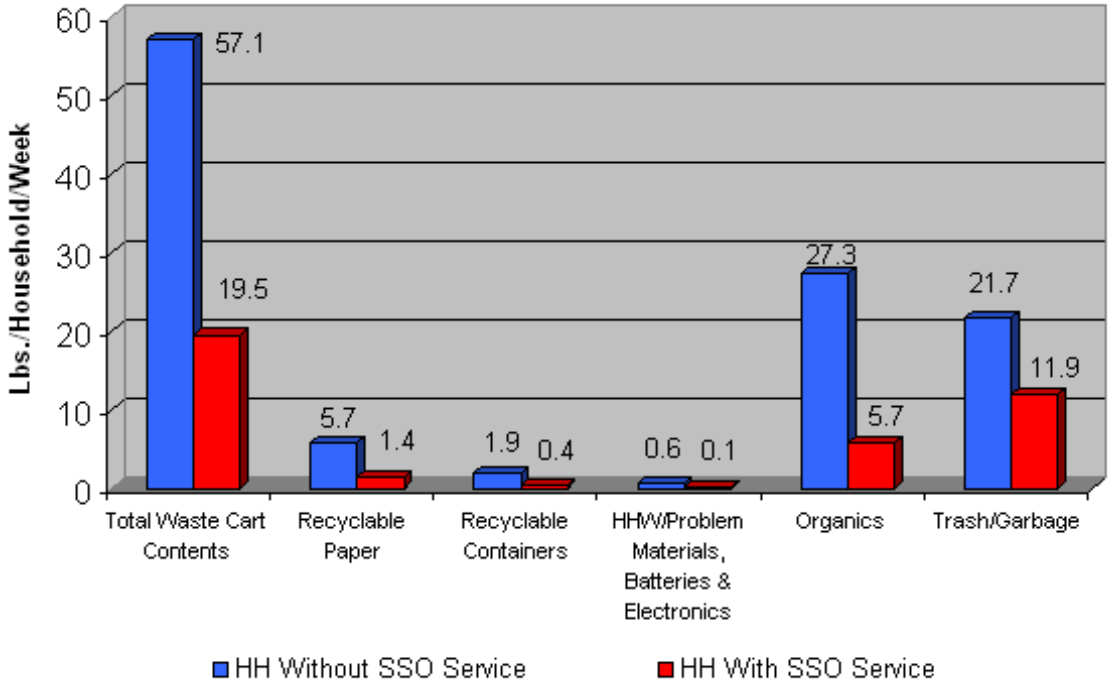
According to the sorting results, office paper/mail appears to represent the single greatest amount of recyclable material remaining in the waste carts, whether it is generated by households receiving SSO collection service (2.7%) or by households not participating in SSO collection programs (3.2%). Some of this paper in the waste cart may be due to residents' concern about identity theft from recycling the paper.

Of the 9,986 pounds of waste coming from routes not having SSO collection service, approximately 13% consisted of materials that could have been recycled. Household batteries, consumer electronics, HHW and problem materials made up 1% of the materials sorted. Of this amount (118.4 pounds), nearly 52% was HHW/problem materials with another 38.5% being consumer electronics. Approximately 86% of the sorted waste was organics and trash/garbage with over half of that material falling into the organics category.

Of the approximately 3,674 pounds of residential waste coming from routes with SSO collection service, 9% of the waste sorted consisted of materials that could have been recycled. Household batteries, consumer electronics, HHW and problem materials made up 0.6% of the waste cart contents. This left approximately 90% of the sorted waste consisting of organics and trash/garbage with fully two-thirds of that material falling into the trash/garbage category.

As noted earlier, on average, households not participating in SSO collection programs generate approximately 57.1 pounds of waste per week as compared to 19.5 pounds of waste per week from those households participating in SSO collection programs. However, the difference in weekly waste cart contents can be broken down even further to examine specific components contained in the waste carts. Figure 3.5 depicts the difference in weekly household generation rates for various constituents of the waste carts from households not receiving SSO collection services and from those that do.

Figure 3.5
Minnetonka Comparison of Average Weekly Pounds of Waste per Households Broken Down By Recyclables, Organics, Trash and Other Constituents



For households not participating in an SSO collection program, the amount of organics found in the waste carts is nearly five times as great on a per household basis as the amount found in waste coming from households participating in an SSO collection program. Furthermore, households participating in SSO collection programs appear to be more motivated and involved in recycling programs. The average weekly amount of waste coming from the SSO collection program households contained four times less recyclable paper and five times less recyclable containers. In addition, household batteries, consumer electronics, HHW and other problem materials were found in significantly lower amounts in waste coming from households participating in SSO programs.

Based on numbers provided by Randy's Environmental Services, the total amount of SSO collected during the week of the sort was approximately 4,940 pounds coming from approximately 267 households. This indicates, on average, approximately 18.5 pounds per household. Adding this to the average weekly household amount of organics remaining in the waste carts gives an overall average weekly generation rate of approximately 24.2 pounds of organics from those households participating in an SSO collection program. This puts the weekly generation of organics closer in line to what is seen in households not receiving SSO collection service.

The amount of organics remaining in the waste carts, especially for households not currently participating in SSO collection programs, points to the potential for diverting a significant portion of the contents of waste carts to an organics collection program. However, the total percentage of organics may be lower than what is reported here. This is due to some amount of wind-blown sand being added and because it was the beginning of the yard and garden season. While yard waste is banned from disposal, it was definitely observed during the sorting process although it was not quantified. Based on all of this, the percentage of household organics,

exclusive of yard waste, found in the Minnetonka waste carts may be somewhat over-represented in the sort data.

Table 3.8 shows the Minnetonka recycling recovery rates. As recyclables collected from households receiving SSO collection services were not tracked separately from those that do not receive this service, the comparison here is based on the total amount of waste sorted.

Most of the materials listed in Table 3.8 have at least a 75% recycling recovery rate, with newspapers/inserts having a very high recovery rate of better than 90%. Glass bottles/jars and corrugated cardboard come in at 88.1% and 83.9%, respectively. Though showing a strong recovery rate, boxboard (66.1%) and office paper/mail (60.5%) have room for improvement in terms of their recovery potential.

Table 3.8
Minnetonka Recycling Recovery Rates

Material	Recycling from Recycling Bin (lbs.)	Recycling from Waste Cart (lbs.)	Total Recyclable Material (lbs.)	Recycling Recovery Rate
Newspapers/Inserts	2,422.3	224.1	2,646.4	91.5%
Magazines/Catalogs	551.4	208.3	759.7	72.6%
Phone Books	597.5	83.0	680.5	87.8%
Office Paper/Mail	646.1	421.8	1,067.9	60.5%
Boxboard	336.0	172.3	508.3	66.1%
Corrugated Cardboard	798.1	153.5	951.6	83.9%
Metal Cans	228.7	75.6	304.3	75.2%
Glass Bottles/Jars	1,575.5	211.9	1,787.4	88.1%
Plastic Bottles	412.9	117.8	530.7	77.8%
Total	**7,568.5**	**1,668.3**	**9,236.8**	**81.9%**

C. COMPARISON OF ST. LOUIS PARK AND MINNETONKA SORT RESULTS

In comparing the St. Louis Park sorting results to the Minnetonka sorting results, there are several differences in the way the two communities manage their waste and recycling collection programs that likely have some influence on the results. These were noted in the Introduction and include:

- Organized collection of waste in St. Louis Park versus an open collection system in Minnetonka;
- Dual-stream recycling collection in St. Louis Park versus single-stream collection in Minnetonka; and
- No SSO collection services offered in St. Louis Park compared to having this option in Minnetonka.

Table 3.9 compares the composition of the curbside recyclables for St. Louis Park and Minnetonka. In Table 3.9, the milk cartons/juice boxes and clothes/linens categories in St. Louis Park were removed and the percentages adjusted accordingly. As the Minnetonka recycling program does not target these materials, removing them from the mix provides a slightly more accurate comparison of the two recycling programs.

Table 3.9
Comparison of Curbside Recyclables Sorting Results – St. Louis Park and Minnetonka[1]

Category	St. Louis Park		Minnetonka	
	Pounds	Percent	Pounds	Percent
Newspapers/Inserts	1,914.9	29.4%	2,422.3	29.8%
Magazines/Catalogs	505.3	7.8%	551.4	6.8%
Phone Books	549.7	8.4%	597.5	7.4%
Office Paper/Mail	422.0	6.5%	646.1	8.0%
Boxboard	309.8	4.8%	336.0	4.1%
Corrugated Cardboard	536.5	8.2%	798.1	9.8%
Metal Cans	243.7	3.7%	228.7	2.8%
Glass Bottles/Jars	1,535.2	23.5%	1,575.5	19.4%
Plastic Bottles	326.0	5.0%	412.9	5.1%
Household Batteries	0	0%	0	0
Consumer Electronics	0.4	< 0.01%	0	0
HHW/Problem Materials	0.3	<0.01%	8.9	0.1%
Trash/Garbage (incl. organics)	173.2	2.7%	547.9	6.7%
Total	**6,517.0**	**100.0%**	**8,125.3**	**100.0%**

[1] For comparison purposes, the categories of milk cartons/juice boxes and clothes/linens under the St. Louis Park program have been removed and the data adjusted. Since the City of Minnetonka does not include these items in their recycling program, removal from the above data set provides a more accurate side-by-side comparison of the recyclables composition.

Based on the data in this table, it appears that most of the materials in the recycling bins of each community are found in the same approximate proportions and do not differ significantly from each other. There are, however, a few items that tend to show up more in one community's recycling bin than in the other.

One example is that glass bottles/jars are more prevalent in the St. Louis Park recycling bins than in the Minnetonka recycling bins. This may be due to demographic differences. For example, a higher economic status, more likely found in Minnetonka, may suggest greater buying or growing of fresh foods, as well as eating more meals away from home. As a result, the generation of bottles and cans, many of which would have contained food and beverages, may be at a lower rate in Minnetonka.

Other items that are more prevalent in one community's recycling bin could be linked to different program characteristics. The amount of trash/garbage found in the Minnetonka recycling program is notably higher than in St. Louis Park's program. Several reasons may account for this.

First, Minnetonka's recycling vendor (Waste Management) operates a single-stream program for curbside recycling. Minnetonka residents place recyclables in curbside bins or in paper bags set next to bins. Drivers load recyclables into the truck commingled (as a single stream) for delivery to the Waste Management recycling facility where it is mechanically separated.

Second, there is very little continuous residential recycling education taking place in Minnetonka. As a result, a number of non-recyclable items end up in the recycling truck including food-contaminated aluminum foil, plastic film, non-recyclable plastics, refrigerated food carton packaging, and pieces of recyclable material too small to effectively recycle (likely broken glass). The non-recyclable items in the recycling bins that are loaded into the truck end up being managed at Waste Management's recycling facility as a processing residue.

In St. Louis Park, the dual-stream collection program also uses bins for collecting recyclables, however, the Eureka collection crews will typically not take something if it's non-recyclable. Instead, they will leave it in the bin along with a tag letting the customer know why it was left. St Louis Park changed recycling collection contractors in October, 2008, providing an opportunity for extensive recycling re-education of the residents.

Table 3.10 isolates the recyclables remaining in the waste carts from each community. For the most part, the recyclables remaining in the waste vary only by a small amount. However, one category appears to be present in the Minnetonka waste stream in a significantly larger proportion than in the St. Louis Park waste stream – office paper/mail.

Table 3.10
Comparison of Recyclables Remaining in the Waste Carts

for St. Louis Park and Minnetonka

Category	St. Louis Park		Minnetonka (w/o SSO Service)		Minnetonka (with SSO Service)	
	Pounds	Percent	Pounds	Percent	Pounds	Percent
Newspapers/Inserts	216.8	14.4%	172.5	13.0%	51.6	15.2%
Magazines/Catalogs	138.7	9.2%	179.0	13.5%	29.3	8.7%
Phone Books	140.8	9.4%	65.5	4.9%	17.5	5.2%
Office Paper/Mail	170.6	11.4%	321.0	24.1%	100.8	29.7%
Boxboard	126.3	8.4%	141.7	10.7%	30.6	9.0%
Corrugated Cardboard	141.2	9.4%	115.0	8.7%	38.5	11.4%
Metal Cans	85.0	5.7%	55.8	4.2%	19.8	5.8%
Glass Bottles/Jars	188.3	12.5%	189.5	14.2%	22.4	6.6%
Plastic Bottles	129.9	8.6%	89.2	6.7%	28.6	8.4%
Milk Cartons/Juice Boxes	15.1	1.0%	-----	-----	----	-----
Clothes/Linens	150.6	10.0%	-----	-----	-----	-----
Total	**1,503.3**	**100.0%**	**1,329.2**	**100.0%**	**339.1**	**100.0%**

Focusing on the recycling recovery rate for specific materials (Table 3.11), both St. Louis Park and Minnetonka residents are doing a good job at recovering many of the more traditional recyclables from the MSW stream including newspapers/inserts, glass bottles/jars, phone books, and corrugated cardboard. The recovery rates are nearly 80% or better for all of these materials

Both communities are currently seeing recycling recovery rates of between 60% and 71% for office paper/mail and boxboard. Though these materials have a relatively high recovery rate, the sorts indicated there are more of these materials in the waste stream that could be recycled. In Minnetonka, specifically, there is room for improved recovery of office paper/mail and boxboard with the current recovery rates at 60.5% and 66.1%, respectively.

Table 3.11
Comparison of Recycling Recovery Rates for
St. Louis Park and Minnetonka

Category	St. Louis Park	Minnetonka
Newspapers/Inserts	89.8%	91.5%
Magazines/Catalogs	78.5%	72.6%
Phone Books	79.6%	87.8%
Office Paper/Mail	71.2%	60.5%
Boxboard	71.0%	66.1%
Corrugated Cardboard	79.2%	83.9%
Metal Cans	74.1%	75.2%
Glass Bottles/Jars	89.1%	88.1%
Plastic Bottles	71.5%	77.8%
Milk Cartons/Juice Boxes	42.8%	-----
Clothes/Linens	0.5%	-----

St. Louis Park has recently added two items to its recycling program that have not been a component of past recycling programs – milk cartons/juice boxes and clothes/linens. These items have been incorporated into the program just within the last nine months. For such a short period of time, the recycling recovery rate of milk cartons/juice boxes is high. The recycling of clothes/linens, however, has to date not been embraced by residents. This may be due to being unaware of the recycling option for this material or the perception that it's too difficult to prepare these materials for recycling (placing in a separate plastic bag and setting it out at curbside). In addition, many residents that have used clothes/linens will give them to a friend or neighbor for reuse, sell them at a garage sale, or donate them to a charity.

In comparing the problem materials found in the recycling and waste sorts, more of these materials were found in the Minnetonka sort (Table 3.12). Even taking into account the larger amount of recyclables and waste sorted in Minnetonka – 21,785 pounds compared to 15,600 pounds in St. Louis Park – Minnetonka had three times as many consumer electronics and 2 ½ times as much HHW/problem materials as St. Louis Park. Still, in both communities, the overall amount of these types of materials in the waste carts and the curbside recyclables accounted for approximately 0.5% of the total materials sorted.

Table 3.12
Comparison of Problem Materials Found in the
Recycling and Waste Sorts in St. Louis Park and Minnetonka

Category	St. Louis Park				Minnetonka			
	Recycling Samples (lbs.)	Waste Samples (lbs.)	Total (lbs.)	Percent of Total Materials Sorted	Recycling Samples (lbs.)	Waste Samples (lbs.)	Total (lbs.)	Percent of Total Materials Sorted
Household Batteries	0	16.2	16.2	0.1%	0	11.3	11.3	< 0.1%
Consumer Electronics	0.4	14.7	15.1	< 0.1%	0	45.6	45.6	0.2%
HHW/Problem Materials	0.3	27.6	27.9	0.2%	8.9	61.5	70.4	0.3%
Total	**0.7**	**58.5**	**59.2**	**< 0.4%**	**8.9**	**118.4**	**127.3**	**< 0.6%**

Finally, regarding the organics portion of the waste cart contents, overall this represented approximately 42% to 43%. There was, however, a stark difference in the amount of organics in the waste carts for Minnetonka households not subscribing to SSO collection service as compared to those that do – 48% to 29%, respectively. This leads to a couple of observations.

Collecting SSO for composting has a significant impact on the amount of organics going into waste carts, reducing this amount by approximately 75% (4,771 pounds to 1,072 pounds). The sorting completed for this study also points to the potential for recovering more organics from those households already receiving this service.

The other observation is that if you compare the St. Louis Park organics component to Minnetonka's organics component just from those households not receiving SSO collection service, the organics portion is 43% and 48% for St. Louis Park and Minnetonka, respectively. This difference may have several explanations including:

- Impacts of on-site sand within the Minnetonka organics fraction; and/or
- Larger amounts of yard waste that were observed in the Minnetonka waste samples.

Other demographic characteristics such as income and age disparities within the two communities may also play some role in the differences.

IV. CONCLUSIONS AND RECOMMENDATIONS

As stated in the Introduction, the primary goal of this study is to determine the recycling recovery rate of materials in curbside recycling programs of two Hennepin County communities – St. Louis Park and Minnetonka – and assess the potential to increase it. Knowing this can help Hennepin County, as well as St. Louis Park and Minnetonka, identify specific materials in the waste carts for more aggressive recovery efforts.

A. CONCLUSIONS

Based on the collected data and analysis, the conclusions drawn from this study include the following:

St. Louis Park Conclusions

- Of the recyclables set out by residents, 64.8% was paper, 32.4% was containers, and 2.7% was combined trash/organics. Household batteries, consumer electronics and HHW/problem materials accounted for less than 0.1% as did clothes/linens.
- The most predominant materials in the curbside recyclables were newspapers/inserts (29.3%) and glass bottles/jars (23.5%).
- Of the waste cart contents, 10.3% was recyclable paper and 4.6% were containers.
- Of the recyclables remaining in the waste carts, those that were found in the largest amounts included:
    - Newspapers/Inserts – 2.4%
    - Glass Bottles/Jars – 2.1%
    - Office Paper/Mail – 1.8%.
- Comparing the recyclables from the curbside program with the recyclables found in the waste carts, five categories have a recycling recovery rate of 75% or greater including:
    - Newspapers/Inserts – 89.8%
    - Glass Bottles/Jars – 89.1%
    - Phone Books – 79.6%
    - Corrugated Cardboard – 79.2%
    - Magazines/Catalogs – 78.5%
- Organics (food waste, non-recyclable paper, and yard waste) accounted for 42.0% of the contents of the waste carts.

Minnetonka Conclusions

- Of the recyclables set out by residents, 65.9% was paper, 27.3% was containers, and 6.7% was combined trash/organics. Household batteries, consumer electronics and HHW/problem materials account for another 0.1%.
- The most predominant materials in the curbside recyclables were newspapers/inserts (29.8%) and glass bottles/jars (19.4%).
- Of the combined waste cart contents (households with and without SSO collection) generated by residents, 9.2% was recyclable paper and 3.0% were containers.
- Of the recyclables remaining in the combined contents of waste carts, those that were found in the largest amounts included:
    - Office Paper/Mail – 3.1%
    - Newspapers/Inserts – 1.6%

- Magazines/Catalogs – 1.5%
- Glass Bottles/Jars – 1.5%

- There were noticeable waste composition differences between households receiving SSO collection and those not receiving this service.

  Households receiving SSO collection services:

  - The recyclable paper category made up 7.2% of the contents of the waste carts with another 1.9% being containers. Organics accounted for 29.2% of the contents of the waste carts.
  - Of the recyclables remaining in the waste carts, one material that was found to be present in significant amounts was office paper/mail (2.7%).

  Households not receiving SSO collection services:

  - Recyclable paper made up 9.8% of the contents of the waste cart, with another 3.4% being containers. Organics accounted for 47.8% of the waste.
  - Of the recyclables remaining in the waste carts, those that were found in the largest amounts included:
    - Office Paper/Mail – 3.2%
    - Glass Bottles/Jars – 1.9%
    - Magazines/Catalogs – 1.8%
    - Newspapers/Inserts – 1.7%

- Comparing the recyclables from the curbside program with the recyclables found in the combined contents of waste carts, six categories have a recycling recovery rate of 75% or greater including:
  - Newspapers/Inserts – 91.5%
  - Glass Bottles/Jars – 88.1%
  - Phone Books – 87.8%
  - Corrugated Cardboard – 83.9%
  - Plastic Bottles – 77.8%
  - Metal Cans – 75.2%

- The waste cart contents of households participating in the SSO collection program consisted of 29.2% organics while the waste generated by households not participating in the SSO collection program consisted of 47.8% organics.

- Households participating in the SSO collection program appear to be more motivated and involved in their recycling efforts than their neighbors not participating in an SSO collection program. The average weekly waste cart pounds per household of those participating in SSO collection efforts contained four times less recyclable paper and five times less recyclable containers than those not participating in an SSO collection program.

General Comparative Conclusions

- In both St. Louis Park and Minnetonka, the general proportion of the recyclable materials found in the curbside bins are similar with glass bottles/jars having a slightly higher presence in the St. Louis Park bins – 23.5% in St. Louis Park versus 19.4% in Minnetonka.

- The amount of non-recyclable materials found in the Minnetonka curbside bins is significantly greater than what was observed in the St. Louis Park bins – 6.7% compared to 2.7%, respectively.

- Comparing the organics component of the waste cart contents, SSO collection programs have a significant impact on the diversion of this material.

- Reinforcing what was observed in Minnetonka, households participating in SSO collection programs appear to be more motivated and involved in their recycling efforts. Recyclable paper and containers found in the St. Louis Park waste carts made up 10.3% and 4.6%, respectively, of the overall composition. This is comparable to what was observed in the Minnetonka sort for households not receiving SSO collection services (9.8% and 3.4%, respectively) and is significantly higher than the sorting results for the Minnetonka households that are receiving SSO collection services (7.2% and 1.9%, respectively).

B. RECOMMENDATIONS

Based on the findings of the study the following recommendations are made:

1. In selecting which materials found in the waste carts should be the focus of educational outreach activities for improving recovery rates, consideration should be given to both the current recovery rate of various materials and the total amount of those materials in the waste stream that can realistically be recovered. Those materials that appear to have the best potential for further recovery efforts include the paper category in general, but more specifically office paper/mail and boxboard. Additionally, efforts to recover more glass bottles and jars from the waste carts could help increase community recycling rates due in part to the density (weight) of this material.
2. In addition to educational outreach efforts for increasing recycling, educational activities should be undertaken to inform residents of which materials should not go in their recycling containers. This is especially true in Minnetonka where trash and organics was nearly 7% of what was found in the curbside recyclables.
3. With organics being over 40% of the contents of waste carts in both St. Louis Park and in those Minnetonka households not participating in the SSO collection program, efforts should be continued to implement residential SSO programs. Not only will this recover more organics for composting, but based on the study results, increased levels of recycling will likely occur with the implementation of SSO collection programs.
4. As time and funding permits, additional recycling recovery rate studies in suburban Hennepin County communities should be conducted to build up a database of program information. Further refinements to the sampling/sorting methodology are also recommended to fine-tune the sorting protocol. One such refinement would be a further breakdown of the organics stream into yard waste and other organics.

APPENDIX A
MATERIAL SORTING CATEGORIES

ST. LOUIS PARK SORTING CATEGORIES

Category	What to Include - YES	What NOT to include - NO
Paper		
Newspaper and Supplements	Newsprints and inserts.	No crumpled newspaper, plastic bags/wrappers.
Magazines and Catalogs	Glossy paper (any thickness).	No plastic bags/wrappers.
Phonebooks	Any kind of phone books.	No plastic bags/wrappers.
Office Paper and Mail	All office paper, file folders, envelopes (with/without windows) notebook paper, spiral notebooks, computer paper, junk mail, shredded paper in a closed paper bag.	No plastic bags/wrappers, gift wrap, ribbons or tissue paper, photographs.
Boxboard	Dry food boxes (cereal, cracker, cake, snack boxes), detergent boxes, tissue boxes, toothpaste boxes, shoe boxes, gift boxes, toy/game boxes, pop & beer boxes.	No egg cartons, frozen/refrigerated food boxes, milk/juice/soup cartons, boxes with food or grease.
Corrugated Cardboard	Most corrugated boxes, cardboard tubes, boxes for office products and electronics	No waxed cardboard, pizza boxes.
Metal		
Metal Cans	Steel food containers including pet food, metal can lids, jar lids, bottle caps, aluminum beverage containers, clean aluminum foil, clean aluminum trays.	No cans that contained hazardous substances, scrap metal, cookware other metals, dirty aluminum foils/trays.
Glass		
Glass Bottles and Jars	All food and beverage glass containers.	No broken glass, glass dishes or glasses, ceramics, mirrors, Pyrex, window glass, light bulbs.
Plastic Bottles and Jars (Plastic Containers With Necks Only)		
Plastic Bottles With Necks	Soda and water bottles, milk jugs, plastic food jars, laundry/dish detergents, shampoos.	No yogurt or margarine tubs, cups or plates, plastic bags, plastic wrap, motor oil bottles, Styrofoam, take-out containers (clamshells), flower pots, bottles that contained hazardous substances,
Aseptic Packaging		
Milk Cartons and Juice Boxes	Milk/juice/soup cartons.	Aluminum juice pouches, snack bags (potato chips, pretzels, etc.).
Textiles		
Clothes and Linens	Towels, sheets, blankets, curtains, belts, coats, hats, gloves, shoes and boots.	No wet or dirty clothes, rags, cloth scraps.

ST. LOUIS PARK SORTING CATEGORIES
(continued)

Category	What to Include - YES	What NOT to include - NO
Problem Materials		
Household Batteries	All small batteries including button batteries.	No automobile batteries (see household hazardous waste).
Consumer Electronics	All electronic items or small appliances containing circuit boards.	Non-electronic appliances (place in garbage).
Household Hazardous Waste (HHW) and Other Problem Materials.	Paints, pesticides, insecticides, weed killer, fluorescent bulbs, motor oil, automobile batteries, items containing mercury, poisons, aerosols, other chemicals.	No empty aerosol cans (place in garbage).
Organics		
Biodegradable and Compostable Materials	**All organic materials that are not typically recycled including all food waste, yard waste and non-recyclable paper** including egg cartons, pizza boxes, waxed boxes, paper cups/plates paper towels/napkins, facial tissue, frozen/refrigerated food boxes, loose shredded/crumpled paper, gift wrap, take-out paper food containers, paper bags, waxed paper, paper fast food wrappers, coffee grounds, coffee filters, tea bags, ALL FOOD SCRAPS.	Chip bags, candy wrappers, foil juice pouches, plastic food wrap, discarded clothing, cloth or disposable diapers (place in garbage).
Household Trash and Garbage		
Household Trash and Garbage	Everything else that does not biodegrade or decompose (plastic toys, plastic packaging, wrappers, Styrofoam, condiment packets, foil bags, other misc. metal items, ceramic cups, glass items, mirrors, rubber, bricks or stones, etc).	No organic materials listed above.

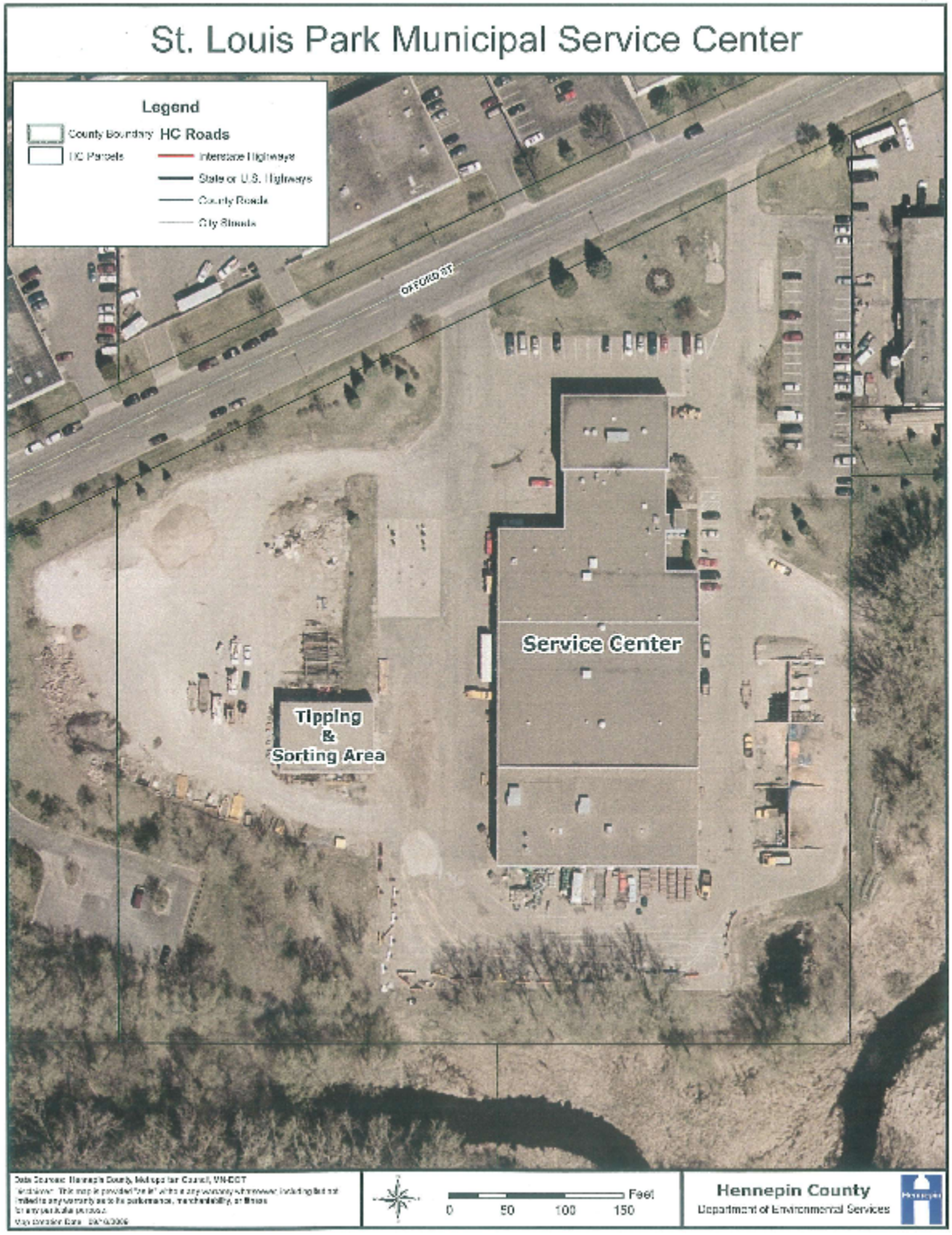
MINNETONKA SORTING CATEGORIES

Category	What to Include - YES	What NOT to include - NO
Paper		
Newspaper and Supplements	Newsprint and inserts.	No crumpled newspaper, plastic bags/wrappers.
Magazines and Catalogs	Glossy paper (any thickness).	No plastic bags/wrappers.
Phonebooks	Any kind of phone books.	No plastic bags/wrappers.
Office Paper and Mail	All office paper, file folders, envelopes (with/without windows) notebook paper, hard and soft-cover books, computer paper, junk mail.	No plastic bags/wrappers, gift wrap, shredded paper, photographs.
Boxboard	Dry food boxes (cereal, cracker, cake, snack boxes), detergent boxes, tissue boxes, toothpaste boxes, shoe boxes, gift boxes, toy/game boxes, pop & beer boxes.	No egg cartons, frozen/refrigerated food boxes, milk/juice/soup cartons, boxes with food or grease.
Corrugated Cardboard	Most corrugated boxes, cardboard tubes, boxes for office products and electronics.	No waxed cardboard, pizza boxes.
Metal		
Metal Cans	Steel food containers including pet food, aluminum beverage containers, clean aluminum foil, clean aluminum trays.	No cans that contained hazardous substances, scrap metal, cookware, other metals, bottle caps, dirty aluminum foils/trays.
Glass		
Glass Bottles and Jars	All food and beverage glass containers.	No broken glass, glass dishes or glasses, ceramics, mirrors, Pyrex, window glass, light bulbs.
Plastic Bottles(Plastic Containers With Necks Only)		
Plastic Bottles With Necks.	Soda and water bottles, milk jugs, plastic food jars, laundry/dish detergent/shampoo bottles.	No yogurt or margarine tubs, cups or plates, plastic bags, plastic wrap, motor oil bottles, Styrofoam, plastic take-out containers (clamshells), flower pots, bottles that contained hazardous substances.
Problem Materials		
Household Batteries	All small batteries including button batteries.	No automobile batteries (see household hazardous waste).
Consumer Electronics	All electronic items or small appliances containing circuit boards.	Non-electronic appliances (place in garbage).

MINNETONKA SORTING CATEGORIES
(continued)

Category	What to Include - YES	What NOT to include - NO
Problem Materials (continued)		
Household Hazardous Waste (HHW) and Other Problem Materials.	Paints, pesticides, insecticides, weed killer, fluorescent bulbs, motor oil, automobile batteries, items containing mercury, poisons, aerosols, other chemicals.	No empty aerosol cans (place in garbage).
Organics		
Biodegradable and Compostable Materials	**All organic materials that are not typically recycled including all food waste, yard waste and non-recyclable paper** including egg cartons, pizza boxes, milk/juice/soup cartons, waxed boxes, frozen/refrigerated food boxes, facial tissue, paper cups/plates, loose shredded or crumpled paper, gift wrap, paper towels/napkins, take-out paper food containers, paper bags, waxed paper, paper fast food wrappers, coffee grounds, coffee filters, tea bags, ALL FOOD SCRAPS.	Chip bags, candy wrappers, foil juice pouches, plastic food wrap, discarded clothing, cloth or disposable diapers (place in garbage).
Household Trash and Garbage		
Household Trash and Garbage	Everything else that does not biodegrade or decompose (plastic toys, plastic packaging, wrappers, Styrofoam, condiment packets, foil bags, other misc. metal items, ceramic cups, glass items, linens, clothes and other textiles, rubber, bricks or stones, etc.	No organic materials listed above.

APPENDIX B
ST. LOUIS PARK SITE PLAN



APPENDIX C
ST. LOUIS PARK SORTING PHOTOS

Photo 1: Pile of Paper to be Sorted

Photo 2: Sorting Table and Tools

Photo 3: Sorting Curbside Recyclables

Photo 4: Garbage to Be Sorted

Photo 5: Crew at Work Sorting a Waste Sample

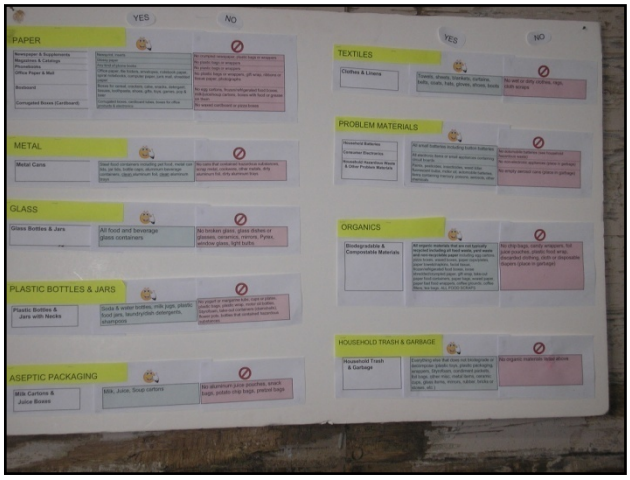


Photo 6: Category Sorting Guidance Sign

Photo 7: Green Sorting Bins

Photo 8: Battery Bucket

Photo 9: Weighing the Sorted Materials

Photo 10: Recording Data Onsite

APPENDIX D
MINNETONKA SITE PLAN

APPENDIX E
MINNETONKA SORTING PHOTOS

Photo 1: Sorting Supply Table

Photo 2: 5-gallon Pails for Excess Liquids

Photo 3: Waste Sample Minus Recyclables

Photo 4: Sorting for Organics

Photo 5: Roll-Off for Sorted Recyclables

Photo 6: Onsite Data Entry

Photo 7: Corralled Recyclables

Photo 8: Set Up For Sorting Recyclables

Photo 9: Sorting Recyclables

Photo 10: Sorted Corrugated Cardboard

Photo 11: Sorted Plastic Containers

Photo 12: Trash From Sorting Recyclables