Our Vision

Red Wing thrives as a vibrant, creative river town that values its natural environment, welcomes all people, and unlocks opportunity for everyone.

Our Mission

We strive to create a sustainable, healthy, accessible, resilient, and equitable community where every person feels at home.

Meeting Announcement and Agenda
Sustainability Commission Workshop
Community Development Building, 419 Bush Street, Red Wing, MN
Tuesday, August 26, 2025, at 5:30 PM

1. **Roll Call**
2. **Communication Items**
   - *2.A.* City Council Liaison Report
   - *2.B.* City Liaison Report
3. **Workshop Items**
   - *3.A.* Organics Feasibility Study (Presentation by Jeff Schneider)
   - *3.B.* Pollinators / Native Plants
   - *3.C.* Subcommittee Reports
4. **Announcements**
   - *4.A.* Topics for Future Agendas
   - *4.B.* Next Meeting Date: To Be Determined
5. **Adjournment**

Accommodations for signing interpreter, Braille, large print, etc. can be made. Call City Hall at 385.3600 seven days prior to the need. Hearing assistance devices are available during meetings.

Organics Collection and Composting

Feasibility Study

Red Wing, Minnesota

RWING 169384 February 20, 2025

COKER COMPOSTING AND CONSULTING

Amplify for Change

City of RED WING

SEH

Building a Better World for All of Us®

Engineers | Architects | Planners | Scientists

Organics Collection and Composting

Feasibility Study
Red Wing, Minnesota

SEH No. RWING 169384

February 20, 2025

Short Elliott Hendrickson Inc.
2351 Connecticut Avenue, Suite 300
Sartell, MN 56377-2485
320.229.4300

Executive Summary

Community engagement with local surveys and focus groups were completed within the City of Red Wing (City), Minnesota, along with local and regional audits indicated that City residents would react positively to a food scraps collection program if there were minimal to no additional costs associated with participating, it is convenient, and if it is coupled with a comprehensive outreach and education program. Residents seemed to react most favorably to curbside collection with a dedicated organics route and least favorably to drop-off site collection, with residents being undecided about curbside co-collection with Durable Compostable Bags (DCBs). Local businesses and some institutions are open to a food scraps collection program for environmental and sustainability reasons, but they all expressed a need to carefully consider implementation factors such as costs, operational logistics, employee education requirements, and ways to avoid odor and vermin issues. Industrial sources of organics in the area were not interested in participating.

Two collection methods were evaluated for a food scraps collection program 1.) curbside collection with a dedicated organics route and 2.) curbside co-collection with DCBs. The first method involves providing households a separate organics cart that would be serviced by a dedicated organics route and truck. The second method uses DCBs to collect organics, which can be placed in the household garbage cart and separated from the waste stream at the Waste Campus, theoretically utilizing the existing solid waste system more for efficiently for collection. Drop off sites were also considered as a step to expand the community organic program, though not for full scale collection. Disposal options included constructing a new local compost facility or hauling to offsite regional compost facilities.

Capturable organic tonnages were estimated for an organic diversion program that considered residential, commercial, and institutional sources. It was estimated that by year 10 of a full-scale food scraps curbside collection program, the City could capture approximately 650 tons of Source Separated Organic Material (SSOM) per year with a moderately successful organic collection program. This is less than 1,000 tons of SSOM per year, which was established as the minimum processing design capacity for a new Compost Facility. Therefore, on an operational level, offsite disposal is more favorable than onsite disposal. It was assumed based on our information that curbside collection with a dedicated route and curbside co-collection with DCBs could capture approximately equal amounts of organic tonnage, whereas drop-off sites would capture less organic tonnage.

The most economical collection method was found to be curbside co-collection with DCBs, which had low capital and low annual operating costs compared to curbside collection with a dedicated organics route, which involved higher capital and operating expenses with a dedicated route. Drop-off sites were not included in the economic comparison to curbside collection, however costs were included and shown to vary depending on the type and operation of the drop-off site. The most economical disposal method was offsite disposal to SMSC Compost Facility in Shakopee with disposal at SET (now WM) Compost Facility and/or Washington/Ramsey future Anerobic Digestion (A&D) Facility being economically equivalent. Onsite disposal options, which included constructing a new compost facility in Red Wing either at the Waste Campus or Lab USA building, have high initial capital costs and higher annual operating costs than sending collected organics to an offsite facility. High costs combined with the issue that the estimated capturable organic tonnage is less than the minimum efficient design capacity of a compost facility, onsite disposal is not recommended.

A compost facility, or onsite disposal, was designed to not have environmental impacts on surface water, groundwater, air quality, and GHG emissions. Surface water impacts will be eliminated with a covered active compost area. Contact water would be captured and discharged to the Red Wing wastewater collection system or collected in on-site containment and discharged off-site and would not impact groundwater. Air quality impacts from dust and odors should be limited with best management practices. Based on modeling, changing food waste management methods from landfilling to composting produces a net reduction in GHG emissions. For offsite disposal, which requires longer hauling distances, this reduction in GHG emissions offsets for any increase in GHG emissions from hauling. Note that modeling indicates no significant difference in GHG emissions between composting and waste-to-energy combustion food waste management methods.

It is recommended that the most feasible full-scale curbside collection organic program for the City includes curbside co-collection with DCBs and offsite disposal to SMSC, SET (now WM) Compost Facility, and/or Washington/Ramsey A&D Facility. A pilot program was initiated to assess the feasibility and effectiveness of a curbside co-collection with DCBs organics collection program. Additionally, the City added a food scraps drop off site at the Waste Campus. The objectives of the pilot program include evaluating resident participation, identifying operational challenges, and determining the overall cost-effectiveness of the program.

The results of the pilot program had favorable community participation, and several participants indicated they would likely participate in a community organics curbside collection program. The rollout of the pilot program was smooth, and residents generally felt comfortable with its execution. The drop off site quite surprisingly collected more food scraps, with minimal to no contamination than the curbside collection pilot. Processing DCBs and extracting the bags from the waste stream posed significant challenges with current staffing and equipment. Despite these difficulties, durable compost bags (DCBs) proved their durability and were generally able to survive the solid waste collection system prior to removal. From a collection standpoint, curbside co-collection with DCBs proved to be as straightforward for participants as household recycling, imposing no additional demands.

The City ended the pilot curbside co-collection program but decided to continue the drop off site program to support future growth in a City organic program. Additional satellite drop off sites may be added based on cost, avoiding excessive spending with minimal participation. Greater community involvement is encouraged through grassroots development, including collaboration with the Sustainability Commission, churches, neighborhood communities, farmers markets. To manage potential odors and vermin, free bags will continue to be offered to drop off site participants, but this may change if costs rise significantly. Smart bins, which use sensors, data analytics and mobile apps to boost collection and sorting efficiency, may be considered for a future curbside collection program, since curbside co-collection with DCBs does not seem a viable collection option given existing staffing, equipment and processing limitations at the Waste Campus.

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Glossary

Abbreviations:

‘	Foot
“	Inch
A&D	Anaerobic Digestion
ADM	Archer-Daniels-Midland Company
ADR	Applicability Determination Request
AERA	Air Emission Risk Assessment
AI	Artificial Intelligence
ASP	Aerated Static Pile
ASTM	ASTM International
BBO	Blue Bag Organics
BHS	Bulk Handling Systems
BMP	Best Management Practices
BPI	Biodegradable Products Institute
C:N	Carbon-Nitrogen Ratio
Waste Campus	Red Wing Solid Waste Campus
CASP	Covered Aerated Static Pile
CESC	City Environmental Service Charge
cf	Cubic Feet
City	City of Red Wing, Minnesota
CO_2	Carbon Dioxide
Creekside	Creekside Soils
DCB	Durable compostable bag
DSI	Dick’s Sanitation
EAW	Environmental Assessment Worksheet
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FTE	Full-Time Equivalent
GHG	Greenhouse Gas
HH	Households
lb	Pound
LS	Lump Sum
MN	Minnesota
MPCA	Minnesota Pollution Control Agency
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
MTCO2e	Metric tons of carbon dioxide equivalent
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industrial Classification System
NPDES	National Pollutant Discharge Elimination System
NRDC	Natural Resources Defense Council
NPV	Net present value
NYSP2I	New York State Pollution Prevention Institute
OWEF	Olmsted County Waste to Energy Facility
PIIC	Prairie Island Indian Community
PFAS	Per- and Polyfluoroalkyl Substances
PFRP	Process to Further Reduce Pathogens
PSI	Pound Per Square Inch
PVC	polyvinyl chloride
R&E	Recycling and Energy
RDF	Refuse Derived Fuel
RWPS	Red Wing Public School
SDR	Standard Dimension Ratio
SDS	State Disposal System
SEH	Short Elliott Hendrickson
SET (now WM)	Specialized Technologies Inc. (now Waste Management Inc.)
SMSC	Shakopee Mdewakanton Sioux Community
SSOM	Source Separated Organic Material
SWPPP	Stormwater Pollution Prevention Plan
TIRC	Treasure Island Resort and Casino
USDA	United States Department of Agriculture
WARM	Waste Reduction Model
wk	Week
WM	Waste Management
WWTF	Wastewater Treatment Facility

Terms:

Aeration	Introducing air into a compost pile using a fan or blower.
Aerobic	A biological process that occurs in the presence of oxygen.
Amendment	Something which is added to soil in order to improve its texture or fertility.
Anaerobic	A biological process that occurs in the absence of oxygen.
Compost	Is the product manufactured through the controlled aerobic, biological decomposition of biodegradable materials. The product has undergone mesophilic and thermophilic temperatures, which significantly reduces the viability of pathogens and weed seeds, and stabilizes the carbon, such that it is beneficial to plant growth. Compost is typically used as a soil amendment but may also contribute plant nutrients. (AAPFCO Definition – Official 2018)
Curing	The maturation process in composting where fungi and higher-order organisms break down the byproducts of active composting degradation to make the compost more suitable for use as a soil amendment.
Feedstock	The incoming compostable materials (e.g., food scraps, yard trimmings, etc.)
Overs	The oversized particles (mostly woody) that are screened out of the finished compost before the product goes to market.
Screening	A mechanical separation process to separate finished compost from other materials in the pile. Screening is often done with a ½" or 3/8" mesh screen.
Static	A compost pile that is not turned or agitated.
Turning	Moving or agitating a pile of compost to homogenize the contents, reduce particle size, release heat and water vapor and to re-introduce fresh air.

Organics Collection and Composting

Feasibility Study

Prepared for City of Red Wing

1 Introduction

The City of Red Wing (City), county seat for Goodhue County, operates their Solid Waste Campus (the Waste Campus) as a local resource for managing solid waste for the City and Goodhue County in Southeast Minnesota bordering Wisconsin. Over the past 10 years, the City's solid waste operations have progressively implemented innovative programs focused on diverting Municipal Solid Waste (MSW) from regional landfills while boosting the recovery of recyclables and energy from the waste stream. Updates to the City's Material Recovery Facility (MRF) transformed the Facility into a viable Refuse Derived Fuel (RDF) operation. Additionally, since 2019, the City has implemented a highly successful curbside single-sort recycling program, and is considering additional actions to increase diversion of other recyclable materials (e.g. organics, yard waste etc.) to meet statewide County recycling goals. The City is also expanding efforts to comply with preferences for waste management systems established in the solid waste management hierarchy Minn. Statutes § 115A.02 (b) in which recycling and composting are preferrable to landfilling and incineration in order to "*protect the state's land, air, water, and other natural resources and the public health*".

Organics made up about a third of the City's waste stream by weight, according to a 2020 waste composition study performed for the City. Following Minnesota Pollution Control Agency (MPCA) waste hierarchy guidelines, the City aims to reduce organics (e.g. food scraps) in the waste stream, through implementing an organics collection program with ultimate disposal at a Compost Facility, as well as promoting food donation to people and/or livestock. In 2021, the City Council authorized the Waste Campus to proceed with investigating the feasibility of an organics diversion plan and to determine the most efficient methods to further increase overall resource recovery through source separated organics diversion.

Short Elliott Hendrickson Inc. (SEH) assembled a team of experts to prepare this Organics Collection and Composting Feasibility Study for the City. This feasibility study was conducted to determine the best course of action in developing an innovative regional organics program by completing the following tasks:

- **Task 1:** Complete a regional audit to determine sources and volumes of available organic materials.
- **Task 2:** Determine organic tonnage and compost recipe.
- **Task 3:** Review various methods for organics collection and best practices.
- **Task 4:** Evaluate potential facility locations.
- **Task 5:** Conduct a cost/impact analysis of collection and processing options.
- **Task 6:** Evaluate MPCA permitting requirements.
- **Task 7:** Assess environmental impacts.

- **Task 8:** Provide recommendations to proceed with a viable source separated organics diversion program that is environmentally and economically viable for the long-term.

1.1 Composting Basics

The United States Department of Agriculture (USDA) defines composting as the process of recycling organic materials into an amendment that can be used to enrich soil and plants. Typical organic materials accepted for composting include food wastes, yard trimmings, leaves, animal manures (but not pet feces), agricultural wastes and some clean industrial residuals such as spent food or process wastes. Composting is an aerobic process (i.e. requires oxygen) where microorganism utilize oxygen to decompose organic material. However, anaerobic digestion (i.e. does not require oxygen) is another form of decomposition and is a quickly emerging, growing industry. Nevertheless, the focus of this report is on aerobic compost processes.

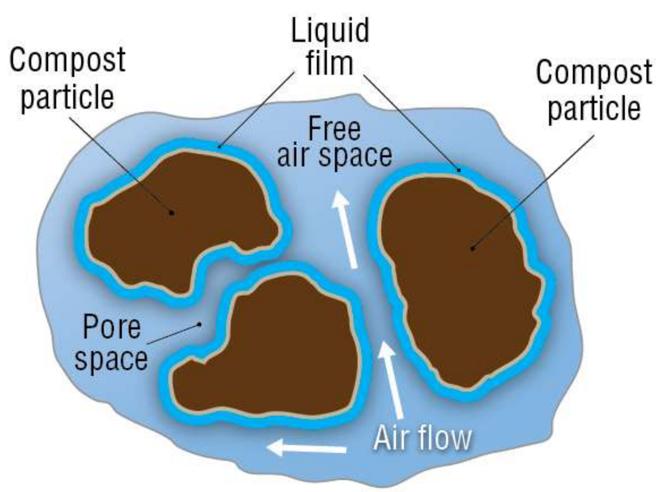
Compost processes, depend on controlling five main parameters:

1. **Carbon-nitrogen ratio (C:N): Mix** nitrogen-rich feedstocks (e.g., food scraps, grass clippings) with carbon-rich feedstocks (e.g., wood chips, leaves) at a ratio of 25:1 carbon to nitrogen by weight. For more on compost recipes and balancing source separated organic material (SSOM) with feedstock, see **Section 3**.
2. **Particle Size:** Wood chips or ground-up brushy yard waste increase the compost pile's porosity and helps maintain aerobic conditions (see **Figure 1** below).
3. **Moisture Content:** This is the amount of water present in the compost relative to the total weight of the compost. Ideal moisture content is maintained between 40-60%, which supports microbial activity and maintains high decomposition rates, enhancing overall compost quality. Microbial activity and decomposition occurs in the thin liquid film (see **Figure 1)**. Excess moisture content can cause conditions in the compost pile to turn anerobic and odorous, but deficient moisture can inhibit microbial activity.
4. **Oxygen Concentration:** The oxygen concentration within the compost pile, expressed as a percentage of the total volume of air present in the compost pile to the total compost volume, is a critical factor in aerobic composting. Maintaining an oxygen concentration above 5% is essential to ensure optimal conditions for decomposition. Insufficient oxygen levels can lead to the pile to switch to anaerobic conditions, which can adversely affect the compost quality and produce offensive odors.
5. **Temperature:** During the active compost phase, which occurs first after mixing the compost together, pile internal temperatures rise, killing pathogenic bacteria in a process called "process to further reduce pathogens" (PFRP) by the MPCA. Microorganisms break down organic materials, releasing heat. Thus, the temperature of the compost pile can directly reflect the microbial activity and decomposition rate within the pile. To achieve PFRP a specific minimum temperature must be maintained for a set time period to reduce pathogenic bacteria. The composting process has three phases, each defined by the compost pile temperature and dominant microorganisms, as discussed below.
    - **a.** Mesophilic phase – During the beginning of composting temperatures rise between 68°F to 113°F. Mesophilic microorganisms dominate the compost pile during this phase.

b. Thermophilic phase –During the thermophilic phase, microbial activity peaks, breaking down organic matter quickly, increasing the compost temperature to 113°F to 158°F. Thermophilic microorganisms dominate during this phase and accelerate decomposition, increasing temperature, thus facilitating pathogen kill-off. PFRP is the term for achieving and maintaining this phase, required by Minnesota Rules 7035.2836. For static aerated piles, PFRP involves maintaining a compost pile temperature of 131°F (55°C) for seven days.

c. Cooling phase –a gradual reduction in temperature occurs as microbial activity decreases due to the depletion of easily degradable organic matter. The compost pile curing process returns the pile to at or near ambient temperatures and indicates that composting is nearing completion. During this phase, mesophilic organisms, fungi and macro-organisms such as worms, arthropods, and insects typically dominate.

Figure 1 – Optimum Compost Pile Configuration



(Source: BioCycle Connect LLC)

1.2 Regional Organics Collection Programs

Regional collection programs differ in method, participation and payment, allowing customization to community needs. Details on organic collection programs are provided in **Section 4**.

1.2.1 Collection Method

Organic collection programs typically collect food scraps and organics through curbside collection programs, drop-off collection sites, or both. These programs can be managed by a municipality or a private vendor/hauler. Drop-off sites allow participants to place organics in bins at designated locations like parks, public buildings, community centers. Curbside collection usually involves using separate organic carts, usually alongside garbage and recycling carts. But some communities have instead opted for co-collection with durable compostable bag (DCB) which are placed in garbage carts for later separation. DCBs are more heavy-duty and thicker than standard compostable bags, which allow them to survive the waste collection process until ultimate removal and separation from the waste stream. The following three types of collection methods will be discussed in more detail in **Section 4**:

1. Organics curbside collection route program
2. Durable compostable bag (DCB) co-collection program
3. Drop off site program

1.2.2 Participation Type

Program participation types typically fall within one of the following categories:

1. **Voluntary**: Households must sign-up for collection services or register to use a drop off location.
2. **Standard offering**: Curbside collection programs are included in the municipal solid waste program. Households receive an organic cart or DCB, but participation is optional.
3. **Mandatory**: Organic diversion and collection participation is required, though these are less common due to complexities around jurisdiction and enforcement.

1.2.3 Payment Method

Organic diversion and collection programs can be funded through subscription fee, general waste service fee, government subsidies or a combination.

1. **General waste service fee:** Municipal programs where households pay through solid waste service fees, regardless of subscription, commonly found in standard curbside collection programs.
2. **Subscription fees:** Voluntary opt-in programs where participating households pay a monthly fee for an organics cart with routine curbside collection by municipal or private haulers.
3. **Subsidized programs** are programs that use governmental funding to pay for collection services (e.g., SCORE funding, etc.). Drop off sites are common subsidized programs that offer organic recycling services to residents at no cost.

1.3 Disposal Options

1.3.1 Common Composting Methods

The three common types of industrial composting are:

1. **Mechanical Aerated Windrow**: This method involves turning a long, narrow compost pile with heavy machinery or specialized equipment to aerate the pile. It is less labor intensive and more efficient than backyard composting, however is considered the most basic form of industrial composting.
2. **Covered Aerated Static Pile (CASP)**: Here, compost piles are placed in concrete bunkers, and air is forced into the pile using underlying perforated pipes, which allows for the pile to be aerated without the need to constantly turn the pile. This process has minimal labor needs but requires high initial setup costs.

3. **In-Vessel**: Organic material is enclosed in a vessel with controlled air flow to aerate the pile. This method is similar to CASP, but in-vessel is a completely enclosed system.

1.3.2 Anaerobic Digestion Facility

Anaerobic digestion uses microorganisms to break down organic matter in an oxygen-depleted environment, producing digestate (sludge) and biogas. Biogas consists of methane, carbon dioxide, and water. Methane can be collected and used for energy. Biodigesters or bioreactors control temperature, moisture and pH to optimize biogas production and methane collection.

2 Public Outreach, Audits, and Interviews

For this feasibility study a multipronged approach was used to gather information on assessing the best organics diversion program for the City. Information was collected on established regional organics diversion programs around the State. Data was collected from the existing City and regional waste shed to estimate and project the capturable organics within the area. Interviews, surveys, and audits were conducted to support and guide these estimates.

- **Survey**: a community-wide survey was shared via a link to understand current residential preferences and habits on food waste disposal.
- **Interviews and focus groups**: individuals and groups from government, business, industry, and institutions were interviewed to gauge community interest in food scraps collection.
- **Audits**: Review of existing Minnesota Organic Diversion Programs.

Each of these approaches are described in more detail below.

2.1 Public Outreach

Amplify for Change (Amplify) and SEH conducted the several public outreach activities to assess resident and business interest in a food scraps diversion program:

- Resident survey
- Red Wing Sustainability Commission focus group
- Local Business Interviews
- Local Business focus group

Though the original public outreach strategy scope included gauging interest in the Prairie Island Indian Community (PIIC), Farmington and Hastings, the City selected to focus on residential and businesses in the City, until they had more clarity on potential opportunities for food scraps waste diversion in Red Wing. Other project tasks continued to include these communities to inform the study (see **Section 4**).

2.1.1 Resident Survey

In Fall 2022, a community-wide shareable link survey was issued to gather input from single-family home residents and asked about current disposal habits and interest in a food waste collection program. Questions included asking if they would participate in curbside collection, the likelihood to participate at drop-off sites, and reasons for not being interested in any food waste collection program.

Survey Details:

- Dates: November 5 – December 16, 2022
- City distribution methods: e-waste drop off flyer, Facebook, and Twitter posts, city website, post on its landing page, “City Beat” page in the local Red Wing newspaper, Chamber of Commerce newsletter, utility bill insert received by all Red Wing households.

- 802 respondents (10% of households)

Survey Highlights:

- 82% of respondents said they put food waste in their garbage can.
- 52% of respondents indicated they were "very likely" and 20% of respondents indicated they were "somewhat likely" to use a weekly curbside collection service.
- 34% of respondents indicated they were "very likely" and 30% of respondents indicated they were "somewhat likely" to buy DCBs for curbside co-collection.
- Reasons residents indicated they were "not likely" to participate in a food scraps collection service were typical for the pre-launch phase in any community. These included: odors, insects and vectors, and limited space indoors and outdoors to store countertop buckets and/or organics carts. Cost of participation was a notable concern.
- Food scrap collection method:
    - Residents were unlikely (55%) to bring food scraps to a drop-off site.
    - Residents were very likely (51%) to use a weekly curbside food waste collection service if the city provides a food scrap cart to all households. However, comments stated that residents do not have space for an additional cart or want it to be locked to keep out animals.
    - Residents were very likely (34%) or somewhat likely (30%) to purchase DCBs and participate with regular trash pickup. Multiple comments were related to the cost of the bags and trash/recycling fee. One person suggested the City provide a credit back to residents for buying and using DCBs.

Survey Summary

The survey for single-family residents revealed a positive yet cautious interest among the City residents for a community provided food scraps collection program. Some people readily supported the idea ("We would be thrilled!") while others made clear their interest is contingent on the program's final details ("I like the idea, but we need to understand the cost. We want to support reducing food waste."). The high response rate is an indication that food scraps collection is not a new idea to residents and ensures that many people know this is something the City is considering for the future. The resident survey is included as **Appendix A**.

2.1.2 Red Wing Sustainability Commission Focus Group

On February 23, 2023, Amplify conducted a focus group with the Red Wing Sustainability Commission. While members of the Sustainability Commission are more inclined to support a food scraps collection program, the discussion focused on their pragmatic suggestions and concerns related to garnering community support to successfully implement a food scraps collection program if pursued.

The purpose of the meeting was to gather the Commission's insights on the opportunities and challenges associated with establishing a City food scraps collection program. The meeting aimed to seek recommendations for effective outreach efforts to raise awareness, should the program be implemented, and to identify potential community champions and partner organizations that could assist in promoting and supporting a City food scraps collection program. Amplify highlights that this initiative is part of a feasibility study funded by grants from the MPCA.

Focus Group Participants' Highlights:

- Interest for more information regarding:
  - A better understanding of cost, household incentives, collection method, and whether other communities will participate in the program.
  - What the City will do with the compost product and whether it will be sold back to the community.
  - Learning about program models from other communities.
- Suggestions:
  - Community education will be key, and raising awareness for why food scraps should not be disposed in landfills.
  - Work with the Sustainability Commission to develop a supporters' list that can help to promote the program.
  - Secure commercial/businesses first to increase total organic collection and bolster resident participation.
  - Partner with hotels, Chamber of Commerce, Main Street organization, the arts group, the Environmental Learning Center, Friends of the Bluff, the YMCA, the farmers market, Facebook groups, and the local bookstore's e-newsletter.

The Red Wing Sustainability Commission Focus Group discussion notes are not included as an appendix to maintain the confidentiality of those interviewed.

2.1.3 Local Business Interviews

To ascertain the business community's perspective and interest regarding the development and implementation of a city-wide food scraps collection program, Amplify interviewed several Red Wing restaurant owners, area businesses and manufacturers (see **Table 1**). Coker Composting and Consulting (Coker) assembled a list of food-based organizations in Red Wing including commercial businesses, restaurants, and grocery stores. Using a North American Industrial Classification System (NAICS) database for the local area, potential interviewees were selected based on the estimated quantity of food waste produced by their business activities. Those who agreed to participate were subsequently interviewed to gather insights into how their organization viewed organics collection.

Table 1 – Local Business Interviews

Business	Current Waste Practice	General Response	Questions
Red Wing Shoe Company (and subsidiaries, including St. James Hotel)	The company currently tracks their carbon, chemical, water, and waste impacts and sets reduction goals for each.	Supports the City's pursuit of a food scraps collection initiative. "A City-sponsored food scraps collection option would help us meet our reduction level for corporate waste impact."	Would human hair from the hair salon in the St. James hotel be compostable? How often would food waste be picked up? Where and how would food waste be stored before collection?
Treasure Island Resort and Casino (TIRC)	35% of the weight of the facility's garbage is food waste. The company has waste management initiatives in place.	The COVID-19 pandemic put a halt to internal discussions focused on food waste diversion options. Food waste was formerly put in barrels and given to farmers; however, new regulations stopped this practice. There is a lot of potential to compost. Specifically interested in separating organics in 'back of house' operations by employees, not from the consumers.	*None*
Archer-Daniels-Midland Company (ADM)	Crushed seeds and twigs are byproducts of the flaxseed oil production, which are currently used as land application to cover refuse.	They would like their organic waste to serve a more beneficial use than current application. The cost would need to be comparable to what they currently pay Waste Management to haul organics.	*None*
Mayo Clinic	The Rochester Mayo Clinic has been composting food waste since the 1990s. At that location, their focus is on back of house food composting due to the challenge of managing consumer sorting.	The Sustainability Leader and Food Services Coordinator expressed an interest in being part of the planning discussions. They prioritize local options to avoid transportation costs. Ease of implementation is needed for success. If there are too many exclusions, it's challenging. The Red Wing Clinic is a small facility that does not have a lot of sorting space.	How will the city deal with collection? Who will transport the waste? Will the city accept food dinnerware and disposable containers? Where will the food scraps be stored? How long does it need to sit on Waste Campus? How often will it be picked up?

Business	Current Waste Practice	General Response	Questions
Liberty's Restaurant and Lounge	Food waste goes to the trash.	Owner is interested in keeping food waste out of the trash. It'll be a change in their process but worth it in the long run.	Could pick-ups be multiple times per week in the summer months?
		Modifying staff behavior will be a challenge but achievable.	
		Primary concern is odor during the summer and stated "even now, I make the effort to clean out my trash collection bins even though they get picked up twice a week. It gets hot and smells bad and then we get flies, and I definitely don't want critters in there. I don't want my customers to be turned off by the smells, or flies."	
Bev's Café	Food waste goes to the trash.	Likes the idea of a compost program but is afraid of attracting rodents.	*None*
		Not all food service providers consistently control garbage and food waste, which attracts rodents in shared or nearby spaces. Would feel better about participating if the Minnesota Department of Health (MDH) were involved in the program's development for restaurants.	
		Interested about DCBs, which was an unfamiliar product.	
Perkin's	Food waste goes to the trash.	No interest.	*None*
Caribou Coffee	Food waste goes to the trash.	The City would need to discuss this with the corporate headquarters to determine interest/participation	*None*

The entire local business interviews are not included as an appendix to maintain the confidentiality of those interviewed.

2.1.4 Local Business Focus Group

On July 20, 2023, Amplify held a focus group with local business owners and managers, in collaboration with the Chamber of Commerce. Emails were sent to recruit participants interest in discussing food scraps collection. Attendees included Mandy's Coffee Shop, Liberty Restaurant, and Family Fare Supermarket and the Chamber of Commerce President and CEO.

Participants supported food scraps collection and shared that they had explored incorporating processes to create a program within their establishment. They highlighted challenges and concerns related to costs, pick-up frequency, operational assistance and implementation.

Focus Group Highlights:

- Most are keen on participating if the program is cost-effective.
- Many shared discomforts with food scraps being disposed in landfills.
- Some already have explored initiatives.
- Employee training concerns exist but aren't seen as insurmountable.
- Staff turnover and education challenges persist in the fast-food industry.
- Grocery stores could more easily implement a program.
- Common concerns include odor and vermin.

The Local Business Focus Group discussion notes are not included as an appendix to maintain the confidentiality of those interviewed.

2.2 Red Wing Area Industrial, Commercial and Institutional Audit

2.2.1 Industrial

Based on NAICS codes (i.e. 311), there are five industrial businesses in the food processing or manufacturing sector near the City. Example NAICS descriptions for these food manufacturing facilities include flour milling, animal slaughtering, retail bakeries, etc. Only one responded to the City's request for information and that industry currently discharges its waste into the city sewer system. This discharge, being a liquid waste, is more suitable for recycling via anaerobic digestion than by composting.

2.2.2 Commercial

Based on a database of commercial establishments with NAICS codes, there are 35 retail food service establishments in the City that collectively produce an estimated 682 tons of food waste per year. This estimate excluded franchise fast food locations, which were not considered due to contamination concerns. Additionally, there are seven supermarkets or other grocery retailers in Goodhue County (County), which the City of Red Wing is in, producing an estimated 359 tons of food waste per year. The County was specifically reviewed for supermarkets food waste due to the significant tonnage of commercial organic waste sources. Unfortunately, none of the supermarkets responded to the City's request for information.

Red Wing Shoe Company supports a possible City organic diversion program. The Company owns a variety of offices, hotels, restaurants, stores, and industrial plants in the City. These sources were included in organic collection estimates, assuming a food scrap collection program was implemented by the City.

Commercial waste haulers and City haulers both service commercial establishments. Challenges in collecting organics from these establishments include but is not limited to a lack of physical space in the kitchens for additional waste collection bins, lack of loading docks/storage space for more carts or roll-offs, and difficulty in down-sizing conventional garbage collection dumpsters and compactors after implementing food scraps and collection and thus producing less municipal solid waste (i.e. garbage).

2.2.3 Institutional

2.2.3.1 Red Wing Public Schools

To evaluate the development of a food scraps collection program for City Public Schools (RWPS) District, the SEH team participated in a meeting with the RWPS District Nutrition Services Director and the Directors of Buildings and Grounds. The RWPS District expressed interest in participating in a program, provided it does not create a burden on operations and increases costs.

Following are key takeaways of the discussion:

- **Food served**:
    - The RWPS District has about 2,400 students and about 65% of students eat at the school consuming about 600 breakfasts and about 1500 lunches each day. However, the volume or participation could increase because of the Free School Meals for Kids Program that was signed into Minnesota State law on March 17, 2023 which will provide free breakfast and lunch to eligible students.
    - The RWPS District supports the external charitable program of Packing for the Weekend to send additional food home on weekends with families in need.
- **Food preparation**:
    - Food is generally stored in high school freezers and distributed to each school kitchen where the meals are prepared on-site, except River Bluffs Education Center, which receives prepared food directly from the high school kitchen.
    - Typically, 90% of the food served in cafeterias is not packaged. Although packaging increased during the pandemic due to social distancing requirements, it has since returned to normal levels.
- **Food waste**:
    - Minimal leftovers are generated – the cafeteria runs a lean program to limit food waste.
    - Cafeteria waste from schools includes compostable and non-compostable products. Compostable products are generally organics or food scraps and BPI certified compostable products.
    - 50% (by total weight) of cafeteria waste is food scraps (i.e. organics) from the kitchen.
    - Currently plastic utensils are used and are not separated from the waste stream.
    - Bowls, plates, and trays are all reusable, not disposable.
    - Currently, students drop off/dispose of waste with minimal supervision.
    - The City currently collects all solid waste from the schools.
- **Food Donation**:
    - The RWPS is not able to share food already heated because it is a liability.
- **Food Scraps Collection and Concerns**:
    - If the City can adjust current food waste storage methods and pick-up frequencies to match disposal timing.
    - Staff availability to monitor and educate the students on food scraps collection is limited.

- Increased costs for training, change to compostable utensils, and disposal costs would strain the budget.

2.3 Existing Organic Collection Program Interviews

Current collection programs around the region vary based on method, participation, and payment. **Section 1.2** describes these different methods, participation and payment types in detail. **Table 2** below is a list of various existing organic programs with some near the city of Red Wing and the majority located in the Metropolitan Area and Greater Minnesota. Please note it is not a comprehensive list of all programs located in the state.

Table 2 – Area Organic Diversion Programs in Minnesota

Program	Population (2021)	Location	Collection	
			Method	Participation
Minneapolis	425,336	Metro	Curbside	Standard Offering
			Drop Off Site	Voluntary
St. Louis Park	49,158	Metro	Curbside	Standard Offering
			Drop Off Site	Voluntary
Edina	53,318	Metro	Curbside	Standard Offering
Lino Lakes	21,608	Metro	Curbside	Voluntary
			Drop Off Site	Voluntary
Hutchinson	14,590	Greater Minnesota (MN)	Curbside	Standard Offering
Carver County	108,626	Metro	Curbside	Voluntary Pilot Program
			Drop Off Site	Voluntary
Dakota County	442,038	Metro	Drop Off Site	Voluntary
Washington/ Ramsey	815,513	Metro	DCB	Voluntary Pilot Program[1]

Notes:
1 – Limited release food scraps durable compost bag pilot program offered to select communities in Ramsey and Washinton Counties, which is described in further detail in Section 4.2.3.

2.3.1 Food Scrap Collection Program Interviews

Seven representatives from organic collection programs in Minneapolis, St. Louis Park, Edina, Lino Lakes, Hutchinson and Carver County were interviewed to understand the requirements for a successful food scraps collection program in Minnesota. Except for Hutchinson, which is located in Greater Minnesota, these programs are in the Metropolitan area, providing a balanced urban and rural perspective which suits the City of Red Wing, which is a primarily urban area located within a predominantly rural County. Detailed notes from the interviews are provided in **Appendix B**. The following highlights were summarized from the interviews.

Interview Highlights and Recommendations:

- Create an organic collection program that has marginal to no additional cost for participants and is covered by waste service fees and subsidies.
- Make program participation voluntary. Contamination issues is a major problem with non-voluntary programs.
- Provide new participants with welcome kits containing FAQs, recycling guidelines and tips to households when they sign-up. Offer a user-friendly website with the same information.
- Prioritize effective public outreach, community support and education for program success. Utilize social media for cost-effective outreach.
    - Host public engagement activities and events to promote organic collection in the community and raise awareness. Use community volunteers and program champions as much as possible for outreach and education.
    - Designate a specific person to manage the program and handle public outreach and field calls.
- Require that food scraps be placed in general compostable bags for any collection method to reduce mess in the summer, reduce cart odors, and prevent organics from sticking to carts during collection in Winter. Note these compostable bags are not DCBs.

2.3.2 Private Waste Hauler Interviews

Private haulers with substantial business in the region were contacted to gather institutional knowledge regarding residential organics collection from waste haulers with relevant experience. Additionally, efforts were made to determine their current interest in offering organic collection services to the surrounding areas. The City of Red Wing provides its own waste hauling and collection services to residents. The private haulers contacted are listed in **Table 3**. Out of eight, three responded to inquiries, and a summary of those interviews is provided below.

Table 3 – Private Haulers Contacted

Private Haulers Contacted	
Company	**City**
Tennis Sanitation	St. Paul
Hagedorn's Lake City Recycling and Disposal	Lake City
LRS	Rochester
Dick's Sanitation	Lakeville
Highland Sanitation and Recycling	Vermillion
Waste Management	Rochester
GFL Environmental	Hager City
Republic	Inver Grove Heights

Private haulers in the region are skeptical about offering organics collection, citing economics as the main concern. They would offer the service if enough households were interested and willing to pay extra fees, or enough centralized drop-off sites would warrant a dedicated organics route. Rural haulers are currently struggling to make recycling routes profitable, making the economic feasibility of an organics route less likely. One hauler expressed concerns with increased truck traffic and greenhouse gas emissions, which would occur with another dedicated route.

Feedback from private waste haulers on organic collection was limited and mixed. If there is sufficient public interest, an additional route will be provided, likely requiring a flat rate to make the route economically viable. Increased truck traffic and greenhouse gas emissions from a dedicated organics collection route could be detrimental. Discussions on GHG emissions from food scraps landfilling vs. composting organics is presented in **Section 8**. Potential societal impacts resulting from increased truck traffic were not investigated in this study. Curbside co-collection using DCBs avoids many of these issues and concerns by utilizing existing solid waste collection infrastructure and haul routes for collection with modifications needed only during processing to remove organics.

2.4 Summary of Surveys, Audits, and Interviews

2.4.1 Resident and Business Surveys

Local surveys and focus groups conducted in the City of Red Wing show that residents would support a food scraps collection program if it is convenient, has minimal or no additional costs, and includes a comprehensive outreach and education program. Residents prefer curbside collection over drop-off sites, with mixed feelings about DCB collection. Select local businesses are open to a compost project for environmental and sustainability reasons but emphasize the need to consider costs, operational logistics, employee education, and ways to avoid odor and rodents

2.4.2 Audits

Findings from the organic audits within the City, indicated that the primary organic sources that are most readily capturable in the City are from residential, commercial, institutional sources. Industrial sources were not favorable for collection. However, local businesses and institutions are generally supportive of a compost project for environmental and sustainability reasons. Many commercial sources of organics were determined, unfortunately very few responded to the City's request for information to gauge the company's interest in participating in an organics collection program. The Red Wing Public School District was found to be the most promising source organics from City institutions.

2.4.3 Interviews

Findings from the regional program interviews indicated that most organic diversion programs are voluntary and require limited to no additional cost to participate. Key findings from the interviews include the importance of community engagement, the need for clear communication and education about the program, and the benefits of having a well-structured and efficient collection system for successful organics collection programs. The representatives also highlighted the challenges they faced, such as contamination issues and the need for ongoing support and funding.

3 Identify Organic Tonnages and Compost Recipe

Estimating the capturable organics from the wasteshed and surrounding area is crucial because it helps the community determine if they should act as a hub or spoke in an integrated solid waste management system. If enough organics are available, a compost facility (hub) may be feasible; otherwise, collecting and hauling organics (spoke) to a nearby facility may be more practical. This affects the following **Section 4**.

As detailed in **Section 1**, compost is commonly made from mixing source separated organic material (SSOM) and feedstocks (e.g., woodchips, yard wastes, leaves). The optimal recipe depends largely on balancing the carbon-nitrogen ratios and moisture content. Thus to determine the amount of feedstock needed for compost facility operations, the incoming food scraps tonnage must first be estimated.

3.1 Organic Sources

Organic waste sources within the City, Goodhue County, and nearby areas were reviewed to estimate the total capturable organics. Communities included Red Wing, Welch, Hastings, Farmington and Lake City. These sources were separated into four main categories: residential, commercial, institutional, and industrial organic sources. Detailed descriptions for this breakdown are provided in **Section 2**. Based on surveys and audits, an estimate was projected for total organic collection tonnage by assuming specific capture rates as discussed later.

3.1.1 Residential

Residential sources of organics include single family multifamily households within the City, which is a relevant distinction as outlined in **Section 4.0**, because typical curbside collection methods are very limited when it comes to servicing multifamily households as compared to single family. Additionally, surrounding communities may be included in this estimate based on existing solid waste trends, since the City Waste Campus currently services all of Goodhue County and several metro areas. While initially the Cities of Farmington and Hastings were included in calculations, they were later excluded because many residents are already participating in an organic collection program in Dakota County.

3.1.2 Commercial

Commercial sources of organics in the City included restaurants, grocery stores, supercenters, nursing homes, hotels, corporate cafeterias and venues. The nearby Treasure Island Resort and Casino (TIRC), which currently sends solid waste to the Waste Campus and Red Wing Shoe Company are also potential sources. Red Wing Shoe Company owns a variety of real estate in the community including a hotel, restaurant, and offices.

3.1.3 Industrial

Food processing industries, manufacturers, suppliers, and agricultural entities can be sources of organics. Nevertheless, **Section 2.2** details that few industrial sources responded to City inquiries, therefore no industrial sources of organics were considered in this estimate.

3.1.4 Institutional

Institutional sources of organics in the City includes schools, universities and colleges, hospitals, county jails and correctional facilities. Red Wing Public Schools (RWPS) District which includes elementary, middle, and high school expressed interested in an organic diversion program as discussed in **Section 2.2**. Red Wing has a county jail, state correctional facility and a hospital. The Mayo Clinic has a small facility located in Red Wing and expressed interest in participating in a City organics collection program, therefore it was included in the organics estimate. Correctional facilities were not directly contacted for comment during audits and surveys; however, they were included during these estimates, albeit at a much lower capture rate.

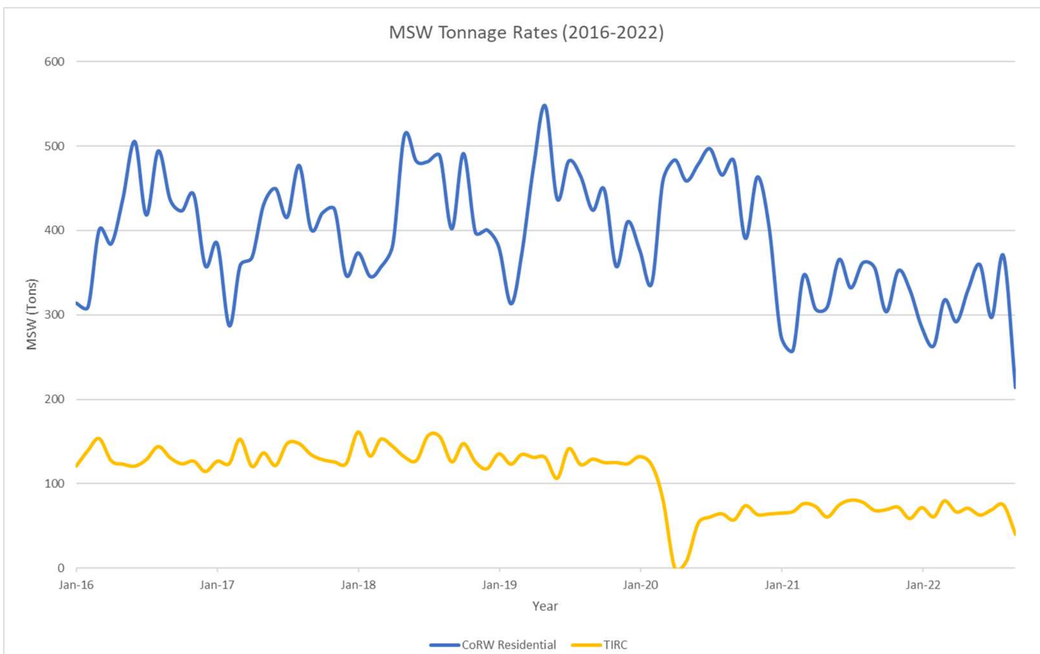
3.2 Organic Estimation Methods

Organic tonnages were estimated either by converting projected MSW tonnage, based on actual solid waste data trends, into organic tonnage, or by using a food waste estimator and generation factor with a specific capture rate. Assumed capture rates were adjusted based on findings in **Section 2** that gauged residential, commercial and institutional interest in participating in a food scraps collection program.

3.2.1 MSW to Organic Conversion

Empirical MSW tonnage data from the Red Wing Waste Campus, including City residential and Treasure Island Resort and Casino (TIRC) commercial data was obtained for 2016 to 2022. This data, shown graphically in **Figure 2**, was used to project future MSW tonnage rates from both these sources. Other commercial MSW data was deemed unreliable due to a variety of businesses sending MSW to the Waste Campus.

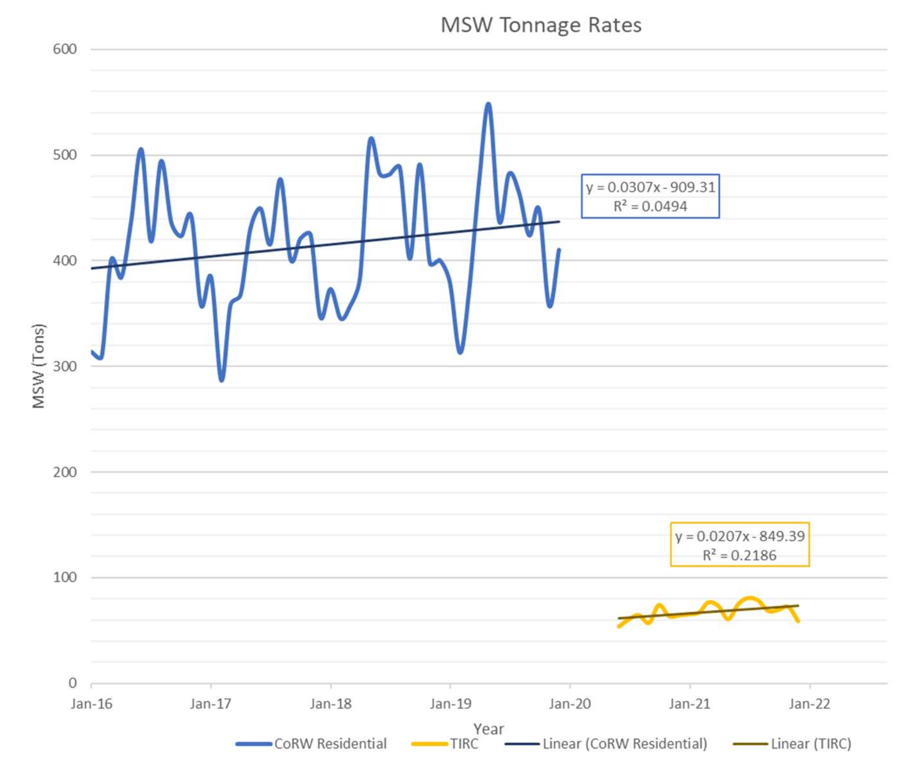
Figure 2 – Specific MSW Tonnage Rates at Waste Campus



Trend lines were created from the data for specific time periods to minimize the impact of data variability and distortions caused by the effect of the COVID-19 pandemic. These trend lines are shown below in **Figure 3.** For Red Wing, residential data was used from 2016 to 2019 generated a linear trend line of $y = 0.0307x - 909.31\ (where\ r2 = 0.0494)$. For TIRC, data from 2020-2022 produced a linear trend line of $y = 0.0207x - 849.39\ (where\ r = 0.02186)$ was generated.

These trend lines were used to project future MSW tonnages from Red Wing residential and TIRC between 2024 to 2030. The projected MSW tonnage was then converted to organic tonnage using the 2022 Red Wing Waste Characterization Study, which found the organic waste fraction to be 19.4 percent food/putrescible. The study is discussed in more detail in **Section 3.2.4**.

Figure 3 – MSW Tonnage Rates Trend Lines



3.2.2 Food Waste Estimator

The second method used a food waste estimator, instead of actual MSW waste flow data, to estimate organic tonnage due to either the unreliability or unavailability of the MSW data. Sources included commercial businesses like hotels, restaurants, venues, and cafeterias, as well as institutional sources such as schools, jails, correctional facilities, and hospitals. The New York State Pollution Prevention Institute (NYSP2I) food waste estimator tool was used to determine organic tonnages. https://www.rit.edu/affiliate/nysp2i/food-waste-estimator

From this website tool, users can select a category such as Lodging and Hotels or Hospitals and fill out an input field to determine the organic tonnage generated from that source. Input fields vary depending on the category and can range from population to number of inmates to number of beds to number of employees. Food waste generation factors are based on the NYSP2I's Organic Resource Locator, Massachusetts Recycling Works Website and the Environmental Protection Agency's (EPA's) Wasted Food Measurements Methodology Scoping Memo (July 2020).

3.2.3 Capture Rates

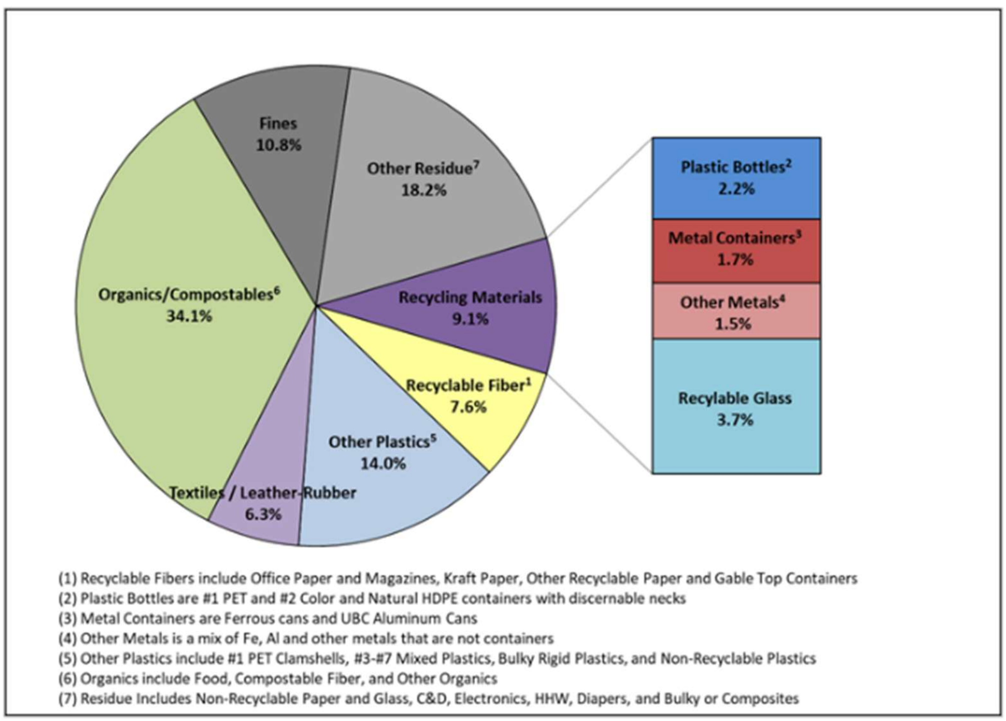
Capture rates are percentages used to adjust the total organic tonnage generation that was projected for a source by accounting for assumed losses or lack of participation in the organic collection program. Higher capture rates are assumed for sources with expected high participation, while lower capture rates are applied where participation is expected to be low.

For Red Wing residential waste streams, a graduated capture rate was implemented to increase over time which was meant to model the potential growth of a future organics collection program. This included having capture rates, household participation and cart setout rates increase and then stabilize through the life of the program. The capture rate was divided into household participation, and cart setout rate, allowing for an initial participation rate that would grow over time.

3.2.4 Waste Characterization Study

To convert MSW tonnage data to estimated organic tonnage, an organic percentage had to be determined for incoming MSW. The City recently conducted an Evaluation of the Efficiency of a New RDF Production System (Dec. 2022), which characterized the composition of incoming waste at the Waste Campus. Organics and compostable fibers make up approximately 34.1 percent by weight of the pre-processed waste stream, as shown on **Figure 4** and in **Table 4**.

Figure 4 – 2022 Red Wing Waste Characterization Pre-Processing Results



Organic materials and compostable products could be further divided into the following fractions:

Table 4 – Waste Characterization Study Organic Composition Results

Material Type	Percentage
Food/Putrescible Waste	19.4 %
Compostable Fibers (any material that will biodegrade under human-driven circumstances)	7.8 %
Other Organics (yard trimmings)	6.8 %
Total	**34.1 %**

To be conservative, only food/putrescible waste percentage, or 19.4 percent, were used to convert MSW tonnage to an organic tonnage fraction. Compostable fibers were excluded due to the uncertainty regarding compostable fibers with growing Per- and Polyfluoroalkyl Substances (PFAS) concerns and not being able to confirm if the products are Biodegradable Products Institute (BPI) certified. Yard waste was not included since most compost facilities in the Metropolitan Area do not allow co-collection of organic food wastes (SSOM) and yard waste. According to Minn Statute 115A.931, yard waste cannot be disposed of with MSW waste. The City of Red Wing offers free yard waste drop off and yard waste composting to residents.

3.2.4.1 Additional Items

Other landfill abatement strategies, besides composting and anerobic digestion, to keep organics out of landfills, include Food to Livestock and Food to People programs. More importantly, Food to People helps to fight hunger in the community. The recent City waste characterization study aimed to estimate the percentage of organics from the incoming MSW waste stream at the Waste Campus that could be classified as “food to people” organics. This involved sorting food organics into edible and non-edible food and packaging per Natural Resources Defense Council (NRDC) 2017 report standards. Results showed about 50% of food waste by weight is edible food, while 15% is packaging and 35% is non-edible food (e.g., bones, peels etc.).

3.3 Organic Tonnage Estimates

3.3.1 Residential

Residential organic sources actual MSW tonnage data from the Waste Campus was used to estimate captured organic tonnages (see **Section 3.2.1** for formula and method). The initial sign-up and household participation rate is projected at 15 percent, increasing by a growth factor of 2.5 percent per year, until reaching 30% by 2030. The participation is expected to stabilize somewhere around 30%, based on comparable food collection programs in the region. A cart set out rate was also considered, which estimates the percentage of organic carts that are set out on a given week during curbside pickup. The estimated captured organic tonnage for a future organic collection program between 2024 to 2030 is provided in **Table 5**.

Table 5 – Residential Organic Tonnage

Year	Projected MSW Tonnage	Organic Fraction (%)	Projected Organic Tonnage	Sign-up Rate (%)	Cart Set-out Rate (%)	Captured Organic Tonnage
2024	5,837	19.4%	1,132	15.0%	60%	102
2025	5,970	19.4%	1,158	17.5%	65%	132
2026	6,104	19.4%	1,184	20.0%	70%	166
2027	6,238	19.4%	1,210	22.5%	75%	204
2028	6,374	19.4%	1,237	25.0%	75%	232
2029	6,509	19.4%	1,263	27.5%	75%	260
2030	6,642	19.4%	1,289	30.0%	75%	290

Equation Used for Residential:

$$Captured\ Organic\ Tonnage = Project\ MSW\ Tonnage\ \times Organic\ (\%) \times Signup\ (\%) \times \text{Cart}\ Setout\ Rate(\%)$$

3.3.2 Commercial

Treasure Island Resort and Casino (TIRC) estimated captured organic tonnages using MSW tonnage data from the Waste Campus (see **Section 3.2.1** for formula and method). Unlike the residential projection, a fixed capture rate of 60% was used instead of a variable one. This capture rate is higher than the maximum variable capture rate used for residential as it is anticipated that if TIRC were to implement an organic diversion program, a higher capture rate could be achieved due to the more controlled environment.

Table 6 – TIRC Organic Tonnage

Year	Projected MSW Tonnage	Organic Fraction (%)	Projected Organic Tonnage	Capture Rate (%)	Captured Organic Tonnage
2024	1,099	19.4%	213	60.0%	128
2025	1,190	19.4%	231	60.0%	139
2026	1,281	19.4%	249	60.0%	149
2027	1,371	19.4%	266	60.0%	160
2028	1,462	19.4%	284	60.0%	170
2029	1,553	19.4%	301	60.0%	181
2030	1,644	19.4%	319	60.0%	191

Additional commercial sources are listed in **Table 7**. These sources used the previously cited Food Waste Estimator to project capturable organics.

Table 7 – Other Commercial Organic Tonnage

Category	Waste Generation Factor	Unit	Population	Capture Rate (%)	Organics (tons/year)
Lodging and Hotels	6.63	Pound (lb)/ room/ week (wk)	62	80%	8.6
Venues and Events	4.2	lb/seat/wk	510	80%	44.6
Restaurants – Full service	52.56	lb/employee/wk	30	80%	32.8
Corporate/Industrial Cafeterias	0.625	lb/meal	140	80%	9.1
				Total	**95**

3.3.3 Institutional and Industrial

Institutional sources were calculated using the Food Waste Estimator as shown in **Table 8**. The following general institutional sources from the City were included:

- Schools
- Correctional/Jails
- Hospitals

Other potential institutional sources in the City include nursing homes, colleges, and universities. Industrial sources were not considered in this analysis for reasons discussed in **Section 2**.

Table 8 – Institutional Organic Tonnage

Category	Waste Generation Factor	Unit	Population	Capture Rate (%)	Organics (tons/year)
Schools					
Elementary	1.13	lb/student/wk	1,304	80%	31
Middle	0.73	lb/student/wk	579	60%	7
High School	0.35	lb/student/wk	579	40%	2
County Jails	7	lb/inmate/wk	170	40%*	12
Correctional Facilities	4.55	lb/inmate/wk	167	40%*	8
Hospitals	23.94	lb/bed/wk	50	40%*	12
				Total	**72**

Notes:
Food waste estimator can be found at https://www.rit.edu/affiliate/nysp2i/food-waste-estimator.
* Low capture rates were assumed since the institutions did not confirm willingness to participate in an organics diversion program.

3.3.4 Total Organic Tonnage

The City's total organic tonnage estimates from residential, commercial/industrial, and institutional sources through 2024 to 2030 are provided in (**Table 9**).

Table 9 – Total Projected Organic Tonnage Estimates

Projected Organic Tonnages					
Year	Residential	Commercial / Industrial		Institutions	Total
		Other	TIRC		
2024	102	95	128	72	**397**
2025	132	95	139	72	**437**
2026	166	95	149	72	**482**
2027	204	95	160	72	**531**
2028	232	95	170	72	**569**
2029	260	95	181	72	**608**
2030	290	95	191	72	**648**

Notes:

1 – City of Red Wing – Residential and Treasure Island Resort and Casino (TIRC) MSW tonnage extrapolated from tonnage data between 2016-2019. Assumes approximately 20% of MSW is food waste or organics.

2 – Organics from schools estimated with https://www.rit.edu/affiliate/nysp2i/food-waste-estimator

3 – City of Red Wing curbside program assumes a starting 20% sign-up rate of participating households, that than grows by 2.5% annually before ending on 30% signup rate.

4 – City of Red Wing curbside program assumes a starting cart set-out rate of 60% that grows by 5% annually before resting at 75%.

5 – TIRC organic waste generation assumes a 60% capture rate.

It is estimated that approximately 650 tons of organic food scraps could be captured from the City of Red Wing and surrounding areas by the year 2030 with the implementation of an organic collection program. The program assumes moderate to high capture rates for residential and select commercial entities.

3.4 Feedstock Characterization and Compost Recipe

3.4.1 Characterization data

The Shakopee Mdewakanton Sioux Community (SMSC) conducted laboratory analysis of the SSOM feedstocks they receive from Hennepin County, Dick's Sanitation (DSI), Republic and Sanimax, all originating from the Twin Cities Metro Area. The composting characteristics of these feedstocks are summarized in **Table 10**. The importance of the parameters listed in the table is described in **Section 1.1**.

Table 10 – Source Separated Organic Material Characterization

Parameter	Hennepin Co.	DSI	Republic	Sanimax	Average
C:N Ratio	19	15	17	19	17.5
Moisture (%)	70.2	74.7	75.9	69.7	72.6
Total Nitrogen (%)	2.5	3.1	2.9	2.7	2.8
Volatile Solids (%)	95.5	91.8	94.5	95.2	94.3
pH	4.9	4.8	4.7	4.3	4.7

These SSOM feedstocks are similar, with low C:N ratios and high moisture content, requiring dry, carbon-rich amendments for composting. The data from Hennepin County was used to develop a composting recipe for Red Wing. Target values for these parameters are provided in **Table 11**.

3.4.2 Recipe Requirements

A composting recipe was developed for Red Wing, which is shown in **Table 11**. The recipe was based on future conditions of 1,000 tons/year SSOM to accommodate potential growth in an organics collection program, the 4,757 tons of yard waste collected by the City in 2021, which includes the recycling of oversized woody particles from the product screening step. 1,000 tons SSOM/year is also considered a minimum baseline design capacity for most industrial compost facilities. Detailed recipe calculations are provided in **Appendix C**. This information was used to evaluate composting facility design requirements at the Waste Campus and the Former Lab USA Facility site, which is discussed further in **Section 5**.

Table 11 – Compost Recipe Model Values

Parameter	Modeled Values	Target Values
C:N Ratio	28	25 – 30
Moisture Content	53%	50% - 55%
Mix Volatile Solids	77%	> 75% - 80%
Mix Free Air Space (predicted)	63%	40% - 60%

3.5 Contamination Issues

Contamination of collected organics with non-compostables (film plastics, hard plastics, glass, metal, etc.) is widespread and problematic. Standard offering programs tend to have worse contamination than voluntary sign-up programs, as noted in **Sections 1** and **4**. While zero contamination is always the goal, a realistic goal is less than 5 percent by weight, with successful programs achieving less than 1 percent contamination. A case study example of an organic collection program contamination audit is included as **Appendix D**.

Contamination can also come from compostable fibers that don't' meet BPI certification, based on the Compost Facility's requirements. BPI certified products either meet ASTM D6400 (plastics) or D6868 (plastics and polymers as coatings or additives) standards. These distinguish biodegradable from compostable items. Most consumer products can be branded as bio-degradable, but BPI labeled products must be designed to breakdown in an industrial composting facility by 1.) having proper disintegration during composting, 2.) adequate level of inherent biodegradation and 3.) no adverse impacts on the ability of composts to support plant growth. This ensures complete decomposition of a product in an industrial compost facility with no adverse effects to the resulting compost.

The evolving regulatory landscape concerning PFAS may substantially alter what products are accepted at compost facilities. PFAS is used in many products as a non-stick coating, water-resistant fabrics, cleaning products, and more, and has been known to be present on compostable single-use items. Although BPI certified compostable products shouldn't have PFAS, trace contamination from other products or recycled products could be present. Consequently, no compostable fiber products were included in the estimation of capturable organic tonnages due to the prevailing uncertainties within the solid waste industry regarding PFAS.

3.5.1 Techniques to Reduce Contamination

The most cost-effective method to reduce contamination is through public outreach and education. This is the approach being employed by Creekside Soils (Creekside) in Hutchinson, Minnesota, which received a grant from the MPCA to develop and launch the "Compost It Right!" program. The program was recently initiated. Other options besides education, some organic collection programs have implemented to reduce contamination is a three-strike policy. This policy removes the organic carts from the household of repeat offenders. Enforcing these policies requires a contamination monitoring program, which can be challenging to implement and maintain. Most organic collection programs instead use a voluntary based system which is known to lower contamination rates.

Mechanical methods to remove contamination at organics recycling facilities include front-end depackaging and back-end compost processing. Depackaging technologies are either hammermills (e.g., Tiger, Doda), horizontal shaft separators (e.g., Scott Turbo-Separator), or cyclonic/centrifugal separators (e.g., Twister). These are larger-throughput machines, and the market offers few depackaging options for smaller-scale facilities at present. For compost processing, the most common mechanical contaminant removal systems are magnets and vacuum-extraction devices (e.g., AirLift Separator, Komptech Hurrikan) set up on the fines and overs discharge belts on final compost screens that focus on removing lighter-weight film plastics. If heavier contaminants are present, such as glass, ballistic separators or densiometric tables can be used. These mechanical contaminant removal systems can add significant additional capital costs.

3.6 Summary

Organic tonnage sources in and around the City were evaluated, estimating capturable organic tonnages if a food scraps collection program was implemented. Major sources include City residential and commercial sources like Treasure Island Resort and Casino. Other, with minor contributions from institutions like the Red Wing Public School System, corrections facilities and hospitals, and other commercial small businesses. Estimates were derived from projected MSW tonnage data converted to organic tonnage or with a food waste estimator tool for each category. Capture rates and other adjusters were applied to estimate the organic tonnage from each source. **Table 9** shows that, by 2030, the City could capture about 650 tons per year of SSOM with a moderately successful organic collection program.

Contamination remains an issue in some organic collection programs, while others have far less than 1% contamination by weight. Program type and public education may significantly impact contamination levels. It was determined that standard offering, where participation is not optional, tend to have more contamination issues than voluntary opt-in programs.

4 Organics Collection Methods

Organic collection programs typically utilize two methods for food scrap organics collection: curbside collection or drop off sites. Variants of curbside collection include either the more common dedicated organics route (e.g. using an organics cart) or curbside co-collection using a DCB (e.g. using a garbage cart), which are later separated from the garbage waste stream. The following sections will review each method in turn and provide an overview of the City's current solid waste collection system.

4.1 Review of Red Wing Solid Waste Program

City residents are required by ordinance to use City services for MSW & recycling services. Although not mandatory, about 70% of commercial and institutional entities opt to use City waste services. The City offers free valet services (e.g. doorstep collection) for residents needing assistance. Additionally, City roll-offs are available for rental.

The City operates the Waste Campus, handling all waste service areas in Goodhue County as well as providing disposal services to two metropolitan communities and the Treasure Island Casino, owned and operated by the Prairie Island Indian Community (PIIC). The Waste Campus features a material recycling facility (MRF) that processes incoming waste by removing recyclable materials and problematic materials from the waste stream. The remaining waste is used to generate refuse derived fuel (RDF) which is used for combustion at the Xcel Energy Steam Plant located in Red Wing. Unprocessed waste that doesn't meet the standards for RDF are sent to the Olmsted County Waste-to-Energy Facility (OWEF) or a permitted regional landfill in Dakota County for disposal.

4.1.1 Routes and Waste Streams

The City provides garbage collection services weekly Monday to Thursday across four routes. Recycling is collected bi-weekly from eight different routes within the same timeframe. Each recycling route day is subdivided into a zone 1 and zone 2; all zone 1 routes are serviced in the same week, followed by zone 2 routes the next week. Detailed information on MSW and recycling collection routes, including service diagrams can be found in **Appendix E**.

The City accepts yard waste from residents and lawn care companies. Residents can drop off brush for free, while commercial tree services are charged by weight for any drop off. The City shreds wood waste with a slow speed sheer shredder which is sent to Xcel as a fuel amendment for wet fuel and to supplement low fuel availability.

Although the City promotes backyard composting through subsidized compost bin sales, education programs and public service announcements as an optimal solution for organic waste diversion, survey responses as provided in **Section 2** indicate a limited interest in backyard composting among City residents.

4.1.2 Equipment

The City owns and operates 11 trucks for garbage and recycling collection services: 4 automated for residential/commercial cart collection and light commercial use, 3 rear-load for commercial and multi-family use, 2 satellite trucks for rural, valet & park collections, and 1 roll-off truck for roll-offs and compactor collections.

The City's solid waste processing operations utilize several pieces of equipment, including 3 wheel loaders, 2 skid steers, 1 windrow turner and tractor, 1 small compost screener and numerous roll-off boxes and 2 more roll-off hook trucks. Additionally, the City owns a slow speed sheer shredder, with a second shredder to be added in early 2024. Equipment lists are provided in **Table 12**. This information was important in cost calculations performed in **Section 6**.

Table 12 – City Solid Waste Program Equipment

Equipment			
City Collection		City Disposal (Waste Campus)	
Quantity	Type	Quantity	Type
11	Packer trucks	3	Front-End Loader
		1	Forklift
		2	Skid Steer
		1	Sheer Shredder
		1	Windrow Truner (yard waste) with a dedicated tractor
		2	Roll-off Hook Trucks
		1	Compost Screener

4.1.3 Solid Waste Service Fees and Charges

Solid waste fees for City waste collection services in 2024 are outlined below. These monthly rates apply to weekly residential waste collection within city limits, based on the volume of cart serviced. The following solid waste fees apply:

- One 48-gallon cart - $20.38 per month
- One 96-gallon cart - $40.73 per month
- Roll-offs and dumpster - rates vary by size, collection frequency and length of service.

In 2024, tipping fees or gate charges at the Waste Campus are outlined below. Charges for self-hauling can be found in the City's fee schedule and are primarily dependent on the volume and type of waste being dropped off. Additional fees apply to specific items such as furniture, electronics, tires, and appliances. Rates for these items can also found in the fee schedule.

- Contract in place - $118.00 per ton
- No contract in place - $128.00 per ton

The City's tip fee includes two charges for all waste generated within the City of Red Wing: the City Environmental Service Charge (CESC) and the Market Rate. The Market Rate is what one would pay if disposing waste at a landfill and was set at $68.25/ton for 2024. The CESC, which covers the remaining cost, is $49.75/ton. State solid waste taxes apply only to the Market Rate (Commercial 17%, Residential 9.75%). The CESC is not taxed. These rates are adjusted annually to ensure cost equity between resource recovery and cheaper landfill options.

4.2 Collection Methods

The evaluated collection methods were Dedicated Curbside, Curbside Co-Collection DCB, and Drop Off Site. Each will be detailed further with examples and potential food scrap collection program uses.

4.2.1 Dedicated Curbside Collection

Curbside collection refers to municipal solid waste collection where households receive a dedicated organics cart that is placed at the curb or alley near the house and serviced weekly. Weekly collection is necessary and required because food waste is perishable, can create odors and may attract vermin if left unattended. Organics are typically collected using a rear load packer truck or an automated truck. These materials are then transported to a transfer station or similar waste processing facility where the load is tipped, inspected and consolidated before being taken to a regional compost facility.

The City would need to develop and manage a curbside organics collection program, modeled after existing garbage collection routes in Red Wing. Due to the inability to co-collect organics without either a split body packer truck or DCBs, an additional truck and staff would be needed to run organics collection. Split body trucks are often inefficient for collecting both organics and garbage or recycling due to uneven fill-up rates, necessitating more trips to the tipping floor with compartments only partially filled in the other compartment.

Collected organics can be taken directly to a compost facility or first to the Waste Campus for processing. It is recommended to haul organics first to a tipping floor to inspect incoming loads and consolidate the organics, improving hauling efficiency and enabling contamination monitoring and control. Sending contaminated loads directly to a compost facility may result in load refusal, fines, additional hauling, processing at the Waste Campus, and/or landfilling, which ultimately increase operational costs. Frequent contamination could also result in increased tipping fees or rejection of the City's organics by the compost facility.

4.2.2 Curbside Co-Collection DCB

DCB co-collection uses a durable, heavy-duty (i.e. thicker) compostable bag for residential food scraps collection, which can be co-collected in a garbage cart, and collected during normal solid waste services. The organics are then removed at the MRF during processing. The main benefit of DCB co-collection is that it doesn't need extra trucks and staff for collection hauling, fitting into existing waste programs with minimal initial costs. However, additional line pickers would most likely be needed to pick the incoming DCBs from the waste stream conveyor, unless as is the case of Ramsey/ Washington's Recycling and Energy (R&E) program, new technologies such as robotics and artificial intelligence can be leveraged (see **Section 4.2.3.1**).

One drawback of this program is that a MRF or processing facility generally is required to sort the incoming DCBs and remove them from the waste stream. However, it might be feasible to remove the bags from the waste stream at a transfer station tipping floor using traditional methods like hand picking. DCBs are designed for easy identification during collection and have an approximate shelf life of one year before the bag may start experiencing performance issues (i.e. tearing).

The feasibility of using a line worker for pulling DCBs will need to be evaluated using different sized bags and various conveyor speeds. Consideration can be given to the fact that the line could be stopped during sorting if needed. It may be possible to segregate city loads so that its known beforehand when DCB's would arrive. A robot was used by Randy's Sanitation Facility in Delano and R&E is planning to use robotics for collection. However, these facilities operate at significantly higher tonnage rates than anticipated at the Waste Campus, which diminishes the justification for substantially higher initial capacity expenditure for automation.

4.2.2.1 Example: Ramsey/Washington R&E

Ramsey/Washington R&E is launching a Food Scraps Pickup program that uses DCBs that will be co-collected with MSW and removed from the waste stream (Ramsey/Washington, 2024). From 2023 to 2026, organics will go to a compost facility, and after 2026 to an anaerobic digestion (A&D) facility. This initiative follows the Blue Bag Organics program by Randy's Sanitation and Organix Solutions in Delano MN (2012 to 2020), which was terminated in December 2020. R&E chose EcoSafe Zero Waste for their compostable bags after researching alternatives (EcoSafe, 2024).

The Food Scraps Pickup program is voluntary and free to residents. Residents can order a six-month supply of bags. These bags are co-collected alongside garbage during regular trash collection days and routes. This method was chosen by R&E partly because there is no existing separate curbside collection for yard waste, and partly due to compost facility's preference to keep source-separated organic materials (SSOM) distinct from yard waste to optimize the composting process. Additionally, R&E determined that co-collection would have a lower carbon footprint than separate collection.

DCBs will be separated from incoming waste streams at the MRF by a 6-axis arm robot provided by Bulk Handling Systems (BHS). The 6-axis system's gripper claw is rated at 22 pounds per pick-up. Under industrial composting conditions, DCBs typically decompose within a few weeks to months, like food waste and other compostable products.

4.2.3 Drop Off Sites Collection

Drop off collection sites are becoming more common in communities with organic collection programs. According to the Closed Loop Partners "Blueprint for Scaling Collection and Composting Infrastructure", food scraps drop off sites are a typical next step after yard waste and backyard composting promotion to continue to grow a community collection program, before initiating larger scale curbside or co-collection (Closed Loop Partners, 2024). These sites can range from a few organic carts placed in public areas to gated, roofed complexes with roll-off containers placed on a concrete pad. This allows drop off sites to be very adaptable community needs and grow with demand. Drop off sites provide communities with a straightforward method to start an organic collection program, which can be expanded over time without incurring substantial initial costs or public disruption.

Drop off sites also present an advantage over curbside collection in being able to service multi-family housing units where curbside collection is not practical. Limitations of drop off sites may include low collection volumes and public interest as demonstrated in Section 2, where a large segment of the community viewed drop off sites as inconvenient.

Red Wing potential drop off sites include:

- **The Waste Campus**, 1873 Bench Street
- **City Hall**, 315 4th Street West
- **Public Works**, 229 Tyler Road North
- **Public Library**, 225 East Avenue
- **Fire Station 2**, 4880 Moundsview Drive
- **City Parks** (A.P. Anderson, Central, etc.)

Dakota County has successfully implemented many drop off sites, and a case study of that operation is included as an example in **Appendix F**.

4.2.4 Collection Methods and Residential Housing Types

The type of residential housing influences the method of organics collection. Single family housing more easily accommodates curbside collection, unlike multifamily units where residents often lack individual solid waste services, making them reliant on what is offered by the development. This is a reason why drop off sites are used for most organic collection programs, because it provides access to the program to those in multifamily units. However, DCBs avoid this issue by utilizing the existing solid waste collection system.

4.3 Organics Collection Summary

The City could implement an organics collection program using curbside collection with a dedicated organics route, curbside co-collection with DCBs ,and/or drop off sites. DCB co-collection can use the current waste collection system, since it is collection with garbage. DCBs would be transported to the Waste Campus where the organics would be separated from the waste stream. These organics could then be inspected and consolidated before being sent to a compost facility. Curbside collection with a dedicated organics cart would involve a weekly route. This method would require an extra collection truck and personnel to carry out. Drop-off sites on the other hand are not recommended as the primary method of collection due to low community interest as described in Section 2. However, it is recommended that drop off sites should be used in conjunction with another collection method to provide greater accessibility to the community at large, and as a powerful way to grow a developing community organics collection program.

5 Disposal Facility Location Evaluation

Disposal options include onsite and offsite facilities. Onsite facilities involve constructing a new compost facility in the City, requiring permitting as discussed in **Section 7**. **Drawings 1 through 5** for proposed onsite facilities are provided at the end of the report. Offsite facilities involve existing or future compost and anaerobic digestion facilities within the region that a City organics collection program could send organics to. The following onsite and offsite disposal options evaluated in the following sections:

Onsite Compost Facilities:

- The Waste Campus
- Former Lab USA Facility

Offsite Disposal Facilities:

- Specialized Technologies Inc. (now Waste Management Inc.) Compost Facility
- SMSC Compost Facility
- Ramsey / Washington Recycling and Energy – Anaerobic Digestion (A&D) Facility (*Future*)

5.1 On-site Composting Facility Evaluation

A footprint layout was developed based on current and planned site uses, and a minimum 1,000 tons per year organic tonnage rate. It assumes a CASP composting facility with yard waste sourced from the Waste Campus. This analysis uses a composting recipe to ensure a high-quality compost, calculating required square footage for each compost process step from waste receipt, pre-processing, mixing, composting, curing, screening, and product storage/distribution.

5.1.1 Red Wing Solid Waste Campus

The following design is part of an assessment of the feasibility of installing an organics processing facility at the Waste Campus.

5.1.1.1 Existing Conditions

The footprint analysis was compared to available spaces at the Waste Campus, which has six decommissioned wastewater treatment sludge basins on site. Former wastewater process piping has been removed from within the basins, but the basins sit on a 4-inch concrete pad that is damaged in some areas and may need inspection and repair for use in composting. The basins are numbered 1 to 5 (with 5 and 6 previously being combined). Currently, Basin No. 3 is used for self-haul demolition transfer, and Basins No. 5 is periodically used for sludge dewatering. Existing conditions for the Waste Campus are shown in **Drawing 2**.

5.1.1.2 Site Conversion

The berm between basins No. 5 and No. 6 was removed, and the lower elevations were filled with borrow material, a continuous 2-foot layer of sand, 6-inch aggregate base and 3-inch bituminous top layer. Basins No. 1 and No. 2 could be similarly joined, creating a pad area for composting, which could provide an approximate 185 feet by 275 feet pad area. Although internal piping to the basins is decommissioned, external piping may still connect to the clarifier for contact water handling, subject to verification. These basins are near the City's industrial wastewater pretreatment plant clarifiers.

The inventory of existing equipment that might be available to support an organic recycling and composting operation is specified in **Section 4.1.2**.

5.1.1.2.1 Footprint Analysis

A footprint analysis was conducted to evaluate the area requirements for a composting facility at the Waste Campus, and the results and minimum square footage requirements is provided in **Table 13**.

Table 13 – Waste Campus Compost Facility Footprint Analysis

Component	At the Waste Campus	
	Square Footage	Acreage
Feedstock Receipt	460	0.01
Feedstock Mixing	4,300	0.10
Composting Pad	15,000	0.34
Biofilter	NA	NA
Curing Pad	9,500	0.22
Screening Area	6,000	0.14
Product Storage	13,125	0.30
Total	**43,385**	**1.11**

5.1.1.2.2 Processing Layout and Description

The following Waste Campus active compost pad layout and plan was developed as shown in **Drawing 3** from the footprint calculations above and site-specific considerations:

- Active Composting Bunkers
- 12 aerated static pile bunkers (16 foot ['] x 40' x 8' each)
- Aeration in positive mode (blow air into pile) controlled by temperature
- Odor control by 8 inch (") top layer of unscreened finished compost (*in-situ* biofilter)
- Contact water collection structure (see **Section 5.1.1.3**)
- Curing, screening, and product storage over at existing yard waste composting area
    - Storm water runoff control (see **Section 5.1.1.3**)

5.1.1.3 Contact Water and Stormwater

The City operates a wastewater pretreatment system on the Waste Campus, which manages the wastewater from the adjacent S.B. Foot Tanning Company tannery facility. To avoid upsetting the pretreatment system, contact water from compost operations will need to be routed into the City's wastewater collection system, downstream of the final pretreatment system outflow monitoring point. The connections to the pretreatment system and City wastewater flow network parameters will control compost operation discharges.

Stormwater that contacts compost that has reached the curing stage (or final compost) after meeting PFRP and Solvita Maturity Index requirements (MN Rules 7035.2836 subp. 9, B(3)), is considered stormwater and does not have to be managed as contact water. The storm water drainage control system must be designed to manage a 24-hour, 10-year storm event (per MN Rules 7035.2836 subp 9, B(3)). However, it has been seen that more stringent storm water design specifications have been required at other composting facilities in Minnesota. The proximity of the Hay Creek trout stream may be a consideration with regards to more strict permitting stormwater design.

The larger stormwater events may preclude catchment and routing of stormwater through the wastewater collection system. However, active composting areas or PFRP portions of the composting operations will be covered, thereby reducing contact water generation during precipitation events. These areas would be excluded from stormwater design requirements.

All stormwater collected in the on-site stormwater detention pond is either re-applied to the yard waste compost under an existing permit, if needed, or pumped to the Wastewater Treatment Facility (WWTF) for treatment. The relatively dry and completely organic make up of compost absorbs significant amounts of stormwater during rain events. Moisture is critical to the compost process and water from the stormwater pond or from other sources may need to be added during the yard waste compost process. Discharge occurs in accordance with the Industrial Stormwater Permit which will need to be reviewed following any final design of an organics composting operation.

5.1.1.4 Traffic Routing

Traffic lanes, parking, loading, and unloading areas for the Waste Campus are depicted on **Drawing 5**. Haulers will include commercial or licensed haulers as well as businesses and residents. The on-site routes differ based on commercial or licensed haulers verses businesses or residential. Also, routes differ based on type of material being dropped off. These routes are depicted on **Drawing 5.** Signage will need to be updated to incorporate organics processing traffic flow patterns.

5.1.2 Former Lab USA Facility

5.1.2.1 Existing Conditions

The Former Lab USA Facility is a 31,000 square foot steel frame structure with 32-foot clear height (**Drawing 4**). The following features are associated with the building:

- Two 25’ by 22’ overhead doors located along the north wall and one 16’ by 16’ overhead on the east wall.
- Steel wide flange beams, columns are per ASTM A572, A992.
- Lintels, plates and embedments per ASTM A36 and pre-finished with one coat of primer.
- Steel side panels are 26 GA semi-concealed with siliconized polyester paint and 2-inch high-strength WMP-50 polypropylene R-7 insulation. Ceiling panels have 4” R-13 insulation.
- Finished floor is 5,000 pound per square inch (PSI) 9”-thick concrete with reinforcement and a surface treatment of liquid hardener and sealer.
  - 14”-thick inertia pads located for equipment supports across the western half of the building.
  - One 24”-thick pad located on the east half of the building.

- 14 load distribution platforms consisting of crushed aggregate and geogrids have been constructed underneath the floor to support processing equipment throughout the western half of the building.

- A trench floor drain runs the length of the overhead doors to a flammable waste trap which feeds to a sump. The sump discharges to a 4” diameter carrier pipe inside an 8” casing pipe to the sanitary sewer line. The piping transitions to a 6” polyvinyl chloride (PVC) Standard Dimension Ratio (SDR) 16 pipe sanitary line at Bench Street.
- An 8” PVC C-900 DR-18 water main entering the building on the north side.

Xcel Energy currently owns the building and building agreements would need to be negotiated prior to use as the City compost facility.

5.1.2.2 Site Conversion

The Former Lab USA Facility was evaluated for development of a CASP composting system. The system would consist of 3-sided block bunkers for the short-term storage of SSOM and pre-ground yard wastes and leaves. It is assumed that yard waste would be pre-ground, using a chipper or similar device, at the current yard waste management site (the Waste Campus). Then received SSOM and pre-processed yard waste feedstocks would be mechanically mixed in an agricultural feed mixer (a Roto Mix 274-12B or equivalent). The mixed feedstocks would be loaded into one of 12 concrete-walled aerated static pile (ASP) bunkers. Aeration channels would have to be formed in the existing floor in the ASP bunkers, which may require the pouring of a new concrete slab on top of the existing building floor. After approximately 28-30 days in active composting within the ASP bunkers, the compost would be removed and returned to the Waste Campus for curing, screening, product storage and product distribution. The Lab USA Facility site location map and proximity to the Waste Campus is provided in **Drawing 2** and **Drawing 4**.

Odor control would be accomplished using an air extraction system to evacuate the air within the building eight (8) times per hour. This exhaust air would be treated in an approximately 25,000 square feet (160’ x 160’) biofiltration system, which given the immense area required, could only be feasibly located in a few locations such as the Lay Down Yard as shown in **Drawing 4**.

5.1.2.2.1 Footprint Analysis

A footprint analysis was conducted to evaluate the area requirements for a composting facility at the Former Lab USA Facility. That analysis is presented in **Table 14**. Note that the curing, screening, and storage components will occur at the Waste Campus as part of the Lab USA composting operations.

Table 14 – Lab USA Compost Facility Footprint Analysis

Component	Former Lab USA Building		The Waste Campus	
	Square Footage	Acres	Square Footage	Acres
Feedstock Receipt	760	0.02	-	-
Feedstock Mixing	4,300	0.10	-	-
Composting Pad	13,600	0.31	-	-
Biofilter	25,700	0.6	-	-
Curing Pad	-	-	9,300	0.21
Screening Area	-	-	6,000	0.14
Product Storage	-	-	13,000	0.3
Totals	**44,360**	**1.03**	**28,300**	**0.65**

5.1.2.2.2 Processing Layout and Description

The following active composting pad layout and design as shown in **Drawing 4** for the Former Lab USA Facility was developed from the footprint calculations provided above and known existing site conditions:

- Active Composting Bunkers
- 12 aerated static pile bunkers, each 12' width x 32' length x 8' height
- Aeration in positive mode (blow air into pile) controlled by moisture content
- Odor control by an external biofilter
- Curing, screening, and product storage over at the Waste Campus existing yard waste processing area

5.1.2.3 Stormwater

As previously discussed, water produced from the PFRP is discharged through the City wastewater network. Contact water would not be produced, since active PRFP composting areas would be located inside the building and covered from stormwater, which would exclude these areas from stormwater requirements.

5.1.2.4 Access Roads and Traffic

The proposed compost facility on the Former Lab USA site utilizes an existing east-west access road (Featherstone Road) off Bench Street for all traffic entering or leaving the site. The Waste Campus is also accessed off Bench Street and is approximately 0.9 miles total distance from the Former Lab USA Facility. Licensed haulers or City waste trucks will be backing up to the existing building on the north side and tipping on the mixing floor area. City dump truck(s) will be loaded with compost that has achieved PFRP and maturity requirements in the building and transporting that compost to the Waste Campus for further curing, storage and eventual distribution in the existing yard waste processing area.

5.1.3 Off-Site Composting Facilities

There are two existing off-site options and two off-site options in planning/permitting/design:

- **SET (now WM)**: located in Rosemount and owned by Waste Management as of March 2023, this 35,000 ton/year SSOM composting facility serves Dakota County and portions of the eastern Twin Cities metro. SET (now WM), under previous ownership, expressed willingness to accept Red Wing SSOM.

- **SMSC**: located in Shakopee, this 55,000 ton/year SSOM composting facility accepts SSOM from the western Twin Cities metro. SMSC is in the process of expanding and relocating the facility to a 330-acre parcel along the Minnesota River across from Chaska. The new facility will be open in 2024 and the current facility on tribal land will be closed. SMSC has expressed a willingness to accept Red Wing SSOM.
- **Ramsey/Washington R & E Anaerobic Digester**: this is a planned 50,000 ton/year anaerobic digester to be located in Newport. This facility is expected to be online in 2026.
- **Hennepin County Anaerobic Digester**: this is a planned 25,000 ton/year anaerobic digester to be located in Brooklyn Park. This facility is expected to be online in 2026. This option was not evaluated further due to the similarity to the Ramsey/Washington R & E Option and non-active status.

5.2 Organics Disposal and Composting Facilities Summary

This section reviewed the construction and installation of compost systems at two existing facilities, one on the Waste Campus and one adjacent to the City's laydown area in the Former Lab USA Facility. The systems were sized based on an estimated minimum throughput of 1,000 tons of organics per year.

The Waste Campus compost system takes advantage of available space and features from the former wastewater treatment lagoon system. Both the Waste Campus and the Former Lab USA Facility would use the current yard waste compost site for feedstock. The proposed facility at the Former Lab USA site utilizes the existing structure on site to support and house the aerated static pile organic wastes bunker system. Final curing, screening, and product storage for either site would be outside near the yard waste area at the Waste Campus. The compost operations at either the Waste Campus or Former Lab USA Facility location also rely on existing site access roadways, power, water, and sewer utilities and stormwater management.

In **Section 3**, it was estimated that a maximum of 650 tons per year of SSOM could be captured with a moderately successful organic collection program. Since this is below the minimum design threshold of 1,000 tons organics per year for an industrial compost facility, pursuing onsite disposal options is not recommended for the City at this time. However, **Section 6 and 7** include onsite disposal options in the economic analysis and permitting discussion, respectively, for potential future consideration.

6 Economic Analysis

6.1 Diversion Methods Evaluated

6.1.1 Collection Options

The following collection options were considered during this cost evaluation:

- Curbside collection with a dedicated City organics route
- Curbside co-collection with DCBs

The specific details related to these programs are outlined in **Section 4**. Drop off sites were excluded in the economic analysis, due to low public interest as determined from findings in **Section 2**. Additionally, drop off sites were projected to collect less organic tonnage than the other methods, everything else being equal, therefore it makes it difficult to compare economically. This exclusion ensures comparisons between curbside collection options is equal. Nonetheless, cost estimates for drop off sites are briefly addressed in **Section 6.1.3**, as this collection method may play an important role in any future organic collection program.

6.1.2 Disposal Options

The following on-site or off-site disposal options were considered during this cost evaluation.

On-Site:

- The Waste Campus Facility
- Lab USA Facility

Off-Site:

- SET (now WM) Facility
- SMSC Facility
- Ramsey / Washington Recycling and Energy – A&D Facility (*Future*)

Onsite and offsite options are described further in **Section 5**.

6.1.3 Drop Off Sites

Drop off sites can range substantially in cost. They can be as simple as a 64-gallon cart placed in a park with appropriate signage and locks, or be more elaborate with concrete pads, fence and roofs. These choices depend on what the community is willing to fund and manage for an organic collection program. A couple examples are provided for reference.

Minneapolis, which employs drop off sites typically equipped with four 64-gallon organic carts per location, were estimated in 2021 to cost approximately $3,518 for the first year and $1,458 for each successive year per drop off site. The baseline costs for these estimates include hauling, personal and processing compost facility tipping fees. Hauling was estimated at $923 per year, while processing costs were projected to be $535.

The additional costs for the first year included items such as purchasing cart locks, site signage and brochures and welcome kits. Welcome kits, which included compostable bags, were estimated to cost $1,340, signage and brochures $600, and locks $120 in the first year. This accounts for the $2,060 difference between first and second year cost projections. While these additional cost items might be considered non-essential, they have been identified as key factors contributing to the success of the Minneapolis drop off program, enhancing community education and participation.

Dakota County built drop off sites with concrete pads, fences and gates and sometimes roofs. Each site was estimated to cost between $15,000 - $20,000 to construct. Roofs minimize the need for snow removal in winter, among providing other benefits. Operational costs are unknown but likely similar to other drop off sites, covering hauling and processing costs. More details on the Dakota County drop off site program is included in **Appendix F**.

6.2 Collection Costs

6.2.1 Household Participation and Organic Tonnages

Collected organic tonnages were estimated using a household participation rate, and organics household (HH) generation rate of 8.4 lbs/HH/week, providing annual organic tonnages for a collection curbside collection program. This simplified approach focuses on evaluation collection and disposal economics, not on refining tonnage projections as discussed in **Section 3**.

An organic density of 43.1 lbs/cubic feet (cf) is used to estimate the number of 6-gallon DCBs needed for collection, assuming zero waste and full bag volume utilization. The total number of organic carts for curbside collection was then calculated from assumed community household participation rates.

The Decennial 2020 Census data for the City of Red Wing was used to ascertain the total amount of 1-unit (single family) households in Red Wing, Minnesota. This information is important as curbside collection programs generally service primarily single-unit housing. However, DCBs could readily provide organics collection methods for both single and multi family utilizing the existing solid waste collection system.

For this economic comparison, it was assumed that curbside collection with DCBs and a dedicated organics route would achieve similar participation rates, and capture rates for organic tonnage. According to the 2020 Census data, Red Wing, Minnesota has a total of 7,253 households. Of these, 71% are 1-unit structures (approximately 5,150), 26% are 2-or-more unit structures, and the remainder (3%) are mobile or other types of unit structures. The number of participating households is calculated by multiplying the household participation rate by the total number of 1-unit households in the City (5,150 households).

Based on insights from **Section 2**, it was observed that most existing organic collection programs within the region reach approximately 30% household participation before leveling off. A notable exemption to this is Minneapolis, which has been able to achieve much higher participation rates. As discussed in **Section 3**, household participation is expected to commence at approximately 15% upon program initiation, increasing annually at 2.5% until leveling off at 30% by year 6, as illustrated in **Table 15**.

Table 15 – Household Participation, Organic Tonnages, Bag Usage and Carts

Year		HH Participation	Estimated Participating HH[1]	Estimated Organic Tonnage per Year[3]	Estimated Bags Used per Year[2]	Estimated Carts In Use
Year 1	2025	15%	773	169	4,513	773
Year 2	2026	17.5%	902	197	5,260	902
Year 3	2027	20%	1030	225	6,008	1,030
Year 4	2028	22.5%	1159	253	6,756	1,159
Year 5	2029	25%	1288	281	7,503	1,288
Year 6	2030	27.5%	1417	309	8,251	1,417
Year 7	2031	30%	1545	337	8,998	1,545
Year 8	2032	30%	1545	337	8,998	1,545
Year 9	2033	30%	1545	337	8,998	1,545
Year 10	2034	30%	1545	337	8,998	1,545
				Total	**74,283**	**1,545**

Notes:
1 - Decennial 2020 Census for the City of Red Wing estimates 5,150 1-unit households, which is used to determine the number of participating households.
2 - DCB assumed to be 6-gallon and an organic waste density of 43.1 lbs/cf. No waste factor was used in determining bag consumption estimates.
3 - Organic tonnage generation determined by assuming that 8.4 lbs are generated per participating household per week (52 weeks per year).

6.2.2 Collection Capital Costs

Capital costs for collection options are shown on **Table 16**. Notably, there is no initial capital investment identified for a DCB co-collection program. **Section 4** explains why automation was not evaluated for City DCB co-collection program, and thus not included in initial capital costs for the program.

Table 16 – Collection Options Capital Costs

Item	Unit Cost	Quantity	Unit	Total Cost
Curbside Collection Program				
32-gallon Collection Cart[1]	$45	1,545	Carts	$69,525
ASL Collection Truck[2]	$300,000	1	Trucks	$300,000
			sum	**$369,525**
Durable Compostable Bag Program[3]				
No capital costs assumed	n/a	n/a	n/a	$0
			sum	**$0**

Notes:
1 – Assume all 32-gallon carts needed for 10-year period purchased at program roll-out and purchased in bulk.
2 – Costs based on new automated side loader solid waste collection truck.
3 – Annual durable bag costs are assumed to be operating, not capital expenditures.

6.2.3 Collection Operational Costs

Labor rates assume that 1 full-time equivalent (FTE) will be required for an organics curbside collection program with a dedicated route and 0.5 FTEs will be needed for a curbside collection DCB co-collection program from year 1 through 10. Curbside collection with a dedicated organics routes requires an operator to drive the route at $70/hour, and DCB co-collection needs a hand picker at $57/hour, as detailed in **Table 17**. An FTE equates to 40 hours worked per week for 52 weeks of the year, or 2,080 hours. Wages assumed loaded labor rates, which include benefits and other overhead expenses associated with labor.

Table 17 – Collection Options Operating Labor Costs

Year	Item	Hourly Rate ($/hr)	FTE[1]	Annual Salary Costs
Curbside Collection Program				
Year 1-10	Operator	$70	1	$145,600
Durable Compostable Bag Program				
Year 1-10	Apprentice - Hand Picker	$57	0.5	$59,280

Notes:

1 - FTE "full-time equivalent" assumes a working full-time employee or combination of part-time employee’s equivalent to 40 hours per week for 52 weeks of the year.

Operating costs for collection options include labor, administration, supplies and maintenance as shown in **Table 18**. Most costs are variable and depend on the level of production, but these costs have been fixed at a particular rate. Costs for maintenance, supplies and administration accounts for less than 10 percent of the total annual operating costs for both options.

Purchasing durable compostable bags (DCBs) is considered an ongoing operating cost and depends on household participation. The unit cost for DCBs assumes bulk purchases from the manufacturer of at least 31,000 bags. Bag shelf life is assumed to be 1 year, which limits the viability of bulk ordering enough bags for several years of operations. 31,000 bags per year is significantly more than what is currently projected for the City, therefore final costs would depend on the feasibility of partnering with existing programs to bulk order DCBs, otherwise the City would have to purchase DCBs at retail price.

Table 18 – Collection Options Operating Costs (Year 10)

Item[1]	Unit	Quantity	Unit Cost	Extension
Curbside Collection Program:				
Labor - Operator	FTE	1	$145,600	$145,600
Truck Maintenance[2]	Trucks	1	$15,000	$15,000
Cart Maintenance	Carts	1	$3,476	$3,476
Supplies (Fuel, etc.)	LS[3]	1	$2,500	$2,500
Administration / Other Services	LS	1	$1,000	$1,000
			sum	**$167,576**
Durable Compostable Bag Program:				
6-gallon DCBs[4]	Bags	8,998	$0.500	$4,499
Labor - Apprentice Maintenance Hand Picker	FTE	0.5	$118,560	$59,280
Administration / Other Services	LS	1	$1,000	$1,000
			sum	**$64,779**

Notes:
1 – Annual operating costs provided in table are associated with Year 10 operating costs.
2 – Estimated at 5% of the annual capital cost of the truck.
3 – Lump Sump
4 – Costs based on Ecosafe heavy-duty bags 6-gallons (24"x30", 1.4 mil), and assumes bulk manufacturer of at least 3,000 lbs resin per run (~31,000 bags per run), which is currently used in Ramsey / Washington Counties for collection.

Operating costs for a dedicated organics curbside collection routes remain fixed from years 1 through 10, while DCB curbside co-collection incurs variable annual operating expenses based the number of bags, which changes per participation rates. Labor constitutes the most significant expense for both curbside collection methods. To mitigate overhead labor costs, methods such as automation or scheduled pickups could be considered to reduce route demand and labor requirements for a functional collection program.

6.2.4 Total Collection Costs

Figure 5 is a cash flow diagram which shows the initial capital cost of investment and annual operating costs. **Figure 6** displays the running total cost per year. Future costs were not adjusted to present value for this comparison. Trend lines for both collection options indicate that DCB curbside co-collection has lower economic costs compared to curbside with a dedicated organics route due to the DCB program having no initial capital cost and lower annual operating costs, based on the analysis assumptions.

Figure 5 – Collection Options Cash Flow Diagram

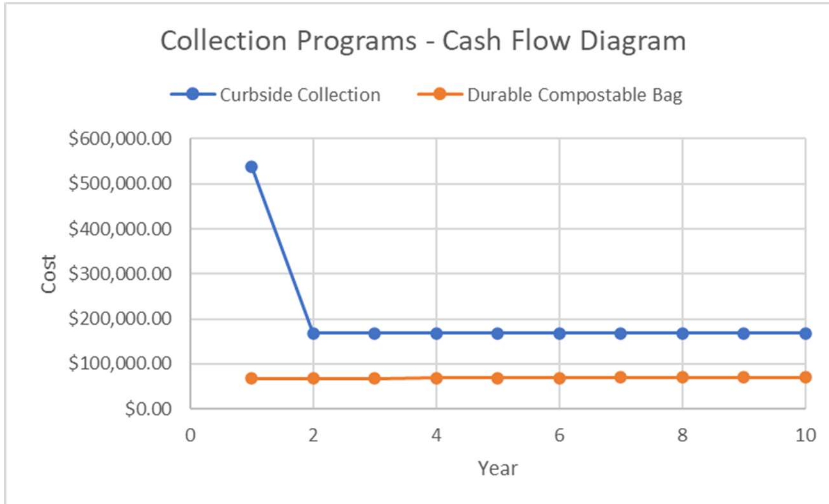
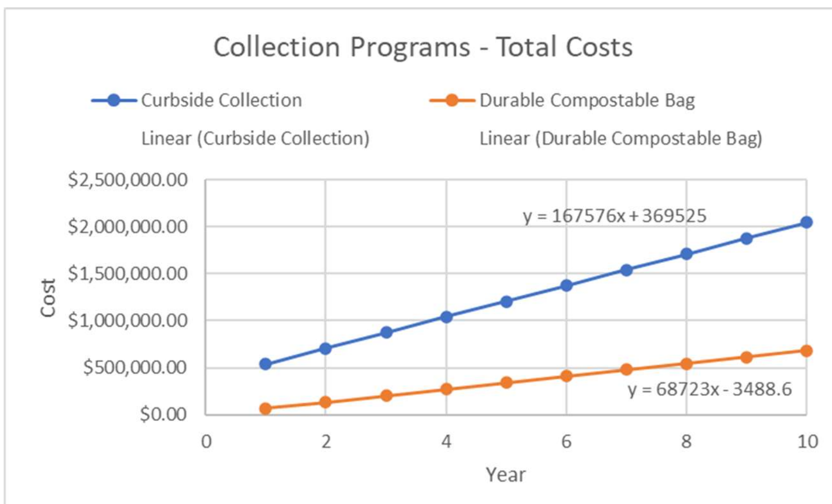


Figure 6 – Collection Options Total Running Costs



6.2.5 Potential Avoided Costs

Consider the potential savings from avoided waste tipping fees that are eliminated by removing organics from the waste stream entering the Waste Campus. This includes tipping fees from downstream landfills and waste-to-energy facilities that receive waste from the Waste Campus. The weighted average cost, based on tipping plus hauling fees, was estimated at $42 per ton. Additional savings from reduced wear and tear of MRF equipment and operational costs are likely but were not included due to the difficultly in substantiating the saving.

6.3 Disposal Costs

Disposal options have been categorized into onsite and offsite solutions. Onsite disposal options include the construction of a new compost facility at the Waste Campus or retrofitting the existing

Former Lab USA building into a compost facility. Offsite disposal options involve hauling organics either to an existing compost facility, namely the SET (now WM) compost facility or SMSC compost facility, or to a future Ramsey/Washington County A&D facility. A net present value (NPV) analysis has been employed to evaluate the capital and operating costs associated with each disposal option, identifying the most financially viable, beneficial solution.

6.3.1 Disposal Capital Costs

Initial capital costs are lined to construction of a new onsite composting facility at the Waste Campus or in the Lab USA Building. No capital costs are expected for transferring organics to an offsite compost facility. **Appendix G** provides capital cost details, using budget estimates from equipment providers and construction cost software for Red Wing, MN (zip code 55066). **Table 19** summarizes principal capital costs for site work, processing equipment, and related items for an onsite compost facility.

Table 19 – Onsite Disposal Options Capital Costs

Component	Waste Campus	Lab USA Building
Site Work	$523,800	$0
Processing	$2,509,320	$1,531,142
Subtotal Construction Costs[1]	**$3,033,120**	**$1,531,142**
Design/Contractor (31.5%)[2]	$955,433	$482,310
Contingency (25%)[2]	$758,280	$382,786
Totals	**$4,746,833**	**$2,396,238**

Notes:
1 – Subtotal construction costs equals site work plus processing costs.
2 – Design/Contractor are determined from general condition (12%), engineering/construction administration (7.5%) and contractor markup (12%) and is Contingency (25%). This equates to a 56.5% markup from estimated subtotal construction costs.

Initial capital costs for a compost facility at the Lab USW Building are lower, as it involves modifying an existing building rather than constructing a new one, which is the case for the Waste Campus. Major cost differences between the Lab USA and Waste Campus options includes a hoop building enclosure and floor slab pouring at the Waste Campus versus a biofilter system at the Lab USA building. Otherwise, many of the capital improvements and facility designs are similar, as shown in **Appendix G** and **Appendix H**. Note that retrofitting an existing building usually incurs higher design, contractor and contingency cost as compared to building new due to more potential unknowns.

6.3.2 Disposal Operational Costs

Operating costs for onsite compost facilities were based on a time-and-motion projection of the labor, machine time and consumables needed to complete each task, including energy and contact water treatment costs. Key tasks involve mixing, stage transportation, screening, and management of compost. The baseline organics processing tonnage was taken as 1,000 tons of SSOM per year (see **Section 5**), which is assumed the minimum throughput for a small industrial compost facility. A summary of costs for labor, machine cost, and consumables is provided in **Table 20**.

Table 20 – Onsite Disposal Facility Operating Costs Subtotals

Item[1]	Unit[2]	Quantity	Unit Cost	Extension
Onsite Waste Campus Facility:				
Labor Costs	LS	1	$204,092	$204,092
Machine/Equipment Costs	LS	1	$128,948	$128,948
Consumables	LS	1	$37,459	$37,459
			Subtotal	$370,500
			Contingency (10%) =	$37,050
			Building & Site Maintenance =	$10,000
			Total Operating Costs =	**$417,550**
Onsite Lab USA Facility:				
Labor Costs	LS	1	$239,916	$239,916
Machine/Equipment Costs	LS	1	$142,568	$142,568
Consumables	LS	1	$37,459	$37,459
			Subtotal	$419,943
			Contingency (10%) =	$41,994
			Building & Site Maintenance =	$10,000
			Total Operating Costs =	**$471,938**

Notes:

1 - See **Appendix G** for details on how lump sum operation costs were calculated.
2 – Unit "LS" means lump sum.

Operating costs for offsite disposal at regional compost facilities include hauling and tipping fees. Hauling rates, based on current regional pricing, were estimated at $0.675 per ton-mile for single trips. Tipping fees depend on the facility. Rates can vary based on an organic collection programs historical contamination rates and whether local compost reuse initiatives exist making close-loop economy for the compost industry.

Table 21 shows total costs for onsite and offsite disposal, assuming an annual organic collection and disposal rate of 1,000 tons of SSOM for all options. However, actual capturable organics in the service area have been estimated to be much lower than this as shown in **Table 9** with tonnage estimates between 397 to 648 tons per year. It was stated in **Section 5.0** that the minimum throughput for an industrial compost facility is approximately 1,000 tons of SSOM per year; therefore, this tonnage rate was used for an equivalent economic comparison of alternatives.

Table 21 – Disposal Options Operating Costs

Item[1]	Unit	Quantity	Unit Cost	Extension
Onsite Disposal Facilities:[2]				
Lab USA Compost Facility				
Facility Operations	LS	1	$471,938	$471,938
Rent	LS	1	$60,000	$60,000
			sum	**$531,938**
Waste Campus Compost Facility				
Facility Operations	LS	1	$417,550	$417,550
			sum	**$417,550**
Offsite Disposal Facilities:				
SET (now WM) Compost Facility				
Hauling [3]	Ton -Mile	350	$0.675	$24,570
Tipping Fee[5]	Tons	1,000	$68	$68,000
			sum	**$92,570**
SMSC Compost Facility				
Hauling	Ton – Mile	570	$0.675	$40,014
Tipping Fee	Tons	1,000	$45	$45,000
			sum	**$85,014**
Ramsey/Washington Anaerobic Digestion Facility[4]				
Hauling	Ton - Mile	400	$0.675	$28,080
Tipping Fee	Tons	1,000	$65	$65,000
			sum	**$93,080**

Notes:
1 – Disposal operating costs for both onsite and offsite options assume 1,000 tons of SSOM generation per year for comparison.
2 – See **Appendix G** for more detailed calculations for onsite disposal operating costs.
3 – Hauling distances are based on single trip distance starting at the Waste Campus, using Google Maps, and assumes x2 hauling events per week that average approximately 10 tons per load (10 tons/load x 2 loads/week x 52 wks/yr ≈ 1,000 tons). Single trip hauling distances are:
- SET (now WM) = 35 miles
- SMSC = 57 miles
- Ram./Wash. Newport Facility (future) = 40 miles

4 – Ramsey/Washington Facility has not been constructed yet, therefore all tipping fee rates and hauling distances are conjectured.
5 – Prevailing tipping fee projections may change from when this analysis was completed.

6.3.3 Disposal Operational Revenues

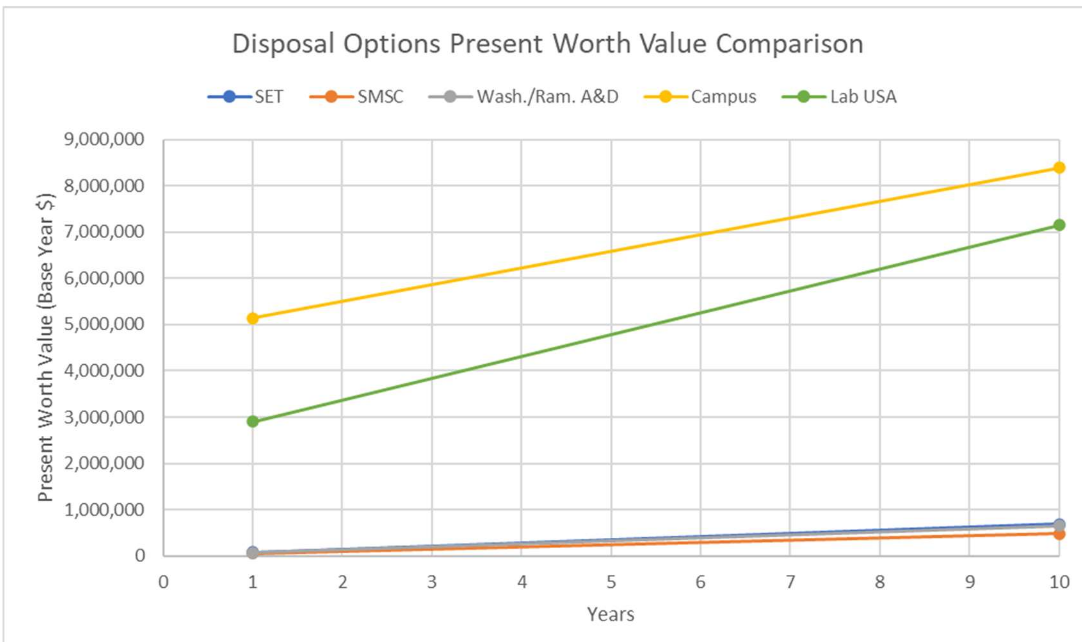
Revenue from compost sales for onsite disposal facilities is the only source of revenue considered. From **Section 3**, using the compost recipe and 1,000 tons of SSOM, it is estimated that 3,526 cubic yards of compost would be generated annually. At $12 per cubic yard, this amounts to approximately $42,250 per year.

6.3.4 Net Present Value Analysis

Present worth value measures the current value of future cash flows and initial investment at the time of calculation. This analysis method is based on the time value of money which assumes that money today is worth more than money in the future due to inflation and investment opportunities. By using a discount rate and an inflation factors, future values are adjusted to present value, as shown in **Appendix I**.

An NPV analysis was deemed appropriate for comparing disposal options economically, as incoming organic tonnages were kept constant at 1,000 tons SSOM per year for all disposal options throughout the design timeframe (2025-2034). This approach contrasts with the variable collection rates assumed for collection options. Which is why NPV was not used to compare collection options economically. Present value calculation for each disposal option is presented in **Appendix I**. Additionally, a graph illustrating the present value for each year is presented in **Figure 7**, along with trend lines for each option.

Figure 7 – Disposal Options Cash Flow Present Values Graph



Onsite Disposal:	Trend Lines
The Waste Campus	y=360,947x + 4,778,106
Lab USA	y=470,977x + 2,437,044
Offsite Disposal:	**Trend Lines**
SET (now WM)	y=89,043x + 7,715
SMSC	y=81,775x + 7,085
Ramsey/Washington A&D	y=89,534x + 7,757
Notes: 1 – Variable x is years from base year (2025) as year 1 and the end year (2034) as year 10. Variable y is dollars ($) adjusted to the present worth base year value (i.e., 2025 dollars).	

The following observations can be made from **Figure 7**:

- There are high initial capital costs and operating costs associated with constructing a new onsite composting facility, with revenue assumed only from compost sales.
- The Waste Campus onsite option requires higher initial capital investment than the Lab USA option due to the construction of a new building versus retrofitting an existing building.
- The Lab USA option has a higher annual operating cost compared to the Waste Campus, owing to the increased hauling costs for transporting compost between the Lab USA building and Waste Campus, as well as annual rent payments.
- According to trend lines, the Waste Campus option is projected to equal the Lab USA option in present value in approximately 21 years (2046), after which the Waste Campus option is more economical than the Lab USA option all else being equal.
- Similar trend lines are observed for all offsite disposal options.

NPV aggregates each present value over the design timeframe. Since no subscription or tipping fee revenues were assumed in the analysis, all values represent costs, resulting in no break-even point for any option. A summary of each NPV is provided in **Table 22**. Detailed calculations can be found in **Appendix I**.

Table 22 – Disposal Options Net Present Value Comparison

Disposal Option	Method	NPV[1]	Unit Cost ($/ton)[2]	NPV % Difference[3]
SMSC	Offsite	$821,034	$82.10	0%
SET (now WM)	Offsite	$894,007	$89.40	9%
Ramsey/Washington A&D	Offsite	$898,932	$89.89	9%
Lab USA	Onsite	$7,124,900	$712.49	768%
Waste Campus	Onsite	$8,370,783	$837.08	920%

Notes:
1 - Net present values are calculated in **Appendix I** and sum each year present worth value for the projected timeframe (i.e., 10 years).
2 - Unit costs are calculated by dividing the net present value cost by 10,000 tons of SSOM (1,000 tons of SSOM processed per year for 10 years).
3 - The NPV percent difference is calculated by the following equation:
$\% \text{ Difference} = (NPV - NPV_{min})/NPV_{min}$

The lowest NPV was identified as offsite disposal to SMSC compost facility. When calculating the percent difference, offsite disposal to SET (now WM) and Ramsey/ Washington A&D is less than 10 percent different, indicating that it is economically a functionally equivalent disposal option. All onsite disposal options exceed 10 percent difference compared to offsite disposal to SMSC, suggesting that onsite disposal options are not as economically viable. The lowest calculated disposal cost, which is disposal at SMSC, was approximately $82.10 per ton of SSOM.

6.3.5 Disposal Options Economic Ranking

NPV analysis shows that offsite disposal to SMSC is the least costly option, while offsite disposal to SET (now WM) and a future Ramsey/ Washington A&D are economically similar and functionally equivalent to SMSC.

Rank	Disposal Option	Capital Cost	Operating Cost	Net Present Value
1	SMSC Compost Facility	$0	$85,014	$821,034
2	SET (now WM) Compost Facility	$0	$92,570	$894,007
3	Washington/Ramsey AD Proposed Facility	$0	$93,080	$898,932
4	Lab USA Compost Facility	$2,396,238	$531,938	$7,124,900
5	The Waste Campus Compost Facility	$4,746,833	$417,550	$8,370,783

6.4 Actual Collection and Disposal Cost Projection

To show projected costs for an example organics program, the lowest cost collection and disposal methods were identified. Costs for a given year were calculated based on projected actual participation and organic tonnage rates. Curbside co-collection with DCBs was found to be the lowest cost collection method, with offsite disposal at SMSC being the cheapest disposal option. Disposal at SET (now WM) or Ramsey/ Washington A&D was economically equivalent. **Table 23** provides example cost calculations for a functioning organics program during Year 6 of program roll-out.

Table 23 – Lowest Cost Collection and Disposal Options Economic Analysis (Year 6)

Given Assumptions:		
SSOM Tonnage =	309	tons/year
	6	Tons/week
	10.2	cubic yards/week
1-Unit Household in Red Wing =	5,150	households
Household Participation =	27.5%	
Participating Households =	1417	households
DCB Used (6-gal) =	8,251	bags
Distance to SMSC Compost Facility (ST)[2] =	57	miles
Haul Loads per Week =	1	loads/week

Item	Unit[2]	Quantity	Unit Cost	Extension
DCB Co-Collection Program:				
6-gallon DCBs	Bags	8,251	$0.500	$4,126
Labor - Apprentice Maintenance Hand Picker	FTE	0.5	$118,560	$59,280
Administration / Other Services	LS	1	$1,000	$1,000
			Sub Total	**$64,406**
Off-Site SMSC Compost Facility:				
Hauling[1]	Ton-Mile	339	$0.675	$11,889
Tipping Fee	Tons	309	$45	$13,905
			Sub Total	**$25,794**
			Total Cost	**$90,199**
			Cost per Ton (SSOM)	**$293.19**
			Cost per Participating Household per Year	**$63.66**
			Cost per Participating Household per Month	**$5.30**

Notes:
1 - Calculation assumes SSOM stored at Waste Campus and hauled weekly to SMSC Compost Facility with 15 cy roll-off truck.
2 – Units “FTE” means full-time equivalent and “LS” means lump sum.

Annual costs for curbside co-collection with DCB and offsite disposal at SMSC for years 1 to 10 after program rollout is provided in **Table 24**. These costs are based on projected participation rates and organic tonnages that were developed in **Table 15**, and operating costs from **Table 18** and **Table 21**. These costs have not been adjusted for future inflation.

Table 24 – Lowest Cost Collection and Disposal Options Economic Analysis (Years 1-10)

Year	# HH Participants	Organics (Tons)	DCB Bags	DCB Co-Collection Costs				Disposal at SMSC			Total Cost
				Bags	Labor	Admin.	Total	Hauling	Tipping	Total	
1	773	169	4,513	$2,257	$59,280	$1,000	$62,537	$6,502	$7,605	$14,107	$76,644
2	902	197	5,260	$2,630	$59,280	$1,000	$62,910	$7,580	$8,865	$16,445	$79,355
3	1,030	225	6,008	$3,004	$59,280	$1,000	$63,284	$8,657	$10,125	$18,782	$82,066
4	1,159	253	6,756	$3,378	$59,280	$1,000	$63,658	$9,734	$11,385	$21,119	$84,777
5	1,288	281	7,503	$3,752	$59,280	$1,000	$64,032	$10,811	$12,645	$23,456	$87,488
6	1,417	309	8,251	$4,126	$59,280	$1,000	$64,406	$11,889	$13,905	$25,794	$90,199
7	1,545	337	8,998	$4,449	$59,280	$1,000	$64,779	$12,966	$15,165	$28,131	$92,910
8	1,545	337	8,998	$4,449	$59,280	$1,000	$64,779	$12,966	$15,165	$28,131	$92,910
9	1,545	337	8,998	$4,449	$59,280	$1,000	$64,779	$12,966	$15,165	$28,131	$92,910
10	1,545	337	8,998	$4,449	$59,280	$1,000	$64,779	$12,966	$15,165	$28,131	$92,910

6.4.1 Payment Options

As discussed in **Section 2,** most organic diversion programs are funded by subscription or general solid waste service fees. While onsite disposal facilities were not deemed cost-effective, if more organics can be captured by a organics collection program from within and around the community, an onsite facility could become more viable through tipping fee revenues.

Implementing a payment plan for the organic collection program with curbside co-collection with DCBs and disposal at the offsite SMSC compost facility would cost participating households around $5.93 per month for the first 10 years. As more households join, monthly fees would decrease. Alternatively, a general solid waste tax applied to all households could cover all program costs with a $1.00 per month increase in current rates.

6.5 Summary

The most economical method for collection and disposal is curbside co-collection with DCBs and offsite disposal at SMSC Compost Facility in Shakopee. Due to high capital and operating costs, curbside collection with a dedicated organics route is less cost-effective than DCB co-collection. Additionally,, a DCB program can be easily integrated into the existing solid waste management system with fewer expenses and adjustments. Onsite disposal options, such as building a new compost facility in Red Wing, incur significantly higher initial capital cost and annual operating costs compared to offsite disposal at a regional compost facility. The higher costs and lower projected organic tonnage make offsite disposal a more economically viable option for an organics program in Red Wing.

NPV analysis showed that disposal at SMSC is the most cost-effective option. However, disposal at SET (now WM) or Ramsey/ Washington A&D would have nearly equivalent net present costs (<10% NPV difference), making them functionally equivalent options from an economic perspective. To fund this program, participating households could pay a monthly subscription fee of $5.93 per month over 10 years, or Red Wing could raise general solid waste fees for all residents by $1.00 per month.

7 Permitting Requirements

The City is evaluating the feasibility of developing a SSOM compost facility. A facility located near current Waste Campus would likely be permitted as an additional waste activity associated with current operations under Minnesota solid waste permit SW-661 issued by the MPCA on December 10, 2019. A facility physically separated from the Waste Campus would likely be permitted as a separate facility, necessitating significantly more permitting efforts than associated with solid waste permit SW-661. For this feasibility study, permitting requirements are outlined for an SSOM compost facility permitted under current solid waste permit SW-661 as an additional waste activity under solid waste permit SW-661. This is assumed to apply to a compost facility located on the existing Waste Campus or on adjacent property at Lab USA (previously permitted under solid waste permit SW-670).

The first step in the planning an SSOM compost facility is to evaluate the permitting requirements. This section covers the regulatory requirements associated with facility siting criteria, design, and operations. Design details and cost estimates is provided in **Section 5** and **8**, respectively. There would be costs associated with permitting but they are not evaluated for this feasibility study. The regulatory review requirements encompass an examination of existing compost facilities included in **Appendix J**. The following section provides a summary of these requirements.

7.1 Permitting Requirements Summary

A SSOM compost facility would require a major permit modification to solid waste permit SW-661 for the Waste Campus, including a new public notice process. Based on this feasibility study, here are key observations for developing a compost facility at the Waste Campus or nearby Lab USA:

Siting Criteria

- The SSOM compost facility would not apply to siting restrictions related to floodplains, shoreland/wild/scenic rivers, wetlands, karst, or air emissions standards.
- Some steps will need to be taken during permitting to adequately address design criteria related to soil type and depth to groundwater.
- Existing permitting documents may be adequate or require minimal modification to address siting criteria, site preparation, site access, stormwater, and contact water disposal.

Design Features

- Primary features associated with a compost facility will include site access, covered mixing structure, active processing pad, leachate collection, screening and bypass area, feedstock area, compost finishing area, and final processed compost area.
- Final design criteria will need to address anticipated permitted waste flows and feedstock needs.
- A contact water management plan would need to be implemented to manage contact water as leachate in the vicinity of the processing pad and mixing areas.
- Rejects and residuals removed once compost is designated as MSW and must be stored under cover or in an area with leachate collection; it is anticipated that this material would be processed on-site under current RDF operations.

Facility Operations (Develop Operations & Maintenance Plan)

- Daily staffing every day that SSOM is received.
- Development of a Waste Analysis Plan for training procedures for inspection and acceptance of organic loads.
- Organic material delivery.
- Management plans for odor, vectors, and nuisance conditions.
- Mixing and measurement procedures to ensure achievement of proper moisture content, carbon to nitrogen ratio, porosity, and pH.
- Management and measurements for windrows, often daily, to assure process to further reduce pathogens (PFRP) has been obtained.
- Compost sampling and testing plan for compost classification including training, equipment, sampling methods, and quality assurance/quality control.
- Reporting, training, and contingency action.
- Information related to compost distribution and end use.

Incorporation of Yard Waste

- Lesser amounts of SSOM could be incorporated into the existing yard waste compost windrows at the Waste Campus following re-permitting of the yard waste composting operation. This would entail additional permitting steps including:
- Regulatory criteria established in Minnesota Rules 7035, require that any alternatives such as combining lesser SSOM waste streams with current yard waste properties would need to be proposed through a demonstration project per Minnesota Rules 7035.2860.
- The demonstration project would need to address issues including liner design, contact and storm water management/treatment, compost contamination, and testing criteria that are currently not applied to yard waste composting program.

8 Environmental Impacts Evaluation

The use of decomposing organic matter in cultivation dates backs thousands of years. In recent times, the use of compost has been found to be beneficial for many purposes. The United States Compost Council has identified the following beneficial uses for compost:

- Improve Soil Health
- Promotes Healthier Plant Growth
- Prevents Soil Erosion
- Assists with Stormwater Management
- Assists with Wetland Reclamation
- Reduces Project Maintenance Costs
- Conserves Water
- Reduces Waste
- Combats Climate Change

While composting has clear benefits, its environmental impacts, such as hauling and facility operations must be evaluated. In Minnesota, composting doesn't require an environmental review for either an Environmental Assessment Worksheet (EAW) or Environmental Impact Statement (EIS). However, a recent voluntary environmental review was completed for the SMSC Organics Recycling Facility in Minnesota (MPCA, 2023) identified four types of environmental impact that may reasonably be expected to occur at a compost facility:

- Surface water quality impacts
- Groundwater impacts
- Air Quality impacts
- Greenhouse gas (GHG) emission impacts.

Each of the above types of impacts are discussed below in reference to compost facilities.

8.1 Surface Water Quality Impacts

Surface water quality impacts at compost facilities is influenced by runoff from stormwater and operational water use. Stormwater runoff can be impacted during initial construction of a compost facility but also during site operations. During operations, runoff may contact potential contaminants due to 1) the application of water to organic material for decomposition and, 2) exposure of compost material to stormwater at various stages of processing, which can then be carried by runoff into streams and water bodies. Therefore, effective management of stormwater at composting facilities is necessary to minimize impacts on surface water quality.

In Minnesota, stormwater associated with compost facilities is managed through the MPCA's National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) through the following stormwater permits:

- NPDES/SDS General Construction Stormwater Permit
- NPDES/SDS Industrial Stormwater Permit

Stormwater permits mandate the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP), detailing best management practices (BMPs) to prevent erosion, control sediment, and reduce stormwater impacts. Inspections and monitoring assess BMPs effectiveness with adjustments being made as needed to meet permit requirements.

In addition to complying with stormwater permit requirements, the MPCA regulates compost contact water as leachate, necessitating collection, storage, and disposal to adhere to leachate management requirements under MR 7035. The infrastructure and procedures required by NPDES/SDS permitting system and solid waste rules for compost facilities effectively minimize any potential surface water quality impacts.

8.2 Groundwater Impacts

Groundwater impacts relate to water quality and water usage. Contact water produced from compost operations and stormwater can affect groundwater quality through soil infiltration. Proper stormwater and contact water management can prevent these impacts.

Water usage at compost facilities varies based on methods and facility size. Most facilities reuse water to maintain optimal moisture contents to maintain high decomposition rates, since most compost operations are net consumers of water. Larger facilities using over 10,000 gallons per day or 1 million gallons per year need a water appropriation permit from the Minnesota Department of Natural Resources (MnDNR) to manage local water resources properly. The water appropriation permit (Minn. Stat § 103G.261) and the regulatory program minimizes the potential for groundwater impacts associated with compost facilities.

8.3 Air Quality Impacts

Composting produces air emissions from decomposing organics and equipment fuel combustion during loading/unloading, turning, grinding, screening, and hauling. Emissions, dust and odors can occur during site construction and operations.

Air quality impacts will vary at each facility based on the location, method of composting, equipment used, and size of the facility. A recent voluntary environmental review of the SMSC Facility (MPCA, 2023) included an extensive stationery air quality assessment including an air emission source evaluation and inventory/ coordination with the MPCA. Emission factors and air modeling were completed through an Applicability Determination Request (ADR) and Air Emission Risk Assessment (AERA) with the proposed annual throughput of up to 172,500 tons of organic material. The results of the AERA for stationary air emissions as well as vehicle emissions air assessment indicated that emissions would not adversely impact air quality.

Sources of dust generally includes vehicle traffic on unpaved roads, equipment and material handling, and windblown debris. Dust generation will potentially occur during construction and can generally be managed with common construction management methods. Similar road preparation through paving, wetting, or other treatment methods will mitigate the potential for dust. Organic material and compost processes incorporate a moisture content to optimize organic material break down; as a result, raw organic materials and compost materials are not susceptible to dust emissions compared to sand and gravel-type operations. In addition, the air assessment and modeling completed for the SMSC facility confirmed fugitive dust is unlikely to exceed National Ambient Air Quality Standards (NAAQS).

Sources of odor at compost facilities generally are found in raw materials, decaying material, and contact water. Odor is primarily controlled through maintenance and operations, but certain facility design can also control odor. For example, contact water generally has a high potential for odor, so many facilities are moving toward indoor composting operations or CASP systems that utilizes bunkers with biolayers and biofilters. The CASP system not only minimizes the generation of contact water, but it accelerates the initial composting steps that are associated with odor. Similarly, large contact water ponds may require aeration to minimize odors. Furthermore, facility design and operations plans should address immediate storage and handling needs if any high potential raw materials that cause odors are to be accepted. In Minnesota, the adequacy of facility design and operations plans are approved through the solid waste permitting process.

Therefore, given the organic diversion needs of the City in comparison to the proposed SMSC facility, it is anticipated that potential emissions from a Red Wing organics compost facility would not adversely impact air quality for facilities in compliance with existing regulatory requirements.

8.4 GHG Emission Impacts

The EPA Waste Reduction Model (WARM) Model v15 can measure potential GHG emission reductions from various waste activities. The net emissions is provided in units of metric tons CO_2 equivalents. It is important to note that this includes emission reductions and carbon storage. As shown in **Appendix K**, the model assumes an emission rates of 0.5 Metric tons of carbon dioxide equivalent ($MTCO_2e$) per short ton for landfilled food waste and -0.12 $MTCO_2e$ per short ton for composted food waste. Therefore, in switching from landfilling organics to composting organics produces a net reduction in GHG emissions of 0.62 $MTCO_2e$ per short ton of food waste.

Hauling and transportation is a significant variable in calculating GHG emissions. The WARM model v15 can determine CO_2 emissions from transportation (miles). The following simplified equation can also be used:

$$GHG\ Emissions = D \cdot W \cdot EF$$

Where,
GHG Emissions = greenhouse gas emissions (grams CO_2)
D = distance shipment traveled (miles)
W = weight of shipment (tons)
EF = Hauling modes specific emission factor (grams CO_2 per ton-mile)

Additional information on GHG as it pertains to WARM calculations for landfills and transportation is included in **Appendix K**.

8.5 Environmental Summary

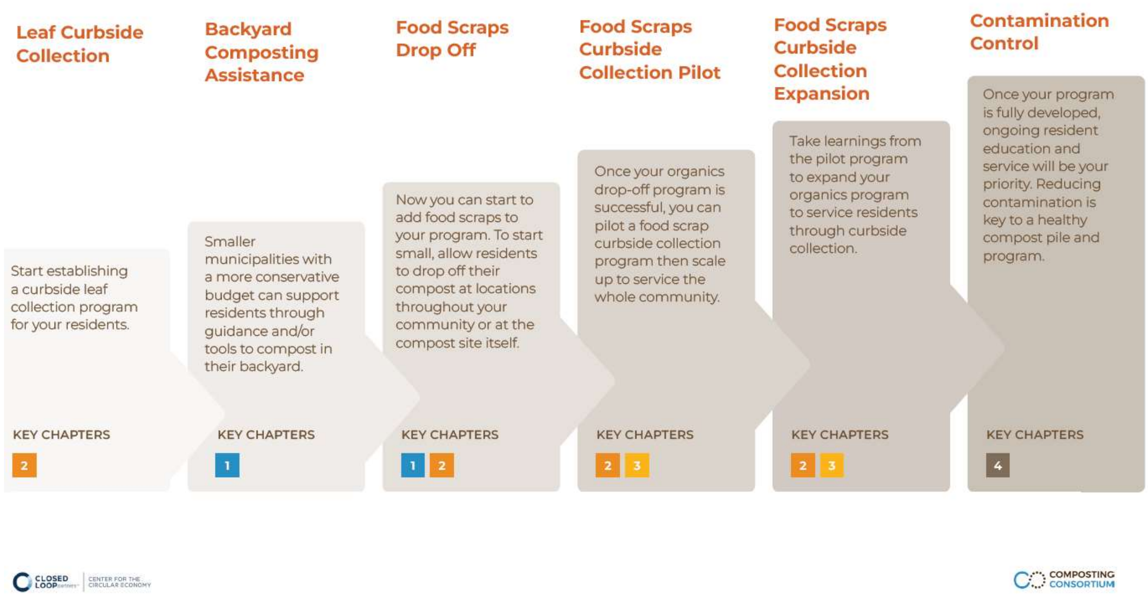
Environmental impacts for an organic diversion program could have potential impacts on stormwater and groundwater quality, air quality and GHG emissions depending on the method of collection and disposal. A compost facility could have potential impacts to surface water, groundwater, air quality and GHG emissions. As was discussed, surface water impacts will be eliminated with a covered active PFRP compost area. Minimal contact water will be produced, since water can be treated as stormwater during curing and final product storage and not leachate. Management of contact water (i.e., a covered active compost facility) will eliminate any groundwater impacts from contact water. Air quality impacts from dust and odors should be limited with best management practices.

Offsite disposal methods have limited effects on air quality and GHG emissions, besides from hauling activities. According to the EPA WARM Model v15, changing food waste management methods from landfilling to composting produces a net reduction in GHG emissions of approximately 0.62 $MTCO_2e$ per short ton of food waste. For offsite disposal requiring longer haul routes for disposal, the reduction in GHG emissions from landfilling to composting more than makes up for the increase in emissions from transport. Note that GHG emissions are approximately equivalent between waste-to-energy and composting of organic waste based on the WARM model.

9 Recommendations

According to the Municipal Blueprint for Composting Report, most organic collection programs undergo a typical growth pattern from yard waste collection to food scraps curbside collection. This typical growth pattern can be seen in **Figure 8** (Closed Loop, 2024). Municipalities should assess their current stage in this growth pattern and plan how to advance while allowing the program to grow and scale naturally as community engagement increases.

Figure 8 – Typical Growth Of An Organics Program From Basic Yard Waste to Full-Scale



(Source: Closed Loop Partners, "A Blueprint for Scaling Collection and Composting Infrastructure", 2024)

The City of Red Wing has a yard waste collection and composting program, but no food scraps collection. Therefore, the next step is to support backyard composting and adding food scraps drop off sites. Some residents indicated in surveys they already participate in backyard composting, and the City started a pilot organic drop off site and food scraps curbside co-collection program, which is detailed in **Section 10**. It is recommended then the City add more food scrap drop off sites, and after these are successful to expand the organics program with curbside collection.

Food scraps curbside collection program options have been outlined by collection and disposal options. Collection options include curbside collection with a dedicated organics route, curbside co-collection with DCBs and drop off sites. Disposal options are offsite or onsite disposal. Onsite disposal considered the construction of a new compost facility at either the Waste Campus or Lab USA building, while offsite considers transporting organics to a regional compost facility.

Each method was evaluated based on a social, operational, economic and environmental perspective. The following sections address each parameter:

- Social – **Section 2**
- Operational – **Section 3, 4** and **5**
- Economic – **Section 6**
- Permitting – **Section 7**
- Environmental – **Section 8**

Each collection/disposal method was scored as it relates to social, operational, economic, and environmental impacts. Adding these scores together reveals the most optimal organic collection program for the City as determined from this feasibility study.

9.1 Social

City of Red Wing residents responded positively to a food scraps collection program if it involves no or minimal costs to participate, is convenient like curbside collection and includes a comprehensive outreach and education program as determined from survey and focus groups. Residents responded less favorably to drop off sites, and were undecided on curbside co-collection with DCBs.

Several businesses in the City of Red Wing including Red Wing Shoe, Treasure Island Resort and Casino (TIRC), ADM, Mayo Clinic, Liberty's Restaurant and Lounge, and Bev's Café, have expressed interest in supporting a City driven food scraps collection program. While many businesses are favorable towards the idea due to environmental and sustainability considerations, they all emphasized the importance of thoroughly evaluating implementation factors such as costs, operational logistics, employee training requirements, and measures to prevent odor and vermin issues. However, many commercial sources of organics within and around the City did not respond to comment.

Industrial sources of organics within the area were not favorable to a organics collection program. Institutional sources of organics, like the Red Wing Public Schools District, were interested and responded favorably to a city food scraps collection program. But like commercial entities in the city, wanted more information about costs and operational logistics before fully supporting an initiative.

9.2 Operational

The scale of operations depends on the amount of organic tonnage captured from an organics collection program. Capturable organic tonnages were estimated based on residential, commercial, and institutional sources in the region. Most of the organics were projected to come from residential and commercial sources. Smaller amounts of organics were estimated to come from other commercial, non-descript and institutional sources. It is projected that after 10 years with an implemented organics collection program the City could capture approximately 650 tons of organics per year with a moderately successful organic collection program. This projected tonnage was assumed for curbside collection options including curbside collection with a dedicated organics route and curbside co-collection with DCBs. While drop off sites are expected to collect less organic tonnage.

Since, this projected tonnage was less than the assumed minimum processing design capacity of 1,000 tons of organics per year for a new industrial compost facility, transporting collected organics to a regional offsite compost facility was found to be more practical than onsite disposal alternatives.

9.3 Economic

Collection method options were evaluated based on estimated capital and operating costs for a given year. A net present value analysis was used to identify the most economically favorable disposal option. Curbside co-collection with DCBs had the lowest capital and operating costs compared to curbside collection with a dedicated organics route. Drop-off sites despite possible lower costs, were assumed to collect less organic tonnage than curbside options and were therefore not central to the economic analysis of collection methods but considered as a secondary component to a comprehensive organics collection program.

The most economical disposal method was determined to be offsite disposal to SMSC, SET (now WM) Compost Facility or Washington/Ramsey A&D. Onsite disposal options involving a new compost facility at the Waste Campus or Lab USA building had high capital and operating costs that made them economically not viable given projected tonnage organic flows.

9.4 Permitting

The active composting stage, or PFRP process, at both proposed compost facilities would be designed to occur indoors. Therefore, stormwater will not contact compost prior to achieving PFRF criteria. A compost facility at the Waste Campus might require modifications to stormwater control features to comply with Minn. Rules 7035.2836 and NPDES MNR050000. At the Lab USA building, all stormwater systems were designed and constructed in accordance with an Industrial Stormwater Permit, also known as the Multi-Sector General Permit (NPDES MNR050000). Since active composting operations are proposed to occur indoors, it is likely the MPCA would grant an exemption for stormwater requirements as long as stormwater does not come in contact with compost prior to meeting PFPR requirements. However, contact water would still likely be generated albeit at reduced rates from normal compost operations.

Minn. Rules 7035.2836, Subp. 9, Item B(4) requires the collection and treatment of all contact water. On the Waste Campus, industrial wastewater pretreatment facilities are available to manage any contact water generation that may occur from compost operations. Given the typical high organic content of compost contact water, leachate would need to bypass the current site pre-treatment system. At the Lab USA facility, leachate management would allow direct release into the existing trench drain discharge since Xcel previously re-routed the sanitary system to bypass the Waste Campus.

Minn. Rules 7035.2836, Subp. 9, Item B(9) requires the installation of a pad and liner system in areas managing SSOM prior to achieving PFRP and curing. Given specific soil conditions are met at the facility. The existing floor structure of the Lab USA building would meet pad design requirements. However, on the Waste Campus, the existing soils likely don’t meet these conditions and would require a designed flooring pad system.

9.5 Environmental

Environmental impacts for an organic collection program may affect stormwater and groundwater quality, air quality and GHG emissions based on the method of collection and disposal. A new compost facility, if located in Red Wing, could have potential impacts to surface water, groundwater, air quality and GHG emissions. Surface water and groundwater impacts will be minimized with a covered active PFRP compost area. The amount of contact water produced from a covered operation may be a net consumer of water depending on moisture contents of feedstocks, temperatures, and curing times. Any contact water not recycled back into active composting, would be collected and discharged to sanitary for ultimate treatment at the Red Wing wastewater treatment plant. Air quality impacts from dust and odors should be limited with best management practices.

Offsite disposal methods have negligible potential impacts to air quality and GHG emissions within the City of Red Wing. According to the EPA WARM Model v15, switch from landfilling to composting food wastes reduces net GHG emissions by approximately 0.62 $MTCO_2e$ per short ton of food waste. This reduction offsets any GHG emissions caused from offsite transportation and longer hauling routes. Note that changing from combustion (waste to energy) to composting of food waste produces no significant change in GHG emissions based on default model inputs.

9.6 Summary

The most feasible organic collection program will be identified by scoring each collection and disposal method based on its social, operational, economic and environmental impact. Methods with positive impacts receive a score of 3, neutral impacts a score of 2, and negative impacts a score of 1. **Table 25** shows the matrix with scores for each parameter. The collection and disposal method with the highest total score will be considered the most feasible and optimal organics program for the City.

Table 25 – Organic Diversion Program Options Evaluation Matrix

Organic Diversion Program	Social	Operational	Economic	Environmental	Total
Collection Methods					
Curbside	3	3	1	1	8
Durable Compost Bag	2	2	3	3	10
Drop Off Site	1	1	2	3	7
Disposal Methods					
Onsite Lab USA	2	1	1	3	7
Onsite Campus	2	1	1	3	7
Offsite SET	2	3	3	2	10
Offsite SMSC	2	3	3	2	10
Offsite Ram/Wash AD	2	3	3	2	10

From this comprehensive comparison, curbside co-collection with DCBs is identified as the best collection method with 10 points. Offsite disposal to a regional compost facility such as SMSC in Shakopee, SET (now WM) in Rosemount, or the future Ramsey/Washington A&D Facility in New Port is recommended as the best disposal method with 10 points each. SMSC was the lowest cost disposal option, however the beforementioned alternatives were economically equivalent. Therefore, the most feasible, optimum organics program for the City is recommended to include curbside co-collection with DCBs for collection and offsite disposal to SMSC compost facility in Shakopee.

10 Food Scraps Pilot Program

10.1 Introduction

In the Fall of 2024, a food scraps pilot program was initiated to explore the feasibility of a full-scale curbside organics collection program. Although this was an additional task to the initial scope of work, it was viewed as essential to acquire firsthand knowledge of the advantages and disadvantages of a city curbside collection program. This pilot included curbside co-collection with DCBs and offsite disposal at SET (now WM), which was identified as the optimal solution for a full-scale curbside organics program, as detailed in **Section 9**. Additionally, a food scraps drop off site was established at the Waste Campus, as a next step in the City's organic program and to service residents not included in the pilot. The goals of the pilot program, its implementation steps (from pre-launch activities to closure), public outreach and education initiatives, data collection methods and final evaluation, are summarized below.

To develop a food scraps curbside collection program, municipalities must focus on two key aspects. First, securing the collaboration of haulers is essential, a task simplified for communities such as Red Wing that manage collection services directly or collaborate with a single hauler. This involves recognizing the priority for haulers to optimize collection routes for efficiency, aiming to collect maximum tonnage while minimizing travel distances. Second, municipalities must encourage waste generators to actively participate and correctly separate organic materials to prevent contamination. Offering incentives for easy and cost-effective organic separation, along with ongoing public education and effective outreach, can help achieve these goals.

Prior to launching a full-scale food scraps curbside collection program, municipalities typically begin with a pilot program first that is then scaled up to service the whole community. The pilot reveals which approaches are likely to work best in that community and can demonstrate the program's viability.

10.2 Objectives

1. Evaluate the operational feasibility food scraps curbside co-collection with DCBs within the existing solid waste management system at the Waste Campus, and to determine what if any additional resources would be needed to manage a scaled-up program.
2. Track the organic tonnage captured from the pilot program by weighing collected food scraps and monitoring for contamination, which would help normalize assumed household food scraps capture rates.
3. Gauge community interest, participation, awareness, and satisfaction from residents that participated in the pilot program.
4. Examine challenges and lessons from the pilot organics program to help the City in planning for any potential expansion of its organic program.

10.3 Design

Duration	Planning Phase: 3 months, June 1-August 31, 2024 Pilot Phase: 3 months (14 weeks), Sept 1-Nov 30, 2024 Evaluation Phase: 1 month, December, 2024
Collection Frequency	Weekly with trash collection
Neighborhoods	Target recruitment in neighborhoods based on household density. This will limit the number of hauler trucks involved in the pilot to one, making it easier for MRF workers to identify which loads need bag separation.
Number of Households	Minimum of 40 households. Determining next steps regarding a broader rollout.
Household participation cost	Free
Household incentive	Free kitchen countertop compost pail ($25 value), free durable compost bags.
Recruitment Start Date	October 1, 2024
Budget line items	– Contractor to help develop, launch & manage pilot with a focus on the participating households (City will focus on MRF and haulers). – Outreach materials (tailor materials available in public domain). – DCBs per household – Compost pail per household – Hauling (staff and truck) – Processing (i.e. disposal tipping fees) – Staff member to help support sorting at the Waste Campus
Acceptable & Non-Acceptable Items	See Appendix L.

10.4 Implementation

The City launched the food scraps pilot program accompanied by a series of community engagement campaigns and involvement initiatives. The pilot timeline included the following timelines:

- June 1 – Pre-pilot Preparation
- July 1 – Recruitment
- Sept. 1 – Pilot Launch
- Dec. 1 – Pilot Wrap Up and Evaluation

Numerous public outreach and education materials, specifically tailored to the City of Red Wing, were developed for the pilot program, including sign-up postcards, stickers, press releases, webpages, education materials (FAQs) and social media posts. The pilot was also promoted at local farmers markets and sustainability commission meetings, engaging the community and increasing involvement. These materials are included in **Appendix L**. It is important to note for other municipalities looking to initiate a pilot organics program, that the Closed Loop municipal partner platform has free compost education materials such as e.g. signs, stickers, tags available online for use. https://www.closedlooppartners.com/research/municipal-blueprint-report/

After selecting a neighborhood on Aspen Avenue for a curbside collection pilot, 32 households voluntarily decided to participate in the target neighborhood and received DCBs and kitchen bins. Weekly emails encouraged participation and gathered feedback. Participants collected food scraps in DCBs, which when full were placed in garbage carts, and these were collected during weekly regular garbage pickups. Information on acceptable materials for food scraps collection was provided in flyers delivered to participants and was available on the webpage. Collected DCBs were processed and separated from the waste stream at the Waste Campus. The garbage truck from the neighborhood pilot route would tip its load separately upon arrival, which would be processed immediately. The load was sent through the incoming conveyor feed and DCBs would be picked from the line and collected in a 64-gallon cart. A handful of bags would be opened to inspect for any contamination. The total weight of food scraps collected would be measured and recorded. At the end of the week, all collected organics from the pilot were hauled to SET (now WM) for disposal.

Additionally, a food scraps drop off site was added at the Waste Campus with two 64-gallon carts placed outside the main office at the Waste Campus. Food scraps were also inspected, weighed and then combined with the curbside pilot organics before being hauling to SET (now WM) compost facility for disposal.

10.5 Results

The curbside collection pilot was conducted for 14 weeks alongside a drop off site. Data from both collection methods was tracked and showed that a total of 4,626 pounds (2.3 tons) of food scraps were collected. The curbside pilot, involving 32 households, gathered 1,735 pounds with an average 124 pounds per week collected. The average DCB bag weight was found to be 3.64 lbs/week. Households often used more than one bag per week. The drop off site at the Waste Campus collected 2,891 pounds, though the number of participants wasn't tracked. Further efforts will encourage residents to sign-up for the drop off site, so that this information can also be tracked, and interested participants could receive updates on the City organics program. **Figures 9, 10 and 11** illustrate weekly collection rates for each method and the total combined.

Data for the curbside pilot program was consistent, but exhibited more variable for the drop off site on a week-to-week basis. While participation and collected weekly tonnage trended downwards from start to finish, curbside collection ultimately was very stable and only decreased by approximately 10 pounds of food scraps collected from week 1 to week 14. Curbside collection tonnage peaked in week 2 at 197 pounds and reached a low in week 13 at 79 pounds collected. Before, during and after surveys were performed for curbside co-collection pilot program participants, which will help shed light on data trends related to curbside collection. More information on these surveys can be found in **Appendix L**.

The variability in drop off site participation and collected food scraps weight may be attributed to various factors related to community engagement efforts, such as having a booth at the local farmers market to promote the program, and weather conditions; participation may have declined as temperatures dropped. More information would have to be collected to determine why this variability, and trends occurred. Surveys could not be conducted for drop off site participants, since no sign-up was required.

Figure 9 – Curbside Co-Collection with DCBs Weekly Collection Rate

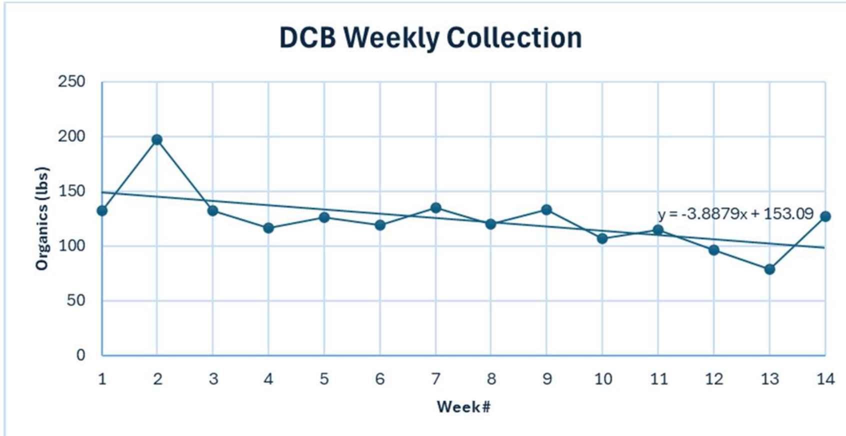


Figure 10 – Drop Off Site Weekly Collection Rate

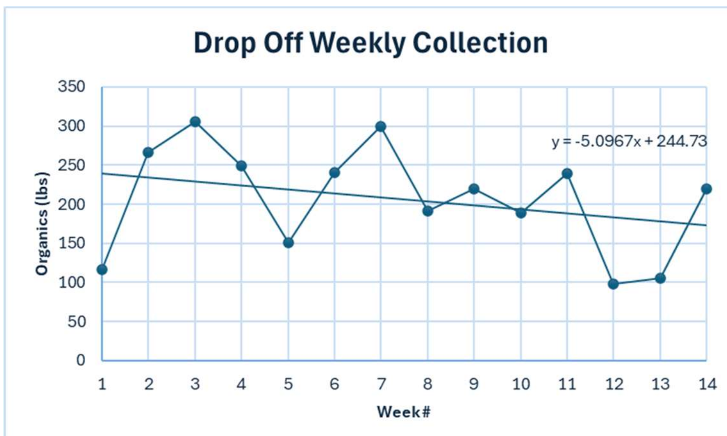


Figure 11 – Total Weekly Collection Rate

10.6 Conclusions

In summary the curbside pilot program had consistent participation and good organic capture rates from participating households. Participants appreciated the outreach and education materials and responded favorably to the entire curbside collection pilot program and indicated they would likely sign-up for any future City curbside collection program. The rollout of the pilot program was smooth, and residents generally felt comfortable with its execution. The drop off site quite surprisingly collected more food scraps, with minimal to no contamination than the curbside collection pilot. However, it was never determined how many residents were using the drop off site.

Processing DCBs and extracting the bags from the waste stream posed significant challenges with current staffing and equipment. The pilot program had ideal conditions where incoming loads with DCBs were segregated and kept separate from other loads on the tipping floor, and hand pickers were notified when a load containing DCBs was being loaded onto the conveyor feed. Even under these ideal conditions, hand pickers struggled to remove DCBs from the waste stream along with all other materials considered problem items prior to RDF processing. Despite these difficulties, durable compost bags (DCBs) proved their durability and were generally able to survive the solid waste collection system prior to removal. From a collection standpoint, curbside co-collection with DCBs proved to be as straightforward for participants as household recycling, imposing no additional demands. Curbside collection with DCBs pilot program ended in November 2024.

The City has decided to continue the drop off site program to support future growth of a City organic program. Additional satellite drop off sites may be added based on cost, avoiding excessive spending with minimal participation. This follows the Municipal Blueprint for Composting Report, which recommends growing a successful food scraps drop off program before starting a pilot curbside and eventual full-scale curbside collection program, as noted in **Section 9** (Closed Loop, 2024). Greater community involvement is encouraged through grassroots development, including collaboration with the Sustainability Commission, churches, neighborhood communities, and farmers markets. To manage potential odors and vermin, free bags will continue to be offered to drop off site participants, but this may change if costs rise significantly. While DCBs are not required for drop off sites, generic compostable bags are always recommended.

Smart bins, which use sensors, data analytics and mobile apps to boost collection and sorting efficiency, may be considered for future organic curbside collection programs. These bins could notify waste managers or automatically detect when food scraps are placed within the bin, allowing for targeted collections and more efficient operations. Currently, the City does not view curbside co-collection with DCBs as viable due to existing staffing, equipment and processing limitations at the Waste Campus. If funding for automatic processing robotics, like those at Ramsey/Washington Recycling & Environmental Center, is secured, this view could change.

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Drawings

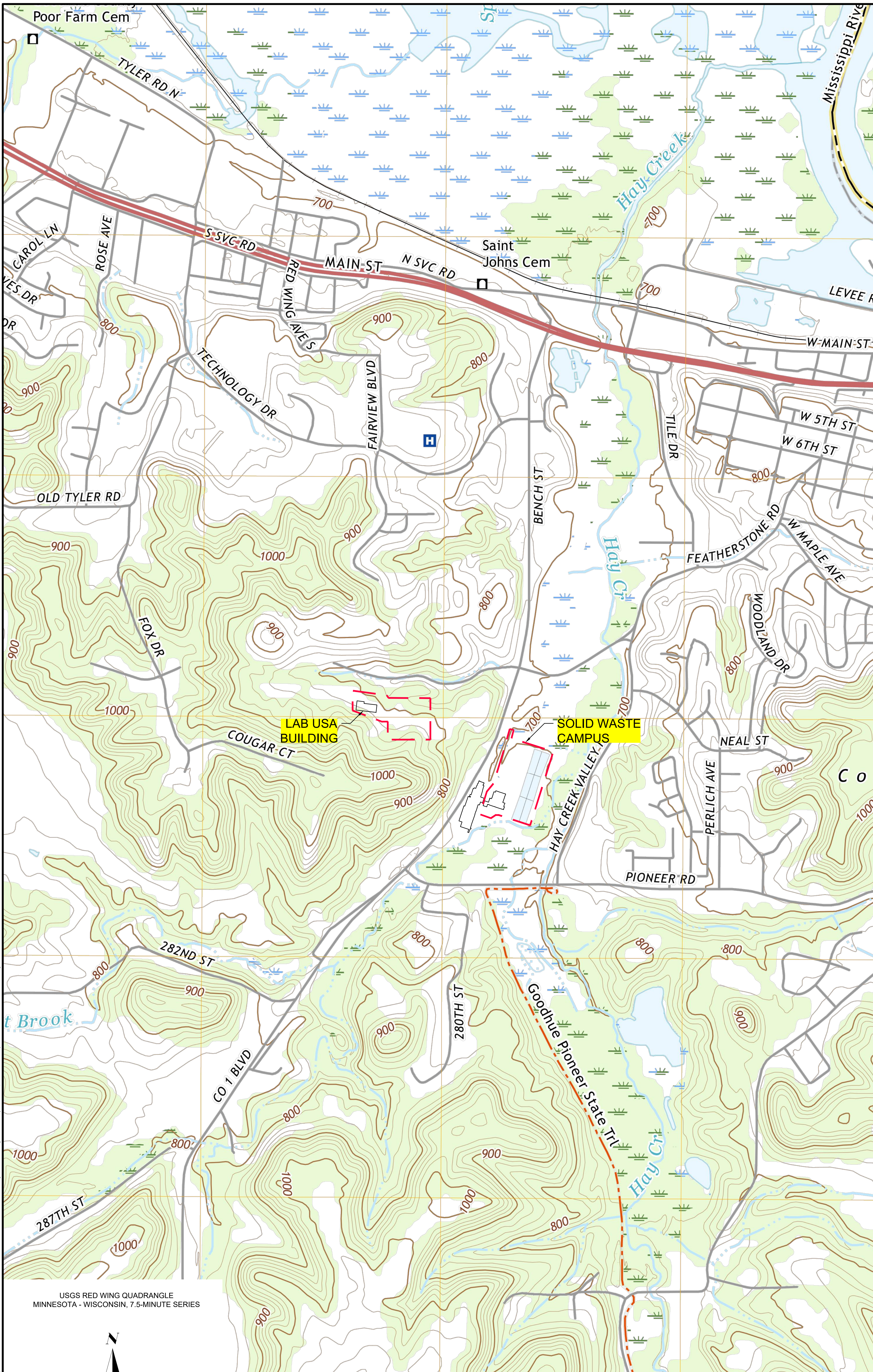
Drawing 1 – Site Location Map

Drawing 2 – Existing Conditions

Drawing 3 – SW Campus Processing Layout

Drawing 4 – Lab USA Building Processing Layout

Drawing 5 – SW Campus Traffic Flow



PROJECT NO.
RWING 169384

DATE:
10/26/2023

SITE LOCATION MAP

SOURCE SEPARATED ORGANICS COLLECTION AND COMPOST FEASIBILITY STUDY

RED WING, MINNESOTA

DRAWING NO. 1

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PROJECT NO.
RWING 169384

DATE:
5/26/2023

EXISTING CONDITIONS

SOURCE SEPARATED ORGANICS COLLECTION AND COMPOST FEASIBILITY STUDY
RED WING, MINNESOTA

DRAWING NO. 2

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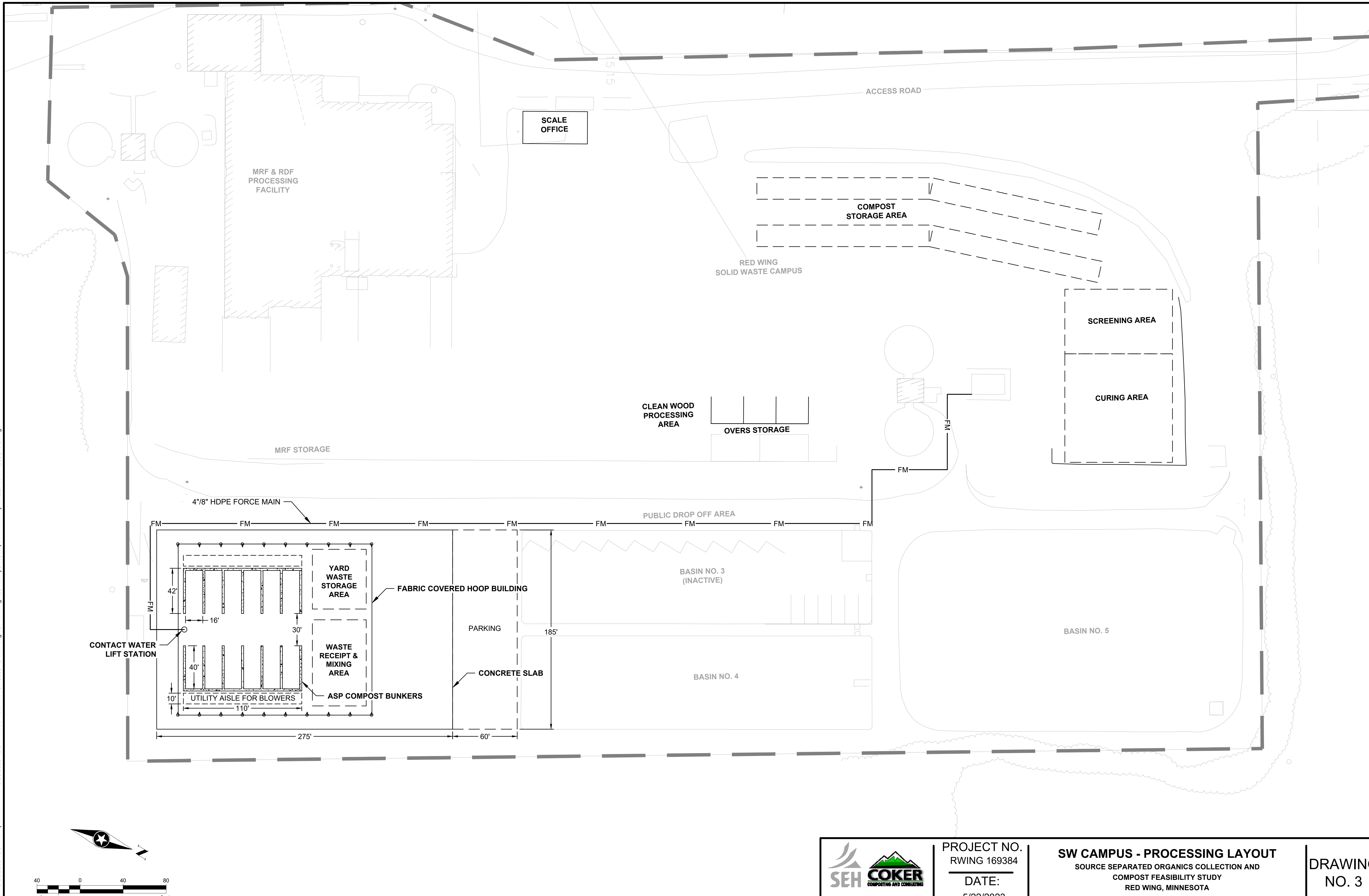

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SEH | COKER COMPOSTING AND CONSULTING

PROJECT NO. RWING 169384

DATE: 5/22/2023

SW CAMPUS - PROCESSING LAYOUT

SOURCE SEPARATED ORGANICS COLLECTION AND COMPOST FEASIBILITY STUDY

RED WING, MINNESOTA

DRAWING NO. 3

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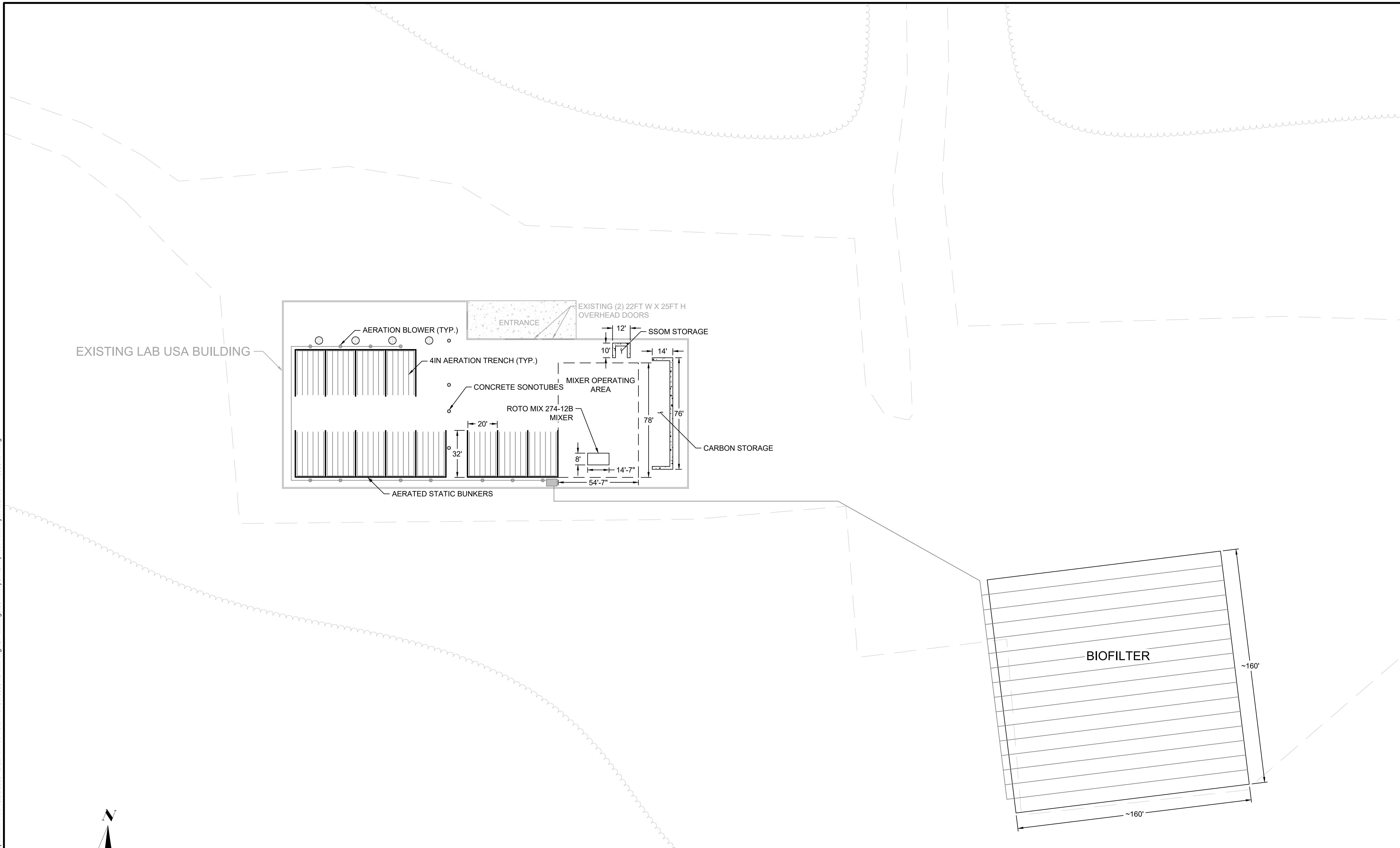


PROJECT NO.
RWING 169384

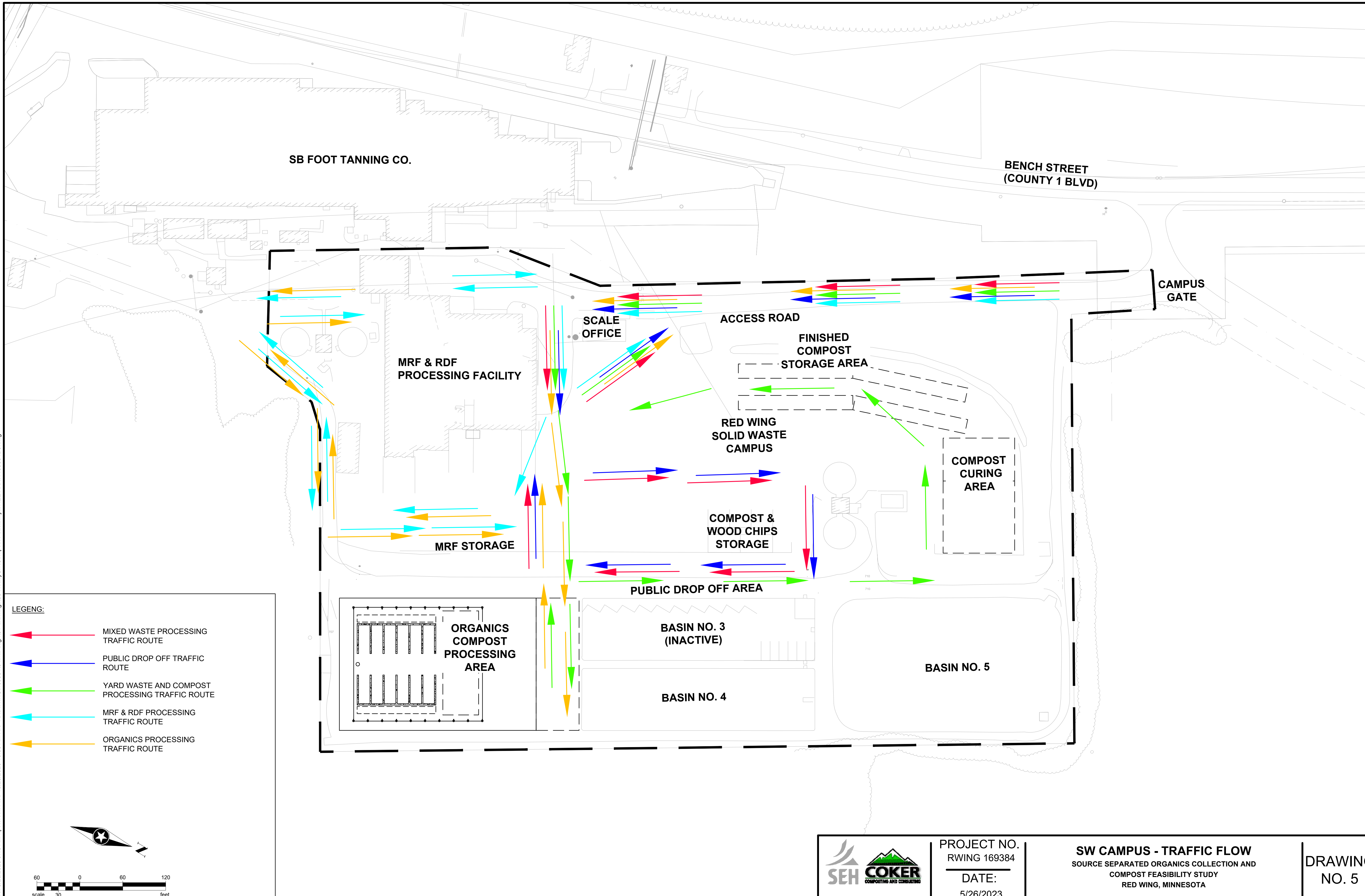
DATE:
5/26/2023

LAB USA BUILDING - PROCESSING LAYOUT

SOURCE SEPARATED ORGANICS COLLECTION AND COMPOST FEASIBILITY STUDY

RED WING, MINNESOTA

DRAWING
NO. 4



SEH COKER COMPOSTING AND CONSULTING

PROJECT NO.
RWING 169384

DATE:
5/26/2023

SW CAMPUS - TRAFFIC FLOW

SOURCE SEPARATED ORGANICS COLLECTION AND
COMPOST FEASIBILITY STUDY
RED WING, MINNESOTA

DRAWING
NO. 5

Save: 5/26/2023 9:16 AM npeterson Plot: 10/26/2023 10:53 AM X:\PT\R\RWING\169384\5-final-dsgn\51-drawings\85-HeavyCiv\Compost Feasibility\SHEETS\RW169384D5.dwg

Appendix A

Resident Survey Results

Food Waste Collection Survey

The City of Red Wing is interested in hearing from residents!

Please complete this 3-minute survey by December 16, 2022.

Red Wing is exploring ways to offer a composting program to meet Minnesota's goal of reducing waste by 75% by 2030. Food waste makes up one-third of household garbage. Composting is nature's way of recycling food waste. Composting turns food waste into rich, healthy soil.

Survey respondents are eligible to win one of three $5 gift cards! Participation in the prize drawing is optional (one entry per person, one prize per household). To be eligible, you must be a Red Wing resident and provide your contact information at the end of the survey. Your contact information will not be shared. Whether you participate in the drawing or not, all survey responses will be confidential.

Thank you! Your feedback will help Red Wing know what matters to its residents about composting food waste.

This project is supported by a grant from the Minnesota Pollution Control Agency.

Food Waste Collection Survey

* 1. Are you a resident of Red Wing?

- ◯ Yes
- ◯ No

Food Waste Collection Survey

2. How do you currently dispose of food waste? (select up to three options)

- [ ] Compost it in my backyard
- [ ] Put it in the garbage can
- [ ] Drop it off at a food scraps collection location
- [ ] Feed it to livestock
- [ ] Other
- [ ] Comment (please specify)

Food Waste Collection Survey

Food Waste Collection Options

The next four questions are about options Red Wing is considering for a food waste collection program.

Food Waste Collection Survey

3. How likely are you to use a weekly curbside food waste collection service if the city provides a food scraps cart to <u>all</u> households?

- ◯ Very likely
- ◯ Somewhat likely
- ◯ Not likely

Comment (please specify):

Food Waste Collection Survey

4. How likely are you to voluntarily sign up for curbside food waste collection if the city provides a food scraps cart and curbside collection?

- ◯ Very likely
- ◯ Somewhat likely
- ◯ Not likely

Comment (please specify):

5. How likely are you to buy durable compost bags from the city and put your food waste in those bags for collection on your regular trash pickup day?

- ◯ Very likely
- ◯ Somewhat likely
- ◯ Not likely

Comment (please specify):

Food Waste Collection Survey

6. How likely are you to take your household's food waste to a nearby drop-off station?

- ◯ Very likely
- ◯ Somewhat likely
- ◯ Not likely

Comment (please specify):

Food Waste Collection Survey

7. Select all the reasons why you are not likely to use a food waste collection service:

- [ ] None, I am likely to use a food waste collection service
- [ ] I worry about the bad smell
- [ ] I worry about attracting insects
- [ ] I worry about attracting rats and other vermin
- [ ] I don’t have a place in my kitchen to collect food waste
- [ ] I don’t have a place for another waste cart
- [ ] I don’t want to pay more
- [ ] I don’t know what materials to put in a curbside food waste collection service
- [ ] Other
- [ ] Comment (please specify):

Food Waste Collection Survey

* 8. What is the name of Red Wing’s annual summer festival? [comment]

Food Waste Collection Survey

9. If you are a Red Wing resident and interested in the drawing for a $5 gift card, provide your contact information below. Your survey responses will remain anonymous. Survey responses will be analyzed in the aggregate and not at the individual level. Emails linked to responses will be deleted following the distribution of prizes. One entry per person, one prize per household, eligibility is limited to Red Wing residents.

First Name:

Last Name:

E-mail:

Street:

City:

Zip Code:

Food Waste Collection Survey

10. Share your email if you are interested in providing additional feedback to support the City’s study of this program.

Email:

Food Waste Collection Survey

This completes the survey. Thank you for your participation!

Food Waste Collection Survey

Sorry, this survey is for Red Wing residents only. Thank you!

Food Waste Collection Survey

Monday, April 08, 2024

1664

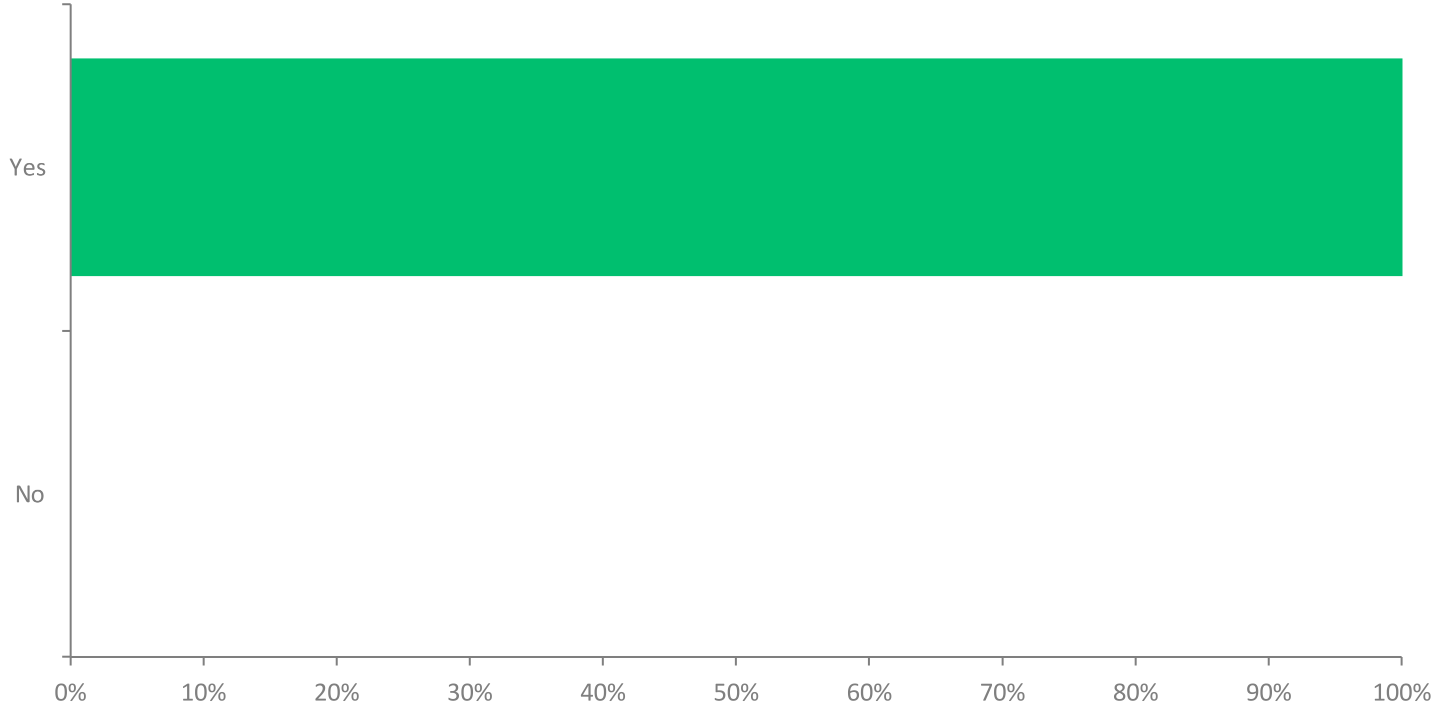
Total Responses

Date Created: Tuesday, November 01, 2022

Complete Responses: 1664

Q1: Are you a resident of Red Wing?

Answered: 802   Skipped: 0



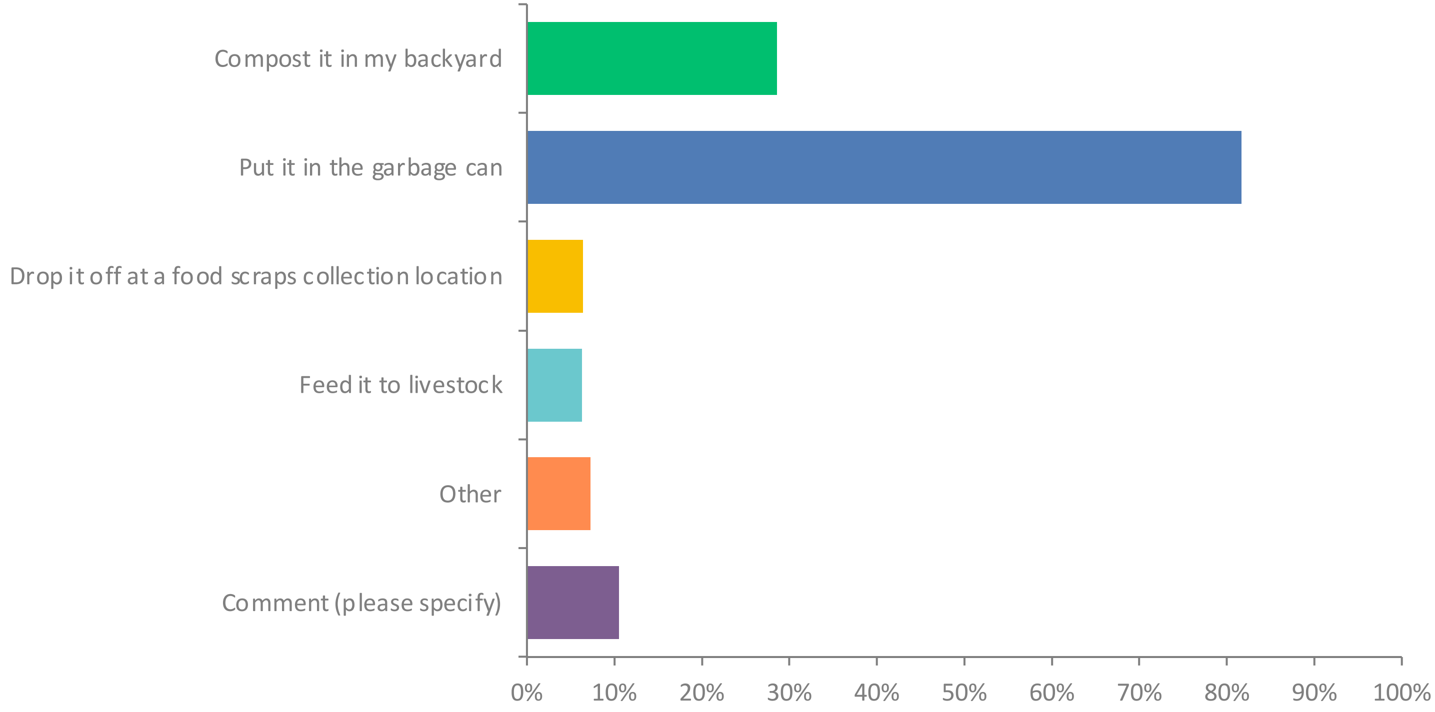
Q1: Are you a resident of Red Wing?

Answered: 802 Skipped: 0

ANSWER CHOICES	RESPONSES	
Yes	100%	802
No	0%	0
TOTAL		802

Q2: How do you currently dispose of food waste? (select up to three options)

Answered: 799 Skipped: 3



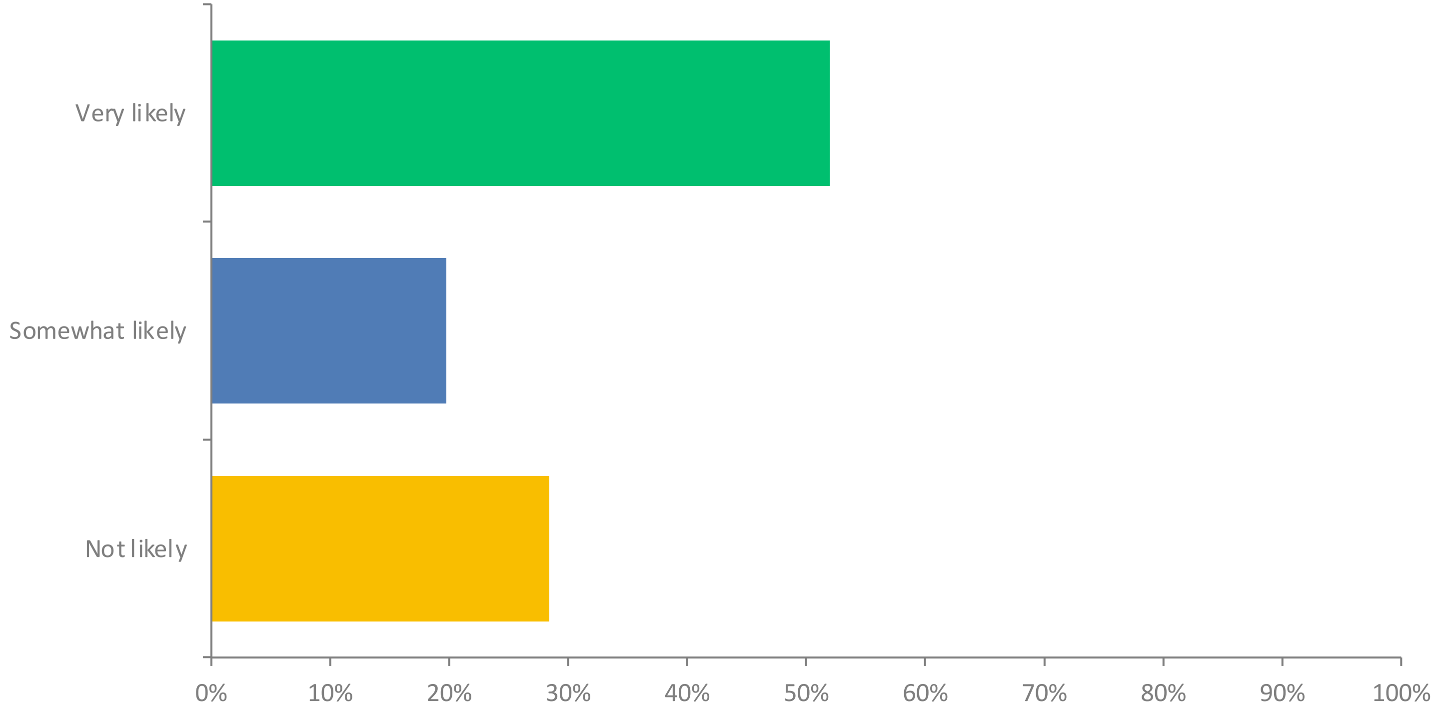
Q2: How do you currently dispose of food waste? (select up to three options)

Answered: 799 Skipped: 3

ANSWER CHOICES	RESPONSES	
Compost it in my backyard	28.54%	228
Put it in the garbage can	81.60%	652
Drop it off at a food scraps collection location	6.38%	51
Feed it to livestock	6.26%	50
Other	7.26%	58
Comment (please specify)	10.51%	84
TOTAL		1123

Q3: How likely are you to use a weekly curbside food waste collection service if the city provides a food scraps cart to all households?

Answered: 797 Skipped: 5



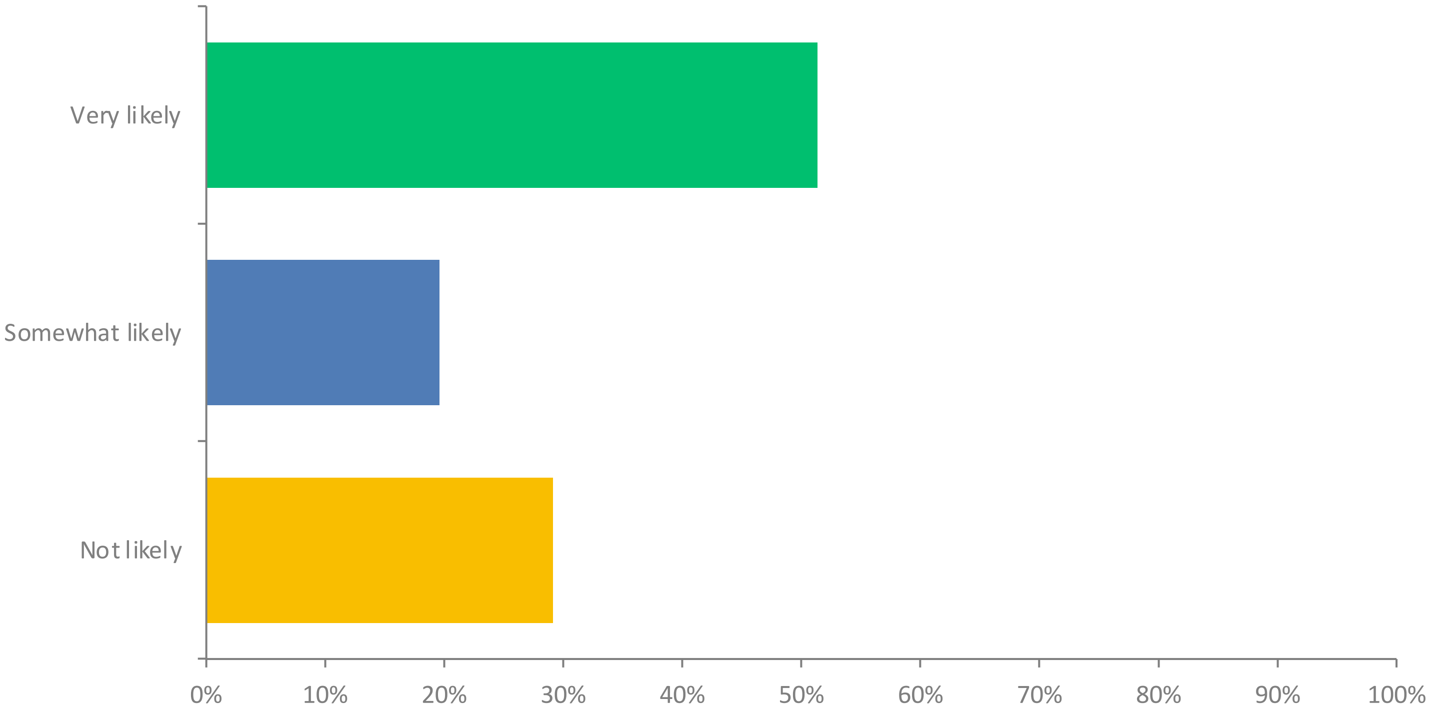
Q3: How likely are you to use a weekly curbside food waste collection service if the city provides a food scraps cart to all households?

Answered: 797   Skipped: 5

ANSWER CHOICES	RESPONSES	
Very likely	51.94%	414
Somewhat likely	19.70%	157
Not likely	28.36%	226
TOTAL		797

Q4: How likely are you to voluntarily sign up for curbside food waste collection if the city provides a food scraps cart and curbside collection?

Answered: 797 Skipped: 5



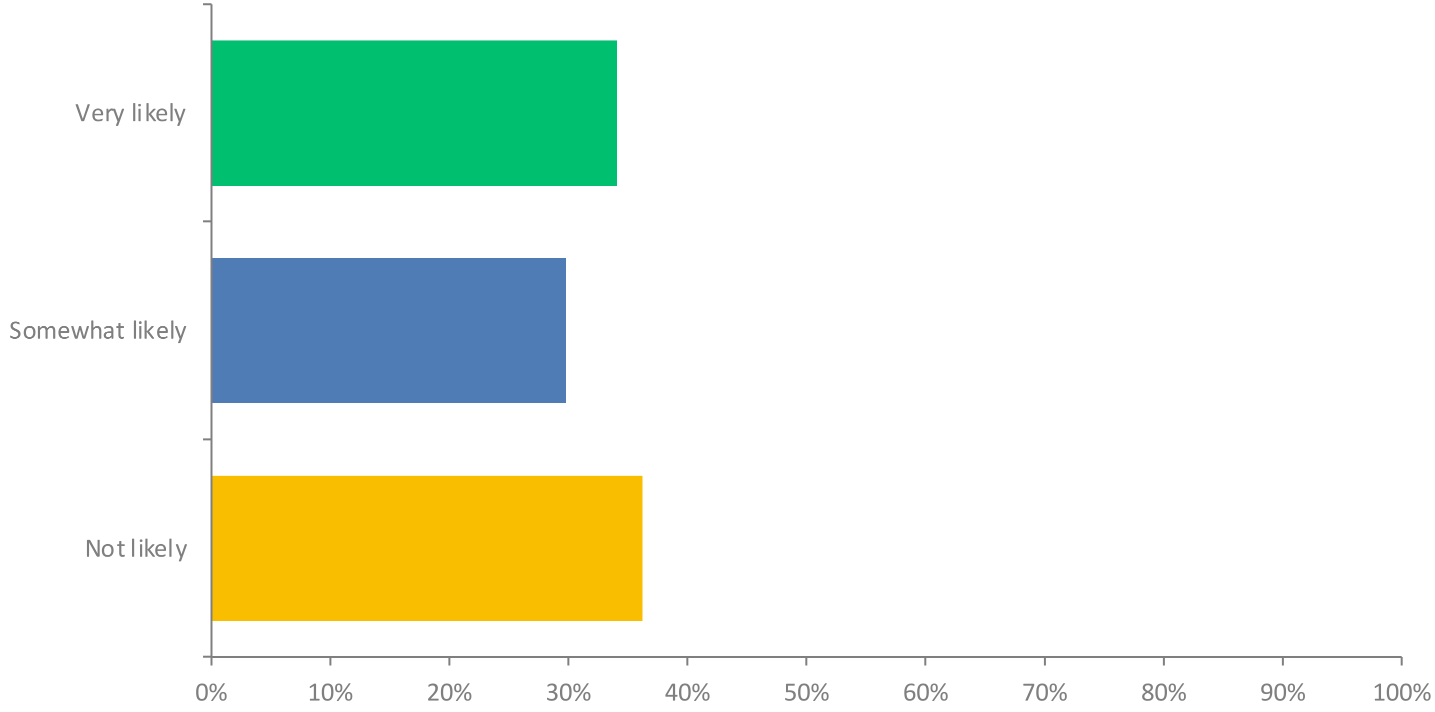
Q4: How likely are you to voluntarily sign up for curbside food waste collection if the city provides a food scraps cart and curbside collection?

Answered: 797 Skipped: 5

ANSWER CHOICES	RESPONSES	
Very likely	51.32%	409
Somewhat likely	19.57%	156
Not likely	29.11%	232
TOTAL		797

Q5: How likely are you to buy durable compost bags from the city and put your food waste in those bags for collection on your regular trash pickup day?

Answered: 796 Skipped: 6



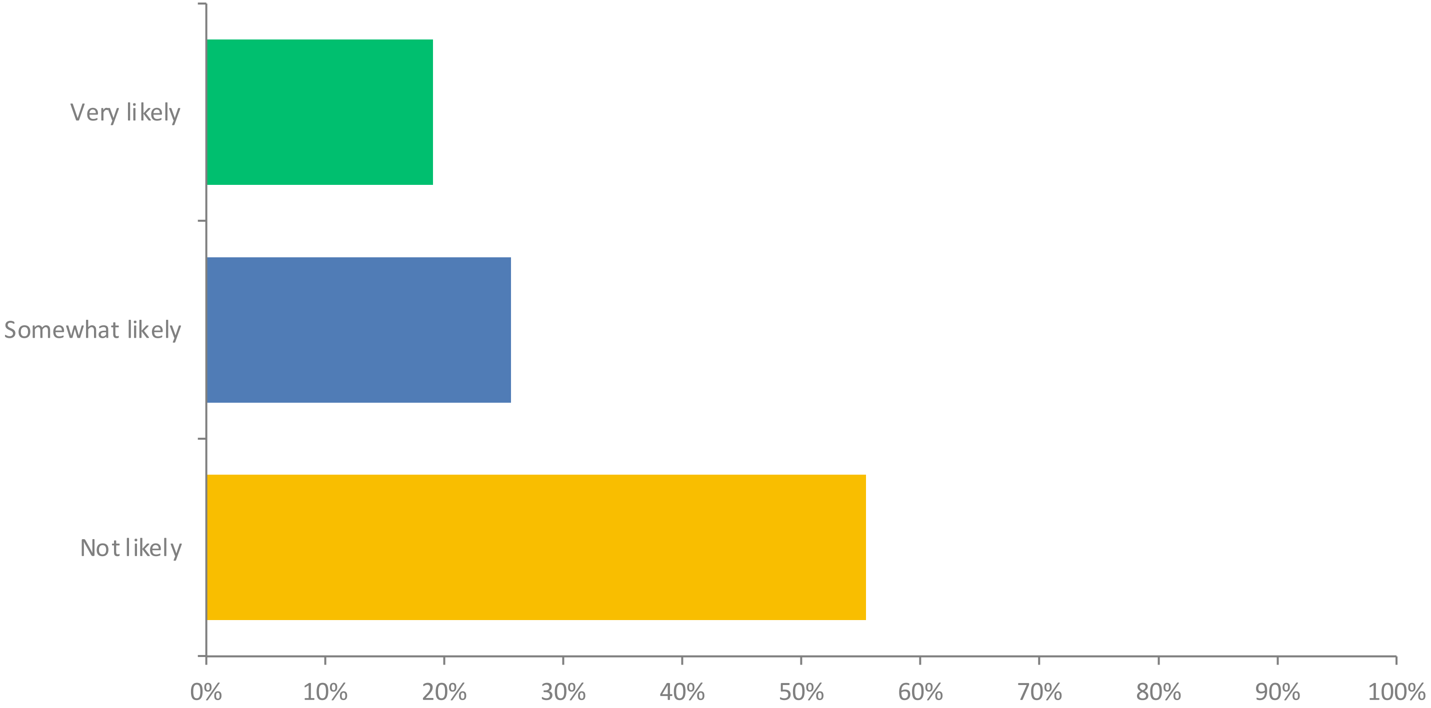
Q5: How likely are you to buy durable compost bags from the city and put your food waste in those bags for collection on your regular trash pickup day?

Answered: 796   Skipped: 6

ANSWER CHOICES	RESPONSES	
Very likely	34.05%	271
Somewhat likely	29.77%	237
Not likely	36.18%	288
TOTAL		796

Q6: How likely are you to take your household's food waste to a nearby drop-off station?

Answered: 798 Skipped: 4



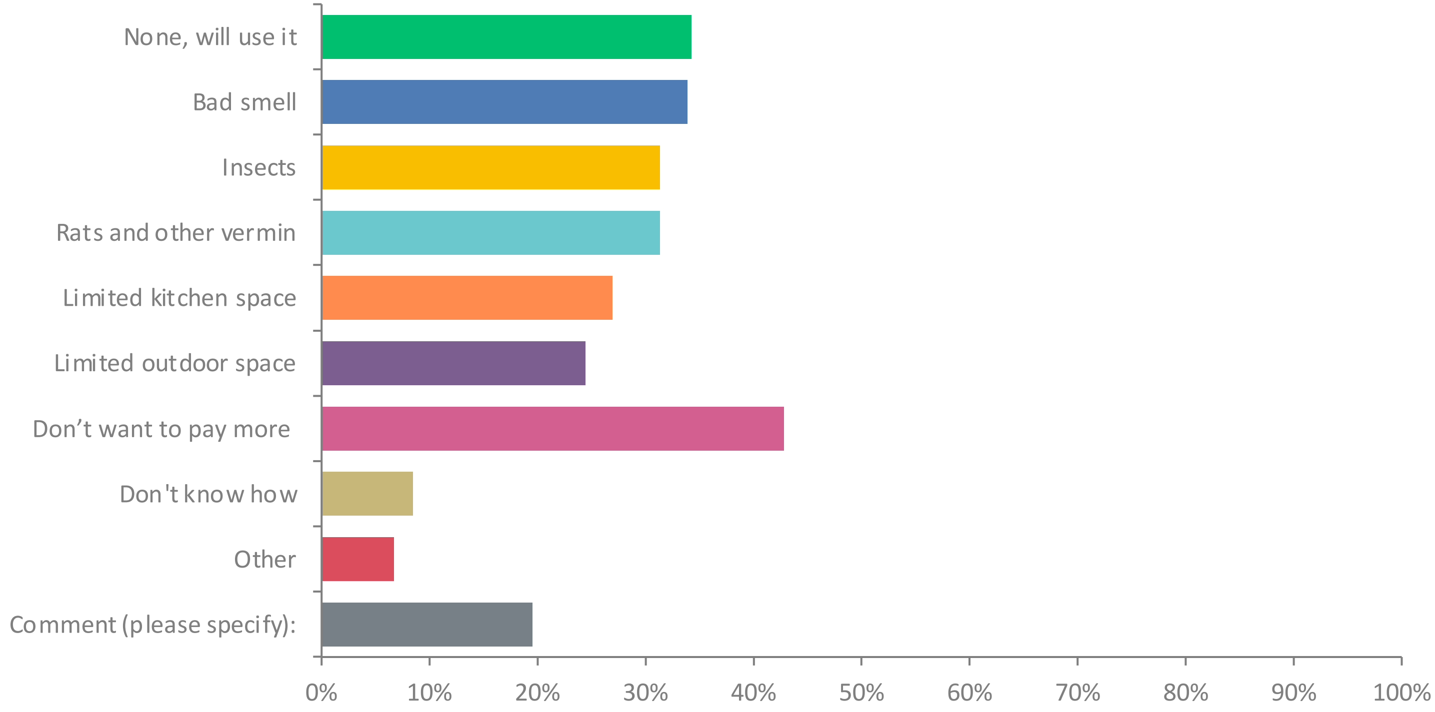
Q6: How likely are you to take your household's food waste to a nearby drop-off station?

Answered: 798 Skipped: 4

ANSWER CHOICES	RESPONSES	
Very likely	19.05%	152
Somewhat likely	25.56%	204
Not likely	55.39%	442
TOTAL		798

Q7: Select all the reasons why you are not likely to use a food waste collection service:

Answered: 795 Skipped: 7



Q2. How do you currently dispose of food waste?
Comment (please specify)

Disposal
most into sink garbage disposal
Limited - live in apartment
Some goes into the garbage disposal and down the drain
We have very little food waste
Put it in a live trap in backyard to trap feral cats.
Sometimes give to my sons chickens
Garbage Disposal
Garbage disposal
garbage disposal
We bought a LOMI and use to amend soil.
Garbage disposal
Feed to pet
Some goes in the garbage disposal
Use garbage disposals
Give to the dog
In summer, we dispose of it at our community garden plot composter
Garbage disposal
incinerator- sink disposal
Primarily in the Garbage Disposal
Sink garbage disposal
Garbage disposal
Dispose with garbage disposal.
Garbage disposal
Garbage disposal
Throw it in my backyard to decompose/for the wildlife
Wet food waste is currently thrown in our garbage
Garbage disposal
Electronic Composter - Lomi
Garbage disposal
We don't normally have food scraps.
Sink garbage disposal
most vegetables get composed in our brush pile.
No comment
Garbage in winter, compost in warm weather
Throw some out to wildlife in backyard
Garbage disposal
Feed to dogs or to the wildlife in my yard
Using garbage disposal for some; otherwise using garbage can.
Hardly ever have any
We don't waste food
Worm composting bin
Down the garbage disposal.
Worm bin
Certain items I set it out in nature for wildlife to eat.
Feed wildlife
flush it down the toilet
Garbage Disposal in Sink
Use garbage disposal.
Or give it to my dog, depending on what it is
Combination of trash and feeding animals
Compost on the farm
Garbage disposal
Garbage disposal
some goes down the food waste disposer in the kitchen sink
Save in bags in freezer and put out in garbage on collection day

compost food items that actually break down and compost; do not put meat fish eggs shells butter oils cheese dairy or cooked food
Bring to friends house for them to compost
you question is a little unclear. All food waste? Or just compostable food waste? I put compostable waste in my compost bin in my back yard. I put old food from the fridge in the garbage.
Put it in our community garden
Sink drain grinder
Countertop dehydrator/composter
Combination sink disposer and garbage
Feed the dog
Run it through the garbage disposal
Garbage disposal
Making a compost barrel to collect my own
We have a home composter but I feel like we generate more waste than what it will fit. Also, it is difficult to manage the brown/green waste at times.
Worms
Garbage disposal
Garbage disposal/grinder; down the kitchen sink drain.
Don't have much
I have very little food waste , what I compost in my yard
Garbage disposal in sink
Sink Disposer
Electric Garbage disposal
Garbage disposal what i can
Disposal
Put it in the sinks garbage disposal
We have a Lomi food composter for fruits and veggies. Meat scraps and bones go into the trash.
In sink aerator
Use garbage disposal
Would love to have a personal composter
Freeze it, then toss into garbage

Q7. Select all the reasons why you are not likely to use a food waste collection service:

Comment (please specify):
The program costs outweigh the benefits
I am a single person living in an apt
i think its a bad plan, too many good intention people will abuse procedure, leaving garbage outside not properly contained, will attract rodents/insects/wild life
Limited income
Enough said!
Already composting
Would prefer yard waste can
Currently do backyard composting
I don't believe in this! Seems people can get rid of their waste independently.
Not giving you one more opportunity to charge taxpayers.
My total weekly garbage output is less than 1 Walmart shopping bag; please just incinerate it. The Plasma Reduction technique leaves almost no landfill mass.

I have no interest in this program.
I hope everyone wants to join this initiative. In the United States, where most food waste still ends up in landfills – the third largest source of methane in the country

I live alone and have almost no food waste. I recycle as much as possible. My total garbage for the week is often less than 2 gallons.
Already composting
Just more government control in our lives
I'd much rather have a yard waste collection. It's difficult to bring to the waste campus.
We have a LOMI
Don't waste our money on this!
Red Wing is a community with relatively large lots, and residents who are concerned about sustainability and wish to compost are likely already doing so. For food waste collection to be successful in Red Wing, the barriers must be kept very low and on an opt-in basis.
I've been enjoying using my own compost heap.
Will use my own composting in non winter months
I would for sure do it if the city picked it up. I'd be less likely if I had to take it to drop off
Most people will not take the time to our correct waste in, not unlike the recycling problems.
I don't generate much garbage or recycling, I put the bins out maybe monthly, and yet I have to find places for them. I'd rather have much smaller bins I could put out more
I already compost all my food scraps.
Waste of resources and tax money
Compost at home
Education needed so people know what food waste is acceptable
I compost my own
Our property doesn't have room for ANOTHER collection container.
More education needed. Sounds like something the community could get behind
I live in apartment building
I would hope that costs would be reasonable, you want people to participate rather than setting up a program that's destined to fail.
We already compost our food scraps to use in our gardens.
I am a single user
Monthly bill for city water, etc, etc, etc,etc,etc,etc,already too high,
Make it easy and convenient for participants and the program will work well.
It's much more environmentally safe to compost at home and keep emissions from pick ups reduced.
I don't have a lot of time to commit to this, so if it is easy then I am very likely to participate!
Already compost at home
It's so easy to do it ourselves
There is no way everyone will put the correct waste in the right bin
once again how much garbage is going to be trucked in and who gets the money for this debacle
I have my own compost
I already throw my vegetable food scraps in my back yard to decompose.
I already compost, my own waste , please don't add services without first lowering the cost
Already composting
Wake up and quit spending our tax dollars, we will not save the world.
I have no interest in participating in a food waste program. Disposing of my food waste in the trash works fine.
Composting gives off methane which has 28 times the GHG warming potential of the alternative of burning it making CO_2 which is far better for the environment.

I'd want a smallish container. Also I don't know of a way to get rid of meat, fish, poultry or bones by using food as fertilizer. Is there one?
NA
I compost the majority of my own food waste
I currently compost my own food waste
This is a terrible idea.
City does not have to be in the business ! City is already involved in to many green agendas !
I already compost for my own garden use
Our electronic Composter works great (4 hrs low power) and produces no bad smells. Can also be used as plant fertilizer.
I think it's a bad idea.
I do NOT want this to increase my taxes
I don't want to pay more without knowing the benefits and deciding if it's worth the money.
We have very very little food waste
Those options selected, I am still very likely to participate. I'm sure guidance will be provided to address any concerns.
Many people would do this irresponsibly and it would attract critters and stink to many neighborhoods. If it tips over in the street it would be nasty. BAD idea for curbside.

We compost for our garden
I have a compost pile on my property
I compost my own food waste. No need for service nor should government be involved in another business better left to private industry.
I have very little food scraps and no room for another cart
At no additional cost to the home owner.
I would use it
I already compost every food scrap possible
I already compost and the rest can go to the tras collection
The recycling we have now is a waste of money due to the fact that a small percentage of the material is actually recycled
I already compost for my garden
We have a compost. Those food waste bags disintegrate quickly.
Additionally cost
Don't see any benefits
Red Wing has found enough ways to spend people's money. No more!!
I feel this is unnecessary for the taxpayer to provide
Depends on how much it costs
The world is desperate for workers to do serious jobs. This is nothing more than a governmental "make work".   Please put a stop to this immediately!!!
I compost in my yard
Very little food waste goes in the garbage can at our house.
It's organic. Collect methane at the landfill.

I already compost at home
Would do voluntarily if without additional cost to me. City services are too costly as it is, and cost of services continues to increase without getting input from residents.

I would prefer an option that doesn't cost more
I absolutely am not paying for this service. Quit finding ways to waste and spend money! This is a ridiculous proposal
If it is free I will use it
Live in apartment so smells are always a concern
Depends on how easy it is to use this service

This looks like another grab for money.
I don’t want to have to transport food waste; I like access to my own compost
It’s another insurance liability. I’d sue the city for failed collection if I were to get bugs or animals.
We use a garbage disposal
Time
Truthfully, I just know myself and would not put in the effort to make the extra trip.
transporting to a drop off site/uncertain on buying bags from city
I am capable of composting my own waste.
Already composting
composting works for green matter and general table scraps contain all sorts of things that rot an smell and never break down into compost
I have my own compost bins
Your mandatory astronomical fees for collection services are contributing to poverty of Red Wing citizens. I would suggest that you put a bar code on garbage and recycling containers, scan when the city empties them, and charge accordingly. I am charged for 26 pick-ups of recycling a year and 52 pick-ups of garbage. In reality, the amount I recycle needs to be picked up only four times a year or less and my garbage less than 12 times a year. I am an older single home-owner and do not generate nearly as much waste as a young family of four. I resent being over-charged for not being a wasteful person!!!
i have a composting system for my gardens
It needs to be convenient enough to add to our busy lives, but I love the idea of it and hope to participate. Another concern would be raccoons, so thought would have to be given to how to keep the scraps contained.
Not enough waste.
Ug! Is this survey about compostable food waste or all food waste? I'm so confused!
I know I would not do this, sorry.
Do not need any more city services
Rarely have food waste to compost.
Waste of taxpayer dollars!
We don’t waste much food
I have a garbage disposal sink drain grinder that gets rid of my waste quickly & cleanly.
Why is this an issue? There are already compost piles at the incinerator. Most people have no use for compost. Where is this issue coming from?!
I use my own compost way in the back of my yard out of sight. Keeping it sealed would stink and could attract rodents.
We have to many wild animals in this area such as coon, foxes, rabbits, loose dogs and cats.
There are only two in household. we eat what we cook
Not needed
Don’t waste the residents money
We have animals that is out at night and we don’t like we do not want them getting into a food cart
All the above
I will use the service depending on the above (cost).
I already compost
i really don't have space in the kitchen to collect food waste, though i'm likely to use food waste collection program
I'm already composting myself
if I moved to an apartment I would definitely use the city's compost plan
I would only use it in winter, when I don’t put food waste on my compost pile
We don't have much food waste
If there is only drop off available as opposed to curb side collection
You can compost on your own! It’s not hard.
I'm doing my own composting.
This is a great idea and would be so beneficial for our environment and community. I'm happy to do whatever is needed to make this a reality in our city.
Driving and delivering would be too much to compete with home options
I compost my own
Ecologically it’s better to just encourage keeping compost on site
just do not want to
Collecting food scraps is a bad idea on many levels.
I would happily participate in a pick up system, but not likely to drop off myself.
We don't need the added expense to our city budget. Incinerating has already been sold as being green for our community why do we need another option?
I have no trust in RW city government .. the cost will be high and rise annually ... A facility and driving compost defeats the greenness of composting ...
I can do it myself for free in my compost.
Depends on how city will use food scraps
I would be unlikely to transport the waste myself as it would be inconvienient to locate the place. I would be worried about spills in my vehicle and do not have the time to transport to the solid waste location especially given the current lack of hours they are open to the public before and after work and on weekends (afternoons only don’t work for me).
Multi unit building accommodation needed
I am 100%for composting but we already do our own
In a apartment building
We have very little food waste, but I know others do.
I’d need more details before committing to this.
I feel like I would be likely to use a food waste collection service, but the issue selected here are ones I would worry about and like more info on. I'm sure I can make room for another bin depending on the size. But the smell and attracting animals part is something I'd worry about and want more info on.
We have very little food wastee
Do my own composting
Our 21 unit building would need to work out logistics
It’s a great idea. I think some households will comply, but others won’t bother. Also the smell will attract insects and animals, making it less attractive to use.
Give me a personal composter for my garden

Appendix B

Program Interviews

MEMORANDUM

PROGRAM: Minneapolis, MN
INTERVIEWEE: Kellie Kish, Recycling Coordinator
INTERVIEWER: Nick Peterson, SEH
DATE: October 21, 2022

RE: Red Wing Organics Feasibility Study
SEH No. RWING 169384 14.00

Contact Information:
Kellie Kish, Recycling Coordinator | kellie.kish@minneapolismn.gov

Program Details:
https://www.minneapolismn.gov/resident-services/garbage-recycling-cleanup/organics-recycling/

City Population: 500,000
County: Hennepin

Program Start: 2008 (Pilot Study – Curbside)

- Pilot program 2008
- Consultant study 2012 - 2013
- Drop-offs 2014 - 2022
- Citywide roll-out 2015 - 2016

Year	Sign-up rate	Annual tons
2015	31.82%	825
2016	40.54%	3,385
2017	43.66%	4,763
2018	46.18%	4,844
2019	48.24%	5,301
2020	49.94%	6,087
2021	51.22%	5,838

Curbside Participation: ~52% (56,100 hh) as of 2022
Drop Off Participation: Over 3,100 signed up w/ 20 drop off sites.
Haulers: City

Estimated Costs per Drop Off Site:

Cost for a drop-off (2022)

Item	Cost per site
Hauling (staff + truck)	$923
Processing	$535
Lock & locking mechanism ($30 / cart; 4 carts / site)	$120
Site signage, brochures, yes/no lists, etc.	$600
100 compostable bag packets for welcome kits (Note: magnets, brochures printing covered by Hennepin County, Kitchen pails donated by BioBag, cost is $2/bag packet and freight of kitchen pails)	$1,340
Total cost for first year (start up)	$3,518
Annual cost / site (after year 1)	$1,458

In 2021 received a grant from Hennepin County to open 5 additional drop-off sites in high-density multi-unit housing areas.

Programs Offered:

- Organic Curbside (City Haulers)
- Organics Drop Off Locations
- Separate Yard Waste Curbside (City Haulers). Yard Waste Season (Nov 28-Dec 2)

By far the largest program in Minnesota is the City of Minneapolis organics program. The program is multifaceted and includes a voluntary curbside program and organic drop off sites. There are currently approximately 56,100 households (2022) that are participating in the curbside collection program. Minneapolis has the highest organics program participation percentage in the Metropolitan Area at roughly 52 percent of households participating in the program. In November 2018, Hennepin County amended Ordinance 13 to mandate all cities (depending on City Class) to provide all single family through fourplex households access to curbside collection of organic material, year-round on a weekly basis by January 1, 2022, which was a significant impetus to implementing organic diversion programs in Hennepin County.

Residents can sign up for the curbside program and receive a welcome after requesting an organics cart. Welcome kits are mailed to participants and include home setup tips, recycling guidelines and ten compostable bags. Small plastic containers for inside the house are not provided by the City of Minneapolis. Organics must be placed in a compostable bag prior to being placed in the cart. In the winter this prevents the organics from sticking to the cart, and in the summer, it holds the liquids, reducing vectors and other issues. Organic cart sizes are 32-gallons; however, residents have the option of requesting a larger (64-gallon) cart if needed. Yard waste is not co-mingled with organics. The City picks up food scraps and other compostable items weekly.

Additionally, there are now twenty drop off sites spaced around the City. Due to contamination concerns residents must also sign up for this program, since all drop off bins are locked. Codes to the combination locks are provided to the resident after signing up. Drop off sites range from being placed at parks, churches, solid waste transfer stations and parking lots. There is no extra cost to take part in any of these programs. Fees are embedded into the standard solid waste fees for all Minneapolis residents, regardless of participation.

Contamination is controlled by tagging carts when contamination is found. The collection process is not automated, therefore solid waste operators check every cart picked up for contamination. Minneapolis operates on a one strike policy, if contamination is found again the cart is removed from the household. If contamination at drop off sites is found, emails are sent to all residents that participate at the given drop off location, notifying the residents of the contamination. The current contamination rate for all organics collected is around 1%.

Highlights:

- Start with 1-3 organic drop off sites, regardless of a curbside program being implemented. Work with Park Board.
- Consider placing drop off sites where people are already frequently coming and going.
- Have a good website with frequently asked questions (FAQ's), recycling guidelines and tips etc.
- Initiate public engagement activities and events to promote organic diversion.
- Welcome kits are effective at communicating information on the program and providing a starting kit of compostable bags and directions of what containers to use.
- Pre-translated materials reduce confusion, depending on the demographics of the community.
- Use paid postage reply cards with bar codes that utilize scanning bar codes for signing up.
- Social media like Facebook, TikTok, Twitter, etc. is an easy, cost-effective outreach method.
- Utilize volunteers and people in the community that will support the program for outreach and educational videos.
- Require organics to be placed in a compostable bag for curbside and drop off sites.
- 64-gallon carts are sufficient for drop off sites. Add more carts if needed. Roll off carts are not required.
    - Provided different cart sizes for curbside program. Start with 32-gallon cart with option to increase to 64-gallon cart. Don't provide smaller carts than 32-gallon carts (depending on method of collection) so that it can still be mechanically lifted by a truck loader, reducing operator injury.

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MEMORANDUM

PROGRAM: St. Louis Park, MN
INTERVIEWEE: Kala Fisher,
INTERVIEWER: Nick Peterson, SEH
DATE: November 7, 2022

RE: Red Wing Organics Feasibility Study
SEH No. RWING 169384 14.00

Population: 50,010
County: Hennepin

Participating Households: 12,300 single family (1-4) units. 5,140 households and 268 multifamily households signed up for drop off sites.

Programs Offered:

- Curbside collection
- Drop off sites

This program has been in place since 2013, which makes it one of the oldest organics diversion programs in the Metropolitan Area. The program started as a voluntary opt-in program with a separate $40/year fee to participate. Yard waste was co-collected with organics. However, the program was modified later due to low participation rates and contamination issues, related to initially allowing compostable items that were later banned. Now the program is voluntary, but program fees are charged to all households regardless of participation, and organics are collected separately from yard waste. The list of acceptable compostable materials also was refined as the industry matured and grew. Currently 5,140 single family households participate in the voluntary curbside program, and 268 multifamily households participate in using drop off sites.

In October 2022, the City increased the number of drop off sites to further access to the program for a growing number of multifamily households in the community. It is estimated that around 40% of the population resides in multifamily housing. Currently the City has around eleven multifamily drop off sites. 64-gallon carts are used for collection. Locks are used to prevent contamination.

Organic program fees are rolled into the solid waste rates that all single-family households pay for garbage, recycling, organics, and yard waste collection. A pay as you throw model is used to determine rates where rates increase with the size of the garbage cart. No tax is applied to recycling, organics, and yard waste services. Currently, organic fees account for 20% of the overall residential solid waste rate. The City also implements commercial rates for small businesses that choose to receive city service and meet certain locational requirements (e.g., ability to set cart on or near existing residential routes). All other businesses, multifamily buildings, schools, etc. can contract directly with private haulers for organics collection.

Organics are collected weekly by the City's contracted hauler from the single-family household curbside program, four city buildings, a handful of small businesses and eleven multifamily drop off sites. Organics are sent to a Hennepin County transfer station, which are then hauled to either Shakopee Mdewakanton Sioux Community's (SMSC) Organics Recycling Facility or Specialized Environmental Technologies (SET) Compost Facility. Contamination rates are usually around 1% (by weight) and are determined by having periodical sorts at the transfer station for selected routes by staff and volunteer.

Compost use is encouraged by the City every spring and fall. It is distributed from a City owned brush drop off site. No charge is given for residents. Residents can collect and transport the compost for their own use at home and in their gardens.

Highlights:

- Make program have no extra cost to participate.
- Provide drop off sites for multifamily household participation. Utilize QR codes on the carts that can be scanned by passersby that allow people to sign up for the program and provides educational outreach.
- Provide adequate signage at drop off sites to instruct users on recycling guidelines etc.
- The largest barrier to the program was public perception and cost.
    - Provide and require compostable bags for curbside program.

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MEMORANDUM

PROGRAM: City of Edina
INTERVIEWEE: Twila Singh, Organics Recycling Coordinate - Edina
INTERVIEWER: Nick Peterson, SEH
DATE: October 26, 2022

RE: Red Wing Organics Feasibility Study
SEH No. RWING 169384 14.00

Program Details:

Program Description:
Standard offering with optional participation. Program costs are embedded into general solid waste fees.

Population: 66,993
No. Participating Households ~ 4,300
County: Hennepin

Program Start: 2019
Cost: $5.5/month (35-gal)

Programs Offered:
- Curbside collection

The City of Edina organics curbside collection was rolled out in June 2020, during the COVID-19 pandemic. The framework for such a program had been laid several years earlier with the City Council focusing on diverting waste from landfills and culminated with Edina passing the Climate Action Plan in December 2021 with the goal to divert 70% of the City's organics away from landfills by 2030, which mirrors many of the climate change objectives outlined in the Paris Agreement.

Like other programs in Hennepin County the program is voluntary and requires residents to sign up to receive an organics cart, however costs for the program are embedded in the solid waste fees for all residents regardless of participation. The organics curbside collection program currently services approximately 4,300 single-family households. Organics are collected on a weekly basis by the City's contracted hauler. 32-gallon carts are used in the curbside collection program with an option to upgrade to 64-gallon carts.

The program received significant backlash during program roll out, since all single-family households received carts during the height of the COVID-19 pandemic. Over 2,000 households returned their carts immediately. However, after several press releases the situation is running smoothly. Participation in the curbside program has fluctuated between 25-30%, but the program has grown since roll out. The City also has several drop off sites for multifamily and small business use.

Highlights:

- Designate a specific outreach person for the program. Field calls directly from the public about the program.
- Get commercial support and sponsors for the program.
- Contract private waste haulers to provide and maintain food scrap carts.

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MEMORANDUM

PROGRAM: Hutchinson (Creekside Soils), MN
INTERVIEWEE: Andy Kosek, Director
INTERVIEWER: Nick Peterson, SEH
DATE: October 21, 2022

RE: Red Wing Organics Feasibility Study
SEH No. RWING 169384 14.00

Contact Information:
Andy Kosek | 320.234.5680 | akosek@creeksidesoils.com

Program Details:
Creekside Soil - (creeksidesoils.com)

Program Description:
Hutchinson has a standard offering program. Organics are sent to Creekside Soils for composting.

County Population: 15,000
County: McLeod

Program Start: 2001
Cost: $28.34 (64-gal)
Participants (current): 4,060 HH

Programs Offered:
- Curbside Standard Offering

The City of Hutchinson has a standard offering organics curbside collection program where each single-family residence has an organics cart. This program was started in 2001. Currently, the program has over 4,000 participating households (2022). 96-gallon carts are used for organics collection with no other size options. Yard waste is co-collected with organics in the same cart.

Contamination is a major issue with the City's organic collection program. Many new initiatives have been underway to reduce contamination. A three-strike program was initiated. If contamination is detected by the hauler, a picture of the contamination is taken and tagged with the address and sent to Creekside Soils. A record of violations is kept, and if any household reaches three violations, the organics cart is removed from the household. This could change to become for stringent to a one or two strike policy.

Organic program fees are folded into resident's solid waste fees. The line item on the bill reads garbage rate which includes garbage, recycling, and organics collection.

Highlights:

- Make any organic curbside collection program voluntary and opt-in.
- Start program small and let program grow over time.
- Assign someone for public outreach and awareness for the project. Someone that will have hands on the project all the time.
- Keep politics out of the conversation and get the public to understand the WHY.

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MEMORANDUM

PROGRAM: Lino Lakes, MN
INTERVIEWEE: Andrew Nelson, Environmental Coordinator – Lino Lakes
INTERVIEWER: Nick Peterson, SEH
DATE: October 7, 2022

RE: Red Wing Organics Feasibility Study
SEH No. RWING 169384 14.00

Contact Information:
Andrew Nelson, Environmental Coordinator | 651.982.2465 | anelson3@linolakes.us

Program Details:
https://linolakes.us/291/Curbside-Organics-Recycling-Program

City Population: 21,000
County: Anoka

Programs Offered:
- Organic Drop Off Locations (City)
- Curbside Organics (Private), Blue bag system.

Program Start: 2016 (Drop Off)
Participants: 400 HH
Cost: Free

The City of Lino Lakes created a drop off site program in 2016 with over 120 residents initially signing up. The program currently has 468 residents (2022) signed up and are using the program with around four drop off sites located around the City. The program is free of charge to all residents. Yard waste is not accepted at any of the organic drop off sites. The City's private hauler collects the organics from the drop off sites and hauls it to SET Compost Facility for processing.

Most drop off sites are located at parks and other public areas. 64-gallon carts are used for collection. The City has not had any major problems with contamination, so the carts are not locked. Also, the City found problems with using combination locks during the Winter months and received complaints from participants that the locks were difficult to use.

An organics collection curbside program, using the durable bag program, was offered through the City's private hauler, however very few residents have requested the service. Currently only 40 single home households are enrolled in the program.

Highlights:

- Monitor for contamination of carts before and after loads are picked up by private waste haulers. Keep contractors honest.
- Track all data in excel.
- Use a lot of signage and stickers at organic drop off carts.
- Newsletters have increased participation in the program by 10% on a regular basis.
- Drop off location siting criteria:
  - Site able to grow and handle additional 64-gallon carts.
  - Property owned/managed by City.
  - Check City Ordinances.
  - Place organic bins 5-10 ft away from trash/recycling bins to reduce contamination.
  - Use a 2-mile radius from all residents when scoping for drop off site locations.
- Make the program free and voluntary for all residents.
- Noticed no major seasonal variation in organics received. Less smell in the Winter.

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MEMORANDUM

PROGRAM: Carver County, MN
INTERVIEWEE: Marcus Zbinden, SWCD 2 Supervisor – Carver County
INTERVIEWER: Nick Peterson, SEH
DATE: October 18, 2022

RE: Red Wing Organics Feasibility Study
SEH No. RWING 169384 14.00

Contact Information:
Marcus Zbinden, SWCD-2 Supervisor | 952.288.4747 | mzbinden@co.carver.mn.us

Program Details:
https://www.co.carver.mn.us/departments/public-services/environmental-services/organics-yard-waste/residential-organics

Population: 100,000
County: Carver

Program Start: 2007

Programs Offered:
- Organics curbside (private haulers) – Comingled w/ yardwaste
- Organics Drop Off @ Environmental Center
- Yard Waste
  - City Drop Off Locations (Compost Sites)
  - Drop Off Locations (Roll Offs)

A pilot curbside collection organics program is being started for a limited number of Chaska and Chanhassen residents through collaboration with Carver County and private waste haulers. Organics are currently commingled with yard waste. An organic drop off site is located at the Carver County Environmental Center in Chaska, MN. There are several yard waste drop off sites in Carver County. Yard waste compost site at the Minnesota Arboretum. Plans are being made for organics to be sent to the SMSC Facility.

Highlights:
- Make it free. Make it voluntary.
- Comingle organics with yard waste for curbside pickup if possible.
- Keep an eye on contamination from institutions and other trouble sources.
- Curbside collection is preferrable to drop off sites.
- Suggest using Betterbin application phone application. Helps identify compostable products based on product barcodes.

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Appendix C

Compost Mix Recipe

Red Wing Composting Facility

Annual Compost Recipe

Prepared by: Craig Coker, Coker Composting & Consulting 2/14/2023

Assumptions:

SSOM feedstocks	1,000	tons/year	(Year 2030 projection)
Yard waste/leaves feedstocks	4,757	tons/year	Red Wing Solid Waste data for 2021

Facility is open 5 days/week (260 days/year)

MIX RATIO CALCULATIONS- ANNUAL VOLUMES — Data input — Data output

INGREDIENTS	Food Scraps	Yard Waste & Leaves	Overs	TOTAL MIX	TARGET
BIODEGRADABLE C (% DWB)	37.6%	26.6%	24.9%		
N (% DWB)	2.5	0.72	0.72		
MOISTURE%	70.2	53.6	35.5		
UNITS IN MIX BY WGT (T)	1,000	4,757	1,003	6,760	
UNITS IN MIX BY WGT (LB)	2,000,000	9,514,000	2,006,160	13,520,160	
UNITS IN MIX BY VOL (CY or Gal)	1,720	14,796	3,120	19,636	
DENSITY (LBS/CY or LBS/GAL)	1163	643	643	688.5	
POUNDS OF CARBON	751,976	2,530,724	499,534	3,782,234	
POUNDS OF NITROGEN	50,000	68,501	14,444	132,945	
C:N RATIO	15	37	35	**28**	20 TO 30
POUNDS OF MOISTURE	1,404,000	5,099,504	712,187	7,215,691	
NUMBER OF UNITS	2,000,000	9,514,000	2,006,160	13,520,160	
PERCENT MOISTURE				**53**	50 TO 65%
VOLATILE SOLIDS (%)	95.5	75.0	65.0		
VOLATILE SOLIDS (LBS)	1,910,000	7,135,500	1,304,004	10,349,504	
UNITS IN MIX BY WGT (LB)	2,000,000	9,514,000	2,006,160	13,520,160	
MIX VS (%)				**77**	> 80%
DENSITY (LBS/CY)	1163	643	643		
DENSITY (KG/M3)	690.0	381.5	381.5		
% AIR SPACE	37.90	65.67	65.67		
FEEDSTOCK VOLUME (CY)	1,719.69	14,796.27	3,120.00	19,636.0	
AIR VOLUME (CY)	651.8	9,716.3	2,048.8	12,416.9	
PREDICTED FREE AIR SPACE				**63%**	40-60%

Data Sources:

Food scraps - Jan. 2019 lab analysis of source-separated food wastes, Hennepin Co, MN

Landscape debris - April 2011 lab analysis of ground yard waste, Crowell Farm, Asheville, NC

Overs C,N, Moisture - Jan. 2014 lab analysis from Royal Oak Farm in VA; other from literature

Predicted FAS equation from Alburquerque, J.A., *et. al.* , "Air Space in Composting Research: A Literature Review"
Compost Science and Utilization , Vol. 16, No. 3, 2008, p. 159-170

Adjusting for Biodegradable Carbon:

Biodegradable Fraction (B.F.) = 0.83 – (0.028) x Lignin Content of Volatile Solids ($L.C._{VS}$)

Biodegradable-C = Total C x B.F. x Volatile Solids (VS)

Feedstock	Carbon (%)	Lignin Content (%)	Biodegradable Fraction (B.F.)	Volatile Solids (%)	Biodegradable Carbon (%)
Example: Yard Trimmings	*49.2%*	*4.1%*	*82.89%*	*98.3%*	*40.1%*
Food Scraps	47.5%	4.1%	82.89%	95.5%	37.6%
Yard wastes and leaves	44.8%	12.7%	82.64%	71.9%	26.6%
Oversized woody wastes	46.3%	12.7%	82.64%	65.0%	24.9%

Biodegradable Fraction & Carbon equations from Chandler, J.A., et.al., "Predicting Methane Fermentation Biodegradability", *Biotechnology and Bioengineering Symposium* , 10,93, 1980

Lignin content data sources:

Food waste - Das, K.C., "Odor Related Issues in Commercial Composting", University of Georgia, 2000

Woody wastes- Richards, T. "Effect of Lignin on Biodegradability", Cornell University, 1996

Assume lignin content of overs similar to woody wastes

Assume mostly poplar and oak in woody wastes

Composting Materials Flows

Residence times (days) for ASP composting

	Composting	Curing	Total
ASP	28	30	58

Daily volumes going to composting (mixed feedstocks)		76	CY/day
Volume of material in primary composting for 28 days		2,115	CY
Daily volumes going to curing (assume 40% volumetric shrinkage)		45	CY/day
Volume of material in curing for 30 days		1,359	CY
Daily volumes going to screening (assume 10% volumetric shrinkage)		41	CY/day
Assume screen yield of 30% overs and 70% fines (product)	Product	29	CY/day
	Overs	12	CY/day

Appendix D

Other SSOM Diversion Programs

Example SSOM Diversion Program

An SEH project team member was recently involved in a contamination audit at Creekside Soils (Creekside) in Hutchinson. Creekside is an enterprise department of the City of Hutchinson, Minnesota created to develop and operate a composting facility handling yard trimmings and SSOM, most of which are food wastes and packaging. It is a standard offer program, meaning that all 4,000+ Hutchinson households can put their SSOM (both food and yard trimmings) into their organics bin for weekly curbside collection. In addition, both landscaping and land-clearing debris are dropped off by residents and contractors. In fiscal year (FY) 2021, Creekside processed 6,796 tons of yard trimmings including 3,787 tons/year from the City of St. Cloud and 1,495 tons of SSOM.

The feedstock audit was performed June 8 through June 17, 2022, and the results are reported in the table below.

Feedstock Audit Results

Audit element	Observed value per load[1]
Tipped load weight	18,688 lbs.
Percent of load audited	5.2%
Compostable Material:	
Food Waste	24.7 lbs.
Other compostables[2]	47.6 lbs.
Yard trimmings	825.3 lbs.
Subtotal =	897.6 lbs
Contaminants:	
Hard plastics	2.7 lbs.
Film plastics	1.3 lbs.
Metal	0.8 lbs.
Glass	0.2 lbs.
Rock/brick	1.8 lbs.
Large wood pieces	25.0 lbs.
Large cardboard	13.0 lbs.
Others[3]	26.5 lbs.
Subtotal =	71.3 lbs
Total =	968.9 lbs
Percent contamination	7.7%
Weight of contaminant/load	1,446.3 lbs.

Notes:

[1]Average of ten daily observations

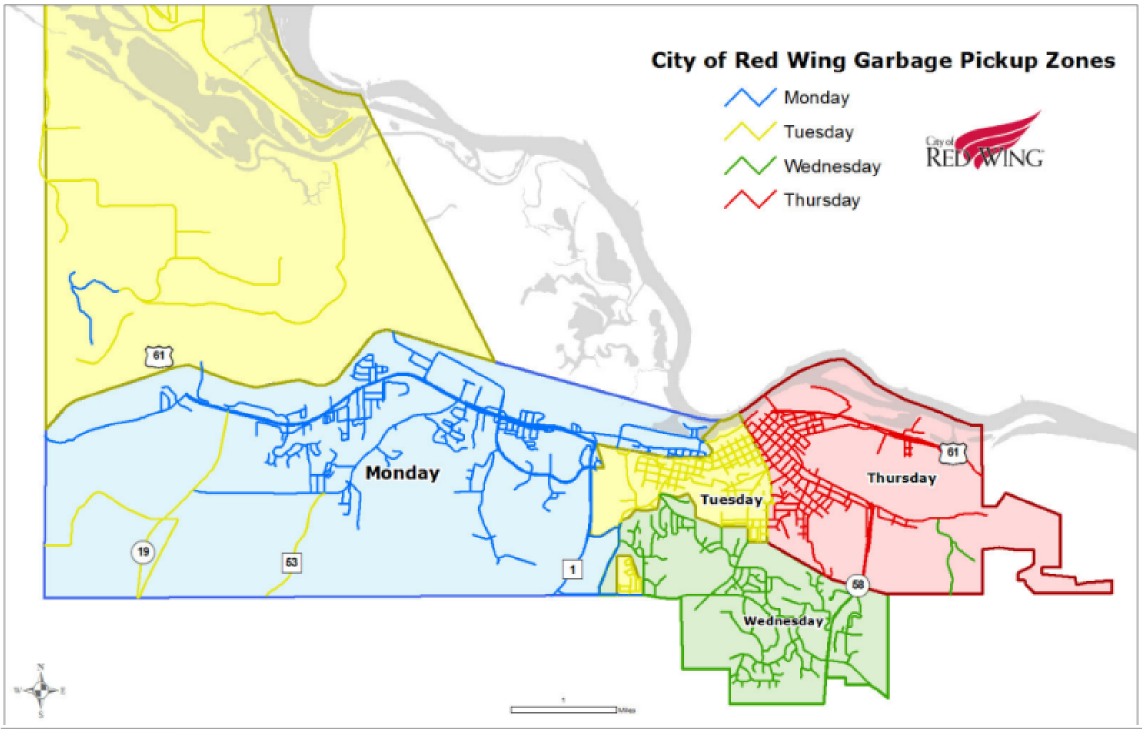
[2]The "Other compostables" was mostly paper items.

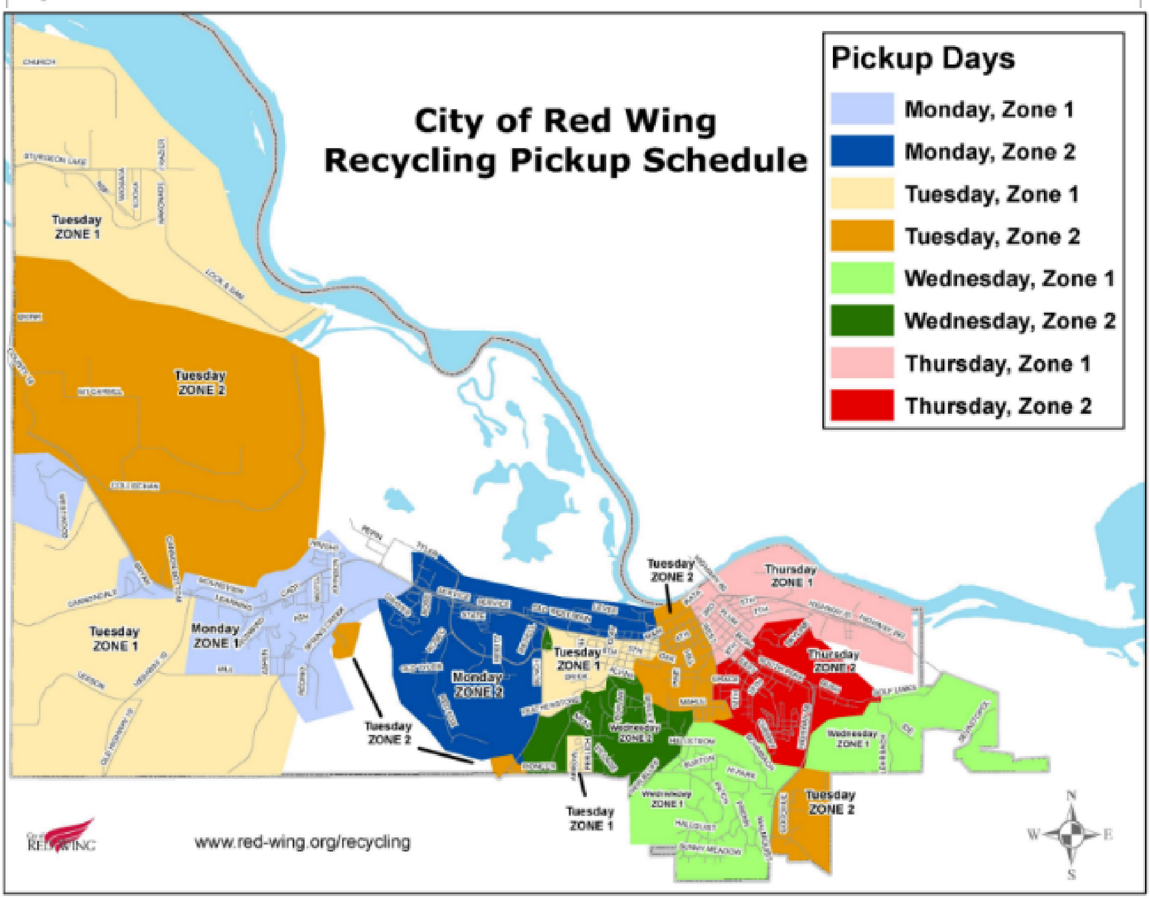
[3]The "others" category includes appliances, clothing, rubber items, plastic cooling fan, blue jeans in a plastic bag, metal grating, painted wood, and Christmas lights that were incorrectly placed into the organics cart. This others category accounts for more than 37 percent by weight of contamination during the audit.

Appendix E

City MSW and Recycling Collection Route Maps

City MSW and Recycling Collection Routes Maps





Source: https://www.red-wing.org/408/Solid-Waste-Division

Appendix F

Example Drop Off Sites Collection

Example of Drop Off Sites Collection: Dakota County

Drop-off stations for SSOM are becoming more widely used. Dakota County has a SSOM drop-off program. This program is used by residents of Hastings and Farmington. In 2022, Dakota County estimates it will divert about 3,000 CY of SSOM (equivalent to about 850 tons). Stations are not staffed. Diversion strategy based on 3-CY or 4-CY leakproof dumpsters, on rollers, picked up with forks on front-loading garbage trucks. Examples of Dakota County drop off sites is shown in Figure 10. 96-gallon carts have also been used successfully in many locations for containers at drop off stations. The City of Minneapolis also utilizes 96-gallon carts with locks for drop off stations.

Drop Off Site Example Pictures (Falls Church, VA)

Stations can be 1.) open, 2.) fenced/gated but open-roofed, and 3.) fenced and roofed. The busiest stations in Dakota County are pulled 3x per week, the others 1- 2x per week. SSOM goes to SET in Rosemount. SET leases land from Dakota County for their composting site and it is a lease requirement to accept SSOM. In photos below, the station shown in the upper left and right is in Burnsville, the lower left photo shows a station in Rosemount and the lower right a station in Farmington. Estimated capital cost per station is $15,000 - $20,000. The station in Rosemount is roofed as the City did not want to devote staff time to clearing away snow; that station cost $18,500.

The stations are located on City property, but the County pays for construction. Stations are open 5 am – 10 pm, 7 days/week. They provide compostable bags for citizen pickup at each station. They used to have keypad locks on the gates, but the locks froze in winter, so they were abandoned. The County reports no real problem with non-registered citizens using the stations.

Example Drop Off Site Pictures (Dakota County, MN)

This is a voluntary sign-up program; residents can sign up online and there is no commitment to continue. To date, 9,196 households in Dakota County have signed up (about 5% of the number of households in the County, which is 169,915). They get a welcome packet that consists of lists of acceptable/unacceptable items for diversion and a map of the drop-off stations. Because it is voluntary sign-up program, contamination has been limited to about 3-4 issues per year, mostly due to yard waste thrown into containers.

There is no fee to residents for participation; MPCA SCORE funds cover the program's cost. The County estimates they will spend about $66,360 to operate the program in 2023, equivalent to about $74.00 per ton for 900 diverted tons. This estimate includes waste hauling ($35,064) and compostable bags ($31,296).

Appendix G

Compost Facility Capital and Operation Costs

G-1 – Campus Capital Costs

G-2 – Campus Operational Costs

G-3 – Lab USA Capital Costs

G-4 – Lab USA Operational Costs

G-1 – Campus Capital Costs

Opinion of Probable Cost - Capital

Project: Red Wing Organics Diversion Feasibility Study — **Project No.** 22-1321
Aerobic Composting at Solid Waste Campus — **Date:** 3/23/2023

Construction Estimating Software:	Zip Code	Material	Labor	Equipment
Incr/Decr from national averages	55066	1%	7%	0

Building/Site Area		Description of Work	Quantity	Units	Unit Cost	Extended Value	Assumption Notes
Site Work							
	Deconstruction	Removal of Lagoons 1 & 2 contents	1	L.S.	$50,000	$50,000	allowance
	Site Preparation	Filling Lagoons 1 &2 with suitable rock					
		Assume filter sand					
		320' L x 85' W x 6.5' D	13,096	CY	$20.00	$262,000	
		Topping rock fill in 1 & 2 with sand					
		320' L x 85' W x 0.5' D	27,200	SF	$0.93	$25,300	6" sand bed over rock fill
		Contact Water Discharge to Sanitary					
		Lift Station and Piping	1	L.S.	$110,000.00	$110,000	
	Paving	Parking areas	11,100	SF	$6.89	$76,500	6" asphalt over 6" base
Subtotal Site Work						$523,800	
Total Site Work						**$523,800**	
	Buildings	Hoop building over waste receipt and composting	20,000	SF	$40.00	$800,000	
	Concrete	floor slab (incl. aeration floor in por	50,875	SF	$8.00	$407,000	8" slab, 4,000 psi concrete
		ASP bunker walls (concrete block)	800	blocks	$150.00	$120,000	installed price
		Back walls: 110' L x 10' H x 2 walls					
		Partition walls (2 x 7 x 40' L x 10' H)					
	Technology	Compost process software	1	Ea	$20,000	$20,000	allowance
	Equipment	Rubber-tired front end loaders	2	Ea	$250,000	$500,000	
		Roto-Mix 274-12B mixer	1	Ea	$150,000	$150,000	
		Aeration blowers	12	Ea	$2,000	$24,000	
		360 CFM/ASP needed - assume Peerless PW-11 1.5 HP blowers					
		Blower variable frequency drives	12	Ea	$350	$4,200	
		ASP thermocouples	24	Ea	$2,000	$48,000	
		Aeration piping	1,440	LF	$4.25	$6,120	
		4' O.C., 3 pipe runs/ASP x 40' L					
		Vacuum-lift separator for screen	1	Ea	$125,000	$125,000	
		Screen	1	Ea	$250,000	$250,000	
	Utilities	Power	1	Ea	$5,000	$5,000	allowance for connections
		Water	1	Ea	$5,000	$5,000	allowance for connections
		Sewer	1	Ea	$30,000	$30,000	allowance for connections
		Stormwater	1	Ea	$5,000	$5,000	allowance for connections
	Other	Biofiltration System (optional) incl p	1,000	SF	$10.00	$10,000	
Subtotal Processing System						$2,509,320	
Total Processing System						**$3,033,120**	

Summary of Opinion of Probable Costs			
Site Work/Scale Complex			$523,800
Processing System			$2,509,320
Other			--
Subtotal Construction Costs			$3,033,120
	General Condition	12%	$363,974
	Engineering/Construction Admin	7.5%	$227,484
	Contractor Markup	12%	$363,974
	Contingency	25%	$758,280
Summary - Total Estimated Costs			**$4,746,833**

Notes:
Opinion of probable cost is preliminary and carries a confidence range of -30% / +50%
Data sourc Craftsman Estimating Software, 2022, adjusted for Zip Code 55066

G-2 – Campus Operational Costs

Opinion of Probable Costs - Operating

Project:	Red Wing Organics Diversion Feasibility	**Project No.:**	22-1321
	Aerobic Composting at Solid Waste Can	**Date:**	5/16/2023

Assumptions

Labor rate (loaded) per hour - average for all workers	$65.24	per hour
Loader, screen machine rate (fuel + insurance + maintenance)	$60.00	per hour
Mixer machine rate	$65.00	per hour
Transfer station tip fee	$120.72	per ton
Facility is open 5 days/week, 52 weeks/yr	260	days/yr
Neglects any overlap of labor functions between tasks		

Processing Volumes

	Avg Annual Vol.		Average Daily Volume	
Food Wastes	1,720	CY/yr	6.6	CY/day
Yard waste & leaves	14,796		56.9	
Overs	3,120		12.0	
Totals	19,636	CY/yr	75.5	CY/day

Scalehouse Operations

Assume scalehouse operations covered by existing Red Wing Solid Waste budget

Materials Handling Assumptions

Assume wastes & products handled by separate loaders with buckets		
Bucket capacity of loader	6	CY
Grinding done by others		
Mixing done by mechanical mixer		
Materials moved to composting and curing with loaders		
Materials moved to storage (overs and compost) by loaders		

Materials Handling - Waste Receipt & Storage

Daily volumes coming into facility	75.5	CY/day
Number of loader "bucket-movements" to keep waste receipt area managed		
Daily volume / capacity of loader bucket	13	buckets/day
Assume time spent per loader movement	3	minutes
Time spent handling feedstocks	38	minutes/day
Convert to hours	0.6	hours/day
Labor cost/year	**$ 10,675**	
Machine cost/year	**$ 9,818**	

Materials Handling - Mixing

Assume contamination controlled by a mix of source control and vacuum extraction on scree

Assume all feedstock mixing done by on-site mechanical mixer

Daily mixing volume needed	=	76	CY/day
Assume use of stationary electric Roto-Mix 274-12B mixer, ca	=	10.0	CY
No. of mixing events daily	=	8	
No. of loader "bucket-movements" to load mixer daily		13	

Assume time spent per loading event to load mixer		5	minutes ea.
Time spent loading mixer daily		63	minutes
	Convert to hours	1.0	hours/day
Assume mixing time per mixing event		15	minutes
Time spent running mixer daily		113	minutes
	Convert to hours	1.9	hours/day
	Labor cost/year	**$ 17,792**	
	Machine cost/year	**$ 49,635**	

Materials Handling - Transport To Composting ASP Bunkers			
Avg. daily volume going to composting (assume 5% shrink in mixing)		72	CY/day
Number of loader bucket movements		12	buckets/day
Time to tear down, pick up, transport to ASP bunker, return		3	min/bucket
Total time needed to move compost to bunker		35.9	minutes/day
	Convert to hours	0.6	hours/day
	Labor cost/year	**$ 10,142**	
	Machine cost/year	**$ 9,327**	

Building ASPs			
Assume all ASPs built with loader		6	CY/bucket
Daily volume coming to composting bunkers		72	CY/day
Number of buckets per day		12	buckets/day
Time needed to install plenum, load bunker, install cover		6	minutes ea.
Time needed to build ASPs		71.7	minutes/day
	Convert to hours	1.2	hours/day
	Labor cost/year	**$ 20,283**	
	Machine cost/year	**$ 18,654**	

ASP Aeration System		
Size of blower	1.5	hp/ASP
Assume 15 min on/45 min off; hours running each day	6	hrs/day
Assumed electrical consumption at 1 kW = 1 hp	1.5	kilowatts
kWh per day	9	kWh/day
Cost of electricity	$ 0.10	per kWh
Annual cost of each motor	$ 329	
Annual electricity cost for 12 blowers	**$ 3,942**	

Leachate Management			
Assume leachate is pumped to Red Wing IWWTP			
Assumed leachate production rate		50	gal/ton
Tonnage of food waste daily		3.8461538	tons/day
Daily leachate production		192	gal/day
	=	26	CF/day
Red Wing industrial sewerage rate		$0.095	per CF
Annual sewerage fee for leachate (only)		**$891.48**	

Materials Handling - Moving Compost to Curing			
Avg. daily volume going to curing (assume 30% shrink)		50	CY/day
Number of loader bucket movements		8	buckets/day
Time to tear down, pick up, and transport		7	min/bucket
Total time needed to move compost to curing		59	minutes/day
	Convert to hours	1.0	hours/day
	Labor cost/year	**$ 16,565**	
	Machine cost/year	**$ 15,234**	

Managing Curing Piles			
Assume curing piles built with loader		6	CY/bucket
Daily volume coming to curing		50	CY/day
Number of buckets per day		8	buckets/day
Time needed to move compost to curing (ea)		6	minutes ea.
Time needed to move compost to curing (all)		50	minutes/day
	Convert to hours	0.8	hours/day
	Labor cost/year	**$ 14,198**	
	Machine cost/year	**$ 13,058**	

Turning Curing Piles			
Total volume of material in turned mass beds per 60-day cure cycle		2,719	CY
Number of bucket movements to turn pile each time		453	movements
Time for each bucket movement		3	minutes
Time needed per turning event		1,359	minutes
	=	23	hours/event
Number of turning events/cycle (assume every 2 weeks)		4	events/cycle
Number of cycles each year		6	cycles/year
Total time spent turning mass curing beds		544	hours/year
	Labor cost/year	**$ 35,475**	
	Machine cost/year	**$ 32,626**	

Screening Compost			
Avg. daily volume going to screening (assume 10% shrink in curing)		45	CY/day
Assume screen hopper volume = loader bucket volume		6	CY
Number of loader bucket movements daily		8	buckets/day
Time to move compost from curing to screening		3	min/bucket
Total time needed to move compost		23	min/day
	Convert to hours	0.4	hrs/day
Assume screen throughput rate		40	CY/hr
Screen run time per day (assume no add'l labor needed)		1	hrs/day
Total time for screening compost and making soil blends		1.1	hrs/day
Assume vacuum extraction for contaminants pulls off		10%	
Volume of contaminants removed daily		5	CY/day
Assumed bulk density		50	lbs/CY
Annual tonnage of contaminants removed		29	tons/year

Labor cost/year	$	**6,389**
Machine cost/year	$	**4,407**
Landfill cost/year	$	**3,547**

Materials Handling - Screened Compost to Storage

Assume fines yield off screen		70	%
Avg. daily volume coming off screen		32	CY/day
Number of loader bucket movements		5	buckets/day
Time to tear down, pick up, transport		3	minutes ea.
Total time needed to move compost to storage		15.8	minutes/day
Total time needed to load and move compost		16	minutes/day
	Convert to hours	**0.3**	**hours/day**
	Labor cost/year	$ **4,472**	
	Machine cost/year	$ **4,113**	

Materials Handling - Overs to Storage

Assume overs yield off screen		30	**%**
Avg. daily volume coming off screen		13.6	CY/day
Number of loader bucket movements		2	buckets/day
Time to tear down, pick up, transport to mixing		5	minutes ea.
Total time needed to load and move overs		11.3	minutes/day
	Convert to hours	**0.19**	**hours/day**
	Labor cost/year	$ **3,195**	
	Machine cost/year	$ **2,938**	

Process Management and Recordkeeping

Time needed to monitor temperatures, moisture, maintain operations log		4.0	hours/day
	Convert to hours	**4.0**	**hours/day**
	Labor cost/year	$ **67,850**	
	Machine cost/year	$ -	

Product Load-Out

Annual compost production volume		3,526	CY/yr
Average daily production volume		14	CY/day
Assume 100% wholesale distribution			
Tractor-trailer load capacity		40	CY
Number of TTL loads needed daily		0.34	per day
Number of bucket movements daily		7	
Time needed per bucket movement		3	min
Time needed to load TTL		20	min. ea.
Time needed to load trucks		6.8	min./day
	Convert to hours	**0.1**	**hours/day**
	Labor cost/year	$ **1,917**	
	Machine cost/year	$ **1,763**	

Annual Operating Expenses Summary

Labor Summary		ASP Composting			
Process	Hrs/Day	Labor Cost	Machine Cost	Consumables	Total
Scalehouse operation	--	--	--	--	--
Waste Receipt	0.6	$10,675	$9,818	--	$20,493
Mixing	2.9	$17,792	$49,635	--	$67,428
Transport to ASPs	0.6	$10,142	$9,327	--	$19,469
Building ASPs	1.2	$20,283	$18,654	--	$38,938
Electricity for ASPs	--	--	--	$3,942	$3,942
Leachate Disposal	--	--	--	$891	$891
Moving Compost to Curing	1.0	$16,565	$15,234	--	$31,799
Managing Curing Piles	0.8	$14,198	$13,058	--	$27,256
Electricity for Curing ASPs				$32,626	$32,626
Screening Compost	0.4	$6,389	$4,407	--	$10,796
Moving Screened Compost to Storage	0.3	$4,472	$4,113	--	$8,586
Move Overs to Storage	0.19	$3,195	$2,938	--	$6,133
Process Management and Recordkeeping	4.0	$67,850	--	--	$67,850
Product Marketing & Sales	0.1	$1,917	$1,763	--	$3,680
Subtotals	12.1	**$204,092**	**$128,948**	**$37,459**	$370,500
Building & Site Maintenance[1]					$10,000
Contingency[2]					$37,050
Totals					**$417,550**

Assume 85% efficiency of site workers			Total	$ 417,550
Number of work-hours needed	14.3	hrs/day	Annual Tons	6,760
FTE's in a 8-hour day	**1.8**	**FTEs**	**Per Ton**	**$ 61.77**

[1]Estimated at 1% of capital cost (1 million $)

[2]Allowance of 10%

G-3 – Lab USA Capital Costs

Opinion of Probable Cost - Capital							
Project:	Red Wing Organics Diversion Feasibility Study			**Project No.**	22-1321		
	Aerobic Composting at Lab USA Building			**Date:**	3/23/2023		
		Construction Estimating Software:	**Zip Code**	**Material**	**Labor**	**Equipment**	
		Incr/Decr from national averages	55066	1%	7%	0	
Building/Site Area		**Description of Work**	**Quantity**	**Units**	**Unit Cost**	**Extended Value**	**Assumption Notes**
Site Work							
None needed							
Subtotal Site Work						$0	
Total Site Work						**$0**	
Processing System (Aerated Static Pile Composting)							
	Demolition	Remove partition wall	1	Ea	$10,000	$10,000	allowance / sonotubes
	Concrete	Aeration floor slab over concr floor	7,680	SF	$8.00	$61,500	8" slab, 4,000 psi concrete
		SSOM storage bunker walls (conc bl	40	blocks	$150.00	$6,000	installed price
		Ground YW storage bunker walls	112	blocks	$150.00	$16,800	installed price
		ASP bunker walls (concrete block)	900	blocks	$150.00	$135,000	installed price
		Back walls: 240' L x 10' H					
		Partition walls (15 x 32' L x 10' H)					
		Bond beam	240	LF	$30	$7,200	
		240' W x 12" H x 24" W					
	Technology	Compost process software	1	Ea	$20,000	$20,000	allowance
	Equipment	Rubber-tired front end loaders	2	Ea	$250,000	$500,000	
		20-CY dump truck	1	Ea	$75,000	$75,000	
		Roto-Mix 274-12B mixer	1	Ea	$150,000	$150,000	
		Aeration blowers	12	Ea	$2,000	$24,000	
		360 CFM/ASP needed - assume Peerless PW-11 1.5 HP blowers					
		Blower variable frequency drives	12	Ea	$350	$4,200	
		ASP thermocouples	24	Ea	$2,000	$48,000	
		Aeration piping	1,152	LF	$4.25	$51,000	
		4' O.C., 3 pipe runs/ASP x 32' L					
		Vacuum-lift separator for screen	1	Ea	$125,000	$125,000	
	Utilities	Power	1	Ea	$5,000	$10,000	allowance for connections
		Water	1	Ea	$5,000	$10,000	allowance for connections
		Sewer	1	Ea	$5,000	$10,000	allowance for connections
		Stormwater	1	Ea	$5,000	$10,000	allowance for connections
	Other	Biofiltration System (optional) incl p	25,744	SF	$10.00	$257,442	
Subtotal Processing System						$1,531,142	
Total Processing System						**$1,531,142**	
Summary of Opinion of Probable Costs							
Site Work/Scale Complex						$0	
Processing System						$1,531,142	
Other						--	
Subtotal Construction Costs						$1,531,142	
		General Condition	12%			$183,737	
		Engineering/Construction Admin	7.5%			$114,836	
		Contractor Markup	12%			$183,737	
		Contingency	25%			$382,786	
Summary - Total Estimated Costs						**$2,396,238**	

Notes:

Opinion of probable cost is preliminary and carries a confidence range of -30% / +50%

Data sourc Craftsman Estimating Software, 2022, adjusted for Zip Code 55066

G-4 – Lab USA Operational Costs

Opinion of Probable Costs - Operating

Project:	Red Wing Organics Diversion Feasibility Study	**Project No.:**	22-1321
	Aerobic Composting at Lab USA Building	**Date:**	5/16/2023

Assumptions

Labor rate (loaded) per hour - average for all workers	$65.24	per hour
Loader, dump truck, screen machine rate (fuel + insurance + maintenance)	$60.00	per hour
Mixer machine rate	$65.00	per hour
Transfer station tip fee	$120.72	per ton
Facility is open 5 days/week, 52 weeks/yr	260	days/yr
Neglects any overlap of labor functions between tasks		

Processing Volumes

	Avg Annual Vol.		Average Daily Volume	
Food Wastes	1,720	CY/yr	6.6	CY/day
Yard waste & leaves	14,796		56.9	
Overs	3,120		12.0	
Totals	19,636	CY/yr	75.5	CY/day

Scalehouse Operations

Assume scalehouse operations covered by existing Red Wing Solid Waste budget

Materials Handling Assumptions

Assume wastes & products handled by separate loaders with buckets		
Bucket capacity of loader	6	CY
Grinding done by others		
Mixing done by mechanical mixer		
Materials moved to composting and curing with loaders		
Materials moved to storage (overs and compost) by loaders		

Moving YW/Overs from SWC to Lab USA

Assume YW/Overs moved by dump truck with 20 CY capacity	20	CY/load
Amount of YW/Overs needed daily	69	CY/day
Number of truck trips daily	3	per day
Transit time between SWC and Lab USA	10	minutes eacl
Total transit time needed daily	34	minutes/day
Number of bucket movements to load dump truck	3.3	ea load
Time needed per bucket movement	2	minutes
Time needed to load each truck	7	minutes/loa(
Time needed to load dump trucks daily	23	minutes/day
Total time needed to load/transit daily	57	minutes/day
Convert to hours	1.0	hours/day
Labor cost/year	**$ 16,234**	
Machine cost/year	**$ 14,930**	

Materials Handling - Waste Receipt & Storage

Daily volumes coming into facility	75.5	CY/day
Number of loader "bucket-movements" to keep waste receipt area managed		
Daily volume / capacity of loader bucket	13	buckets/day

Assume time spent per loader movement			3	minutes
Time spent handling feedstocks			38	minutes/day
	Convert to hours		0.6	hours/day
	Labor cost/year	**$**	**10,675**	
	Machine cost/year	**$**	**9,818**	
Materials Handling - Mixing				
Assume contamination controlled by a mix of source control and vacuum extraction on screen				
Assume all feedstock mixing done by on-site mechanical mixer				
Daily mixing volume needed	=		76	CY/day
Assume use of stationary electric Roto-Mix 274-12B mixer, capacity:	=		10.0	CY
No. of mixing events daily	=		8	
No. of loader "bucket-movements" to load mixer daily			13	
Assume time spent per loading event to load mixer			7	minutes ea.
Time spent loading mixer daily			88	minutes
	Convert to hours		1.5	hours/day
Assume mixing time per mixing event			15	minutes
Time spent running mixer daily			113	minutes
	Convert to hours		1.9	hours/day
	Labor cost/year	**$**	**24,909**	
	Machine cost/year	**$**	**56,726**	
Materials Handling - Transport To Composting ASP Bunkers				
Avg. daily volume going to composting (assume 5% shrink in mixing)			72	CY/day
Number of loader bucket movements			12	buckets/day
Time to tear down, pick up, transport to ASP bunker, return			3	min/bucket
Total time needed to move compost to bunker			35.9	minutes/day
	Convert to hours		0.6	hours/day
	Labor cost/year	**$**	**10,142**	
	Machine cost/year	**$**	**9,327**	
Building ASPs				
Assume all ASPs built with loader			6	CY/bucket
Daily volume coming to composting bunkers			72	CY/day
Number of buckets per day			12	buckets/day
Time needed to install plenum, load bunker, install cover			6	minutes ea.
Time needed to build ASPs			71.7	minutes/day
	Convert to hours		1.2	hours/day
	Labor cost/year	**$**	**20,283**	
	Machine cost/year	**$**	**18,654**	
ASP Aeration System				
Size of blower			1.5	hp/ASP
Assume 15 min on/45 min off; hours running each day			6	hrs/day
Assumed electrical consumption at 1 kW = 1 hp			1.5	kilowatts
kWh per day			9	kWh/day
Cost of electricity		$	0.10	per kWh

Annual cost of each motor	$	329	
Annual electricity cost for 12 blowers	**$**	**3,942**	

Leachate Management			
Assume leachate drains by gravity to Red Wing IWWTP			
Assumed leachate production rate		50	gal/ton
Tonnage of food waste daily		3.846153846	tons/day
Daily leachate production		192	gal/day
	=	26	CF/day
Red Wing industrial sewerage rate		$0.095	per CF
Annual sewerage fee for leachate (only)		**$891.48**	

Materials Handling - Moving Compost to Curing at SWC				
Avg. daily volume going to curing (assume 30% shrink)			50	CY/day
Number of loader bucket movements			8	buckets/day
Time to tear down, pick up, and load truck			7	min/bucket
Time needed daily to move compost to dump truck			59	minutes/day
Assume compost moved to SWC by YW/Overs dump truck			20	CY/load
Number of truck trips daily			3	per day
Transit time between Lab USA and SWC			10	minutes each
Total transit time needed daily			25	minutes/day
Total time needed to move compost to curing			84	minutes/day
	Convert to hours		1.4	hours/day
	Labor cost/year	**$**	**23,664**	
	Machine cost/year	**$**	**21,763**	

Managing Curing Piles				
Assume curing piles built with loader			6	CY/bucket
Daily volume coming to curing			50	CY/day
Number of buckets per day			8	buckets/day
Time needed to move compost to curing (ea)			6	minutes ea.
Time needed to move compost to curing (all)			50	minutes/day
	Convert to hours		0.8	hours/day
	Labor cost/year	**$**	**14,198**	
	Machine cost/year	**$**	**13,058**	

Turning Curing Piles				
Total volume of material in turned mass beds per 60-day cure cycle			2,719	CY
Number of bucket movements to turn pile each time			453	movements
Time for each bucket movement			3	minutes
Time needed per turning event			1,359	minutes
		=	23	hours/event
Number of turning events/cycle (assume every 2 weeks)			4	events/cycle
Number of cycles each year			6	cycles/year
Total time spent turning mass curing beds			544	hours/year
	Labor cost/year	**$**	**35,475**	
	Machine cost/year	**$**	**32,626**	

Screening Compost			
Avg. daily volume going to screening (assume 10% shrink in curing)		45	CY/day
Assume screen hopper volume = loader bucket volume		6	CY
Number of loader bucket movements daily		8	buckets/day
Time to move compost from curing to screening		3	min/bucket
Total time needed to move compost		23	min/day
Convert to hours		0.4	hrs/day
Assume screen throughput rate		40	CY/hr
Screen run time per day (assume no add'l labor needed)		1	hrs/day
Total time for screening compost and making soil blends		1.1	hrs/day
Assume vacuum extraction for contaminants pulls off		10%	
Volume of contaminants removed daily		5	CY/day
Assumed bulk density		50	lbs/CY
Annual tonnage of contaminants removed		29	tons/year
Labor cost/year	$	**6,389**	
Machine cost/year	$	**4,407**	
Landfill cost/year	$	**3,547**	
Materials Handling - Screened Compost to Storage			
Assume fines yield off screen		70	%
Avg. daily volume coming off screen		32	CY/day
Number of loader bucket movements		5	buckets/day
Time to tear down, pick up, transport		3	minutes ea.
Total time needed to move compost to storage		15.8	minutes/day
Total time needed to load and move compost		16	minutes/day
Convert to hours		**0.3**	**hours/day**
Labor cost/year	$	**4,472**	
Machine cost/year	$	**4,113**	
Materials Handling - Overs to Storage			
Assume overs yield off screen		30	**%**
Avg. daily volume coming off screen		13.6	CY/day
Number of loader bucket movements		2	buckets/day
Time to tear down, pick up, transport to mixing		5	minutes ea.
Total time needed to load and move overs		11.3	minutes/day
Convert to hours		**0.19**	**hours/day**
Labor cost/year	$	**3,195**	
Machine cost/year	$	**2,938**	
Process Management and Recordkeeping			
Time needed to monitor temperatures, moisture, maintain operations log		4.0	hours/day
Convert to hours		**4.0**	**hours/day**
Labor cost/year	$	**67,850**	
Machine cost/year	$	**-**	
Product Load-Out			
Annual compost production volume		3,526	CY/yr

Average daily production volume	14	CY/day
Assume 100% wholesale distribution		
Tractor-trailer load capacity	40	CY
Number of TTL loads needed daily	0.34	per day
Number of bucket movements daily	7	
Time needed per bucket movement	3	min
Time needed to load TTL	20	min. ea.
Time needed to load trucks	6.8	min./day
Convert to hours	**0.1**	**hours/day**
Labor cost/year	**$ 1,917**	
Machine cost/year	**$ 1,763**	

Labor Summary		Annual Operating Expenses Summary ASP Composting			
Process	Hrs/Day	Labor Cost	Machine Costs	Consumables	Total
Scalehouse operation	--	--	--	--	--
ving YW/overs from SWC to Lab	1.0	$16,234	$14,930	--	$31,164
Waste Receipt	0.6	$10,675	$9,818	--	$20,493
Mixing	3.4	$24,909	$56,726	--	$81,636
Transport to ASPs	0.6	$10,142	$9,327	--	$19,469
Building ASPs	1.2	$20,283	$18,654	--	$38,938
Electricity for ASPs	--	--	--	$3,942	$3,942
Leachate Disposal	--	--	--	$891	$891
Moving Compost to Curing	1.4	$23,664	$21,763	--	$45,427
Managing Curing Piles	0.8	$14,198	$13,058	--	$27,256
Electricity for Curing ASPs				$32,626	$32,626
Screening Compost	0.4	$6,389	$4,407	--	$10,796
Moving Screened Compost to Storage	0.3	$4,472	$4,113	--	$8,586
Move Overs to Storage	0.19	$3,195	$2,938	--	$6,133
Process Management and Recordkeeping	4.0	$67,850	--	--	$67,850
Product Marketing & Sales	0.1	$1,917	$1,763	--	$3,680
Subtotals	13.9	**$239,916**	**$142,568**	**$37,459**	$419,943
Building & Site Maintenance[1]					$10,000
Contingency[2]					$41,994
Totals					**$471,938**

Assume 85% efficiency of site workers			Total	$ 471,938
Number of work-hours needed	16.4	hrs/day	Annual Tons	6,760
FTE's in a 8-hour day	**2.05**	**FTEs**	**Per Ton**	**$ 69.81**

[1]Estimated at 1% of capital cost (1 million $)

[2]Allowance of 10%

Appendix H

Compost Facility Footprint Analysis

H-1 – Campus Compost Facility

H-2 – Lab USA Building Compost Facility

H-1 – Campus Compost Facility

Red Wing Composting Facility
Aerated Static Pile Footprint Analysis
Craig Coker, Coker Composting & Consulting 2/13/2023

Assumptions:
1. Facility is open 5 days/week, 52 weeks/year (260 days/yr)
2. Facility will use aerated static pile composting and turned pile curing
3. All waste receipt, pre-processing, composting under roof or inside building
4. Curing, screening, product storage outside

Waste Volumes (in cubic yards)

	Average Annual Volume (CY)	Average Daily Volume (CY)	
SSOM	1,720	7	
Yard waste & leave	14,796	57	
Overs	3,120	12	
Totals		76	CY/day

Composting Materials Flows

Residence times for ASP composting

	Composting		Curing		Total	
ASP	28	days	60	days	88	days

Average daily Volumes going to composting
Daily volumes of mixed feedstocks = 76 CY/day

Volume of material in Primary Composting (assume no volume loss due to mixing)

	Residence Days	Mixed feedstock	
ASP	28	2,115	CY

Average daily Volumes going to curing (assume 40% volume shrink in composting)
Daily volumes of composted feedstocks = 45 CY/day

Volume of material in Curing:

	Residence Days	Composted	
ASP	60	2,719	CY

Average daily Volumes going to screening (assume 10% volume shrink in curing):
Daily volumes of compost = 41 CY/day

Screening
Assume approx. 70% finished compost capture rate and 30% going to overs
Finished compost production (daily):
Daily volumes of screened compost = 29 CY/day
Daily volumes of overs = 12 CY/day
Overs go to waste receipt area
Finished compost production (annually, based on 260-day year)
Annual volume of screened compost = 7,422 CY/year

Feedstocks Receipt

Assume daily delivery of feedstocks 5 days/week
Assume all feedstock deliveries by various vehicles (trash trucks, pickups, etc.)
SSOM
Assume all deliveries are made inside building
Assume feedstock receipts area cleared off by end of each day (if possible)

Size receipts area for 2 days incoming feedstocks		13	CY
	=	357	CF
Assume maximum receipts pile height	=	6	ft
Needed receipts area footprint	=	60	SF
Allow more area for vehicle, people and equipment movement	=	400	SF

Total SSOM Feedstock receipts area	=	**460**	**SF**
Yard Waste & Screen Overs			
Assume yard waste stored, ground in current yard waste area			
Assume screen overs stored in current yard waste area			
Average daily volumes of yard waste + overs	=	69	CY/day
Assume 7 days storage capacity	=	482	CY
Average pile height	=	8	ft
Pile footprint	=	1,628	SF
Allow another 50% for vehicle, equipment, people movement	=	814	SF
Total Yard Waste + Overs Receipt/storage area	=	**2,442**	**SF**

Feedstock Processing

Assume contamination controlled by a mix of source control and vacuum extraction on screen

Assume all feedstock mixing done by on-site mechanical mixer

Daily mixing volume needed	=	76	CY/day
Assume use of stationary electric Roto-Mix 274-12B mixer, capacity:	=	10.0	CY
No. of mixing events daily	=	8	
Operating Dimensions	=	8	ft W
	=	15	ft. L

Allow 20' on 3 sides for equipment access & safety zone, 50' in front for loading:

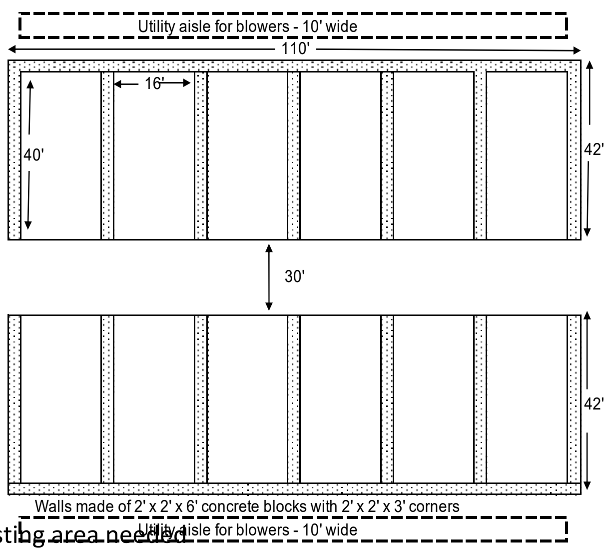
Mixing area needed	=	**4,300**	**SF**

Active Composting ASP Footprint Calculations

Composting residence time	=	28	days
Total volume in composting per cycle	=	2,115	CY
Assume one ASP built every 2.5 days			
Pile volume	=	189	CY
	=	5,098	CF
Assumed ASP pile height (net of 0.5' mulch plenum + 0.5' biocover)	=	8	ft
Footprint of each ASP	=	637	SF
Assume ASP pile width	=	16	ft
Assumed ASP pile length	=	40	ft
Volume capacity of each ASP bunker	=	5,098	CF
	=	189	CY
Number of ASPs in each cycle			
Total volume in cycle / volume of each pile	=	11	ASPs

Assume concrete block bunkers (2' thick)

Assume 30' wide working aisle between rows of ASPs



Composting area needed	=	14,740	SF
Dimensions	=	134	ft L
	=	110	ft W

<u>Composting aeration system</u>

Assume one blower/pile			
Volume of each pile	=	189	CY
Assumed bulk density of each pile	=	900	lbs/CY
Wet tonnage in each pile	=	85.0	tons
Assumed pile moisture content	=	50	%
Dry tonnage in each pile	=	42.5	dry tons
Aeration rate	=	500	CFH/dry ton
Aeration needed for each pile	=	21,241	CFH/ASP
Blower air flow needed	=	354	CFM/ASP

Allow 10' wide utility aisle behind piles for blowers, piping

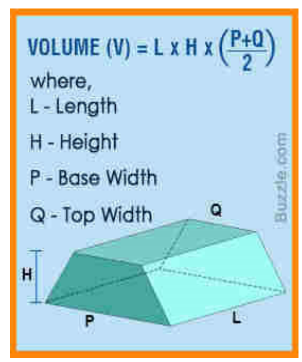
Composting pad area needed	**=**	**15,000**	**SF**

Leachate Tank

Assume all leachate discharged to Red Wing industrial pretreatment system

Curing Pad Sizing and Layout Calculations			
Assume 40% volume shrink during composting			
Average daily volume to composting	=	76	CY/day
Average daily volume to curing	=	45	CY/day
Assume turned mass bed curing			
Total volume of material in piles during 60-day curing period	=	2,719	CY
	=	73,408	ft3
Assume curing pile height	=	10	ft
Curing pile footprint	=	7,341	SF
Allow 20' wide working area in front of pile			
Curing area needed	=	9,341	SF
Dimensions (incl. 20' W x 100' L empty space to turn pile into)	=	100	ft L
		120	ft W

Screening & Product Storage Sizing and Layout Calculations			
Assume use of a trommel with 3/8" screen			
Assume approximately 70%/30% fines/overs split			
Plan on four months finished compost storage			
Daily volume going to screening (10% volume shrinkage in curing)	=	41	CY/day
Daily volume of compost going to storage	=	29	CY/day
Daily volume of overs going to storage	=	12	CY/day
Screen size	Leng	50	ft
	Widt	10	ft
Allow 25 ft all sides for equipment movement			
Screening area needed	**=**	**6,000**	**SF**
Total Volume in Storage Pile			
Daily volume x 5 days/week operation x 4 months capac		2,284	CY
	=	61,663	CF
Assume maximum pile height	=	10	ft
Assume pile base width	=	20	ft
Volume per linear foot (trapezoidal - V=1/2(B1+B2)*H*L)	=	3.70	CY/LF
Total linear footage of storage piles needed		620	LF
Assume pile length		160	ft.
Number of storage piles needed	=	4	
Space allowance around piles for equipment, vehicle loading etc.	=	25	ft
Area of compost product storage pile	=	12,525	SF
Assume 20' x 30' area in front of pile for equipment access			
Product storage area needed	=	**13,125**	**SF**



Area Summary - aerated static pile	Area (sq. ft.)	Area (acres)
Feedstock Receipt	460	0.01
Feedstock Mixing	4,300	0.10
Composting Pad	15,000	0.34
Curing Pad	9,500	0.22
Screening Area	6,000	0.14
Product Storage Area	13,125	0.30
Total	**48,385**	**1.11**

H-2 – Lab USA Building Compost Facility

Red Wing Composting Facility
Aerated Static Pile Footprint Analysis at Lab USA Building
Craig Coker, Coker Composting & Consulting 2/19/2023

Assumptions:
1. Facility is open 5 days/week, 52 weeks/year (260 days/yr)
2. Facility will use aerated static pile composting and turned pile curing
3. All waste receipt, pre-processing, composting ***inside LabUSA building***
4. Curing, screening, product storage outside at YW area in Solid Waste Campus across street

Waste Volumes (in cubic yards)

	Average Annual Volume (CY)	Average Daily Volume (CY)	
SSOM	1,720	7	
Yard waste & leave:	14,796	57	
Overs	3,120	12	
Totals		76	CY/day

Composting Materials Flows

Residence times for ASP composting

	Composting		Curing		Total	
ASP	28	days	60	days	88	days

Average daily Volumes going to composting
Daily volumes of mixed feedstocks = 76 CY/day
Volume of material in Primary Composting (assume no volume loss due to mixing)

	Residence Days	Mixed feedstock	
ASP	28	2,115	CY

Average daily Volumes going to curing (assume 40% volume shrink in composting)
Daily volumes of composted feedstocks = 45 CY/day
Volume of material in Curing:

	Residence Days	Composted	
ASP	60	2,719	CY

Average daily Volumes going to screening (assume 10% volume shrink in curing):
Daily volumes of compost = 41 CY/day
Screening
Assume approx. 70% finished compost capture rate and 30% going to overs
Finished compost production (daily):
Daily volumes of screened compost = 29 CY/day
Daily volumes of overs = 12 CY/day
Overs go to waste receipt area
Finished compost production (annually, based on 260-day year)
Annual volume of screened compost = 7,422 CY/year

Feedstocks Receipt

Assume daily delivery of feedstocks 5 days/week
Assume all feedstock deliveries by various vehicles (trash trucks, pickups, etc.)

SSOM

Assume all deliveries are made inside Lab USA building			
Assume feedstock receipts area cleared off by end of each day (if possible)			
Size receipts area for 2 days incoming feedstocks		13	CY
	=	357	CF
Assume maximum receipts pile height	=	6	ft
Needed receipts area footprint	=	60	SF
Assume 3-sided concrete block bunker	=	8	ft L
		8	ft W

Yard Waste & Screen Overs

Assume yard waste stored, ground in current yard waste area at Solid Waste Campus			
Assume screen overs stored in current yard waste area			
Average daily volumes of yard waste + overs	=	69	CY/day
Assume ground-up YW and screen overs delivered to LabUSA building			
Assume 3 days storage capacity	=	207	CY
Average pile height	=	8	ft
Pile footprint	=	698	SF
Assume 3-sided concrete block bunker	=	72	ft L
		12	ft W

Feedstock Processing

Assume contamination controlled by a mix of source control and vacuum extraction on screen

Assume all feedstock mixing done by on-site mechanical mixer			
Daily mixing volume needed	=	76	CY/day
Assume use of stationary electric Roto-Mix 274-12B mixer, capacity:	=	10.0	CY
No. of mixing events daily	=	8	
Operating Dimensions	=	8	ft W
	=	15	ft. L
Allow 20' on 3 sides for equipment access & safety zone, 50' in front for loading:			
Mixing area needed	=	**4,300**	**SF**

Active Composting ASP Footprint Calculations

Composting residence time	=	28	days
Total volume in composting per cycle	=	2,115	CY
Assume one ASP built every 2.5 days			
Pile volume	=	189	CY
	=	5,098	CF
Assumed ASP pile height (net of 0.5' mulch plenum + 0.5' biocover)	=	8	ft
Footprint of each ASP	=	637	SF
Assume ASP pile width	=	20	ft
Assumed ASP pile length	=	32	ft
Volume capacity of each ASP bunker	=	5,120	CF
	=	190	CY
Number of ASPs in each cycle			
Total volume in cycle / volume of each pile	=	11	ASPs
Assume reinforced concrete walls (6" thick)			
<u>Composting aeration system</u>			
Assume one blower/pile			
Volume of each pile	=	189	CY
Assumed bulk density of each pile	=	900	lbs/CY
Wet tonnage in each pile	=	85.0	tons
Assumed pile moisture content	=	50	%
Dry tonnage in each pile	=	42.5	dry tons
Aeration rate	=	500	CFH/dry ton
Aeration needed for each pile	=	21,241	CFH/ASP
Blower air flow needed	=	354	CFM/ASP
Allow 10' wide utility aisle behind piles for blowers, piping			

Leachate Tank

Assume all leachate discharged to Red Wing industrial pretreatment system

Biofilter

Assume building air evacuation rate	=	8	exchanges/hour
Building volume - gross	=	1,105,353	ft3
Less volume taken up by composting ASPs	=	67,568	ft3
Less volume taken up by feedstock storage	=	7,296	ft3
Less volume taken up by mixer	=	720	ft3
Net building air volume	=	1,029,769	ft3
Air extraction rate	=	8,238,152	ft3/hour
	=	137,303	ft3/minute
Desired gas retention time in biofilter	=	45	seconds
	=	0.75	minutes
Volume of biofilter needed	=	102,977	ft3
Assumed biofilter depth	=	4	ft
Biofilter footprint	=	25,744	SF
	=	0.6	ac.

Curing Pad Sizing and Layout Calculations (at Solid Waste Campus)			
Assume 40% volume shrink during composting			
Average daily volume to composting	=	76	CY/day
Average daily volume to curing	=	45	CY/day
Assume turned mass bed curing			
Total volume of material in piles during 60-day curing period	=	2,719	CY
	=	73,408	ft3
Assume curing pile height	=	10	ft
Curing pile footprint	=	7,341	SF
Allow 20' wide working area in front of pile			
Curing area needed	=	9,341	SF
Dimensions (incl. 20' W x 100' L empty space to turn pile into)	=	100	ft L
		120	ft W

Screening & Product Storage Sizing and Layout Calculations (at Solid Waste Campus)			
Assume use of a trommel with 3/8" screen			
Assume approximately 70%/30% fines/overs split			
Plan on four months finished compost storage			
Daily volume going to screening (10% volume shrinkage in curing)	=	37	CY/day
Daily volume of compost going to storage	=	29	CY/day
Daily volume of overs going to storage	=	7	CY/day
Screen size	Lengt	50	ft
	Widt	10	ft
Allow 25 ft all sides for equipment movement			
Screening area needed	**=**	**6,000**	**SF**
<u>Total Volume in Storage Pile</u>			
Daily volume x 5 days/week operation x 4 months capaci		2,349	CY
	=	63,425	CF
Assume maximum pile height	=	10	ft
Assume pile base width	=	20	ft
Volume per linear foot (trapezoidal - V=1/2(B1+B2)*H*L)	=	3.70	CY/LF
Total linear footage of storage piles needed		640	LF
Assume pile length		160	ft.
Number of storage piles needed	=	4	
Space allowance around piles for equipment, vehicle loading etc.	=	25	ft
Area of compost product storage pile	=	12,925	SF
Assume 20' x 30' area in front of pile for equipment access			
Product storage area needed	=	**13,000**	**SF**

Appendix I

Net Present Value Analysis Disposal Options

Present Value Equation:

$$PV = \frac{FV(1 + i \cdot n)}{(1 + r)^n}$$

Key:
PV = Present value ($)
FV = Future value ($)
r = discount (or interest) rate
i = inflation rate
n = number of periods (years)

The nominal discount rate was taken at 3 percent based on current Red Wing municipal bond rates, and the inflation rate was taken at 2.2 percent based on the February 2023 Congressional Budget Office (CBO) economic forecast for 2025-2033. The number of periods is taken as years in this analysis. It applies compound interest, so that interest increases exponentially over subsequent periods.

Red Wing Organics Diversion Feasibility Study

Net Present Value analysis

Nominal Discount Rate (%) = 3.00 Red Wing Municipal Bond Rate

Expected Inflation Rate (%)[1] = 2.20 Feb 2023 CBO inflation estimate

Economic Life (years) = 10

Alt. 1a Disposal Offsite disposal at SET (now WM) Compost Facility

Year		Capital Expenditure[3] - current $	Annual Operations Cost - Base Year $	Cost Inflation Factor	Annual Cost - Current Year $	Annual Revenues - Base Year $	Revenue Inflation Factor	Annual Revenue - Current Year $	Total Expenditures - Current yr $	Present Worth Factor	Present Worth[2] of Total Cost - Base Yr $
2025	Year 1		$115,250	1.0000	$115,250		1.0000		$115,250	1.0000	$115,250
2026	Year 2		$115,250	1.0220	$117,786		1.0220		$117,786	0.9709	$114,355
2027	Year 3		$115,250	1.0445	$120,377		1.0445		$120,377	0.9426	$113,467
2028	Year 4		$115,250	1.0675	$123,025		1.0675		$123,025	0.9151	$112,585
2029	Year 5		$115,250	1.0909	$125,732		1.0909		$125,732	0.8885	$111,711
2030	Year 6		$115,250	1.1149	$128,498		1.1149		$128,498	0.8626	$110,843
2031	Year 7		$115,250	1.1395	$131,325		1.1395		$131,325	0.8375	$109,982
2032	Year 8		$115,250	1.1645	$134,214		1.1645		$134,214	0.8131	$109,128
2033	Year 9		$115,250	1.1902	$137,167		1.1902		$137,167	0.7894	$108,281
2034	Year 10		$115,250	1.2163	$140,184		1.2163		$140,184	0.7664	$107,439
										NPV=	**$1,113,042**

Notes

1 - Inflation rate is Feb 2023 CBO Economic Forecast for 2025-2033

2 - Present worth factor based on single payment present worth (P/F, i%, n) or $(1 = i)^{-n}$

Red Wing Organics Diversion Feasibility Study

Net Present Value analysis

Nominal Discount Rate (%) = 3.00 Red Wing Municipal Bond Rate

Expected Inflation Rate (%)[1] = 2.20 Feb 2023 CBO inflation estimate

Economic Life (years) = 10

Alt. 1a Disposal Offsite disposal at SMSC Compost Facility

Year		Capital Expenditure[3] - current $	Annual Operations Cost - Base Year $	Cost Inflation Factor	Annual Cost - Current Year $	Annual Revenues - Base Year $	Revenue Inflation Factor	Annual Revenue - Current Year $	Total Expenditures - Current yr $	Present Worth Factor	Present Worth[2] of Total Cost - Base Yr $
2025	Year 1	$0	$105,750	1.0000	$105,750	$0	1.0000	$0	$105,750	1.0000	$105,750
2026	Year 2		$105,750	1.0220	$108,077		1.0220		$108,077	0.9709	$104,929
2027	Year 3		$105,750	1.0445	$110,454		1.0445		$110,454	0.9426	$104,114
2028	Year 4		$105,750	1.0675	$112,884		1.0675		$112,884	0.9151	$103,305
2029	Year 5		$105,750	1.0909	$115,368		1.0909		$115,368	0.8885	$102,503
2030	Year 6		$105,750	1.1149	$117,906		1.1149		$117,906	0.8626	$101,707
2031	Year 7		$105,750	1.1395	$120,500		1.1395		$120,500	0.8375	$100,917
2032	Year 8		$105,750	1.1645	$123,151		1.1645		$123,151	0.8131	$100,133
2033	Year 9		$105,750	1.1902	$125,860		1.1902		$125,860	0.7894	$99,355
2034	Year 10		$105,750	1.2163	$128,629		1.2163		$128,629	0.7664	$98,583
										NPV=	**$1,021,294**

Notes

1 - Inflation rate is Feb 2023 CBO Economic Forecast for 2025-2033

2 - Present worth factor based on single payment present worth (P/F, i%, n) or $(1 = i)^{-n}$

Red Wing Organics Diversion Feasibility Study

Net Present Value analysis

Nominal Discount Rate (%) = 3.00 Red Wing Municipal Bond Rate

Expected Inflation Rate (%)[1] = 2.20 Feb 2023 CBO inflation estimate

Economic Life (years) = 10

Alt. 1a Disposal Offsite disposal at Washington/Ramsey Anaerobic Digestion (AD) Facility <Future>

Year		Capital Expenditure[3] - current $	Annual Operations Cost - Base Year $	Cost Inflation Factor	Annual Cost - Current Year $	Annual Revenues - Base Year $	Revenue Inflation Factor	Annual Revenue - Current Year $	Total Expenditures - Current yr $	Present Worth Factor	Present Worth[2] of Total Cost - Base Yr $
2025	Year 1	$0	$119,000	1.0000	$119,000	$0	1.0000	$0	$119,000	1.0000	$119,000
2026	Year 2		$119,000	1.0220	$121,618		1.0220		$121,618	0.9709	$118,076
2027	Year 3		$119,000	1.0445	$124,294		1.0445		$124,294	0.9426	$117,159
2028	Year 4		$119,000	1.0675	$127,028		1.0675		$127,028	0.9151	$116,249
2029	Year 5		$119,000	1.0909	$129,823		1.0909		$129,823	0.8885	$115,346
2030	Year 6		$119,000	1.1149	$132,679		1.1149		$132,679	0.8626	$114,450
2031	Year 7		$119,000	1.1395	$135,598		1.1395		$135,598	0.8375	$113,561
2032	Year 8		$119,000	1.1645	$138,581		1.1645		$138,581	0.8131	$112,679
2033	Year 9		$119,000	1.1902	$141,630		1.1902		$141,630	0.7894	$111,804
2034	Year 10		$119,000	1.2163	$144,745		1.2163		$144,745	0.7664	$110,935
										NPV=	**$1,149,258**

Notes

1 - Inflation rate is Feb 2023 CBO Economic Forecast for 2025-2033

2 - Present worth factor based on single payment present worth (P/F, i%, n) or $(1 = i)^{-n}$

Red Wing Organics Diversion Feasibility Study

Net Present Value analysis

Nominal Discount Rate (%) = 3.00 Red Wing Municipal Bond Rate

Expected Inflation Rate (%)[1] = 2.20 Feb 2023 CBO inflation estimate

Economic Life (years) = 10

Alt. 1a **Disposal** **Onsite disposal Red Wing Solid Waste Campus Compost Facility**

Year		Capital Expenditure[3] - current $	Annual Operations Cost - Base Year $	Cost Inflation Factor	Annual Cost - Current Year $	Annual Revenues - Base Year $	Revenue Inflation Factor	Annual Revenue - Current Year $	Total Expenditures - Current yr $	Present Worth Factor	Present Worth[2] of Total Cost - Base Yr $
2025	Year 1	$4,746,833	$417,550	1.0000	$5,164,383	$42,308	1.0000	$42,308	$5,122,075	1.0000	$5,122,075
2026	Year 2		$417,550	1.0220	$426,736	$42,308	1.0220	$43,238	$383,498	0.9709	$372,328
2027	Year 3		$417,550	1.0445	$436,124	$42,308	1.0445	$44,190	$391,935	0.9426	$369,436
2028	Year 4		$417,550	1.0675	$445,719	$42,308	1.0675	$45,162	$400,557	0.9151	$366,566
2029	Year 5		$417,550	1.0909	$455,525	$42,308	1.0909	$46,155	$409,369	0.8885	$363,719
2030	Year 6		$417,550	1.1149	$465,546	$42,308	1.1149	$47,171	$418,375	0.8626	$360,894
2031	Year 7		$417,550	1.1395	$475,788	$42,308	1.1395	$48,209	$427,580	0.8375	$358,091
2032	Year 8		$417,550	1.1645	$486,256	$42,308	1.1645	$49,269	$436,986	0.8131	$355,310
2033	Year 9		$417,550	1.1902	$496,953	$42,308	1.1902	$50,353	$446,600	0.7894	$352,550
2034	Year 10		$417,550	1.2163	$507,886	$42,308	1.2163	$51,461	$456,425	0.7664	$349,812
										NPV=	**$8,370,783**

Notes

1 - Inflation rate is Feb 2023 CBO Economic Forecast for 2025-2033

2 - Present worth factor based on single payment present worth (P/F, i%, n) or $(1 = i)^{-n}$

Red Wing Organics Diversion Feasibility Study

Net Present Value analysis

Nominal Discount Rate (%) = 3.00 Red Wing Municipal Bond Rate

Expected Inflation Rate (%)[1] = 2.20 Feb 2023 CBO inflation estimate

Economic Life (years) = 10

Alt. 1a Disposal Onsite disposal at Red Wing Lab USA Compost Facility

Year		Capital Expenditure[3] - current $	Annual Operations Cost - Base Year $	Cost Inflation Factor	Annual Cost - Current Year $	Annual Revenues - Base Year $	Revenue Inflation Factor	Annual Revenue - Current Year $	Total Expenditures - Current yr $	Present Worth Factor	Present Worth[2] of Total Cost - Base Yr $
2025	Year 1	$2,396,238	$531,938	1.0000	$2,928,175	$42,308	1.0000	$42,308	$2,885,867	1.0000	$2,885,867
2026	Year 2		$531,938	1.0220	$543,640	$42,308	1.0220	$43,238	$500,402	0.9709	$485,827
2027	Year 3		$531,938	1.0445	$555,600	$42,308	1.0445	$44,190	$511,411	0.9426	$482,054
2028	Year 4		$531,938	1.0675	$567,824	$42,308	1.0675	$45,162	$522,662	0.9151	$478,309
2029	Year 5		$531,938	1.0909	$580,316	$42,308	1.0909	$46,155	$534,160	0.8885	$474,594
2030	Year 6		$531,938	1.1149	$593,083	$42,308	1.1149	$47,171	$545,912	0.8626	$470,908
2031	Year 7		$531,938	1.1395	$606,130	$42,308	1.1395	$48,209	$557,922	0.8375	$467,251
2032	Year 8		$531,938	1.1645	$619,465	$42,308	1.1645	$49,269	$570,196	0.8131	$463,622
2033	Year 9		$531,938	1.1902	$633,094	$42,308	1.1902	$50,353	$582,740	0.7894	$460,021
2034	Year 10		$531,938	1.2163	$647,022	$42,308	1.2163	$51,461	$595,561	0.7664	$456,448
										NPV=	**$7,124,900**

Notes

1 - Inflation rate is Feb 2023 CBO Economic Forecast for 2025-2033

2 - Present worth factor based on single payment present worth (P/F, i%, n) or $(1 = i)^{-n}$

Appendix J

Permitting Requirements

1.1 Regulatory Review

1.1.1 Regulatory Requirements

Development and operation of a SSOM compost facility is regulated under Minn. Rules 7001 and 7035. Minn. Rules 7001.3000 through 7001.3550 establishes the minimum requirements for solid waste management facility permits. In particular, Minn. Rules 7001.3375 establishes the minimum requirements for the final application for compost facilities which include, but is not limited to:

1. Description of the area for each stage of the composting process.
2. Description of the design and physical features of the facility, including run-off, run-on, and leachate control systems.
3. Description of the material to be composted.
4. Description of the composition of the rejects and residuals.
5. Description of the disposal method for the rejects and residuals.
6. Design of an odor control system.
7. Design and performance specifications of the compost facility.
8. Description of the composting method including retention time, temperature to be achieved, number of turns needed, and the air flow design.
9. Operating plan including a waste analysis plan.
10. Description of the proposed uses for the compost.
11. MPCA-approved work plan and report summarizing field activities.
12. Evidence that the owner and operator have obtained all necessary local approvals.

As discussed in **Section 5**, two locations were evaluated for a potential compost facility: the Campus, and the Lab USA Facility. The advantages of incorporating a new compost facility at the Campus into the existing solid waste permit number SW-661 include:

- Once permitted additional permit applications, public notices, or environmental review would not be required during future permitting efforts.
- Existing information and/or requirements regarding site conditions and related permits, such as stormwater or leachate discharge permits, would apply to all solid waste activities. If planned accordingly, no additional permits would be required.
- Monitoring and annual reporting for all activities would be combined.

Disadvantages to combining the compost facility under the existing solid waste permit include:

- The Facility would be located around 20 miles from the primary source of compostable material and feedstock. However, this distance is significantly less than the other nearest compost facility (e.g., SET).
- Based on site conditions, the compost operations would move a solid waste activity closer to the nearest residence, however this activity would still be further than 500 feet away from the nearest residence.
- If enforceable operational issues arise at either the RDF or Compost facility, it will translate as an issue for the entire combined operations.

1.1.2 Review of Existing Compost Facilities

Our team has reviewed publications and worked with several Minnesota compost site managers to gain insight on their experience regarding regulations and operations. Based on the information obtained, the following issues, in no particular order, were identified as the primary concerns for existing facilities in Minnesota:

- Inadequate space for curing and interim operations.
- Fluctuating volumes, odor, monitoring, and disposal of contact water (storm events vs. odor-related issues during low precipitation time periods).
- Time to complete the curing operations to the final product (as much as one year or more).
- Contamination of compost with non-compostable material and removal of contaminants (e.g., screening techniques and disposal).
- Monitoring and documentation to maintain curing temperatures and to meet classification and maturity requirements.
- Finding an end market for the final product.
- Regulatory requirements and inspections.

Of the above issues identified from existing facilities, the greatest concerns were those beyond the control of the facility operators on a day-to-day basis such as contact water management and finding an adequate end market for the final product.

1.1.3 Environmental Review

Currently, compost facilities do not fall within any mandatory categories for an Environmental Assessment Worksheet (EAW) or Environmental Impact Statement (EIS) as provided in MN Rules 4410. However, local concerns have resulted in voluntary EAW's being completed for other facilities in Minnesota.

1.2 Siting Criteria

Minn. Rules 7035.2836, Subp. 8 and its references establishes specific siting criteria associated with SSOM compost facilities. Siting criteria for current solid waste operations and facilities were addressed in detail as part of the previous permitting efforts for the Campus and the Lab USA facility. Site conditions at the Campus and Lab USA sites were defined during geotechnical investigation. In most cases, the existing information from prior investigations and permitting will directly apply to siting criteria for the permitting of an SSOM compost facility.

The Campus and associated features were developed over time on approximately 16 acres located on Bench Street in Red Wing, Minnesota. Construction of the on-site wastewater basins were completed in the 1960's and the original waste combustor was installed in 1982 with a boiler system to generate steam for energy from the combustion of MSW. The former waste-to-energy facility has been transformed into an integrated solid waste management facility that includes an MRF, a refuse derived fuel (RDF) production facility, and areas for yard waste composting, clean wood chipping, construction and demolition debris recovery and transfer, recovery of recyclables and diversion of problem materials from the MRF. The City's industrial wastewater treatment system is also located on-site.

Lab USA's resource recovery facility permitted under SW-670 was constructed near the intersection of Bench Street and Featherstone on land owned by Xcel Energy that has been leased to the City of Red Wing through the years. Prior to the construction of the 30,000 square foot building in 2017, the property was undeveloped buffer land for Xcel Energy's Red Wing Ash Disposal Facility (Xcel's Landfill) that has been operating under solid waste permit number SW-

307 since 1987. Other site development associated with the facility included stormwater management features, sanitary sewer, and scale installation. Lab USA terminated operations at the facility in 2020.

1.2.1 Location Standards

Minn. Rules 7035.2836, Subp. 8, Item A, refers to location requirements established in Minn. Rules 7035.2555. The rules specifically prohibits development of a solid waste management facility within a floodplain, within a shoreland or wild and scenic river land use district, within a wetland, or where air emissions would violate ambient air quality standards.

Based on previous permitting and environmental review efforts, the proposed location for the SSOM compost facility would not apply to criteria related to floodplains, shoreland or wild and scenic rivers, wetlands, or air emissions standards.

1.2.2 Karst Features

Minn. Rules 7035.2836, Subp. 8, Item B specifically prohibits development of a solid waste management facility on a site with karst features including sinkholes, disappearing streams, and caves.

Based on previous geologic and hydrogeologic investigations, the proposed locations for the SSOM compost facility would not apply to criteria related to karst.

1.2.3 Water Table

Minn. Rules 7035.2836, Subp. 8, Item C specifically prohibits development of a solid waste management facility within five vertical feet of the water table. Based on prior geotechnical investigations, depth to groundwater at the two sites would not appear to be a limiting factor for SSOM compost facility siting as follows:

- The Campus: depth to the water table ranges from 10 to 20 feet below ground surface (bgs).
- Lab USA Facility: Depth to the water tables ranges from 12 to 24.5 feet bgs.

However, water table conditions must be confirmed as part of the permitting process. The MPCA has prepared a checklist for completion of a Site Suitability Work Plan for a SSOM Composting Facility (w-sw3-52) that requires MPCA approval prior to implementation. In addition, Minn. Rules 7035.2836, Subp. 9, Item B(1) specifically lists the required site preparation information that must be developed as part of the engineering design report that will likely include the following items:

- Completion of a geotechnical investigation to further determine site-specific conditions in the actual area of the proposed compost facility.
- Installation of one or more shallow piezometers in the actual area of the proposed compost facility to confirm groundwater conditions as part of the geotechnical investigation.

Therefore, based on previous geologic and hydrogeologic investigations, some steps will need to be taken during permitting to adequately address the water table location criteria.

1.2.4 Distance from Nearest Residence Property Boundary

Minn. Rules 7035.2836, Subp. 8, Item C specifically prohibits development of a solid waste management facility within 500 feet from the nearest residence as measured from all compost activities to the closest edge of the residential property boundary.

Based on site location information, the nearest residence property boundary for both the Campus and the Lab USA facility exceeds 1,000 feet. Therefore, based on existing site conditions, siting criteria associated with residential property boundary is not considered an issue for either site.

1.3 Design Criteria

Minn. Rules 7035.2836, Subp. 9 and its references establishes specific design requirements associated with SSOM compost facilities, which are discussed in detail in **Section 5**. But in general, design requirements are related to site preparation and access, stormwater management, contact water management and treatment, waste flows and ultimate deposition, liner design and process design.

1.3.1 Permitting Design Report

Part of the permit application process includes the development of an engineering design report. The following sections below describe the information required for the engineering design report in reference to the proposed compost operations.

1.3.1.1 Site Preparation

Minn. Rules 7035.2836, Subp. 9, Item B(1) specifically lists the required site preparation information that must be developed as part of the permit application. Site preparations must include clearing and grubbing for the compost operating and storage areas, building locations, topsoil stripping, excavations, berm construction, drainage control structures, storm water management systems, contact water collection systems, access roads, screening, fencing, and other distinctive design features.

As part of permitting process, the layout will need to be finalized to illustrate specific design features. Construction requirements for SSOM compost facilities are presented in Minn. Rules 7035.2836, Subp. 10 and include MPCA notification, quality control and quality assurance, and construction documentation and certification.

In general, information regarding site preparation itself will reference similar site preparation requirements for development already included in the Campus and Lab USA permitting documents. However, given the condition of existing pond structures on the Campus that would potentially be used for compost operations, considerable improvements and repair would be required to meet design criteria. Conversely, the relatively new Lab USA structure would require minimal if any upgrades to meet design criteria.

1.3.1.2 Facility Access

Minn. Rules 7035.2836, Subp. 9, Item B(2) specifically requires that access to the facility must be controlled to prevent unauthorized entry. Both the Campus and the Lab USA facility currently have limited access through controlled access roads and limited perimeter accessibility. Therefore, limited effort is anticipated to address regulatory requirements for adequate site control.

1.3.1.3 Stormwater Drainage

Minn. Rules 7035.2836, Subp. 9, Item B(3) specifically requires that stormwater be diverted around and away from the compost storage and operating areas. Specifically, the stormwater drainage control system must be designed to manage a 24-hour, 10-year storm event. Stormwater management is important primarily because the diversion of stormwater eliminates contact with waste and reduces leachate treatment requirements. Stormwater diversion would include the design of drainage ditches and the resultant conveyance and monitoring from the compost facility for discharge under an Industrial Stormwater Permit.

At the Lab USA facility, all stormwater was designed and constructed in accordance with an Industrial Stormwater Permit also known as the Multi-Sector General Permit (NPDES MNR050000), but not necessarily compost stormwater requirements. However, since compost operations are planned for indoors, it is likely that the MPCA would give an exemption for stormwater requirements as long as stormwater does not come in contact with compost prior to meeting maturity requirements.

A compost facility on the Campus may entail modification of stormwater control features to meet Minn. Rules 7035.2836 and NPDES MNR050000). In addition, any outdoor composting operations would not be eligible for stormwater exemptions.

1.3.1.4 Contact Water Collection and Treatment

Minn. Rules 7035.2836, Subp. 9, Item B(4) specifically requires that all contact water be collected and treated. The rule specifically references the municipal solid waste rules (Minn. Rules 7035.2815, Subp. 9) for leachate collection. The key design criteria for leachate collection includes a water balance calculation to estimate leachate generation rates and to provide adequate storage for the leachate following certain size storm events. Storage can be in the form of a tank or in a lined leachate pond.

Various existing compost operators indicate that while a leachate pond allows for evaporation, it also has the greatest potential for odor generation during hot, dry periods. However, compost generally has high suspended solids which could present an excessive buildup of sediment in storage tanks. Minnesota operators also indicated that they generally do not need to use the leachate for moisture in the compost process because there is often adequate moisture provided in the SSOM itself and from precipitation events. Operators also indicated that hauling leachate collected from processing and mixing areas tends to be a major burden to facility operations following rain events (cost and labor).

On the Campus, industrial wastewater pretreatment facilities are available to manage leachate. Although pond structures are available on-site for storage, improvements may be required to meet requirements under Minn. Rules 7035.2836; a leachate pond would generally include a composite liner consisting of compacted clay and HDPE. However, given the high organic content of the compost leachate, leachate would need to bypass the site pre-treatment system. At the Lab USA facility, leachate management would allow direct release to the existing trench drain discharge since Xcel previously re-routed the sanitary to bypass the Campus. For both scenarios, costs to discharge and treat leachate would be at the discretion of the City as these facilities are owned and operated by the City.

1.3.1.5 Rejects and Residuals

Minn. Rules 7035.2836, Subp. 9, Item B(5) specifically stipulates that rejects and residuals removed from the waste streams be stored, transported, and disposed properly. Note rejects and residuals are considered contaminants that are un-compostable. This does not include “overs”, which are compostable materials which take longer to break-down (e.g., cellulose rich materials like woodchips). Overs are recycled and sent to the beginning of the composting process for mixing with incoming material. Whereas rejects and residuals (i.e., contaminants) are removed and sent to a solid waste facility for disposal. Contaminant examples and case studies are discussed in more detail in **Section 3**.

Non-compostable materials are generally removed from the material following curing using a mechanical screening method. This process could take several screening efforts to remove the rejects and residuals from the compost based on size and material. The removed material generally is designated as MSW and must be stored properly either under cover or in an area with leachate collection. Depending on the volume of rejects and residuals, placement into a covered roll-off may be most cost-effective. It is anticipated that this material would be diverted to the RDF facility for inclusion in the waste-to-energy operations.

1.3.1.6 Tipping, Mixing, Active Composting, Curing, and Storage Areas

Minn. Rules 7035.2836, Subp. 9, Item B(6) specifically requires that all areas of compost operations be conducted on a "hard-packed, all-weather surface" to minimize migration of materials or contact water into the subsurface.

1.3.1.7 Soil Separation to the Water Table

Minn. Rules 7035.2836, Subp. 9, Item B(7) stipulates that the working surface of the SSOM compost facility have a minimum of five feet of soil separation to the water table. Water table conditions will be required to be confirmed as part of the permitting process. The MPCA has prepared a checklist for completion of a Site Suitability Work Plan for a Source-Separated Compost Facility (w-sw3-52) that requires MPCA approval prior to implementation.

1.3.1.8 Soil Type

Minn. Rules 7035.2836, Subp. 9, Item B(8) stipulates acceptable soil type for the compost area above the water table to include sandy clay loam, sandy clay, clay loam, silty clay loam, silty clay, and clay. An alternate separation distance between the activities and the water table may be approved under certain conditions including the presence of a perched water table or if it can be demonstrated that the high-water levels are a response to abnormally wet periods. Because the Lab USA site already has a structure that meet processing pad requirements, the soil type criteria is not a concern.

On the Campus, soil conditions have been defined as part of previous geotechnical testing. Because of the soil types and the significant presence of fill material, the soil classifications required for the compost area are not anticipated to meet the design criteria.

To address depth to groundwater and soil type from a regulatory and design perspective, a geotechnical report or shallow piezometer could be installed in the area of the proposed compost facility.

1.3.1.9 Pad Design

Minn. Rules 7035.2836, Subp. 9, Item B(9) requires the installation of a pad system in all areas where SSOM will be managed and composted prior to curing, if soil criteria described in Item B(8) cannot be met. The existing floor structure of the Lab USA building would meet the Pad Design requirements.

On the Campus, the existing soil conditions are unlikely to meet the required soil conditions for compost operations as stipulated in Minn. Rules 7035.2836, Subp. 9, Item B(8). Our experience has indicated that the use of compacted clayey soils will not provide a durable enough surface for actual composting operations requiring the use of heavy equipment and in reference to leachate collection. The MPCA's preference is that the processing surface be comprised of a durable, impervious pad surface such as concrete or asphalt that will: Maintain its integrity long-term; prevent leachate penetration into underlying soils; and readily convey leachate toward a leachate storage system. Obviously, a concrete pad, which generally would be more costly, will maintain its integrity longer than an asphalt surface.

Therefore, based on the need to maintain long-term integrity of a durable surface, a cost analysis should be made during design to include a concrete or asphalt processing pad.

1.3.1.10 Minimize Liquids, Odors, Vector, and Nuisance Conditions

Minn. Rules 7035.2836, Subp. 9, Item B(10) stipulates that the site must be designed to minimize liquids, odors, vectors, and nuisance conditions such as litter, noise, ponding, water, and erosion. These issues are generally less related to design and more related to site operations.

1.3.1.11 Equipment Needs

Actual equipment needs for composting can vary widely based on the waste flows and size of the processing pads. Some general needs for equipment for windrow operations include:

- Front end loaders for receiving, loading, and pile formation.
- Grinder or shredder used to grind yard waste and mix feedstock.
- Screener to remove contaminated material, unwanted objects, and clumps of compost.
- Dump truck to transport feedstock from receiving area to active compost site, curing area, and final storage area.
- Pickup truck to transports employees, maintenance equipment, and materials around site.

1.4 Site Operations

Minn. Rules 7035.2836, Subp. 11 and its references establishes specific operational requirements associated with SSOM compost facilities. Final operations will be based on the final design as described in Section 3.0. General operation requirements are presented below in reference to known and anticipated conditions for the proposed Red Wing compost facility.

1.4.1 Operation and Maintenance Manual

Minn. Rules 7035.2836, Subp. 11, Item A stipulates the development of an operation and maintenance manual specific for the compost facility. The manual must be included in the permit application. The manual must address all aspects of SSOM management including training, leachate, stormwater, odor, and sampling.

The Campus currently operates under an Operations Plan developed as part of past permitting documents. Modifications to certain sections will need to be incorporated into the existing Operations Plan as part of the permit application with new sections pertaining specifically to the compost operations. Further detail is provided on operations in the following sections.

1.4.2 Minimum Operating Requirements

Minn. Rules 7035.2836, Subp. 11, Item B describes the minimum operating requirements for a SSOM compost facility. Sixteen (16) different criteria are listed and summarized below. Some criteria are combined in the following sections if the item and its intent are similar.

1.4.2.1 Access

Minn. Rules 7035.2836, Subp. 11, Item B(1) requires access points to the facility must be secured when the facility is closed.

1.4.2.2 Delivery and Storage

Minn. Rules 7035.2836, Subp. 11, Item B(2), B(3), and B(4) include information related to delivery, end of day operations, and reject and residual (salvageable and recyclable) storage and removal. In addition, Minn. Rules 7035.2836, Subp. 11, Item B(8) establishes requirements to control wind dispersion of any particulate matter.

Delivery of SSOM will be directed to a mixing structure or area, while feedstock will be delivered directly into their designated storage area. The facility will need to be staffed every day that SSOM is received. A cover is generally recommended over the mixing structure to protect the material from wind and precipitation. Reject and residuals will need to be stored under cover in its designated area and removed once containers have been filled. Additional wind dispersion efforts must be developed for the facility to possibly include a frequency of waste turning, wetting of the SSOM compost at various stages, and covering with new compost to prevent generation of particulate matter.

1.4.2.3 Leachate Management

Minn. Rules 7035.2836, Subp. 11, Item B(5) indicates that all water in contact with SSOM, immature compost, and residuals must be diverted to a collection and treatment system.

All SSOM delivered to the facility will be placed directly in the mixing structure; all liquid generated in the mixing structure will need to be conveyed to the Leachate Collection System. In addition, routine cleaning of the floor of the mixing structure may also generate contact water that will need to be conveyed to the Leachate Collection System. All contact water or leachate generated on a processing pad from immature compost must also be conveyed to the Leachate Collection System. Any rejects or residuals in contact with stormwater in the screening and bypass storage area must also be diverted to the Leachate Collection System; however, storage of rejects and residuals undercover could reduce leachate generation.

As necessary, the compost operations will need to manage the leachate similar to the Landfill operations. Arrangements will need to be made to coordinate leachate sampling and testing and to conduct routine inspections and/or measurements for scheduling of leachate hauling, as necessary. In addition, any sludge built up in ponds or tanks will also need to be routinely completed. Leachate sampling and testing can be added to the facility’s existing Landfill monitoring plan. Similarly, routine inspections and measurements of the compost facility can be added to the Landfill's routine inspection.

1.4.2.4 Stormwater Management

Minn. Rules 7035.2836, Subp. 11, Item B(6), and B(7) indicates that stormwater must be managed through the federal and state NPDES programs. In addition, the rule allows use of contact water and stormwater to be used as moisture in the composting process.

An Industrial Stormwater Permit must be obtained for the discharge of stormwater at the compost facility. On the Campus, stormwater is already being managed under an existing permit and the current SWPPP. The existing stormwater pond and conveyance systems may be adequate to manage the stormwater generated in the vicinity of the compost facility. If the pond cannot be used, additional discharge monitoring requirements may need to be added to the existing Industrial Stormwater Permit as well as the SWPPP.

No changes for stormwater design are anticipated on the Lab USA site. If all active composting operations are completed indoors, an exemption may be obtained for the Industrial Stormwater Permit.

1.4.2.5 SSOM Management Plan

Minn. Rules 7035.2836, Subp. 11, Item B(9) describes the required development of a detailed SSOM Management Plan to include a waste analysis plan, delivery locations, method of delivery, and management methods. Details on the required elements are presented in separate sections below.

1.4.2.6 Waste Analysis Plan

Minn. Rules 7035.2836, Subp. 11, Item B(9)(a) indicates that a waste analysis plan must be developed to characterize SSOM prior to acceptance the facility. SSOM is defined in Minn. Rules 7035.0300, subpart 105a to include: Compostable material as defined by Minn. Statutes, Section 115A.03 as food wastes, fish and animal waste, plant materials, and paper that are not recyclable; yard waste; vegetative wastes; and compostable material defined in ASTM6400 and ASTM D6868. Acceptable bulking agents include untreated wood waste, nonrecyclable paper, ground tree and shrub materials, and other similar materials.

Development of a waste analysis plan will include the training and procedures for facility staff to inspect loads of materials that are received at the compost facility. If significant amounts of unacceptable materials are found during inspections or processing, Red Wing may need to work with its SSOM suppliers to reduce the contaminated items to acceptable levels.

1.4.2.7 Management Methods

The SSOM Management Plan must also establish the management methods to be utilized at the proposed compost facility as described in the following sections.

1.4.2.7.1 Delivery

Minn. Rules 7035.2836, Subp. 11, Item B(9)(b) indicates that the Operations Plan must designate an area to where SSOM will be delivered.

A mixing structure and a designated Feedstock Area will need to be included in the facility layout. Any SSOM haulers will be directed to the mixing structure for offload; likewise, any yard waste or other feedstock haulers will be directed to the Feedstock Area.

1.4.2.7.2 Odor, Vectors, and Nuisance Conditions

Minn. Rules 7035.2836, Subp. 11, Item B(9)(c) indicates that the Operations Plan must establish operations for delivery to manage odor, vectors and other nuisance conditions as well as minimize leachate generation.

It is recommended that the mixing structure be covered to reduce the potential of leachate generation and sized to manage the volume of SSOM anticipated on a daily basis along with any additional feedstock material such as yard waste. The appropriate ratios of SSOM and feedstock can enhance the composting process to minimize odor. The facility will need to be staffed every day that SSOM is received so that all material in the mixing structure can be mixed and removed daily in order to minimize issues associated with odor and vectors.

1.4.2.7.3 Mixing

Minn. Rules 7035.2836, Subp. 11, Item B(9)(c) indicates that the Operations Plan must establish mixing procedures to ensure that the proper moisture content, C:N ratio, porosity, and pH can be achieved.

As described above, any SSOM haulers will be directed to the mixing structure for offload; likewise, any yard waste or other feedstock haulers will be directed to the Feedstock Area. The facility operators will need to be trained to determine and measure the ratios of SSOM placed in the mixing structure and material used from the Feedstock Area for the development of a useful final compost product. It generally takes several years for compost operators to become confident in the mixing ratios that establish the best quality compost since most final compost products take one to two years to develop. Facility operators will also need to be trained to operate the necessary equipment for mixing and sizing such as loaders, grinders, screens, etc. and pumps for obtaining water for moisture control.

1.4.2.7.4 Process to Further Reduce Pathogens (PFRP) and Compost Maturity

Minn. Rules 7035.2836, Subp. 11, Item B(10) establish the requirements defined as the Process to Further Reduce Pathogens (PFRP). Operations will initially require monitoring and recording of temperature and retention time on a daily basis, ultimately reducing the frequency to weekly measurements. Compost maturity is defined in Minn. Rules 7035.2836, Subp. 5, Item J(1) as "…more than 60 percent decomposition has been achieved as determined by an ignition-loss analysis and one test method approved by the commissioner…" Several methods of processing and testing are allowed.

PFRP can be achieved through utilization of the windrow method for composting which is described in Minn. Rules 7035.2836, Subp. 11, Item B(10)(a) and is defined of an unconfined composting process with periodic aeration and mixing. Minn. Rules 7035.2836, Subp. 11, Item B(10) further describes the requirements for the windrow method and includes a temperature measurement before (0 to 4 hours) and after (0 to 24 hours) each windrow is turned. As necessary, bulking agents such as yard waste and wood chips must be incorporated to increase porosity and promote aerobic conditions. Windrow height must not exceed 12 feet, aerobic conditions must be sustained, and a temperature of 55 degrees Celsius (131 degrees F) must be maintained in the windrow for at least 15 days.

All windrows for the composting process are proposed for placement on a processing pad. For planning purposes, it has been assumed that the windrows would be 8 feet high and 15 feet wide with a separation for equipment access of about 8 feet. Temperature measuring equipment will need to be available daily during initial operations and weekly thereafter. However, temperature measurements will also need to be recorded every three to five days when the windrows are turned. Although the rule states that a curing temperature of 15 days is adequate, Minnesota operators have indicated that they feel that 15 days is not adequate and prefer to plan for 20 to 30 days to make sure that the entire windrow meets PFRP criteria.

Alternatively, all active compost operations (immature compost) can be completed within an on-site building, such as the Lab USA structure, in order to eliminate direct contact with stormwater and reduce leachate generation. The final design of the compost building may be fitted with bunkers, pushwalls, and/or mechanical aerations systems to promote curing. Regardless of the use of windrows or mechanical aeration, PRFP monitoring requirements remain the same.

1.4.2.8 Compost Sampling, Testing, and Classification

Minn. Rules 7035.2836, Subp. 11, Item B(11) states that sampling and testing requirements be established for the compost facility in reference to compost classification. Minn. Rules 7035.2836, Subp. 5, Item J describes the required elements of a compost sampling and testing plan with additional testing requirements to establish compost classification included in Minn. Rules 7035.2836, Subp. 6. The sampling and testing plan must include training requirements, equipment to be used, and equipment decontamination as well as procedures for selecting sampling locations, grab sample collection, compositing samples, chain-of-custody and storage, and quality assurance/quality control. In addition, the plan must provide analytical parameters and methods and how the results will be used in reference to compost batches and statistics as well as cumulative and annual pollutant loading rates for Class II compost.

A Monitoring Plan will need to be developed to address specific aspects of the compost facility. Training of staff and purchase of equipment will need to be made for sample collection or contracted out. Sample analysis at some point would or could include the following parameters prior to distribution:

Maturity Determination

Percent decomposition
Arsenic (As)
Cadmium (Cd)
Copper (Cu)
Lead (Pb)
Mercury (Hg)
Molybdenum (Mo)
Nickel (Ni)
Selenium (Se)
PCB
Zinc (Zn)
Inert material content (%)
pH
Moisture content
Particle size
NPK ratio
Soluble salt content

Compost Classification - Class I (Limits Apply)

Arsenic (As)
Cadmium (Cd)
Copper (Cu)
Lead (Pb)
Mercury (Hg)
Molybdenum (Mo)
Nickel (Ni)
Selenium (Se)
PCB
Zinc (Zn)
Inert material content (%)

Compost Classification - Class II (Limits Apply)

Annual Pollutant Loading Rate
Cumulative Loading Rate
Arsenic (As)
Cadmium (Cd)
Copper (Cu)
Lead (Pb)
Mercury (Hg)
Molybdenum (Mo)
Nickel (Ni)
Selenium (Se)
Zinc (Zn)
Inert material content (%)

1.4.2.9 Management Plan

Minn. Rules 7035.2836, Subp. 11, Item B(12) requires development of a specific odor management plan since odor is a primary issue associated with mixing and tipping areas, active compost processing areas, and contact water ponding areas. The rule states that best management practices (BMPs) need to be established to address oxygen levels and porosity to minimize odors. In addition, the rule states that the plan must detail how the facility will handle and resolve odor complaints.

A number of comments or steps were provided in previous sections that are meant to assist in odor control such as the covered and controlled mixing structure, the location of a processing pad furthest from the residential property boundary, the necessary frequency of monitoring and turning windrows, and weighing the pros and cons related to leachate ponds and tanks. Ultimately, development of the Odor Management Plan will emphasize the needed daily staffing, training, and equipment for proper odor control.

Annual Report

Minn. Rules 7035.2836, Subp. 11, Item B(14) requires the submittal of an annual report that includes information as to the county of origin and volume of SSOM received. Minn. Rules 7035.2836, Subp. 5, Item K further describes annual report details including quantities of all related materials as well as the breakdown of recyclables and rejects, sources of nutrient or bulking agents, temperature and retention time data, classification of compost produced, lab analysis, and record of distribution of Class II compost.

Because the composting operation will be incorporated into the existing solid waste permit, reporting requirements will be added to current requirements of the Landfill. Additional forms and documents will need to be developed to efficiently record all the required information for easy entry in on-line reporting forms that will be included in current online submittal documents. Personnel will need to be assigned data recording and filing duties to assure that all information is available for a February 1 annual report deadline.

1.4.2.10 Contingency Action Plan

Minn. Rules 7035.2836, Subp. 11, Item B(15) includes the need for a contingency action plan and appropriate notification to the MPCA in the event the facility becomes inoperable.

The Red Wing Campus has already developed a Contingency Plan that is incorporated into the facility Operation & Maintenance Plan. The Contingency Plan may need some modifications to address specific aspects of the compost facility, but the plan is thorough in that it covers multiple scenarios including event-triggered contingencies, inspection-triggered contingencies, and monitoring-triggered contingencies.

1.4.2.11 Facility Operator and Training

Minn. Rules 7035.2836, Subp. 11, Item B(13) describes the requirements associated with a personnel training program referencing solid waste training requirements under Minn. Rules 7035.2545, Subp. 3 and Subp. 4, as well as specific training needed to operate a SSOM compost facility. Specific requirements for an SSOM compost facility include an initial 24 contact hours of training within the first 12 months of employment and 5 contact hours annually thereafter.

Current certified operators at the Red Wing Campus may already meet the requirements of Minn. Rules 7035.2545, Subp. 3 and Subp. 4. It is our understanding that some of the required original 24 hours of training is related to the Minn. Rules 7035.2545. However, reviewing the MPCA training website, the MPCA has not recently offered many opportunities for compost-specific training. A number of other organizations do offer training opportunities annually including: the Minnesota Compost Council and the Wisconsin Institute for Sustainable Technology.

1.4.2.12 Compost Distribution and End Use

Minn. Rules 7035.2836, Subp. 7 provides information on the distribution and end use requirements for a compost facility. In general, the rule states that the facility must develop a distribution plan as part of the permit application and could include registration with the Minnesota Department of Agriculture (fertilizer and soil amendments) as well as other allowable end uses. Class I compost has unrestricted use, but Class II compost has some restrictions including requirement of an information sheet to be provided to the end user.

Because the actual end use and/or classification will not be known until the final testing of the material against the limits established in Minn. Rules 7035.2836, the distribution plan will need to provide information on multiple options. For a Class II Compost, knowledge on nutrient management for soils will be critical to provide this information.

Because a Class II compost, by definition, fails to meet the Class I criteria, an information sheet must be provided to the end user including:

- Certification as a Class II compost.
- A list of best management practices for its use.
- Annual and cumulate application rates.
- Maturity test results.
- Inert content test results.

Any other test results.

Appendix K

Greenhouse Gas Calculations

Landfills are classes either as either having no landfill gas (LFG) recovery system, LFG recovery system with flare only and LFG recovery and electricity generation. GHG emissions decrease with methane capture and energy generation. GHG emission are calculated by determining the amount of methane production from anaerobic decomposition of biogenic carbon compounds, transportation Carbon Dioxie (CO_2) emissions from hauling and landfill equipment, carbon stored in the landfill and CO_2 emissions avoided through LFG gas-to-energy. The national average is 0.5 $MTCO_2e$ per short ton for landfilled food waste.

The composting emission factor is negative and implies that composting is a carbon sink, which means it stores more carbon in the soil than it emits into the air. The model assumes collection, transportation, mechanical turning, and soil carbon storage to generate.

Exhibit 1-10 from the WARM Organic Material Chapters, indicate the emission factors for several waste management practices. Note that switching from combustion to composting produces a net increase in GHG emissions occurs of 0.01 $MTCO_2e$ per short ton of food waste.

Exhibit 1-10: Net Emissions for Food Waste and Mixed Organics under Each Materials Management Option (MTCO2E/Short Ton)

Material	Net Source Reduction Emissions	Net Recycling Emissions	Net Composting Emissions	Net Combustion Emissions	Net Landfilling Emissions	Net Anaerobic Digestion Emissions[a]
Food Waste	(3.66)	NA	(0.12)	(0.13)	0.50	(0.04)
Food Waste (non-meat)	(0.76)	NA	(0.12)	(0.13)	0.50	(0.04)
Food Waste (meat only)	(15.10)	NA	(0.12)	(0.13)	0.50	(0.04)
Beef	(30.09)	NA	(0.12)	(0.13)	0.50	(0.04)
Poultry	(2.45)	NA	(0.12)	(0.13)	0.50	(0.04)
Grains	(0.62)	NA	(0.12)	(0.13)	0.50	(0.04)
Bread	(0.66)	NA	(0.12)	(0.13)	0.50	(0.04)
Fruits and Vegetables	(0.44)	NA	(0.12)	(0.13)	0.50	(0.04)
Dairy Products	(1.75)	NA	(0.12)	(0.13)	0.50	(0.04)
Mixed Organics	NA	NA	(0.09)	(0.15)	0.18	(0.06)

Note: Negative values denote net GHG emission reductions or carbon storage from a materials management practice.
NA = Not applicable.
[a] Emission factors for dry digestion with curing of digestate before land application.

According to Environmental Defense Fund (EDF) green freight handbook, for a truck mode of shipment an average emission factor of 161.8 grams CO_2 per ton-mile can be used. Only CO_2 emissions are assumed for hauling. For example, if the load weight is assumed at 20 tons, then the miles or distance hauled needed to eliminate any GHG emission reductions from changing management methods from landfilling to composting can be determined. The WARM model indicates that a net reduction of 12.4 $MTCO_2e$ (~1.125 x10^7 grams CO_2) will occur for 20 tons of food waste diverted from the landfill to a compost facility. If this value is taken as the total GHG emissions, then haul distance can be solved for, which is calculated as approximately 3,500 miles for a single load of food waste. For reference, the distance between New York City and Los Angeles is approximately 2,750 miles, which is 750 miles short of the distance needed to travel. This equates to the total distance that would need to be travelled until all GHG savings are depleted, which shows how significant the difference in GHG emissions is between the two waste management methods.

GHG Emissions	12.4	MTCO2e
Load Weight	20	tons
Emission Factor	161.8	grams CO2
	1.78E-04	MTCO2e
Distance	3,476	Miles

Appendix L

Food Scraps Pilot Program Information

Red Wing Food Scraps Collection Pilot Program

Curbside and Drop Off Site

Pilot Timeline and Tasks

June 1 Pre-pilot Preparation

- Established a process for collection and processing.
- Organized transfer and disposal at a Compost Facility
- Obtained kitchen bins and Durable Compostable Bags
- Developed outreach/educational materials
- Identified neighborhoods to target for pilot

July 1 Recruitment

- Marketed the pilot (social media, website, media outlets)
- Recruited participants

Outreach and Education Materials

Sign-up Postcards

Sign-up Sticker for trash carts

Outreach and Education Materials

red-wing.org/FoodScrapsPilot

Sign up for Red Wing's
Food Scraps Collection Program

The City of Red Wing is excited to launch a free 3-month pilot food scrap collection program! Starting September 3rd – November 30th, participating households will collect food scraps in specialized compostable bags, which can then be placed in their curbside trash for weekly collection. And the bonus: receive a FREE kitchen compost bin and special compostable bags!

Spots are limited, so go to **red-wing.org/FoodScrapsPilot** or **scan the QR code** at the top of the page to sign up!

Interested in collecting your food scraps but don't live on the designated streets?

A food scraps drop-off bin will be available at the Solid Waste Campus located at 1873 Bench Street. Residents are encouraged to drop off their food scraps at this location. This service is free of charge for residents with proof of residence.

Why collect food scraps?

Food scraps make up about 30% of Red Wing's trash. By composting food waste, you turn it into enriched soil rather than waste.

If you live on the following designated Red Wing streets, you are eligible to participate:

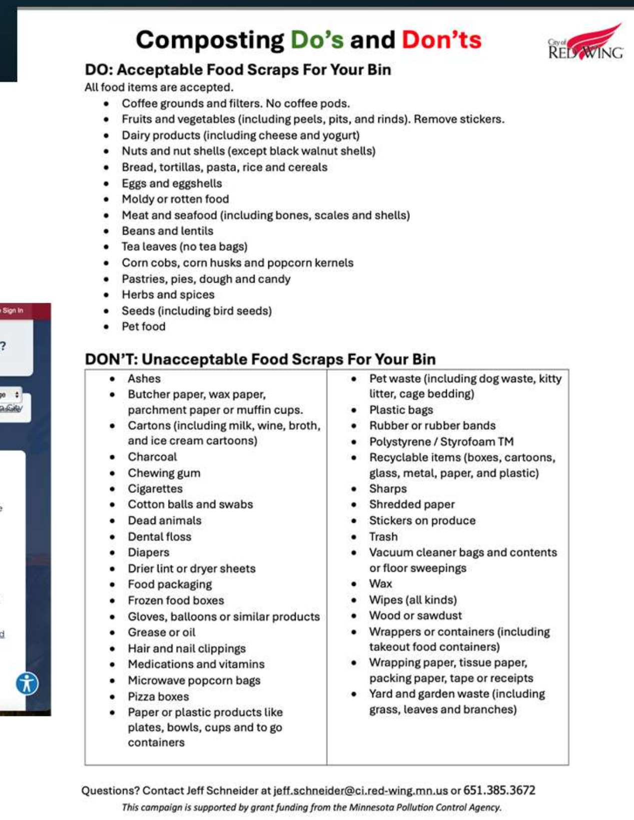
- Aspen Ave
- Aurora Circle
- Big Sky Ct
- Birch Ave
- Breckenridge Dr
- Chalet Ct
- Cottonwood Ave
- Mt Hood Lane
- Nelson Ave
- Nordic Dr
- Reding Ave
- Snowbird Dr
- Steamboat Dr
- Valley View Dr
- Wiebusch Dr

Funding to support this pilot program is provided by the Minnesota Pollution Control Agency (MPCA) and the City of Red Wing.

City of Red Wing

Press Release

Webpage



Composting Do's and Don'ts

City of Red Wing

DO: Acceptable Food Scraps For Your Bin

All food items are accepted.

- Coffee grounds and filters. No coffee pods.
- Fruits and vegetables (including peels, pits, and rinds). Remove stickers.
- Dairy products (including cheese and yogurt)
- Nuts and nut shells (except black walnut shells)
- Bread, tortillas, pasta, rice and cereals
- Eggs and eggshells
- Moldy or rotten food
- Meat and seafood (including bones, scales and shells)
- Beans and lentils
- Tea leaves (no tea bags)
- Corn cobs, corn husks and popcorn kernels
- Pastries, pies, dough and candy
- Herbs and spices
- Seeds (including bird seeds)
- Pet food

DON'T: Unacceptable Food Scraps For Your Bin

- Ashes
- Butcher paper, wax paper, parchment paper or muffin cups.
- Cartons (including milk, wine, broth, and ice cream cartoons)
- Charcoal
- Chewing gum
- Cigarettes
- Cotton balls and swabs
- Dead animals
- Dental floss
- Diapers
- Drier lint or dryer sheets
- Food packaging
- Frozen food boxes
- Gloves, balloons or similar products
- Grease or oil
- Hair and nail clippings
- Medications and vitamins
- Microwave popcorn bags
- Pizza boxes
- Paper or plastic products like plates, bowls, cups and to go containers
- Pet waste (including dog waste, kitty litter, cage bedding)
- Plastic bags
- Rubber or rubber bands
- Polystyrene / Styrofoam TM
- Recyclable items (boxes, cartoons, glass, metal, paper, and plastic)
- Sharps
- Shredded paper
- Stickers on produce
- Trash
- Vacuum cleaner bags and contents or floor sweepings
- Wax
- Wipes (all kinds)
- Wood or sawdust
- Wrappers or containers (including takeout food containers)
- Wrapping paper, tissue paper, packing paper, tape or receipts
- Yard and garden waste (including grass, leaves and branches)

Questions? Contact Jeff Schneider at jeff.schneider@ci.red-wing.mn.us or 651.385.3672

This campaign is supported by grant funding from the Minnesota Pollution Control Agency.

Educational Material

Pilot Timeline and Tasks

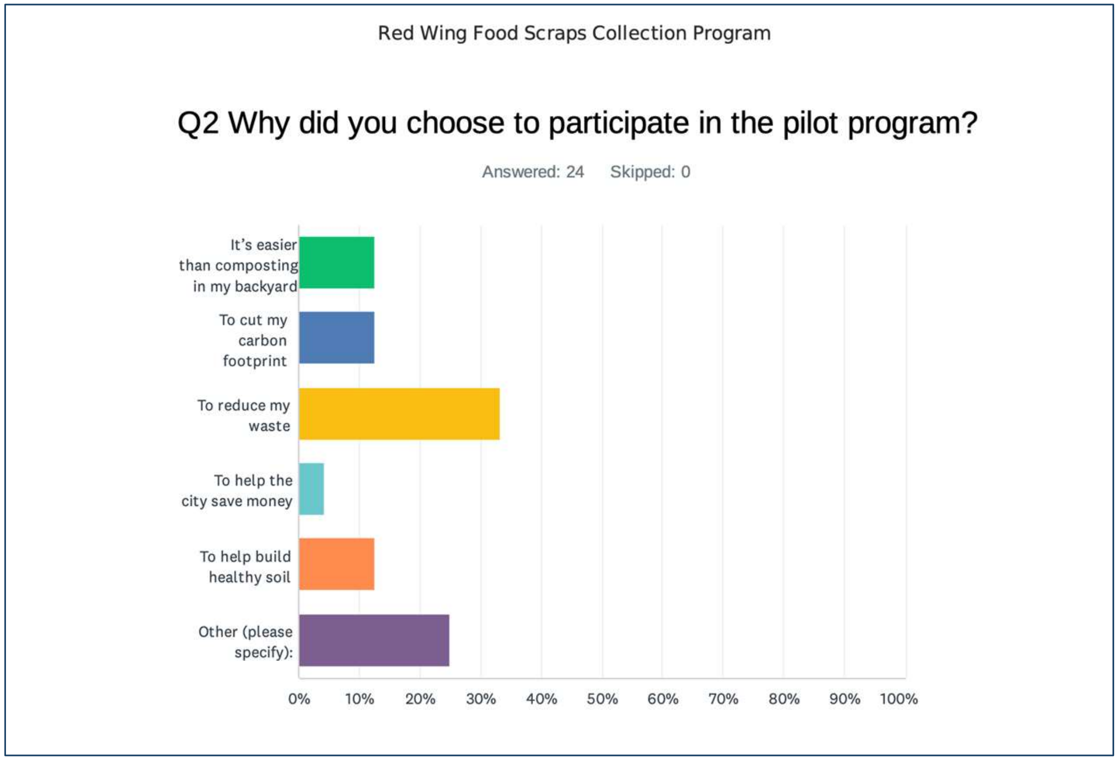
Sept 1 Pilot Launch

- Registered 32 homes across two neighborhoods
- Delivered kitchen bins and bags
- Sent weekly emails encouraging participation
- Tracked organics collection data
- Launched Waste Campus drop-off site

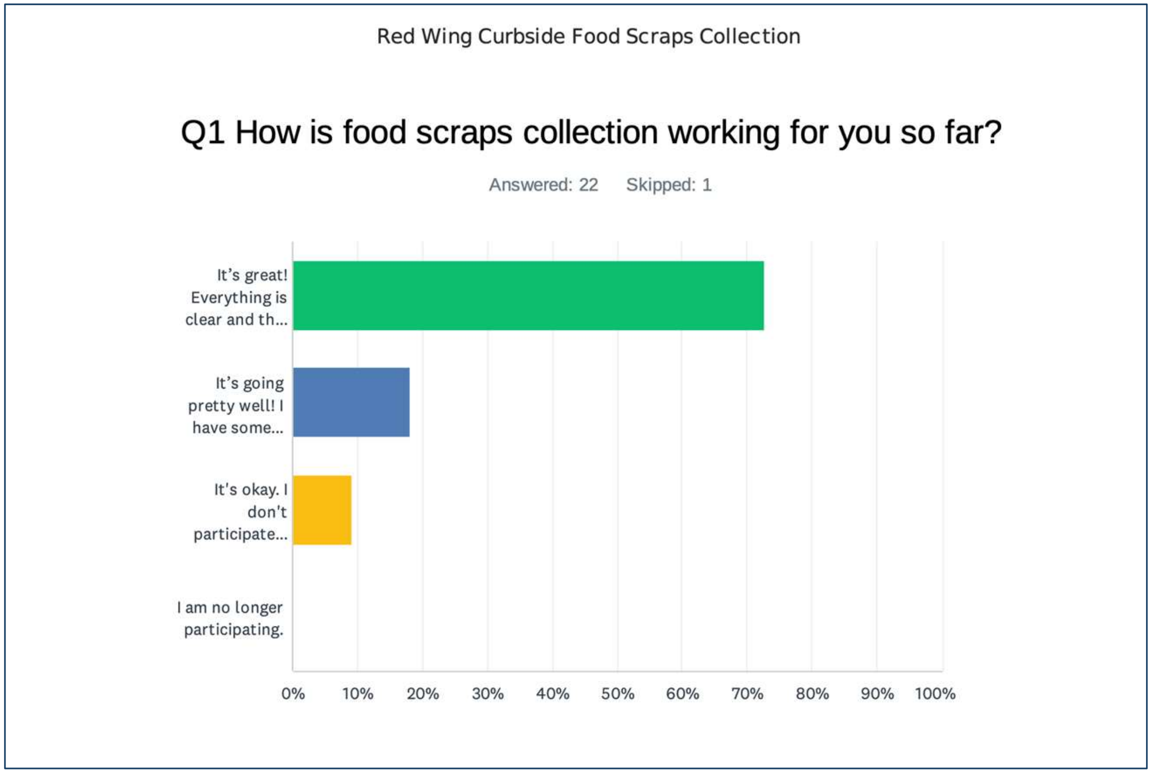
Dec 1 Pilot Evaluation

- Conducted 3 participating household surveys (pre, mid, post)
- Audited collection (number of bags, contamination, weight)

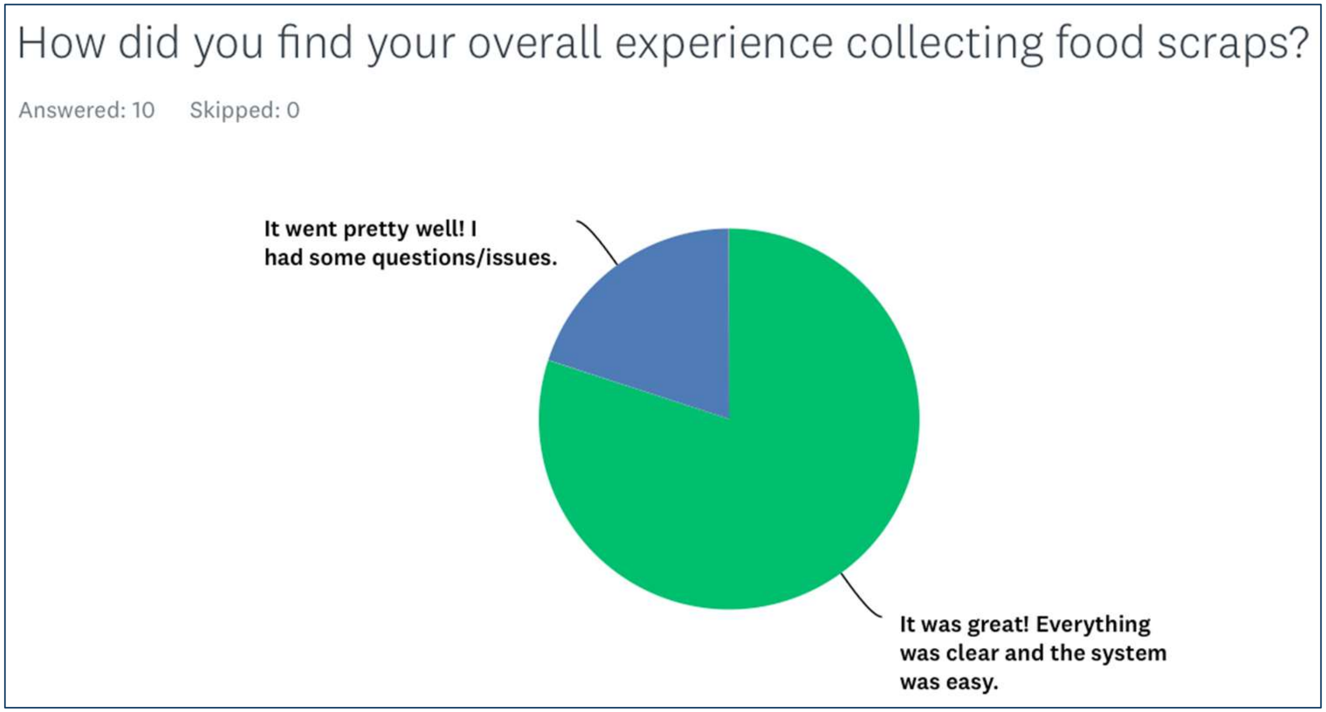
Pre-Pilot Survey Results



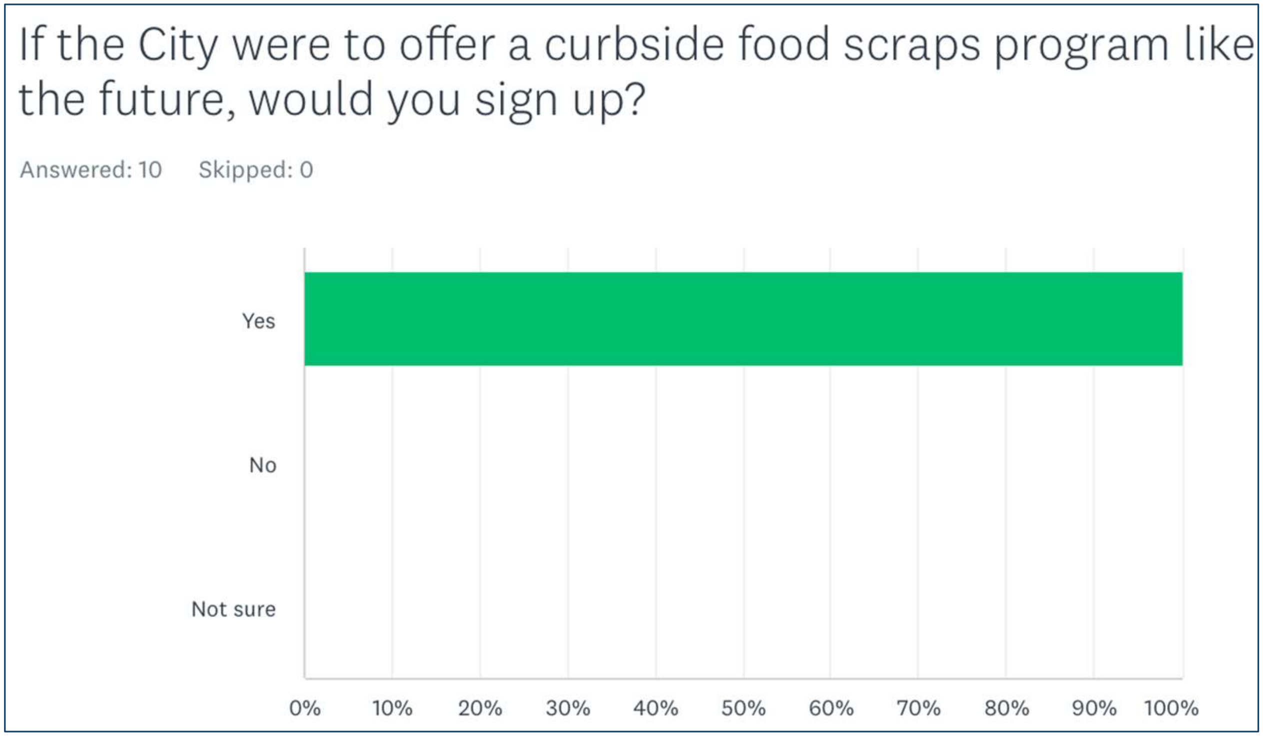
Mid-Pilot Survey Results



Post-Pilot Survey Results



Post-Pilot Survey Results



Post-Pilot Survey Comments

It cuts down on garbage, is easy, and replenishes the earth. All good things in my book!

I was surprised how well the countertop compost bin contained smells. I did not have to take out the compost too often, which I expected I would have to.

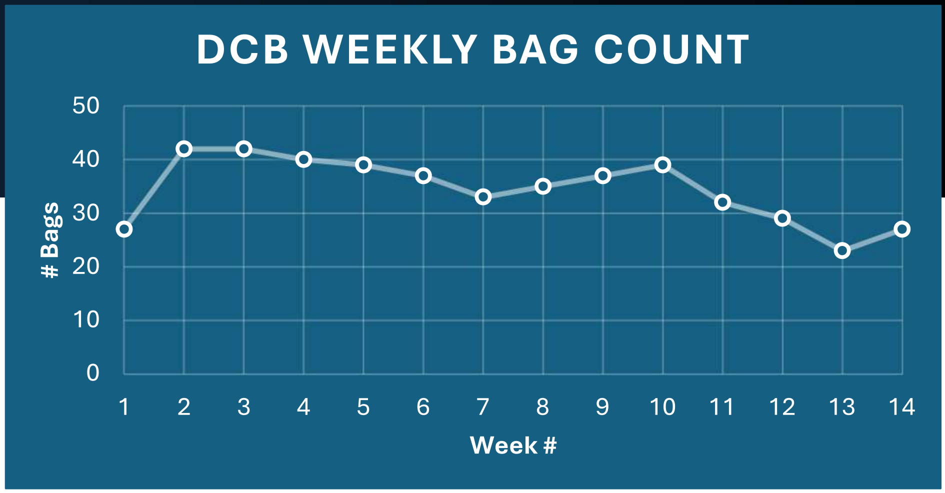
I think that it was a great program. You did a wonderful job.

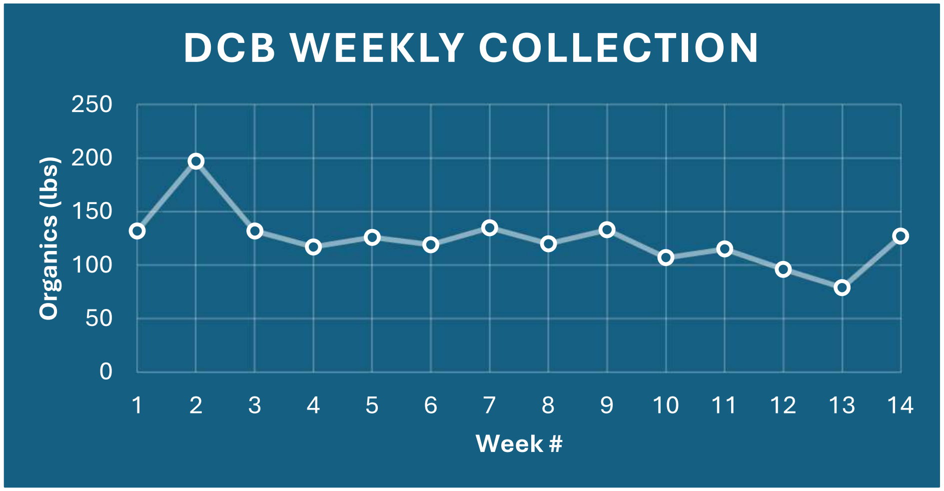
It was easy, I scrape plates off already. So putting them in a separate bin wasn't anything extra and was happy to be more green with trash.

Audit Results

Durable Compost Bag:

- Total Bags Collected = 482 bags
- Total Weight Collected = 1,735 lbs
- Contamination (%) ≈ 1.5%
- Average Bag Weight = 3.64 lbs/bag
- Average Bags per Week = 34 bags/wk





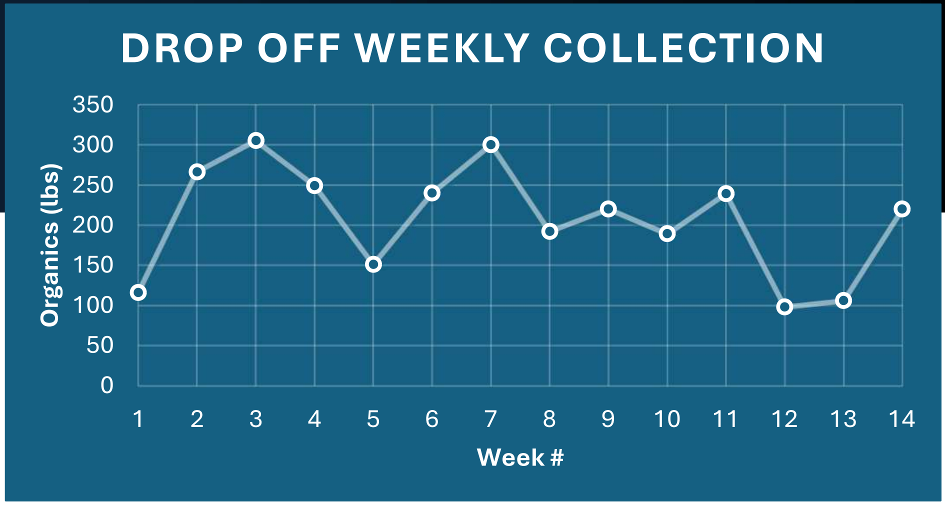
Audit Results

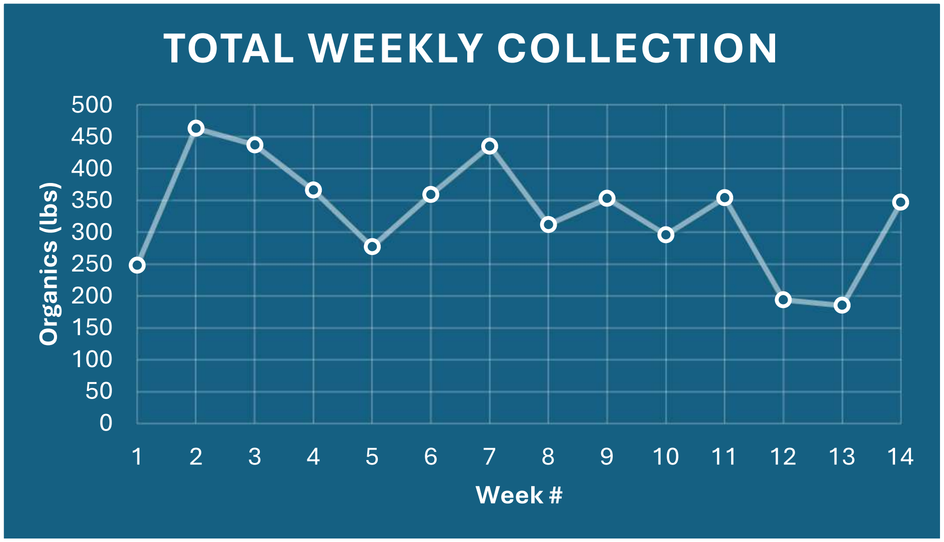
Drop Off Site:

- Total Weight Collected = 2,891 lbs
- Contamination (%) < 1%

Combined Programs:

- Total Weight Collected = 4,626 lbs
- Daily Collection Rate = 54 lbs/day





Conclusion – Pilot was a Success!

- Consistent participation
- Residents used the drop-off site
- Minimal contamination
- Durable Compostable Bags worked well and are convenient
- Participants appreciated the outreach & education materials

Opportunities

- More promotion of the drop-off site will increase its use
- Relatively easy to add 1-2 more drop-off sites (e.g., neighborhood or farmer's market)
- Engage a partner (e.g., Sustainability Commission) to build resident awareness about food scraps collection and the drop-off site(s)
- Awareness is growing as more residents discover that family and friends in other areas compost.

Questions?

Funding to support this pilot program is provided by the Minnesota Pollution Control Agency (MPCA) and the City of Red Wing

Red Wing Food Scraps Collection Program

This September, we are excited to launch a free 3-month pilot food scrap collection program in your neighborhood! Spots are limited, so go to red-wing.org/FoodScrapsPilot or scan the QR code to sign up!

1

Line your kitchen bin with your compostable bag.

2

Place your food scraps in your lined kitchen bin.

3

Once your compostable bag is full, tie it up and place it in your trash cart.

4

Once processed, the food scraps will turn into compost!

Sign Up Today!

red-wing.org/FoodScrapsPilot

Participants will receive **FREE** special compostable bags and a kitchen bin provided by the City!

Questions?

651.385.3672

www.red-wing.org

City of RED WING

315 West 4th Street
Red Wing, MN 55066

Sign up for Red Wing's

Food Scraps Collection Program

Scan the QR code or use the website link to learn more.
For more information call **651.385.3672.**

red-wing.org/FoodScrapsPilot

September - November

Participate in a free curbside food scrap collection in your neighborhood.

Limited Spots

Limited spots are available! Act fast and sign up today!

Join the Change

Be part of the change and turn your food scraps into compost!

Participants will receive **FREE** special compostable bags and a kitchen compost bin!

Funding to support this pilot program is provided by the Minnesota Pollution Control Agency and the City of Red Wing

For more information about the Food Scraps Drop-Off Program, please visit
red-wing.org/FoodScrapsDropOff

The City of Red Wing **is excited to announce a pilot to collect food scraps!**

Food scraps drop-off bins will be available at the **Solid Waste Campus located at 1873 Bench Street**. Residents are encouraged to drop off their food scraps at this location. This service is free of charge for residents with proof of residency.

Organics make up one-third of the waste generated in Red Wing, and the City's goal is to minimize land disposal and incineration. The collected food scraps will be transported to a nearby commercial compost facility where they will break down into finished compost within six months. This compost enriches gardens and landscaping by enhancing soil water retention and nutrient content, supporting living organisms, controlling erosion, and managing stormwater runoff.

Funding to support this pilot program is provided by the Minnesota Pollution Control Agency (MPCA) and the City of Red Wing.

City of RED WING

red-wing.org/
FoodScrapsPilot

Sign up for Red Wing's **Food Scraps Collection Program**

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- Reding Ave
- Snowbird Dr
- Steamboat Dr
- Valley View Dr
- Wiebusch Dr

Funding to support this pilot program is provided by the Minnesota Pollution Control Agency (MPCA) and the City of Red Wing.

City of RED WING

facebook

Log In

City of Red Wing Government
August 21, 2024 ·

Exciting news! From September 3 through November 30, we're offering a FREE new program that can turn your food scraps into something valuable. All Red Wing residents can drop off food scraps at the Waste Campus (1873 Bench St.), free of charge, with proof of residency. To learn more, visit https://www.red-wing.org/1155/Food-Scraps-Drop-Off-Site

During this time, the City is also running a curbside food scraps collection pilot in the Burnside South neighborhood. Eligible households have been notified and are encouraged to sign up and participate. To learn more, visit https://www.red-wing.org/.../Food-Scraps-Collection-Pilot...

Did you know that about one-third of Red Wing's waste is food scraps? Instead of incinerating them, we can turn these scraps into nutrient-rich compost that benefits gardens, improves soil, and supports local

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facebook Log In

City of Red Wing Government
November 25, 2024 ·

Whether it's the peels from the potatoes you'll be mashing or old leftovers that get tucked away in the back of the fridge too long, don't toss your Thanksgiving food scraps in the trash. Compost them at the Waste Campus drop-off site!

The drop-off site has been extended through the end of the year and is a great way to turn your food scraps, from holiday meals or otherwise, into nutrient-rich compost. Learn more: https://www.red-wing.org/1155/Food-Scraps-Drop-Off-Site

16 3 11

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Food Scraps Collection Pilot Program

Welcome to Red Wing's Pilot Food Scraps Collection Program!

We are thrilled to announce the launch of our new pilot curbside food scraps collection program, starting this September! This pilot is available to select households in Red Wing, and we invite you to be a part of this exciting initiative to make our city greener and more sustainable. Sign up now as spaces are limited!

How It Works

Step 1: Receive Your Free Supplies

Participating households will receive a free kitchen compost container and a supply of special compostable bags. These bags are designed to make collecting your food scraps easy and convenient. Once you are enrolled in the program, City staff will drop off the supplies at your house.

Step 2: Collect Your Food Scraps

Line your kitchen compost container with the durable compostable bags (DCBs) provided by the City and then place your food scraps in your lined container. The DCBs are thicker than the traditional compostable bags s at retailers. ONLY use the City-provided DCBs for this pilot program. They are perfect for holding kitchen waste, such as fruit and vegetable peels, coffee grounds, eggshells, and more.

Step 3: Put Your Food Scraps Bags in Trash Cart

When your durable compostable bag is full, tie it up and place it in your trash cart. Your regular trash collection schedule will continue without any changes, so just set your cart out as usual.

Step 4: City Collection and Composting

The City will separate the durable compostable bags from the rest of the trash and transport them to a composting facility. Here, your food scraps will be transformed into nutrient-rich soil amendment that benefits our environment.

Why Participate?

Free Supplies

All participants receive a complimentary kitchen compost container and durable compostable bags for the duration of the program.

You Can Make a Difference

Help reduce Red Wing’s carbon footprint and contribute to the creation of nutrient-rich compost.

It's Our Community

Join your neighbors in making a positive impact on our community’s sustainability efforts.

Your Feedback Matters

As a participant in this pilot program, your experience and feedback are crucial. The City will gather your insights over the course of the next three months to improve the program in case it is considered for a broader rollout.

Limited Spaces Available – Sign Up Now!

This pilot program is limited in the number of participants, so don't miss your chance to be part of this special initiative. Sign up today to secure your spot and receive your free composting supplies.

Click here to participate!

Together, we can make a difference!

Funding to support this pilot program was provided by the Minnesota Pollution Control Agency and the City of Red Wing.

Contact Us

Jeff Schneider

Deputy Director of Solid Waste

Phone: 651.385.3672

FAQs

- What can I put in my food scraps bags?
- What can't I put in my food scraps bags?
- How do I collect my food scraps?
- What types of bags are acceptable?
- Why collect food scraps?
- Why use food scrap bags instead of separate food scrap carts?
- What happens to my food scrap bag after I put it in my trash cart?

View All

- Composting Do's and Don'ts (Printable PDF)

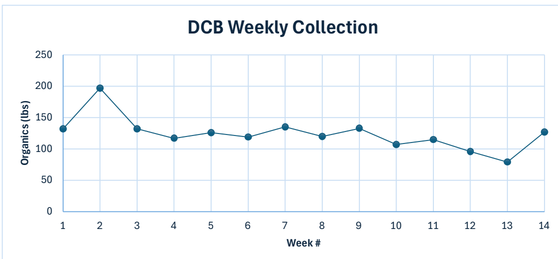
Weekly Stats

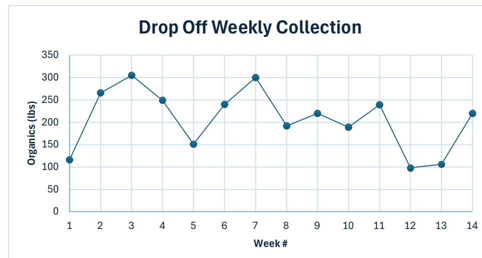
- Week 1 Update (PDF)
- Week 2 Update (PDF)
- Week 3 Update (PDF)
- Week 4 Update (PDF)
- Week 5 Update (PDF)
- Week 6 Update (PDF)
- Week 7 Update (PDF)

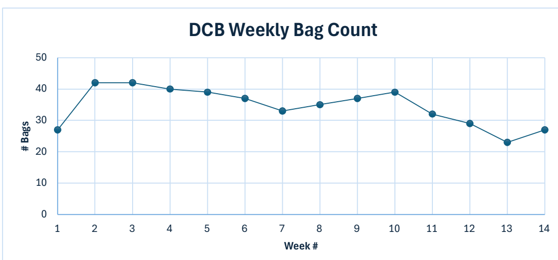
- Week 8 Update (PDF)
- Week 9 Update (PDF)
- Week 10 Update (PDF)
- Week 11 Update (PDF)
- Week 12 Update (PDF)

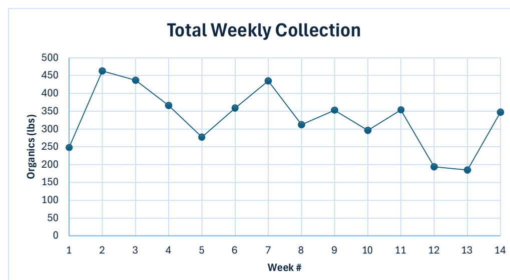
Red Wing Food Scraps Collection Pilot Study
Drop Off signup =
DCB Household signup = 32

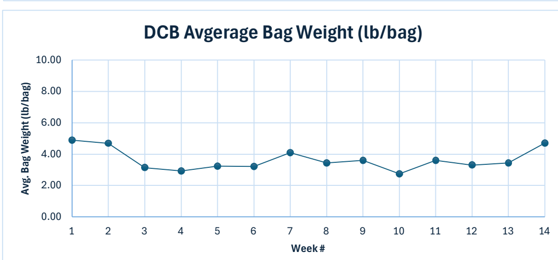
						DCB Co-Collection				Drop Off Collection			Total		
Week	Start	End	Duration (days)	# Bags	# Defect Bags	Organics Collected (lb)	Average Weight (lb) / Bag	# Bags Checked	# Bags Contaminated	Organics Collected (lb)	# Bags Checked	Contamination %	Organics Collected (lb)	Collection Rate (lbs/day)	Notes:
1	8/26/2024	9/3/2024	8	27	2	132	4.89	6	0	116		0	248	31.00	2 DCB bags (not counted) were torn and shredded in transit
2	9/3/2024	9/9/2024	6	42	0	197	4.69	8	1	266	7	0	463	77.17	1 DCB bag found on line was contaminated w/ plastic inside the bag, and thrown on. Not included in bag count.
3	9/9/2024	9/16/2024	7	42	1	132	3.14	7	0	305	5	0	437	62.43	1 DCB shredded
4	9/17/2024	9/23/2024	6	40	0	117	2.93	5	1	249	5	0	366	61.00	1 DCB bag from neighborhood was contaminated with Styrofoam packaging (Removed).
5	9/24/2024	9/30/2024	6	39	1	126	3.23	5	0	151	5	0	277	46.17	1 DCB bag was shredded
6	10/1/2024	10/7/2024	6	37	0	119	3.22	6	0	240	5	0	359	59.83	0 DCB bags shredded
7	10/8/2024	10/14/2024	6	33	0	135	4.09	6	0	300	5	0	435	72.50	0 DCB bags shredded
8	10/15/2024	10/21/2024	6	35	0	120	3.43	6	0	192	5	0	312	52.00	0 DCB bags shredded
9	10/22/2024	10/29/2024	7	37	0	133	3.59	6	0	220	5	0	353	50.43	0 DCB bags shredded
10	10/30/2024	11/4/2024	5	39	0	107	2.74	6	0	189	4	0	296	59.20	0 DCB bags shredded
11	11/5/2024	11/12/2024	7	32	0	115	3.59	6	0	239	7	0	354	50.57	0 DCB bags shredded
12	11/13/2024	11/18/2024	5	29	2	96	3.31	6	0	98	4	0	194	38.80	2 DCB bags shredded
13	11/19/2024	11/25/2024	6	23	1	79	3.43	6	0	106	3	0	185	30.83	1 DCB shredded
14	11/26/2024	12/2/2024	6	27	0	127	4.70	6	0	220	3	1	347	57.83	Drop Off: 1 aluminum can, may have been placed in can by window customer.
x															
			avg	*34*	*avg*	*123.93*	*3.64*		*avg*	*206.50*		*avg*	*330.43*	*53.55*	
					sum	1735	lbs		sum	2891		sum	4626	lbs	
				0		3.14	# 96-gal carts						8.36	# 96-gal carts	











*average household organics generation rate national avg. assumes 8.4 lb/hh/wk and orgnaic density as 43.1 lb/cf