



## Memorandum

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Ramsey/Washington Counties Resource Recovery Board (Project Board)  
Joint Staff Committee

CC: Jennefer Klennert, Foth Infrastructure & Environment, LLC (Foth)

FR: Nathan Klett, Foth  
Warren Shuros, Foth

RE: Mixed Waste Processing – Update on Technology Status

This memorandum is intended to provide an update on the current technology status of mixed waste processing (MWP) equipment, economics of MWP, and marketability of recycled materials. The focus is on what additional information is needed to continue forward with this technology.

The Scope of Resource Management includes significant efforts to increase collection and recovery of source-separated recyclables (SSR) and source-separated organics (SSO). The State set a goal for the Counties to reach a 75% recycling level. Previous analysis has shown that the 75% recycling goal may not be reached solely by SSR/SSO. The MWP system provides a method to recover the highest overall percentage of recyclables and particularly organics.

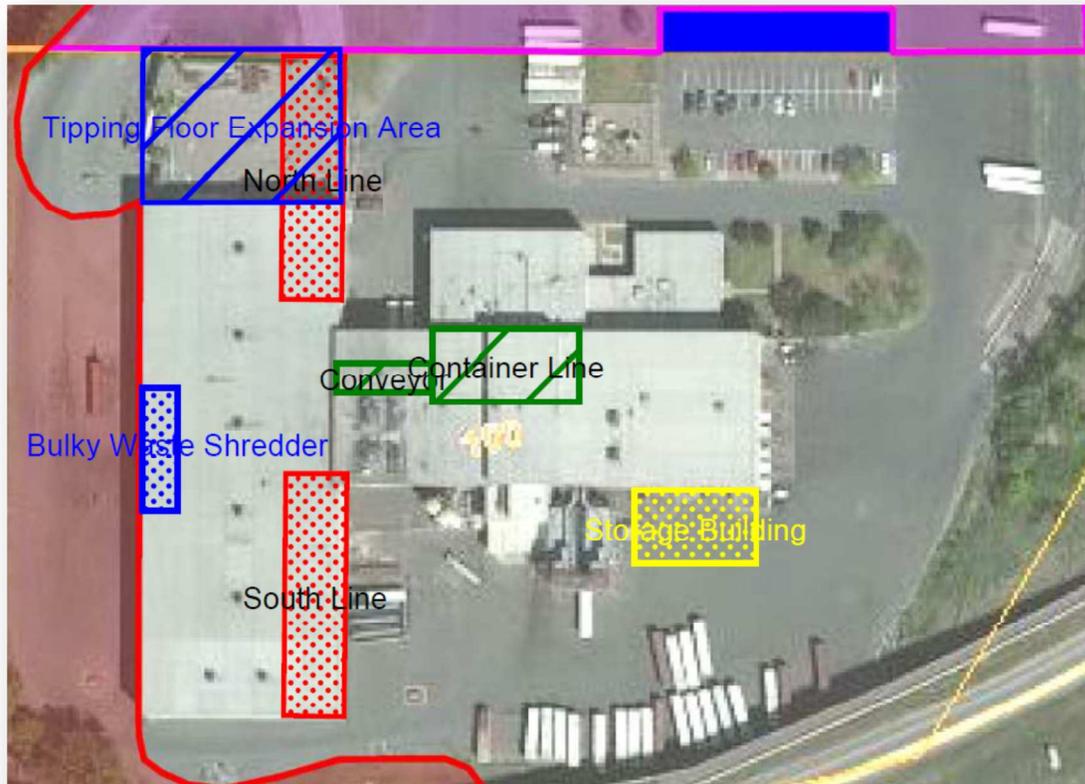
### **1 Mixed Waste Processing at the Newport Facility**

Foth previously performed a preliminary analysis to determine if a MWP system targeting ferrous, non-ferrous, plastic containers, and commercial cardboard could be co-located at the Newport Facility with the RDF processing equipment. The analysis concluded that there is sufficient space for a MWP system with a capacity of 340,000 tons municipal solid waste (MSW) per year at the Newport Facility. This will require an addition to the current tipping floor, relocating the bulky waste shredder, and constructing an additional storage building in order to move stored materials from within the current building.

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Figure 1 shows a potential layout option for adding the MWP equipment at the Newport Facility.

**Figure 1**  
**Potential Site/Equipment Layout**



The time line for final system and building modification designs, processing equipment system procurement, completing renovations, construction of the necessary new facilities and installation of the MWP equipment is estimated to be approximately 2 years. Additional waste sorts will be necessary to quantify the variability of the incoming waste during different seasons.

### **1.1 Necessary Permits**

As noted previously, adding MWP equipment at the Newport Facility would require renovations and construction of new facilities, which will require a Building Permit and a construction stormwater permit. Most of the existing permits for the facility (industrial stormwater, air emissions, solid waste, etc.) would require modification to include the MWP equipment. A completely new or separate permit for MWP is not anticipated since the same volume and types of material will be managed at the facility as are currently managed.

The Prairie Lakes Municipal Solid Waste Authority recently added a MWP system to the Perham Resource Recovery Facility in Perham, Minnesota as part of a facility expansion. They noted that the MWP system was a very minor part of the total waste-to-energy/recycling facility permit process. The only comments for the MWP system were related to what MSW could be allowed to by-pass the MWP system.

## **1.2 Material Flow**

Addition of MWP equipment at the Newport Facility would result in changes to the flow of material at the facility as well as additional materials being removed prior to entering the existing refuse derived fuel (RDF) lines. Approximately 340,000 tons of the assumed 400,000 tons per year (TPY) of MSW delivered to the facility would first be processed with the MWP equipment to remove ferrous, non-ferrous, cardboard, plastic containers, and organic material. It is anticipated that any MSW remaining after processing through the MWP line would be transferred (via conveyor) back to the beginning of the RDF lines. It is assumed some additional ferrous and non-ferrous recovery will occur in the RDF lines since there is equipment on these lines intended to remove these materials and the MWP will not process the entire 400,000 tpy. Other materials that are not currently removed include cardboard, plastic containers and organics.

### **1.2.1 Recyclables**

Materials that the MWP equipment will be designed to remove are anticipated to include:

- ◆ Ferrous
- ◆ Nonferrous (primarily aluminum)
- ◆ Cardboard (commercial loads only)
- ◆ Plastic containers (HDPE and PET plastic)

The MWP equipment will also target organics in the waste stream, which will be discussed in the following section. It is important to note that newsprint and other recyclable fibers are not targeted for recycling recovery as these are the most sensitive recyclable materials to contamination from garbage. These fibers can be recovered as part of the RDF.

The specific equipment used in the MWP system for targeting these recyclable materials has been proven to provide reliable recovery rates for recyclables. With the addition of the MWP equipment at the Newport Facility, it is anticipated that there will be an increase in the amount of ferrous and nonferrous captured (the current system removes some ferrous and nonferrous) and additional materials will be removed/recycled prior to processing into RDF. The MWP system is anticipated to assist the Counties in working toward the 75% recycling goals. In addition, the recyclable materials discussed in this section have a market value to provide some revenue for system operation. Some of the ferrous and non-ferrous metals are already being sorted and are being marketed successfully. The additional plastic containers are anticipated to also be successfully recovered and can be marketed to existing plastics recycling markets. The cardboard targeted for recovery is currently planned to only be sorted from commercial wastes with the focus on cardboard with minimal contamination to ensure the marketability of cardboard bales.

### 1.2.2 Organics

The current preliminary design for the MWP system at the Newport Facility includes equipment intended to remove organic material from the input MSW. This organic material will need to be loaded on trucks and hauled to a privately owned facility for beneficial reuse in either a composting operation or anaerobic digestion facility (i.e. will not be hauled to the Xcel combustor plants). Removal of organic material will assist the Counties in working toward the 75% recycling goals, but will present an additional cost to transport and to pay a vendor to further process the organic material.

### 1.2.3 Remaining MSW

The majority of the MSW will pass through the MWP system to the existing RDF processing system. The current preliminary design for adding MWP equipment at the Newport Facility includes conveyors to transfer this remaining MSW to the RDF lines after processing through the MWP system so the material can be further processed into RDF. It is anticipated that this will result in further ferrous and nonferrous recovery, which are currently included in the RDF processing lines.

### 1.2.4 Material Flow Summary

Table 1 provides a summary by material category of the estimated breakdown of the 400,000 tpy delivered to the Newport Facility.

**Table 1  
Material Flow Summary**

Material	Tons			
Total MSW	400,000			
Bulky Waste to Landfill		26,800		
MWP System		340,000		
Bypassed Material to RDF process		33,200		
Nonferrous Recycled			2,515	
Ferrous Recycled			14,060	
Organics to Private AD Contractor			42,500	
HDPE Recycled			1,530	
PET Recycled			2,805	
Cardboard Recycled			5,985	
Process Residue to Landfill			14,001	
RDF to Xcel Combustion Plants			289,804	
Ash from Combustion to Landfill				83,029

The bulky waste materials are removed prior to processing and are typically landfilled. The bypassed material would go directly into the current processing equipment for processing into RDF. The process residue is material that remains after processing into RDF that is not suitable as RDF and is currently landfilled. The addition of a MWP system increases the amount of material that is recycled or otherwise diverted from the landfill by approximately 69,000 tpy.

## **2 Technology Updates**

### **2.1 Reference Facility – Montgomery County, Alabama**

The MWP equipment currently being used at the Montgomery facility was considered as a “reference facility” for installation at the Newport Facility. It is a proven technology designed and manufactured by Bulk Handling Systems (BHS). The BHS MWP system includes bag breakers, manual sorting, disc screens, eddy current separation, magnets, air sorting (Nihot), and optical sorting (NRT) technologies for recyclable material removal.

### **2.2 MWP System Vendors**

Numerous MWP system equipment vendors offer turnkey systems for material recovery from MSW and include:

- ◆ CP Manufacturing
- ◆ Machinex Technologies Inc.
- ◆ Vecoplan
- ◆ Bulk Handling Systems (BHS)
- ◆ Bollegraf
- ◆ Van Dyk

The list above is not intended to provide an endorsement or be all inclusive. It simply indicates there are multiple companies in business to develop and provide proven systems for MWP. The main difference in these systems is related to separation of fine materials (organics). Some of these systems use disc screens for size separation and others use trommel screens.

## **3 Economics**

The economics associated with the addition of MWP system at the Newport Facility include initial renovations, construction, and procurement of the MWP equipment, operating costs and potential revenues from marketable materials.

### **3.1 Renovation, Construction and Procurement Costs**

The costs associated with the addition of MWP equipment at the Newport Facility include renovations/additions to the current facility, construction for additional support facilities, and procurement/installation of the MWP system.

The total site related renovation and construction costs for adding MWP equipment to target ferrous, nonferrous, cardboard, plastics, and organics in the MSW delivered to the Newport Facility is estimated to be \$6.2 to \$7.35 million, using 2016 dollars. This includes the estimated MWP equipment installation costs.

The total equipment cost associated with MWP equipment from the tipping floor through the end of the container sort line (including uncaptured MSW return conveyor) is estimated to be \$12.55 to \$13.40 million, using 2016 dollars

The total cost for adding MWP equipment, as well as the site related renovation and construction is estimated to be between \$18.75 and \$20.75 million.

Table 2 provides a summary of the estimated capital costs associated with the addition of a MWP system at the Newport Facility.

**Table 2**  
**Estimated Capital Costs**

	Site and Building	MWP Equipment	Total
<b>Estimated Capital Cost (\$)</b>	6,200,000 - 7,350,000	12,550,000 - 13,400,000	18,750,000 - 20,750,000

### **3.2 Operating Costs**

Operating costs include labor, added electrical usage, and maintenance associated with operation of the MWP equipment. Based on the estimated labor rates and assuming an operating schedule similar to the current schedule, the total estimated labor cost for adding MWP is approximately \$4 million, using 2016 dollars.

The increased cost associated with electrical usage based on installation of the MWP system is estimated to be \$375,000 annually, using 2016 dollars, for electrical usage to operate the entire system. This represents approximately a 50% increase over the electrical cost estimated for the current RDF system.

The MWP system equipment maintenance generally includes costs associated with the conveyors, air classifiers, optical and eddy current separators and the polishing screen. Based on the anticipated maintenance items and communication with equipment vendors the estimated maintenance cost in 2016 dollars for the MWP system is estimated to be \$600,000/year.

The total annual operation and maintenance cost associated with operation of a MWP system at the Newport Facility are estimated to be approximately \$4,980,000 (not including the cost of organic material management).

### **3.3 Potential Revenues**

Plastic containers (PET and HDPE), cardboard, ferrous and non-ferrous are marketable products that are considered a potential revenue source resulting from separation with MWP equipment. The market for these materials is dependent on the quality (cleanliness) and is subject to fluctuations. Table 3 presents the estimated revenue from the sale of these marketable materials.

**Table 3**  
**Estimated Potential Revenue from**  
**Materials Recovered Using a MWP System at Newport**

Material	Current Market Rate/Ton <sup>1</sup>	Assumed Market Price/Ton <sup>2</sup>	Estimated Annual Revenue
PET	\$252	\$176	\$493,680
HDPE	\$475	\$332	\$507,960
Cardboard	\$70	\$49	\$293,265
Ferrous (Tin/Steel containers)	\$90	\$63	\$404,900
Non-ferrous (Aluminum)	\$1,430	\$1,000	\$2,310,000
<b>Estimated Total Annual Revenue</b>			<b>\$4,009,805</b>

1. Current market prices from RecyclingMarkets.net accessed on March 16, 2015.
2. The assumed market price is approximately 70% of the current market price to be conservative given market variability.

The estimated revenue associated with the marketable materials recovered using a MWP system is estimated to be approximately \$4.0 million annually. Recyclable materials are commodities in markets with dramatic variations in pricing due to supply and demand. The commodities are marketed globally. Historically and continuing, there are peaks and valleys in the market pricing. Experienced recycling facility operators have learned to budget for lower range pricing and carry through down times with reserve funds generated during high markets.

There are costs associated with the recovered organics from the MWP system. Currently there is no established market for the organic material recovered from the MWP system.

### **3.4 Potential Jobs Created**

Installation of MWP equipment at the Newport Facility will create construction jobs during renovations of the facility and construction of necessary support facilities. It is anticipated that approximately 35 to 40 temporary construction jobs will be created and will have a duration of approximately 18 months. Once the MWP equipment is installed and operational it will require approximately 60 new full time employees.

## **4 Additional Data Needs**

### **4.1 Material Quality and Markets**

Additional information pertaining to the quality of the material resulting from processing MSW with MWP equipment will be beneficial to determine both the market value for the recyclable materials as well as the cost to manage the organic fraction of the MSW that will be captured.

#### **4.1.1 Recyclables**

The main concern with the recyclable materials recovered from MSW using a MWP system is the quality or “cleanliness” of the material. It is anticipated that the ferrous and non-ferrous will be similar or “cleaner” than the current RDF processing system, which has a market for these materials.

The containers (HDPE and PET plastics) and cardboard may be “contaminated” with food waste and other wet organic material which may reduce their value. It is important to obtain additional information pertaining to other operations that are currently capturing these materials from the MSW stream using MWP equipment.

#### **4.1.2 Organics**

Similar to recyclable materials, the quality of the organics captured using MWP equipment is an important factor related to the cost of organics management. The quality of the organics will also impact the material produced from the organics (e.g. biogas and compost). The MWP equipment will target organics from the fine material in MSW, which means there is potential to also capture broken glass fragments, grit, and “small” plastic pieces. These “contaminants” will affect the cost to have a private vendor take the material as well as the quality of the end product produced by the private vendor.

The main options for the organics are to send them to a composting facility or an anaerobic digestion facility. Additional information pertaining to the quality of the organic fraction from processing MSW using MWP equipment is necessary. Also, it is important to determine the status of possible anaerobic digestion vendors given the current market for the biogas they produce. It is also important to determine if additional steps will be necessary to further process the organic material into a Class I or Class II compost. Minnesota Administrative Rule 7035.2836 indicates that Class I compost must not contain greater than three percent inert materials and Class II compost must not contain greater than four percent inert materials. Since there is currently not an operational AD facility in the immediate vicinity of the Newport Facility, it is assumed that composting the material may be a required interim step to achieve the Project Board’s Scope of Resource Management.

#### **4.2 Documented Recovery Rates**

Removal of recyclable material using MWP equipment is a proven technology. It has been used to process single stream recyclables since the 1990’s. However, current information pertaining to specific recovery rates for ferrous, nonferrous, plastics, and organics using MWP equipment from a MSW stream is limited. Therefore, it is important to obtain additional data about the recovery rates from processing MSW with MWP equipment, which includes information about the composition of the waste stream entering the MWP system.

#### **4.3 Waste Composition Data – Montgomery**

Considering the Montgomery facility was considered as a “reference facility” for installation at the Newport Facility, it is important to obtain data about the incoming waste composition in order to compare the waste stream with the Ramsey/Washington waste stream. Related to the waste composition is obtaining additional data about operational characteristics of the MWP System installed in Montgomery. Additional waste composition data should be obtained for the material entering the Newport Facility in order to get a better understanding of how seasonal variation affects the incoming waste stream.

## 4.4 Impacts of Adding MWP at Newport

### 4.4.1 Change Vehicle Traffic

No significant change in vehicle traffic (incoming and outgoing) is anticipated to result from the addition of MWP at the Newport Facility.

### 4.4.2 Change in Odor

The material entering the facility will remain unchanged with the addition of MWP equipment. The organics removed will not be stored onsite so the addition of MWP equipment at the Newport Facility is not anticipated to result in a change in odors at the facility.

### 4.4.3 Change in Noise

All of the MWP equipment is anticipated to be within the facility so no significant change in noise is anticipated.

## 5 Potential Specific Steps

Related to the additional data needs are the potential specific steps to use to gather the necessary information and to move through the implementation process and meet the schedule of the Scope for Resource Management. These steps include:

<b>MWP Pre-procurement Planning</b>	January 2016 to June 2016
Data acquisition re: organics recovery	
◆ Focused, seasonal waste composition	
◆ Test sorts of commercial and residential wastes	
◆ Data comparison to operating facilities	
◆ Operating facility site visits	
◆ Effectiveness of different organics sorting equipment/methods	
Discussions/input from Existing Plant Management	
MWP system vendor tours of Newport	
Monitor status of private AD facility developers	
Determine interest/needs of existing composting facility owners	
Meet with various regulatory bodies regarding any impacts to permits and MPCA specifically re: classification of organics recovered via MWP	
Discussion of various procurement methods for the MWP system	
Determine/develop interest in this project opportunity with potential MWP	

system vendors, gather input/ideas, thoughts on procurement process, etc.	
<b>Procurement (Assuming Turnkey, Design/Build/Start- Up Contractor for a System)</b>	July to December, 2016
Develop procurement document(s)	
“Market” project to potential contractors	
Gain approvals to issue	
Determine Proposal Evaluation Team	
Go through procurement process of pre- proposal conference, questions, addenda	
Evaluate proposals, potential partnerships formed, etc.	
Select/contract with vendor best fitting needs	
Finalize contract	
Board authorization	
<b>Final Design/Permitting</b>	January to June, 2017
Contractor develops construction documents	
“Board “ reviews/accepts	
Prepare/finalize any permit documents and submit	
Develop coordination plan for installation and maintaining RDF processing	
Consider staffing needs, approaches, and select preferred option	
Recruit MWP system manager	
<b>Construction/Installation</b>	September to December, 2017
Monitor equipment construction/installation with on- site construction observation	
Monitor project according to contract	
Review/accept start- up testing procedures	
Operations coordinate work with contractor to maximize continued operations	
Monitor start- up and performance testing	
Recruit/hire operations staff	