Report

Assessment of the Processing Capacity and Capability of the Newport Facility

Project I.D.: 15R002.02

Prepared For:
Ramsey/Washington Recycling and Energy Board
(fka) Ramsey/Washington Resource Recovery Project Board

November 2015

Ramsey/Washington
RECYCLING & ENERGY BOARD

Foth

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November 10, 2015

Zack Hansen, Judy Hunter, Kate Bartelt, and Mike Hagan
Joint Leadership Committee
Ramsey/Washington Recycling and Energy Board
(fka) Ramsey/Washington Counties Resource Recovery Project Board
2785 White Bear Ave N
Maplewood, MN 55109

Dear Leadership Committee Members:

RE: Assessment of the Processing Capacity and Capability of the Newport Facility

This letter transmits the final report of the Assessment of the Processing Capacity and Capability of the Newport Facility. Separate documents have been prepared addressing safety and IT hardware and software capabilities and are not part of this assessment.

This report documents that the Newport Facility has the capacity and capability to produce RDF to meet the Xcel Fuel Supply Agreement provided:

- Adequate MSW quantities of at least 380,000 to 400,000 tons are delivered per year.
- The supplies of spare parts for ongoing maintenance are available and restocked at adequate levels.
- Existing supervisors and key staff continue in their employment at the Newport Facility during the transition of ownership providing the experience and knowledge to operate the Facility.
- Relationships with the key suppliers are maintained to provide parts, service, and knowledge known to be important for timely maintenance and repair.

We look forward to discussing this report and related documents as the Ramsey/Washington Recycling and Energy Board further considers the purchase of the Newport Facility.

Sincerely,

Foth Infrastructure & Environment, LLC

Nathan Klett
Project Engineer

Curt Hartog, P.E.
Technical Director

CC: Warren Shuros, Client Director
Jennefer Klennert, Project Manager

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Ramsey/Washington Recycling and Energy Board
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Maplewood, MN 55109

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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Enginner under the laws of the State of Minnesota.

Curtis L. Hartog, P.E.
Technology Director

Signature: ____________________ License # 44024

Date: 11/10/2015

Disclaimer: Reports prepared by Foth and its subconsultants were prepared under constraints of cost, time, and scope; and reflect a limited investigation and evaluation rather than a full, total, complete or extensive assessment or evaluation. Foth's assessment was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by Engineering Professionals practicing in this or similar localities. No other warrenty or guarantee, expressed or implied, is made as to the conclusions and professional advice included in this report.

The findings of this report are valid as of the date of the investigations.

The confirmations contained in this report are based upon observation of conditions at the Facility/property and/or information provided by the R&E Board, RRT, and/or investigation of record.

The report's accuracy is limited to the information available from interviews, records and other information provided by the R&E Board and RRT.

Foth bears no responsibility for hidden or latent conditions or misrepresentations by the R&E Board, its representatives or any other parties.

Foth's reports are not intended to have direct bearing on the value of the property.

It is possible that conditions unpermitted, undocumented, not observed or otherwise concealed regarding the Newport Facility operation/property could exist. Additional information which was not found or made available to Foth may result in a modification of opinion presented in this report.

Assessment of the Capacity and Capability of the Newport Facility

Contents

Contents

Tables

Figures

Photographs

Appendices

Assessment of Processing Capacity and Capability of the Newport Facility

Executive Summary

This report provides the Ramsey/Washington Recycling and Energy Board with an analysis of the ability of the Newport Facility to continue to produce RDF to meet the Fuel Supply Agreement with Xcel Energy. The Fuel Supply Agreement requires Resource Recovery Technologies, LLC (RRT) to deliver "a minimum of 320,000 tons, in the aggregate for both Xcel Combustion Plants, per calendar year." It is important to note that a subsequent agreement does encourage the production of RDF above the minimum annual amount of 320,000 tons but does not establish a higher minimum value. It is also noted that RRT has historically produced RDF at other facilities that could contribute to meeting the 320,000 minimum tons.

This report is based on observations made at the Newport Facility, discussions with RRT staff, and the Newport Facility's historic ability to produce the required 320,000 tons of RDF annually. Historic production records from 1998 to 2014 were used to determine the Newport Facility's ability to produce RDF at the levels required. Foth has determined there are four major items to ensure the Newport Facility continues to operate as it has in the past and meets the Fuel Supply Agreement

Item 1 – Waste Deliveries

Based on the historical record, in order for the Newport Facility to produce a minimum of 320,000 tons of RDF annually, the Newport Facility must receive sufficient MSW to produce the RDF. Figure ES-1 shows the historic waste deliveries and RDF produced from 1998 to 2014. The figure indicates that the Newport Facility needs to receive 380,000 to 400,000 tons of MSW annually to produce the required 320,000 tons of RDF. Should the Newport Facility not receive the required MSW, then RDF production may not meet the Fuel Supply Agreement. Continued waste deliveries to the Newport Facility are an important factor in meeting the Fuel Supply Agreement.

Item 2 – Equipment Maintenance and Spare Parts

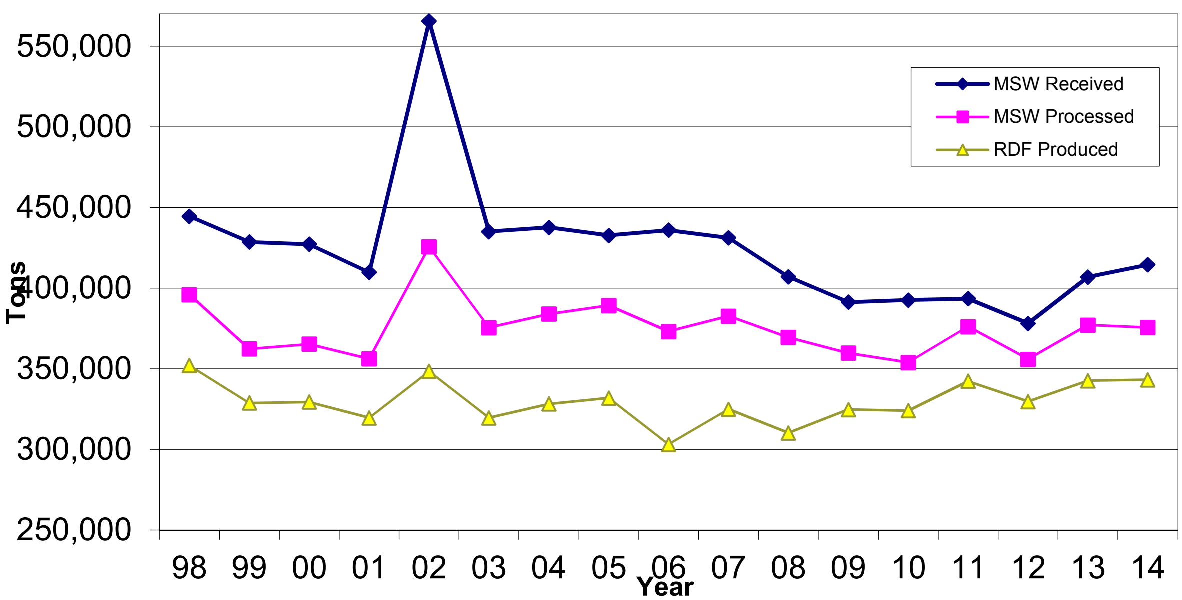
Foth's reviews of the Newport Facility and discussions with RRT have concluded that the equipment used to produce the RDF requires continued maintenance on a periodic basis. Very few items in the RDF production process require zero maintenance. To the contrary, most equipment requires daily inspection and maintenance of some kind. The majority of the equipment has been modified to some extent in order to reduce the required maintenance and increase performance at the Facility.

Maintenance requires an adequate supply of spare parts in the Newport Facility. Many of the spare parts used for maintenance and repair have some lead time to obtain, so the inventory of spare parts is needed for maintaining the Newport Facility. If there are delays because spare parts are not readily available when maintenance and repair are needed, this could impact RDF production and the ability to meet the Fuel Supply Agreement.

The Newport Facility typically has in inventory one or more of each major component part (hammer mill, shredder components, etc.). When the part is replaced, the replacement part is ordered so the inventory of spare parts on hand remains constant. Should this system of inventory and replacement of spare parts be discontinued, meeting the Fuel Supply Agreement would be challenging. The inventory of major components are scattered throughout the plant area with no documentation as to the location of the parts. The location is known by the on-site staff operating the plant, but is not documented.

It should be noted that RRT continues to perform all necessary equipment maintenance (Appendix A contains monthly operating reports with monthly maintenance items) and is continuing to replace/restock spare parts. To that end, there are specific spare parts with long lead times that have been ordered for delivery after the first of the year. These spare parts will need to be paid for upon delivery. The spare parts are needed in order to maintain Newport Facility operation.

Figure ES-1
Comparison of MSW Received to RDF Produced
at the Newport Facility



Source: Table 2-1

Item 3 – Staff

Foth has concluded that many of the components in the Newport Facility are considered custom applications. This requires a knowledge base on each component and the modifications that have been completed along with the maintenance and repair procedures for the components. This knowledge is held by the current staff at the Newport Facility. There is little documentation as to the repair or replacement procedures used for maintenance at the Newport Facility. Foth recommends the R&E Board invest in the development of procedures and processes to capture the intellectual capital held by the current staff.

Should there be a disruption of staff at the Newport Facility, some of the knowledge base could be lost and would require significant time to regain. This may impact the Fuel Supply Agreement production requirements by experiencing longer delays in repairs and maintenance which could increase non-production time. Foth encourages that staff turnover be limited throughout the transition and operating period. Staff consistency and knowledge transfer are needed to continue the historic performance.

Foth identified some key staff as being close to retirement. Procedures should be initiated at the Newport Facility to ensure knowledge capture (from key staff) of key plant elements to ensure continued operation. RRT Management noted that they have a current policy to cross train employees to learn each other's duties and roles. This may also require shadowing key plant employees for extended periods to capture and document processes and procedures. Initiation of maintenance and repair procedures documentation is also recommended. Since the Newport Facility has many custom components, documentation of maintenance, repair and replacement procedures is needed to document processes that are required to continued plant operations.

Staff have significant supplier relationships that assist in obtaining spare parts and repairs quickly to meet RDF production requirements. For example, the key supplier when a hammer mill rotor needs to be removed and replaced or repaired is the crane service to lift the hammer mill unit out of the carriage through the roof of the Newport Facility. Knowing who to contact and having the relationship to obtain quick response is needed to ensure adequate RDF production. Foth noted, there are several of these types of relationships that exist with outside suppliers and vendors. Losing these relationships may cause an increase in plant down time and impact the ability to meet the Fuel Supply Agreement.

Item 4 – Suppliers

The suppliers and vendors used by the Newport Facility should be maintained throughout the transition and continued operation of the Newport Facility. Many of the suppliers also have a history with the Newport Facility and understand the unique nature of the plant, the customization that has occurred and the production of the RDF. These suppliers may not to be the "low bid" supplier because of the custom work they have completed at the Newport Facility. For example, the machine shop used to resurface the hammer mill parts is based in Duluth. That machine shop has completed this work for decades and understands the specific application and wear on the hammer mill. Replacement of current suppliers with other lower cost suppliers may impact the ability of the plant to obtain services and supplies meeting the needs for RDF production. Additionally, there is considerable experience that is part of many of the suppliers that allows for efficient and timely repairs. As the Board operates the Newport Facility, it is recommended that multiple vendors be engaged to support the parts and repairs needs. This will provide some flexibility in addressing maintenance and provide competitive pricing for service and repairs.

Foth conducted a review of the Newport Facility and conducted interviews of current staff to identify needs and components for the production of RDF. Since the MSW to RDF process at the Newport Facility has two lines (Line A and Line B) the complete and total stoppage of RDF production is unlikely. However, Foth identified a key component in the processing system, conveyor C12-ferrous, which is shared by both production lines. If this conveyor is not operational, the RDF produced would contain ferrous material, which may not be accepted by Xcel and the marketable ferrous will not be recovered. RRT has indicated the inventory of spare parts is sufficient that conveyor downtime would be limited to a day or two should conveyor parts require complete replacement. Another key component to RDF production is the power supply to the Newport Facility. Should complete power be lost to the Newport Facility, RDF production would cease. Finally, a natural disaster, should it impact the Newport Facility, has the potential to cause RDF production to cease. It is important to note, the operating history indicates that a long term and complete RDF production stoppage has not occurred.

Foth also reviewed each individual component in the MSW to RDF process and identified the components impact on RDF production, plant failure risk and mitigation strategy to reduce or eliminate plant failure risk. Since the plant does have two production lines, total plant failure caused by one component failure is unlikely. However, component failure could cause reduced RDF production for a period of time. But a component failure has historically not caused the Fuel Supply Agreement to be violated.

This report does not address items that were presented in stand-alone reports such as the mobile equipment, plant safety and computer systems that operate the Newport Facility. This report should be used in conjunction with the other reports to provide the R&E Board with a complete understanding of the Newport Facility and the production of RDF to meet the Fuel Supply Agreement.

Based on the historical record and the continued delivery of waste, maintenance of equipment and spare parts inventory, maintenance of staff and maintenance of supplier relationships, it is Foth's opinion that the Newport Facility is expected to continue to convert MSW to RDF to meet the requirements of the Fuel Supply Agreement.

List of Abbreviations, Acronyms, and Symbols

BWR	Bulky Waste Residue
CIP	Capital Improvement Projects
EPA	Environmental Protection Agency
EPCRA	Minnesota Emergency Planning and Community Right to Know Act
Foth	Foth Infrastructure & Environment, LLC
HP	Horse Power
HVAC	Heating, Ventilation, and Air-Conditioning
K	Thousand
KV	kilovolt
KVA	Kilo Volt-Amps
M	Million
MP2 Program	Maintenance Processes 2nd Edition
MPCA	Minnesota Pollution Control Agency
MSW	Municipal Solid Waste
MVA	Mega Volt-Amps
MWPC	Minnesota Waste Processing Corporation
Newport Facility	Newport Resource Recovery Facility
O&M	Operations and Maintenance
R&E Board	Ramsey/Washington Recycling and Energy Board
RDF	Refuse-Derived Fuel
RRT	Resource Recovery Technologies, LLC
SWPPP	Stormwater Pollution Prevention Plan
TLO	Trash Load Out
v	Volt
Xcel	Xcel Energy, Inc.

1 Introduction

The Ramsey/Washington Counties Resource Recovery Project Board has formed a new joint powers board called the Ramsey/Washington Recycling and Energy Board (R&E Board) and is considering the purchase of the Newport Resource Recovery Facility (Newport Facility) from Resource Recovery Technologies LLC (RRT). This report provides an assessment of the capacity and capability of the Newport Facility to process municipal solid waste (MSW) in amounts needed to meet the current Fuel Supply Agreement with Xcel Energy.

Foth Infrastructure & Environment, LLC (Foth) conducted a technical analysis of the Newport Facility in 2013. This report updates the 2013 report to the current status of the Newport Facility. Portions of the Foth scope of work were related to the Asset Purchase Agreement between the R&E Board and RRT and included in the Conditions Precedent to completing the sale/purchase. The specific scope below is pertinent to Conditions Precedent of the Asset Purchase Agreement.

1. **Assess the processing capacity and capability of the Facility;**

   Based on a review of historical performance data and observations made by Foth of Facility equipment and operations during a specified time period, provide an opinion on the range of processing capacity of the Facility. Identify the volumes of MSW needed for processing on an annual basis. Assess whether or not the Facility has the capability to perform by processing that range of tonnages of MSW in times and at rates needed to meet the current Fuel Supply Agreement (referred to as the "Commercial Processing Rate").

2. **Assess the operational safety of the Facility;**

   Based on observations, assessments and a review of data made by Foth during September and October 2015 provide an opinion on the safety status at the Facility and identify gaps in operational safety when the Facility is operated at the Commercial Processing Rate.

3. **Identify limitations of the Facility;**

   Based on a review of historical performance data and observations made by Foth during a specified period of time, identify and describe potential Facility limitations when the Facility is operated at the Commercial Processing Rate with Ramsey and Washington County MSW at start-up, and based on assumptions, short term (1 yr), and long term (5 yr) operations.

4. **Assess the on-site business hardware and software, particularly the Allen Bradley system (equipment operating system), CompuWeigh and MP2, to determine whether or not it will function with the R&E Board's hardware and software in order to operate and maintain the Facility;**

   Based on observations and assessments made by Foth and Foth's subcontractors, assess whether the acquired software and hardware when used with the hardware and software of the R&E Board can operate and maintain the Facility and carry out business operations under R&E Board ownership. Assessments and determinations completed for the Allen Bradley system will be at the Commercial Processing Rate.

5. **Provide opinions whether or not the Facility can process MSW in quantities and capacities to adequately fulfill the Fuel Supply Agreement.**
    a. An opinion as to whether or not the Acquired Assets, including the Facility, has a processing capacity of X to Y tons of MSW per year, and is capable of being operated within OSHA and industry safety standards at the Commercial Processing Rate to produce sufficient refuse derived fuel to meet the Fuel Supply Agreement.

    b. An opinion as to whether or not the acquired software and hardware when used with the hardware and software of the R&E Board can operate and maintain the Facility and carry out business operations under R&E Board ownership. Assessments and determinations completed for the Allen Bradley system will be at the Commercial Processing Rate.

The scope of work included site visits to the facilities, numerous discussions with operation and maintenance staff, review of relevant documents, inclusion of the record of operating history maintained by Foth from 1998 to 2014, and follow up discussions with plant management. A Safety Assessment was completed by Foth and is provided in a separate report titled "*Safety Assessment Site Visit – September 15-16, 2015 Resource Recovery Technologies (RRT) Facility*". Foth obtained the services of a subcontractor, Heartland Business Systems, specializing in software and hardware/ business functions and separate reports titled *"Resource Recovery Technology, LLC (RRT) Newport Resource Recovery Facility IT Assessment"* were prepared. This safety assessment fulfilled the requirements of Scope Item 2. These reports fulfilled the requirements of Scope Item 4. Scope Items 1, 3, and 5 are addressed in this report.

2 Newport Facility

2.1 Background and General Status

In order to complete this technical status update and provide the opinions related to the Conditions Precedent, a condition assessment was conducted based on site visits by differing engineering disciplines and a retired refuse-derived fuel facility operator, visual observations for most systems and equipment, examination of maintenance records and discussion with RRT staff from the Newport Facility. An initial site visit was conducted; with several follow up site visits and telephone discussions.

This assessment included examination of major equipment and components within the Facility that have the potential to impact the ability to reliably produce RDF to meet the Fuel Supply Agreement.

The current processing facility is a 129,000 square foot building on a 14-acre parcel of land. The Facility was originally constructed in 1986-87. The site includes inbound and outbound lanes with scales adjacent to a scalehouse; trailer parking areas; a 64,000 square foot (approximate) receiving building/tipping floor; a bulky waste residue shredder and loadout; processing building; administration building; service center; dust collection facilities; recyclables loadout; and residue and RDF loadout areas. RRT has demonstrated the current Newport Facility and Staff can process 1,700 to 2,000 tons per day of MSW into RDF.

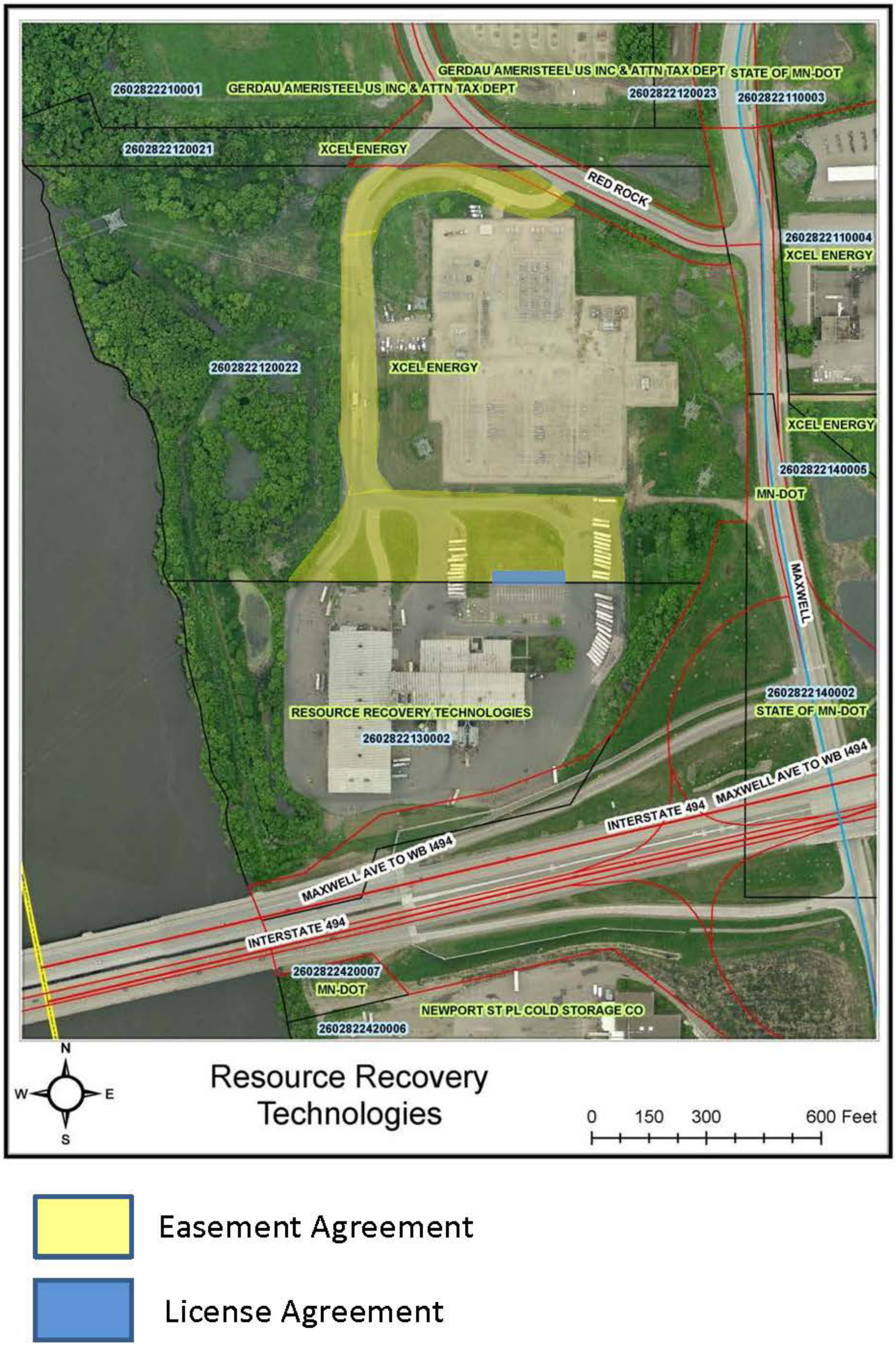
A Facility site layout showing the 14-acre parcel of land, buildings and associated support facilities (scales, etc.) is provided as Figure 2-1 (includes adjoining properties). Figure 2-1 also shows the areas covered by the Easement Agreement and License Agreement between RRT and Xcel.

Staff at the Newport Facility generally use the *Maintenance Processes 2nd Edition* (MP2) computer program to track maintenance on both stationary and mobile equipment as well as some building maintenance items. The program is generally based on equipment manufacturer recommended maintenance schedules. However, much of the processing equipment has been modified (improved based on experience at the Facility) in order to minimize maintenance and the MP2 program has been updated based on staff experience. The program is generally used to track "items on hand" such as belts, motors, etc. It should be noted that based on the custom nature of the modified equipment and the current staff experience with the RDF production equipment, the manufacturers recommended maintenance intervals may no longer be valid.

Foth was provided with a printed copy of recent maintenance data from the MP2 program so the data could be reviewed at that time. Staff from RRT indicated that not everything is strictly tracked using this program as the program is getting outdated. However, RRT staff indicated that maintenance is performed on a routine basis in order to maintain operation of the Newport Facility. Additionally, the maintenance supervisors prepare and provide daily work logs to the maintenance staff indicating what maintenance is required during the shift. These work logs were examined during a site visit to the Facility. The work logs are reviewed by the maintenance supervisors to confirm maintenance items and to assign items that were not completed to a subsequent shift. Since the equipment continues to operate at an appropriate level of production, RRT believes that is proof of its effectiveness and that the maintenance is occurring as required. Staff at RRT noted that during the 2015 operating year, daily and monthly production records were set for RRT's operating experience.

The CIP budget for the Newport Facility has remained relatively constant and is typically in the range of $1 to $2 million annually. This generally does not include the annually budgeted O&M costs for the Newport Facility.

Figure 2-1
Newport Facility & Surrounding Properties



2.2 Performance Metrics

Assessing the historical performance data provides information regarding the processing capacity and the Newport Facility's ongoing capability. Table 2-1 provides a comparison of the Newport Facility performance for the last eleven years, 2004 to 2014 and covers all waste delivered, not just waste from R/W Counties.

The MSW received from 2004 through 2007 was consistently between 431,000 and 438,000 tons per year. In 2008, 406,986 tons were received, down 24,216 tons from 2007 (5.6% decrease). In 2009, 391,329 tons were received, down 15,657 tons from 2008 (3.8% decrease). In 2010, MSW deliveries increased 1,304 tons as deliveries stabilized for the year and continued stable into 2011. Deliveries dropped by 15,429 tons in 2012 to 378,055. Deliveries increased in 2013 to 406,896 tons and increased again in 2014 to 414,557 tons.

The RDF produced remained stable during the 2004-2013 time frame since RRT processes higher percentages of waste to maintain RDF production. Despite reduced MSW deliveries, the Newport Facility has consistently produced similar quantities of RDF in order to meet their contractual obligations with Xcel for fuel. RRT has delivered some RDF to Great River Energy (GRE) to avoid landfilling from 2011-2014.

The amount of non-ferrous (aluminum) recovered dropped after a spike in 2010, and stayed consistent from 2011 through 2013 before increasing in 2014 to the 2004 level. The amount of ferrous sold decreased steadily between 2004 through 2012, before rebounding in 2013 and 2014 to the 2004 levels.

The Process Residue has shown a continued downward trend from the 2006 high of 56,472 tons to 18,017 tons in 2014. Bulky waste residue has decreased over time from the high of 63,947 tons (15% of MSW received) in 2006 to 32,832 tons (8% of MSW received) in 2014. RDF yield percentage has increased from the low in 2006 of 81.2% to 91.4% in 2014. The Percentage Not Landfilled in 2014 (95.2%) exceeded the processing contract and state required level of 85%

Table 2-1
Plant Performance Comparison

OPERATING PARAMETER	YEAR										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
MSW Received (tons)	437,603	432,667	435,987	431,202	406,986	391,329	392,633	393,484	378,055	406,896	414,557
MSW Processed (tons)	383,958	389,200	373,097	382,624	369,476	359,744	353,860	376,153	355,890	377,094	375,617
RDF Produced (tons)	328,220	331,848	303,048	324,856	310,175	324,684	324,042	342,267	329,656	342,582	343,169
RDF to Red Wing (tons)	187,109	193,688	168,220	180,393	177,385	182,572	181,809	175,769	181,594	189,710	174,187
RDF to Wilmarth (tons)	141,112	138,161	134,827	144,289	132,789	142,114	134,857	150,935	132,541	146,970	156,919
RDF to GRE (tons)	NA	NA	NA	NA	NA	NA	630	15,563	15,521	5,903	12,063
Non Ferrous (tons)	758	823	874	832	484	429	681	521	551	581	778
Process Residue (tons)	41,285	43,854	56,472	41,382	36,353	20,728	15,655	16,098	12,036	20,047	18,017
Ferrous Delivered (tons)	16,532	15,718	15,703	15,570	14,458	13,858	12,880	14,394	13,614	13,925	13,647
Fluff Returned (tons)	2,847	2,677	3,014	3,548	3,440	3,721	3,863	4,018	4,051	2,500	2,956
Ferrous Sold (tons)	13,687	13,443	12,691	12,316	11,014	10,136	9,017	10,376	9,563	13,925	13,647
Bulky Waste Residue (tons)	45,754	41,036	63,947	52,907	52,286	37,203	32,521	19,240	16,088	25,542	32,832
RDF Yield (%)	85.5%	85.3%	81.2%	84.9%	83.9%	90.3%	91.6%	91.0%	92.6%	90.8%	91.4%
BWR/Process Residue (%)	19.9%	19.6%	27.6%	21.9%	21.8%	14.8%	12.3%	9.0%	7.4%	11.2%	12.3%
Percent not landfilled (%)	89.2%	88.9%	84.9%	88.3%	87.1%	93.2%	94.4%	93.9%	95.5%	94.7%	95.2%
MSW Processed %	87.7%	90.0%	85.6%	88.7%	90.8%	91.9%	90.1%	95.6%	94.1%	92.7%	90.6%

Data Source: Foth compilation of Facility Monthly Operational Reports

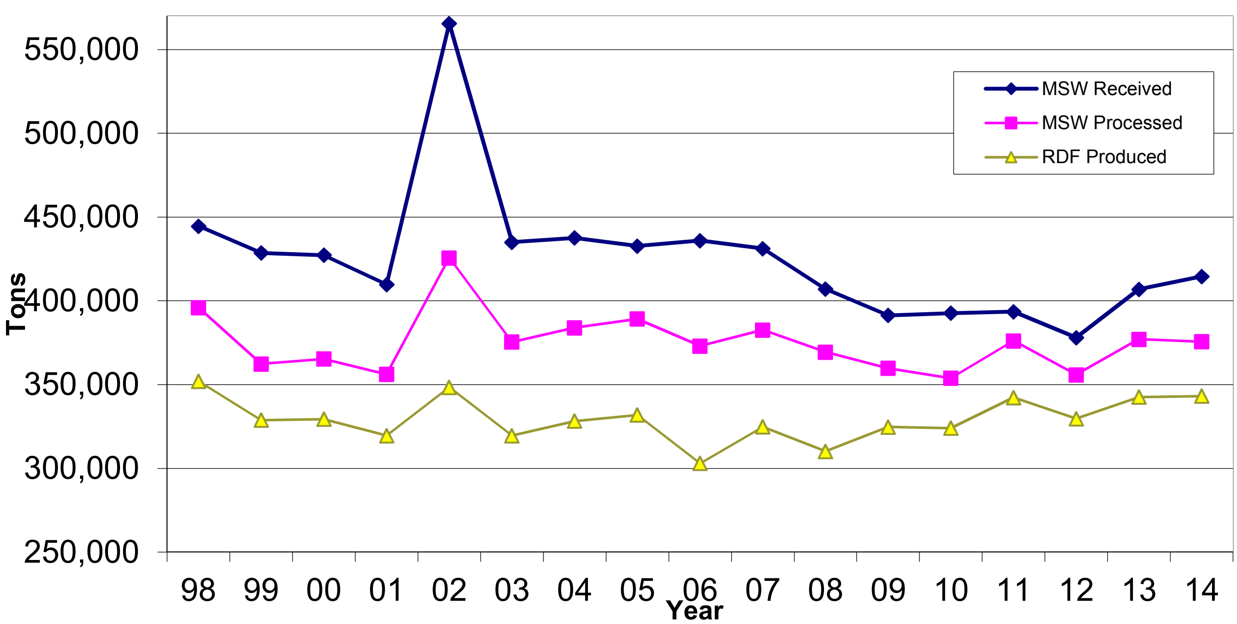
Note: Minimum RDF tons required by the Fuel Supply Agreement was met in all years when RDF from all RRT sources is included.

Following are four figures covering the seventeen-year period from 1998 through 2014. It should be noted that deliveries in 2002 were abnormally high for a single year which somewhat skews the trend lines.

Comparison of MSW received to RDF produced (Figure 2-2) indicates a slight downward trend in MSW received; a slight downward trend of MSW processed; and a stable trend in RDF produced from 2006 and 2014. The amount of RDF produced annually has been at or above 325,000 tons per year since 2009 despite deliveries ranging from a low of 378,055 tons to a high of 414,557 (a difference of 36,502 tons).

The seventeen year trend line for RDF produced is flat above 325,000 tons per year. Assuming 320,000 tons of RDF is required as a part of the Xcel Fuel Supply Agreement there is a minimum number of tons of MSW received in order to satisfy the Fuel Supply Agreement. The exact number of tons of MSW required depends on the efficiency of RDF production; but appears based on historic information to be between 380,000 and 400,000 tons MSW annually.

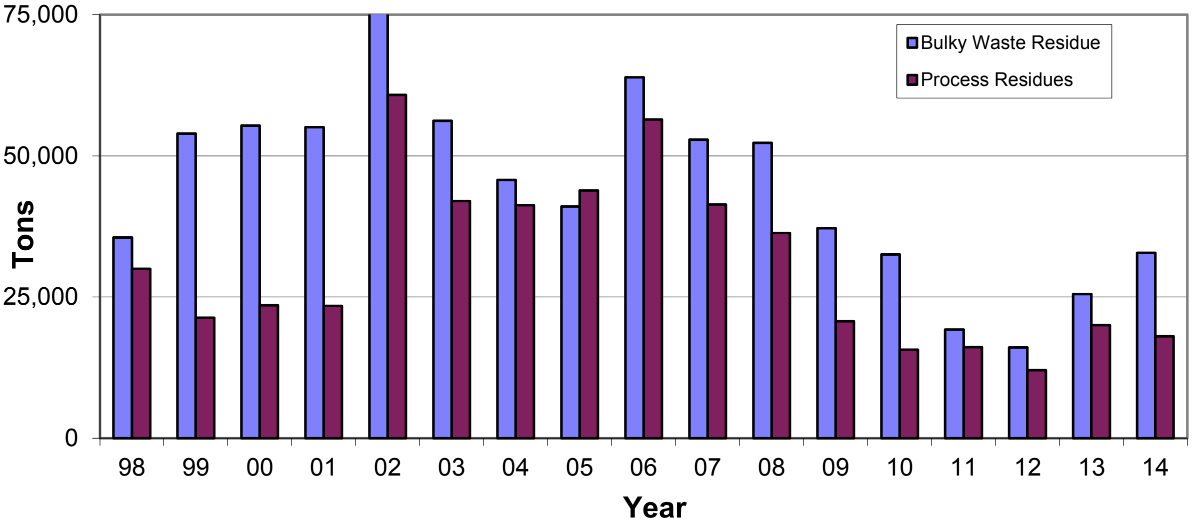
Figure 2-2
Comparison of MSW Received to RDF Produced at the Newport Facility



Source: Table 2-1

Figure 2-3 shows the comparison of process residues and bulky waste residues. Bulky waste residues peaked in 2002 at the time of the spike in waste deliveries, and decreased significantly through 2012. Slight increases in bulky waste residues have been noted in 2013 and 2014. Process residues have decreased since the high in 2006, with the smallest amount in 2012 when deliveries were down and a higher percentage of MSW was processed into RDF. Process residues also increased slightly in 2013 and 2014.

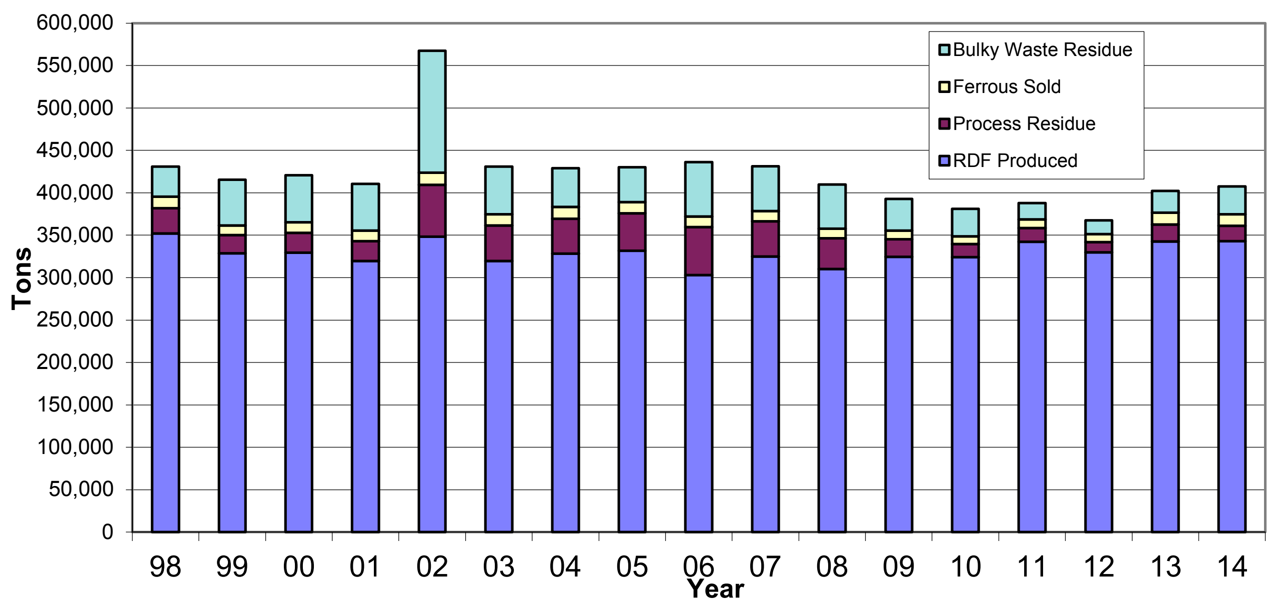
Figure 2-3
Comparison of Newport Facility Residues



Source: Table 2-1

Comparison of Outputs (Figure 2-4) shows the relative proportions of the primary Newport Facility outputs. RDF has been historically stable around 325,000 tons. Bulky waste residue, process residue and ferrous sold constitute a significantly lower percentage of the outputs since 2006.

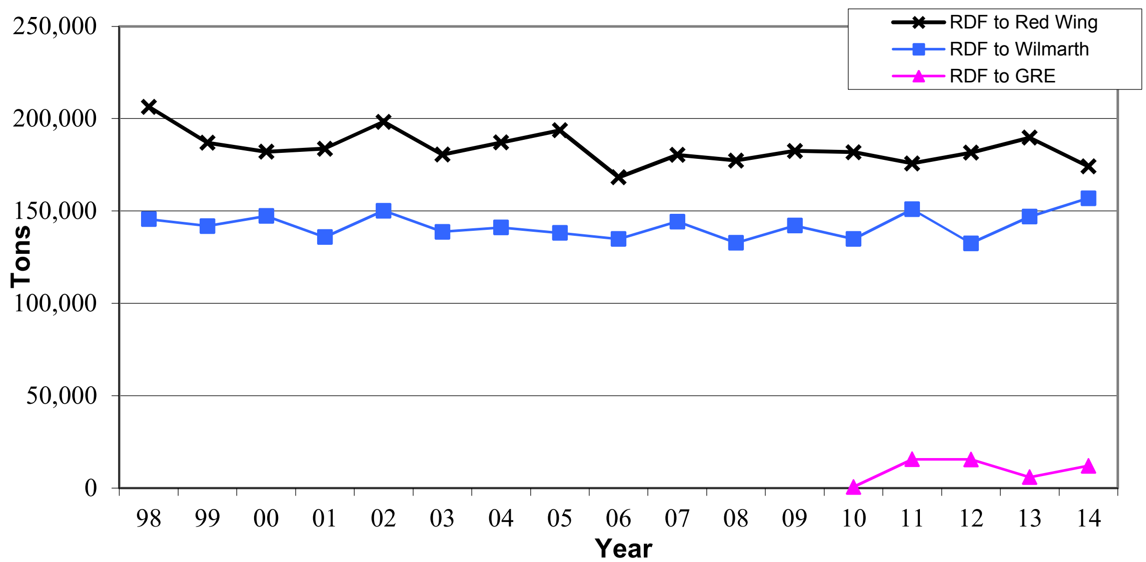
Figure 2-4
Comparison of Outputs
Newport Facility



Source: Table 2-1

Figure 2-5 indicates that the RDF sent to the two burn plants has been relatively stable from 1998-2014. Slightly smaller tonnages were delivered to Red Wing in 2014 while slightly higher tonnages were delivered to Wilmarth that year. RRT delivered 5,000 to 15,000 plus tons per year of RDF to Great River Energy between 2010 and 2014.

Figure 2-5
Newport Facility RDF to Burn Plants



Source: Table 2-1

RRT has two performance guarantees in the Solid Waste Processing Agreement with R/W Counties; 85% of County waste accepted by RRT must be processed, and, of this processed waste, 85% must be recovered as RDF or secondary materials. Based on the contractual methods for calculations, in 2014 RRT processed 90.6% of the MSW accepted and recovered 91.4% of the MSW processed. RRT exceeded both performance guarantees in the Solid Waste Processing Agreement.

The historical data demonstrates a consistent performance capability in processing different tonnages of MSW to meet or exceed the amount of RDF specified in the Fuel Supply Agreement requirements, provided the MSW is received at the Newport Facility.

2.3 General Equipment Status

There are two processing lines at the Newport Facility, designated as “A” line and “B” line, which are similar in design and capacity. Each line begins at the in-feed area in the MSW tipping floor area and ends at the RDF trailer loading area. Each line operates independent of the other with the exception of the shared “C12” & “C123” conveyors.

If the C12 conveyor is not operational, the RDF produced would contain ferrous material, which may not be accepted by Xcel and the marketable ferrous will not be recovered. This conveyor is needed to continue production of acceptable RDF at the Newport Facility. If the C123 conveyor is not operating, a diverter gate can be activated and the Facility can continue operating. This allows the non-ferrous to remain in the RDF and would reduce the recovery of non-ferrous for marketing. It is important to note that both conveyors can be off line and the production of RDF would continue. However, the inclusion of ferrous and non-ferrous materials in the RDF for an extended time may impact the Xcel facilities ability to meet air emissions criteria.

RRT indicated that the Newport Facility has stock belts, motors and gears boxes (i.e. wear parts) so that the Newport Facility is only down for half a day or less if repairs to the shared conveyors are necessary. A separate line includes the bulky waste shredder adjacent to the trash load out (TLO) conveyor. This line is used to either shred bulky waste residue (BWR) that is loaded with the grapple or directly load the BWR onto the load out conveyor.

The bulky waste shear shredder generally operates to provide additional material (shredded BWR) for the processing lines when there is an insufficient amount of MSW on the tipping floor to produce the amount of RDF needed for Xcel plant operation. The waste stream shredder is also used to size reduce mattresses received at the Newport Facility to minimize disposal costs. The shredded BWR is typically blended with MSW to produce an RDF that is within the specifications required by the burn facilities.

2.3.1 Equipment Evolution and Improvement - General

RRT indicates most of the processing equipment has evolved to its current state of design and operation in order to fit the requirements of RDF production while minimizing required maintenance. The air classifiers, eddy current separators, air knives and baler are very close to original. The majority of the remaining processing equipment has been modified to some extent and undergoes a continuous evaluation based on the maintenance requirement and operating performance.

Modifications to the electric drive motors, reducers, couplings and belt-drives on virtually all the equipment have been performed in an attempt to reduce the maintenance necessary and increase the longevity of the specific piece of equipment.

Another modification included revising the hydraulics on the RDF compactors due to hydraulic oil overheating. The RDF compactors stroke continuously resulting in lower hydraulic oil temperature and better RDF compaction in the trailer. The residue compactors were modified to operate intermittently (as opposed to continuously), which resulted in less wear on the compactor. A modification to the Positive Roof Ventilators, which involved converting the “V-Belt” drives and belts to “toothed-belt” drives and belts, was performed at a relative high initial capital cost. However, RRT reported this reduced maintenance from once every three weeks (with two maintenance staff) to several times per year (with a single maintenance staff member).

RRT indicated that there are about 30 troughed roller belt conveyors throughout the facility and four (4) metal tray conveyors. Extensive work has been and continues to be performed to extend the service life of bearings, bearing seals, rollers and belting on the conveyors. White iron bushings originally used on the metal pan conveyor rollers were replaced with rollers that are constructed with sealed roller ball bearings.

RRT stated this greatly extended the service life of the rollers and bearings. A re-design of the lubrication system was performed which, RRT believes, greatly extended the operating life between major conveyor component replacements.

The result of these changes is that stock replacement equipment is not readily available from the original equipment manufacturer. However, the modifications performed on most of the equipment have been performed with other readily available stock components of higher quality/durability, which means repair or component replacement should be possible with minimal downtime.

Another result of these changes is revision to the preventative maintenance schedule based on operator experience with the modified equipment. Several pieces of processing equipment have been extensively customized or custom built for RRT's specific application. Examples include the hammer mill rotor and the bulky waste shear shredder.

2.3.2 Scheduled Routine Service/Replacement/Maintenance - General

The term "Replacement" in this context refers to replacing components or parts of a specific machine. Replacement does not refer to removing the machine from the process and installing a new or different machine in its place. Replacement of parts on the equipment is completed as maintenance at the Facility.

Maintenance at the Facility for individual pieces of equipment is an ongoing process. Due to the variability of the material (MSW) being processed, a "routine" service/maintenance schedule is extremely difficult to follow. Instead, equipment is consistently (daily) examined for wear and is maintained and serviced as necessary based on the visual observations. Staff at the Facility indicated, for example, that a troughed belt conveyor may last 15 years or need replacing in less than a week depending on what material is in the MSW. Appendix A contains a summary of the monthly maintenance performed during 2014 and 2015.

Several pieces of equipment are examined on a daily basis and serviced as necessary (due to reduced RDF quality or failure). RRT Staff have experience maintaining the equipment and know potential wear items that need frequent inspection.

2.3.3 Major Plant Failure Risk - General

Since the facility has two independent processing lines, it should be capable of operating on at least one line for some time. If the C12 ferrous shared conveyor was to go down, RRT has historically ceased production of RDF until the C12 conveyor was repaired. Staff at RRT indicated that they stock belts, motors and gears boxes (i.e. wear parts) for the shared conveyor to minimize facility downtime if emergency repairs are necessary. If equipment other than conveyor C12 goes down, the Facility can maintain operation on at least one line. Consequently a complete, long term shutdown of the Facility has not occurred.

Potential causes of a complete shutdown of the Facility would be an extended major power loss or a complete loss of the computer-based operating system. Such shut downs would be of limited duration.

Another cause might be a hammer mill explosion of a magnitude to cause significant damage, but this has not occurred since the Facility started operation. A collapse of the building or a major portion of the building, such as from a tornado or fire, could cause a complete shutdown.

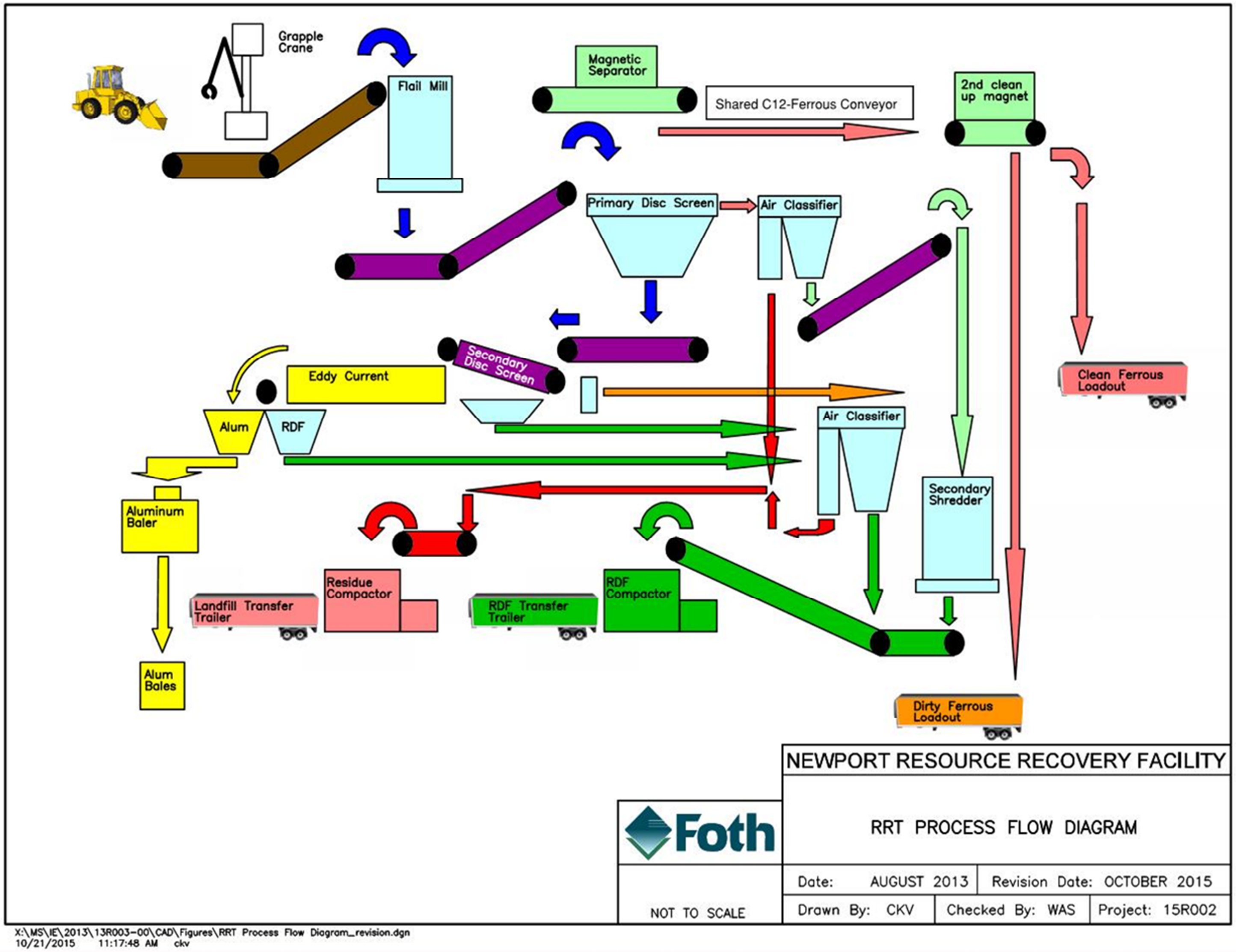
Additionally, given that the Facility is positioned near the Mississippi River, there is the potential risk associated with flooding. Though there are potential risks, as listed above, it should be noted that historically none of these have occurred or have caused a major plant failure.

The Facility may experience short term shut-downs due to failure of an individual piece of equipment that may stop or limit production on a specific line for minutes, hours or possibly day(s) depending on the piece of equipment involved. A specific history on the number of outages or length of time for each outage was not available from RRT. However, given the nature of the material and the process, it is not unreasonable to expect some type of outage on a monthly basis. However, based on the historical records, these shutdowns have not caused the facility to violate the Fuel Supply Agreement with Xcel. The extent of the outage will be dependent on plant management, maintenance policies and the availability of spare parts. In the case of the hammer mills, it is crucial to have key spare parts available on site, ready to install. Spare parts like a rotor, hammers and pins are examples of key spare parts that are used in the hammer mill on each line and these spare parts are maintained on site and replaced as they wear out.

2.3.4 RDF Processing - General

Prior to providing a detailed description of each piece of equipment involved in processing MSW into RDF, both a visual representation, Figure 2-6 (general flow chart not specific to the Newport RDF Facility) and written description (specifically describing the process at the Newport RDF Facility) of the processing line are provided.

Figure 2-6
RRT Process Flow Diagram



The process steps at Newport are:

1. Incoming trucks are weighed.
2. Trucks unload MSW on the tipping floor.
3. Primary sorting and transport of the MSW to the in-feed conveyors, bulky waste shredder (if the material is bulky), ferrous or residue. This is accomplished by the front end loaders and grapples in the tipping floor area.
4. In-feed conveyors move the MSW to the hammer mill for size reduction.
5. Conveyors move the material exiting the hammer mill to the magnetic separator for removal of ferrous materials. Material that is generally free of ferrous is conveyed to the primary disc screen. Additional details relating to ferrous materials processing is described in Step 10.
6. The primary disc screen separates material by physical size, under four (4) inches, called "throughs", and over four (4) inches, called "overs". The "throughs" are conveyed to the secondary disc screen for further processing. The material considered "overs" are conveyed to the primary air classifier which is described in Step 11.
7. The secondary disc screen separates material under two (2) inches in size from the "throughs" of the primary disc screen. Material larger than two (2) inches in size is conveyed to the non-ferrous eddy current separator. The material less than two (2) inches in size is considered RDF and is conveyed to RDF loadout.
8. The over 2 inch material from Step 7 is conveyed to the eddy current separator for aluminum removal. Material exiting the eddy current separator is conveyed to an air classifier. Further aluminum processing will be described in Step 15.
9. Aluminum-free material from the eddy current separator (Step 8) and the secondary disc screen "throughs" (Step 7) are combined and conveyed to the air classifier, where additional residue is removed. This material is then considered RDF.
10. Ferrous material, from (Step 5) is conveyed to a second "clean-up" magnet where "clean" ferrous materials are removed and conveyed to the clean ferrous loadout. The remaining ferrous material is considered "dirty ferrous" and is conveyed to a separate dirty ferrous loadout.
11. Overs from the primary disc screen (Step 6) are conveyed to an air classifier in order to separate the material into "heavy" and "light". Heavy materials are considered residue and are conveyed to the residue loadout for eventual delivery to the landfill. Light materials are large pieces of RDF and are conveyed to the secondary shredder.
12. The light materials enter the secondary shredder in order to reduce the size of the materials to an acceptable size for RDF. The material is then conveyed to the RDF loadout.
13. "Throughs" from the secondary disc screen (Step 7) are conveyed to an air classifier, where heavy residue materials are removed and conveyed to the residue loadout for the eventual delivery to the landfill. Light material from the air classifier is RDF and is conveyed to RDF loadout.

14. On the tipping floor is the BWR shear shredder, a grapple crane and a discharge conveyor (in addition to lines A and B). This equipment is used to reduce the size of the bulky waste received at the facility. The bulky waste is reduced to a size that can be fed into lines A or B in the event there is insufficient MSW. The grapple crane is also used to load waste onto a metal pan in-feed conveyor that is used to transfer BWR to the TLO if the BWR is not necessary for supplementing MSW in the processing lines.
15. Aluminum from the eddy current separator (Step # 8 above) is conveyed by belt conveyors to the aluminum baler, where it is baled so it can be brought to market.

2.4 Specific Equipment Description

The Facility operates two processing lines (A & B), since both lines are very similar, the detailed descriptions of each piece of equipment will generally focus on the A line. It is implied that the description also applies to the B line unless noted otherwise. A description of each major equipment component, scheduled maintenance/replacement, maintenance history, impact of RDF production, risk, and mitigation actions is provided in subsequent sections.

2.4.1 A Line: In-Feed Conveyors

A submerged conveyor is located in a pit in the tipping floor for loading MSW with a front end loader. The other conveyor is inclined and conveys the MSW into the hammer mill. Photograph 1 shows the in-feed pit and inclined conveyors located in the tipping floor area adjacent to the grapples.

Photograph 1: In-feed Pit and Inclined Conveyors

1. **<u>Description and Purpose:</u>**
   The first conveyor is a metal pan conveyor with a horizontal "pit" section made of metal trays carried between roller chains. This conveyor must absorb the impact of material dropped onto it from the front end loaders as well as impacts from the grapple as the grapple picks out material not appropriate (large metal items, inerts, bulky waste, etc.) for RDF production. The second conveyor is an inclined, metal tray cleated conveyor that conveys and elevates the material into the hammer mill. The inclined conveyor is prone to abrasive wear due to the types of material it must convey, the inclined nature of its application, and exposure to fires and explosions that may occur in the hammer mill.

2. **Impact on RDF Production:**
   It is essential for the conveyors to operate in order to continue operating the processing lines. When either A or B line in-feed conveyors are down, the production of RDF on that line stops and RDF trailer loading on that line stops.

3. **Plant Failure Risk:**
   It is of the utmost importance that these conveyors operate at design rates to meet the fuel requirements of Xcel. If mechanical failure of either conveyor occurred the Facility would be forced to operate at a lower rate for a period of time.

4. **Mitigations:**
   The daily inspections and continual efforts by RRT to find better, more durable components keep the in-feed conveyors operational at their current rates. An example of this is that RRT has replaced the guide roller bushings (normal wear item) with sealed bearings to reduce maintenance and downtime. Additionally, RRT has increased the structural supports of the inclined conveyor to minimize warping of the inclined conveyor pans from grapple crane impacts when removing material not appropriate for RDF production. Employee training and diligent presorting by the front end loader and grapple operators is vital to keeping the in-feed conveyors operating at their current rates. Maintaining the current stock of spare parts is also critical to continuous operations and minimized down time for repairs.

2.4.2 Grapple Cranes (A, B, and Bulky Waste Lines)

Built-Rite 2100 stationary electric grapple cranes are positioned near the metal pan in-feed conveyor and near the bulky waste shear shredder and conveyor for the trash load out. Photograph 2 shows the grapple cranes for both A and B lines.

Photograph 2: Grapple Cranes on A and B Lines

1. **<u>Description and Purpose:</u>**
   The grapple cranes are built by North Shore/Built Rite and are generally stock single boom, pivoting, hydraulic cranes equipped with a grapple attachment. At A and B lines, the grapples are used to pick up and remove items that cannot be processed into RDF that is placed on the in-feed conveyor by the front end loaders. The front end loaders transfer the removed items to a staging area near the third grapple where the grapple can load the material into either the shear shredder or the in-feed conveyor for trash load out. The grapple cranes are also used to spread out the piles of MSW on the in-feed conveyor for a more uniform flow of MSW into the hammer mill.

2. **<u>Maintenance History:</u>**
   RRT has made repairs, redesigned and reinforced several sections of the grapple cranes boom based on experience with the equipment. RRT reported the grapple crane manufacturer has begun constructing cranes using the modified design. One of the three (3) grapple cranes received a complete rebuild in 2010 due to a machine fire at the Bulky Waste line. The remaining grapple cranes are maintained on an as needed basis.

3. **<u>Impact on RDF Production:</u>**
   It is essential that the grapple cranes at A and B lines operate because when the wrong material (e.g. large metal objects, propane cylinder, etc.) from the MSW gets into the remainder of the process line (specifically the hammer mill), extensive damage can occur. If these grapple cranes are not operational; the in-feed conveyor may be stopped or input significantly reduced.

   The grapple located near the bulky waste shredder and trash load out in-feed conveyor is not considered essential to RDF production. However, this grapple is used to load material into the bulky waste shredder in order to reduce the size of the bulky waste to provide material of the proper size to A and B lines. This occurs during periods of low incoming MSW volumes.

4. **<u>Plant Failure Risk</u>:**
   It is of the utmost importance that the grapple cranes at A and B lines operate to meet the fuel requirements for Xcel. Failure to operate the grapple may allow materials within the MSW to enter the remaining process, which could damage other equipment that may result in stopping production for minutes or days. Additionally, it may result in RDF that is not within the specifications for Xcel.

   Operation of the grapple crane at the shredder/trash load out is typically not critical to RDF production. However, it is important to have the grapple crane operational in order to support the reduction in size of the bulky waste so that the facility can maximize the RDF yield and minimize the amount of refuse that must be landfilled.

5. **Mitigations**:
The MP2 program and the continual efforts to find better components keep the grapples operating at their current level. Employee training and diligence keeping improper MSW from entering the system is vital to keeping the plant operational. An adequate stock of spare parts, including a spare clam-shell should be maintained and was at the Facility at the time of this report. Additionally, since all grapple cranes share the same parts is considered a mitigation strategy.

2.4.3 Bulky Waste Shear Shredder with Discharge Conveyors

The bulky waste shear shredder is loaded with sorted MSW (i.e. bulky waste) by the grapple. The bulky waste shear shredder operates at a slow speed (unlike the hammer mills), reduces the size of the material and drops it on to the discharge conveyor. The discharge belt conveyor is loaded with size reduced material and conveys the material to a pile on the tipping floor. Currently the Bulky Waste shear shredder is being used to size reduce mattresses prior to loading them into the trash load out conveyor. Photograph 3 shows the grapple crane (foreground) and bulky waste shear shredder (back ground).

Photograph 3: Grapple and Bulky Waste Shear Shredder

1. **Description and Purpose**:
The bulky waste shear shredder was designed based on extensive input from RRT and relies upon specially designed cutters attached to rotors that are positioned within a metal frame with a narrow tolerance (between frame and rotor). This allows the Shredder to shear, tear, and fracture material that enters the Shredder. Staff at RRT indicated that the shredder was built and put into operation in 1999 and had a major overhaul in 2013. The shredder receives over-sized, heavy, bulky components of MSW from the grapple crane and must shred the material in order to reduce the size.

   The material must be resized so that it can be processed into RDF on A and B lines when adequate MSW is not available on the tipping floor (i.e., there is not enough material to meet Xcel's agreement) or to reduce the size of mattresses for trash load out (TLO).

The troughed belt discharge conveyor is used to convey the size reduced material to the tipping floor where the front end loaders bring the material to the appropriate location. The shear shredder was designed with significant input from RRT staff to fit this specific application.

2. **Maintenance History:**
   The bulky waste shear shredder is a unique hydraulic powered machine and RRT indicates it is not an "off the shelf" model. Specialized knowledge related to proper operation, repair, and maintenance of this machine has been learned by the plant staff. The MP2 system has a history which is used as a basis for projecting future repair and maintenance needs. The bulky waste shear shredder performs a very demanding/heavy duty task, it is apparent the maintenance is performed in order to keep it operational.

3. **Impact on RDF Production:**
   Loss of production of the bulky waste shear shredder for a short period of time, i.e., minutes or hours, would not impact RDF production. Loss of production for extended periods of time, i.e., days or weeks, could change the mode of operation to include more bulky waste material going to the landfill or reduced RDF production if insufficient MSW was being received at the facility, which may impact the goal of maximizing RDF production.

4. **Plant Failure Risk:**
   Operation of the bulky waste shear shredder and associated conveyors is not critical to the production of RDF. However, it does allow for the production of RDF from MSW that is too big or bulky for normal processing on A and B lines. The bulky waste shear shredder increases the yield and decreases the amount of material going to the landfill. It is important to have this equipment and system operating to maximize RDF production, but its operation is not a critical failure point.

5. **Mitigations:**
   The MP2 program and the continual efforts to find better components to keep the bulky waste shear shredder and associated conveyors operating optimally. An adequate stock of spare parts should be maintained on site.

2.4.4 Primary Hammer Mill:

The primary hammer mill is designed to reduce the physical size of the MSW for further processing. Reducing the physical size may include tearing open packaged MSW and reducing the contents of the package to the correct size. There are two (2) primary hammer mills operating at the facility (i.e., at A and B lines). Photographs 4 and 5 show the primary hammer mill within the concrete structure and the rotor that is housed in the primary hammer mill.

Photograph 4: Hammer Mill

Photograph 5: Rotor

1. **<u>Description and Purpose</u>:**
   Several of the processing steps use the physical size (i.e., length, width, and height) of the pieces of MSW to accomplish their task. Steps like disc screening, air classification, magnetic separation, and aluminum separation all work more efficiently when small pieces are provided. Therefore, size reduction by the primary hammer mill is essential to effective material processing through A and B lines and efficient removal of ferrous, non-ferrous metals and grit. Size reduction is accomplished by rotating a large diameter rotor that has hammers attached using pins. The pins allow the hammers to swing as the rotor is turned, which in turn crushes or grinds material between the hammer and slotted grating and resizes the material.

   The MSW entering the primary hammer mill can and has contained materials that are flammable and/or explosive under certain conditions (i.e. materials that can produce a spark when struck by the hammers). When the combination of events is just right (e.g. spark and fuel), a fire and/or explosion may occur. Therefore, the primary hammer mill, motor, in-feed hopper, cooling air blower and duct, and MSW discharge hopper all are designed to survive both fires and explosions.

   To contain and prevent these events from traveling through the entire facility, a vented, reinforced concrete containment room, built according to codes and insurance requirements, was built around each primary hammer mill and motor. Each room contains a redesigned cylindrical stack that vents the energy from an explosion through the roof of the containment room to atmosphere.

   The redesigned venting stacks were installed in 2013 (A-line) and 2014 (B-line) and RRT reports the cylindrical vents withstand explosions significantly better than the previous rectangular vent stacks. Both rooms have experienced several fires and explosions in the past. The explosions vary from minor (i.e. small camping LP tanks/aerosol containers), which have no noticeable impact on the hammer mill to more major explosions (i.e. 20 pound LP cylinders), which may cause and RDF line to shut down.

The majority of the major explosions are avoided by the grapple crane operator removing the larger LP tanks. RRT indicated the major explosions occur a few times per year and may cause a line outage for a few days. Based on the nature of the MSW being processed, it is anticipated that future fires/explosions are inevitable but current processes are implemented to limit the downtime and impact from these events.

The plant was originally commissioned with 2 (two) 300HP flail mills. These were found to be insufficient to size incoming material and were replaced with 1000HP Jeffrey Rader hammer mills. The hammer mills proved to be considerably more effective at size reduction of incoming material.

Around 2004 during routine repair and replacement of mill parts, a redesign of the hammer mills was performed based on operational experience. Motors were re-wound to produce 1200HP, stiffeners and gussets were added in known weak spots on the hammer mill housing, and existing steel component sizes were generally doubled. The resulting upgraded hammer mill has been in operation for approximately 11 years and seen significantly less wear and damage from explosions and general usage in that time.

The rotors have been modified so that all material contact surfaces are removable sacrificial parts that can be readily changed with minimal downtime. RRT reports these improvements have extended the rotor replacement schedule from less than a year, to approximately every 5 to 7 years, resulting in significant time and money savings to the plant. A review of the parts on hand in September 2015 shows a left hand and right hand rotor at the facility. Replacement of the rotors is typically schedule during outages at the Xcel facilities (typically February).

Based on experience with hammer mill operation, RRT has designed and constructed a modification that allows them to remove "bridged" material from the hammer mill in-feed hopper while the hammer mill is operating. A "bridge" is created when large pieces within the MSW stop the flow of MSW into the primary hammer mill.

Originally this bridged material was removed by stopping the entire line and having staff go into the primary hammer mill to dislodge it. The modification allows the hammer mill to keep operating and uses three (3) "plug busters" on hydraulic rams to push the bridged material into the hammer mill. This has eliminated virtually all manual labor and downtime to clear the bridging.

2. **<u>Maintenance History:</u>**
Crushing or grinding MSW into smaller pieces is a very abrasive process. The hammers and pins connecting the hammers to the rotor wear out and need frequent replacement. Based on review of the operating reports included in Appendix A the hammers are replaced approximately every 4-6 week. There are 24 hammers per mill, each weighing 140 pounds. Replacement of the hammers and other wear parts is performed as needed based on visual inspection. In the event of an outright hammer failure, sensors monitoring vibration will immediately shut down the affected hammer mill (assuming vibration exceeds the set threshold).

A replacement hammer can be installed with a matched part in under an hour. Larger wear parts such as the grates require more downtime and are replaced every 6 months on a planned maintenance schedule. RRT has an extensive history of redesign and re-manufacturing of many of the parts of the mill. This is a result of experience and a need to minimize down time due to part failures. The mill has been replaced and updated, and includes revised metallurgy for the hammers and associated wear parts. RRT staff also pays close attention to the lubricants used in the main rotor shaft bearings, which can be monitored from the supervisor's computer.

3. **Impact on RDF Production:**
   Excess hammer wear results in a decrease in the quality of RDF being produced that is noticeable by Xcel. If the hammer mill is not operating, the entire line is not producing RDF. If the primary hammer mill is not producing RDF to the required specifications, there may be issues at both Xcel plants.

4. **Plant Failure Risk:**
   Proper operation of the primary hammer mill is essential for RDF production. If the mill is not operational, the entire line is not processing and half the production at the facility is stopped. Stopping the motor and associated rotating mass of the mill takes approximately 20 minutes. Therefore, reasons to stop the mill affect at least 30 minutes of production. Replacing primary worn or broken parts usually requires extensive efforts due to the size and weight of those parts (e.g., the 12 ton rotor).

   Large cranes must be brought onsite, and outside expert service technicians may be needed. This is both expensive and time consuming, requiring between 12 and 16 hours or more of downtime. If the hammer mills on both lines were to be down at the same time, all RDF production would stop.

5. **Mitigations:**
   Maintaining an adequate stock of spare parts (specifically hammers and pins) and proper maintenance (i.e. monitoring the rotor bearings continuous oiling system through the PLC and replacing filters for large motor cooling) are essential to efficient and effective production of RDF. Feeding only MSW properly suited to the abilities of the hammer mill is very important and requires proper training of the front end loader and grapple crane operators. Additionally, maintaining supplier relations is critical to continued operations. Large crane operators that can respond quickly to remove and re-install the rotor through the roof of the facility and machine shops (i.e. Industrial Welders & Machinist Inc. in Duluth) that rebuild parts are required for long term operation of the hammer mills.

2.4.5 Troughed Roller Bed Belt Conveyors

Once the MSW exits the primary hammer mill, it is transported to various pieces of processing equipment by troughed belt conveyors. The following comments generally apply to all (approximately 30) troughed roller bed belt conveyors throughout the process on both A and B lines. The belts range in length from approximately 36 feet to 310 feet. Two exceptions are the conveyors feeding material to and carrying material away from the bulky waste shear shredder.

These belt conveyors have the most severe duty due to the size, weight, and composition of material placed on them. However, their operation is not as critical to RDF production as the conveyors on A and B lines. Photograph 6 shows a typical troughed roller bed belt conveyor used at various locations throughout the Facility.

Photograph 6: Typical Troughed Roller Bed Belt Conveyor

1. **<u>Description and Purpose</u>:**
   Troughed roller bed belt conveyors transport material from operation to operation starting at the discharge of the hammer mill and ending at the RDF load out. They are also used to convey non-ferrous metals to the baler, and debris to the trailer loading system.

   Troughed roller bed belt conveyors consist of rubber covered fabric belting stretched between two large diameter drums or pulleys. At one end of the conveyor there is a drum, known as the head pulley, which is driven by a motor. At the other end of the conveyor there is another drum, or tail pulley, which is not driven.

   The conveyor belt is supported on an adjustable frame to maintain proper belt tension and belt alignment. Between the head and tail pulleys, the belt rolls over numerous support stands each with three smaller rollers which form the belt into a trough shape and provide some rigidity to the belt. This shape keeps the material centered on the belt and generally helps prevent material from falling off the sides of the belt.

   Material is usually placed on the belt near the tail pulley end and discharged at the head pulley end. Material can also be placed on the belt between the head and tail pulleys. These loading zones require special design consideration to account for the impact from dropping the material may have on the belt. Usually additional support stands and rollers are used in loading zones.

2. **Maintenance History**
   Typical maintenance for the troughed roller bed belt conveyors is physical examination of the belts for signs of wear. If a small section is damaged the small section may be replaced using alligator laces to connect the replacement belt. Section replacement is typically a temporary repair. Maintenance is performed on an as needed basis.

3. **Impact on RDF Production:**
   The impact of an unplanned stoppage of a troughed bed belt conveyor on RDF production depends on the location of the conveyor in the process. Conveyors carrying processed material from one step to the next step will cause an immediate stoppage in RDF production. Conveyors carrying by-products (i.e. debris, ferrous metals or non-ferrous metals) will cause a gradual stoppage in RDF production. If one of the conveyors feeding the compactors breaks down, this will cause a sudden slowdown. However, only one conveyor is critical to RDF production, C12, which is a shared conveyors; thus conveyor failure would slow down, but not cease RDF production.

4. **Plant Failure Risk:**
   A long-term stoppage of any particular conveyor transporting processed material on either of the processing lines will reduce RDF production. Conveyor failures on both lines at the same time may cause major RDF production delays depending on the time required to repair the conveyors.

5. **Mitigations:**
   Maintaining an adequate supply of spare parts, including belting and rollers, is essential and is a practice that RRT has been following. Timely replacement of parts exhibiting wear is essential, and it is critical to follow a proven lubrication program. Retaining trained and experienced staff to repair any damage causing a stoppage is required to ensure RDF production.

2.4.6 Magnetic Separator

The magnetic separator at the Facility is a Dings Co. magnetic belt separator. This separator removes ferrous metal pieces from the processed MSW after processing through the primary hammer mill. The sorted ferrous metals are transferred to a sliding belt conveyor where the material is conveyed to a second clean up magnet. Photograph 7 shows a magnetic separator at the Newport Facility.

Photograph 7: Magnetic Separator

1. **<u>Description and Purpose</u>:**
   Ferrous metal within the partially processed MSW exiting the hammer mill must be removed, not only because the material will cause problems at the Xcel plants, but because there is a market for the material. On the end of the hammer mill discharge conveyor, suspended over the discharge belt is the magnetic belt conveyor. Ferrous material in the MSW stream is attracted to the magnet and "sticks" to the belt. The belt conveys the ferrous materials to the end of the discharge conveyor, where the magnet releases the materials onto a ferrous conveyor. The MSW free of or mostly free of ferrous materials is deposited onto the primary disc screen. The magnet must be operating when the hammer mill discharge conveyor operates.

2. **Maintenance History:**
   Typical maintenance for the magnetic separator includes nightly cleaning during the maintenance shift.

3. **<u>Impact on RDF Production</u>:**
   If the magnet is not operating, RDF could continue to be produced. However, the quality of RDF produced declines since there will be an increase in the amount of ferrous in the RDF. This may not be accepted by Xcel and the marketable ferrous will not be recovered. Therefore, if the processing magnet is down, RRT indicated that they shut the affected line down.

4. **<u>Plant Failure Risk</u>:**
   Failure to remove ferrous metal from the RDF can be a serious issue for Xcel, depending on the amount of ferrous metal in the RDF. If there is excessive ferrous in the RDF Xcel will likely not accept the delivered RDF. Burning of ferrous materials at the Xcel plants could violate air permit limits on the plant.

5. **<u>Mitigations:</u>**
   Assuming that current and past RDF has not had excessive amounts of ferrous metals, the past and current maintenance procedures are considered adequate mitigations.

2.4.7 Primary Disc Screen

The primary disc screen is a Jeffrey Rader brand disc screen. It is used to sort material by particle size that has passed through the magnetic separator. Photograph 8 is a representative photograph that shows the interior offset discs which allow smaller materials to fall between the rotor and discs.

Photograph 8: Primary Disc Screen

1. **Description and Purpose:**
   As shown in Photograph 8, the primary disc screen is used for sorting by particle size. The primary disc screen has rows of rotating wheels ("discs") at an incline that are in line with each other to allow smaller material (in this case under six (6) inches) to fall between the discs and larger material (over six (6) inches) to be carried along each set of rotating discs until the material reaches the discharge roller. The fraction under six (6) inches goes to the secondary disc screen and the fraction over six (6) inches goes to the air classifier.

   RRT indicated that the primary disc screen has been modified by re-configuring the hydrostatic drive in an attempt to reduce excessive heat generated in the hydraulic system during operation. RRT indicated this modification has been successful and reduces wear on the disc screen. Modifications have also been made to the disc size and spacing to improve the separation performance.

2. **Maintenance History:**
   Typical maintenance for the primary disc screens includes nightly cleaning during the maintenance shift and making sure the bearings are greased. The first three rows of discs wear most quickly and may need replacement in 12-18 months after initial replacement. Typically all discs (on individual shafts) are replaced every 3 years. RRT indicated they perform this replacement during Xcel outages and are scheduled for replacement in February 2016.

3. **<u>Impact on RDF Production</u>:**
Failure to operate the disc screen will stop RDF production on an individual line since the process cannot be by-passed. If too much MSW of one size is not separated, the downstream process for the other fraction may be impacted and may cause additional processing challenges.

4. **<u>Plant Failure Risk</u>:**
The plant failure risk is considered low since all of the spare parts are available in the Facility. Long term failure on one line will reduce the amount of RDF produced since it will cease production on one line. Long term failure on both lines would result in a complete stop to RDF production. Material cannot bypass the primary disc screen and thus a complete plant failure will result if both primary disc screens are not operating.

5. **<u>Mitigations</u>:**
Maintaining common wear parts and performing maintenance as necessary has resulted in maintaining smooth operation and performance of the primary disc screen.

2.4.8 Air Classifier

RRT indicated that the air classifier is a custom built piece of equipment, but assembled using "off the shelf" components. Similar in function to the primary disc screen it is used to sort material, but it is designed to separate materials based on the density (weight) of the materials rather than sorting based on size. Photograph 9 shows the exterior of the air classifier.

Photograph 9: Air Classifier

1. **<u>Description and Purpose</u>:**
The air classifier uses the forward velocity of the material leaving the primary disc screen in conjunction with an upward air flow to force light (low density) material to "float" while heavy (high density) materials "fall" onto a debris conveyor. This action provides two material streams, one with "light" materials and one with "heavy" materials. Heavy materials at this stage of processing are considered not suitable for RDF, and are conveyed to process residue loadout to be landfilled. Light materials are conveyed to the secondary shredder for additional processing.

2. **Maintenance History**:
   Typical maintenance for the air classified includes visual observation nightly and cleaning as necessary.

3. **Impact on RDF Production**:
   If there is inadequate air flow, processable “light” materials fall onto the conveyor as a “heavy” material and will increase the landfilled tonnage while reducing the tonnage of RDF produced. Complete failure to operate the air classifier will allow all the material to pass through as “heavy” material and onto the conveyor to process residue load out to be landfilled.

4. **Plant Failure Risk**:
   The plant failure risk is low as total failure would not result from a non-functioning air classifier. However, during the time period necessary to find and resolve a classifier failure, RDF production from the “light” material would cease and all “overs” material would leave the facility as process residue that would be landfilled. This would decrease RDF production and increase disposal costs.

5. **Mitigations**:
   Maintaining an adequate stock of spare parts to allow for rapid repairs is considered satisfactory mitigation since the Facility can continue operation for a short period without the air classifier if necessary.

2.4.9 Secondary Shredder

The secondary shredder is a Williams Crusher hammer mill that has been modified by RRT after years of experience. The shredder is designed to reduce the size of the air classified “overs” to pieces five (5) inches or smaller in any dimension in order to meet the specifications for RDF established by Xcel. Photograph 10 shows the secondary shredder.

Photograph 10: Secondary Shredder

1. **Description and Purpose:**
   This shredder is similar in function and operation to the primary hammer mill (size reduction) previously discussed. The unit is physically smaller and operates with an 800 hp motor. The material entering the secondary shredder is already processed MSW that only needs to be resized to satisfy the RDF specifications set by Xcel. This is the final processing step for the MSW to meet RDF specifications and material leaving this operation is ready for loading into trailers.

2. **Maintenance History:**
   Pneumatic plugs busters have been added to this equipment similar to the hydraulic versions in the hammer mills. The result is that employees rarely if ever need to open the machine to remove clogs, increasing safety and reducing downtime.

3. **Impact on RDF Production:**
   If this unit is not operating it can be bypassed, but the RDF produced will be larger and "heavier" then typically produced.

4. **Plant Failure Risk:**
   Failure of the secondary shredder will stop production of RDF so there is a moderate plant failure risk. However, repair or replacement is likely possible in hours to a few days. Past maintenance activities should be maintained to ensure RDF production. To date, the secondary shredder has not caused a plant failure in the past.

5. **Mitigations:**
   Continued maintenance and repair is considered adequate plant failure risk mitigation.

2.4.10 RDF Compactor/Loader

The compactor/loaders are used to fill the trailers leaving the Newport Facility and are used to make sure that the trailers are at their maximum capacity. The compactors at the Facility have undergone some modification to the hydraulic system, but would still be considered generally an "off-the-shelf" piece of equipment. Photograph 11 shows the RDF compactor/loader with a trailer being filled from one of the processing lines.

Photograph 11: RDF Compactor/Loader

1. **Description and Purpose:**
Each line has two compactor/loaders and two trailer loading stations (i.e. four (4) trailers can be parked and filled). Each processing line has a mass flow scale that records the amount of RDF flowing into a compactor/loader. The control room operator is responsible for loading trailers to the prescribed weight with one compactor/loader, and transfers the loading to the second compactor/loader without interruption to the flow of RDF. He then notifies the yard truck operator when the full trailer can be removed, weighed and replaced with an empty trailer. Upon completion the control room operator is notified by the yard truck operator that the compactor/loader is ready with an empty trailer.

2. **Maintenance History:**
Maintenance is performed on an as needed basis.

3. **Scheduled Routine Service/Replacement:**
Each compactor/loader is cleaned after each production day and checked for wear and faulty parts. Replacements and repairs are made as needed or scheduled for a suitable time. Lubrication is performed as required, and the hydraulic system is checked periodically. RRT has modified the hydraulic system so that the ram used to compact waste travels at a much slower speed. The reported benefit is that the hydraulic system stays significantly cooler and the trailers are filled more uniformly.

4. **Impact on RDF Production**:
If one compactor/loader is inoperable, the line can continue to operate in a reduced manner. However, in this case the entire line must be stopped when the trailer is full in order to remove and replace with an empty trailer. This is not typically the operating case for the Newport Facility. Each line has two trailer load out systems.

   If the weigh scale stops working, production can continue, trailer would need to be weighed on the main scales requiring more time and potentially slowing down inbound customers.

5. **Plant Failure Risk**:
If both compactor loader units go down on a single line, the entire line stops. When one unit is back on-line, the line will operate.

6. **Mitigations:**
Having an adequate supply of hydraulic fluids and spare parts is important. Maintaining a well trained staff is critical so maintenance on the RDF compactor/load out is conducted.

2.4.11 Ferrous Conveyor

The ferrous conveyor moves ferrous materials from both magnetic separators to the secondary cleanup magnet. It is one of only two shared conveyors in the facility, and thus is critical to the operation of both lines.

1. **Description and Purpose:**
Each line has a magnetic separator that removes ferrous materials from the material stream and deposits them onto the ferrous conveyor. Ferrous materials are then conveyed to the secondary cleanup magnet where they are divided into "clean" and "dirty" ferrous. The ferrous conveyor similar in function and construction to the troughed roller bed conveyors, the primary difference is the means of belt support. Instead of periodic roller stands, the belt is supported by a continuous steel trough with a lining that allows the belt to slide smoothly over the surface.

2. **Maintenance History:**
In 2008 the Facility engaged Wolf Material Handling systems to update the body of the C12 ferrous conveyor from a troughed roller to a sliding belt type. The sliding belts require more frequent changes, but the update has eliminated down time associated with ferrous materials becoming entangled in the rollers supporting the belt. This change reduced overall maintenance and Facility shutdowns caused by this shared conveyor.

3. **Impact on RDF Production**:
If the ferrous conveyor is not operational, the Facility could still process material by turning off the magnets. However, RDF produced with excess ferrous material is unacceptable to the Xcel plants. For this reason RRT indicated that they shut the Facility down in the event of a failure of the ferrous conveyor.

4. **Plant Failure Risk**:
Failure of the ferrous conveyor will stop production of usable RDF so there is a moderate plant failure risk. However, repair or replacement is generally possible in half a day or less. Staff at RRT indicated that they stock belts, motors, gears boxes, and other wear parts for this conveyor to minimize down time.

5. **Mitigations:**
With repairs requiring only hours to execute, stocking drive components and wear parts for this conveyor is considered an adequate mitigation strategy.

2.4.12 Second Cleanup Magnet

The second cleanup magnet is similar to the magnetic belt separator. The second cleanup magnet removes ferrous metal pieces from the material leaving the magnetic belt separator. Photograph 12 shows a magnetic separator at the facility and is representative of the second cleanup magnet.

Photograph 12: Second Cleanup Magnet

1. **<u>Description and Purpose</u>:**
   Ferrous material sorted from the processed MSW by the magnetic separator is conveyed by slider bed conveyor to the secondary cleanup magnet. This magnet is similar in construction and operation to the main magnetic separator. In this case, ferrous metal pieces that are fairly or completely free of other materials are attracted to the magnet, leaving ferrous pieces that have non-ferrous materials attached to them. The pieces of "clean" ferrous are conveyed via chute to the "clean ferrous loadout" and sold. The remaining ferrous material is considered to be "dirty" and is diverted to the "dirty ferrous loadout" and sold at a lower price than "clean ferrous".

2. **<u>Maintenance History:</u>**
   Typical maintenance for the second cleanup magnet includes nightly cleaning during the maintenance shift.

3. **<u>Impact on RDF Production:</u>**
   If the second cleanup magnet does not operate, all ferrous material sorted from the MSW will go to the "dirty ferrous loadout". This will not impact fuel production but will reduce revenue from the sale of ferrous materials.

4. **<u>Plant Failure Risk:</u>**
   The plant failure risk associated with the second cleanup magnet is negligible since it is not directly related to RDF production.

5. **Mitigations:**
   Visual inspection and repairs as necessary are considered adequate mitigation measures for the second cleanup magnet.

2.4.13 Secondary Disc Screen

The function of the secondary disc screen is similar to the primary disc screen; sorting material based on size. Photograph 13 is a photograph that shows the rotors and discs of the secondary disc screen.

Photograph 13: Secondary Disc Screen

1. **Description and Purpose:**
   The secondary disc screen receives the material six (6) inches and smaller from the primary disc screen as well as low density material from the secondary shredder that has passed through the air classifier and sorts the material at the two (2) inch size. Greater than two (2) inch material is considered RDF, and less than two (2) inch goes to the secondary air classifier.

2. **Maintenance History:**
   Typical maintenance for the secondary disc screens includes nightly cleaning during the maintenance shift and making sure the bearings are greased. Other maintenance is performed on an as needed basis.

3. **Impact on RDF Production:**
   If the secondary disc screen is not operating, a diverter gate is activated to bypass the secondary disc screen. The main impact on RDF production is that the RDF will contain non-ferrous material.

4. **<u>Plant Failure Risk:</u>**
   The plant failure risk due to failure of the secondary disc screen is very low since the secondary disc screen can be bypassed. However, the RDF will contain non-ferrous material.

5. **<u>Mitigations:</u>**
   The MP2 program and continual efforts to find better components should be continued to keep the secondary disc screen operating at its current level. An adequate stock of spare parts should be maintained.

2.4.14 Eddy Current Separator

The eddy current separator is a Steinert brand separator that sorts and removes pieces of non-ferrous (i.e. aluminum) materials from the "throughs" material from the primary disc. Photograph 14 shows the eddy current separator operating at the Newport Facility.

Photograph 14: Eddy Current Separator

1. **<u>Description and Purpose:</u>**
   Ferrous materials in the "throughs" from the primary disc screen have been removed by the magnetic separator, but the non-ferrous metal materials remain in the process stream. The vast majority of non-ferrous metals are aluminum. The eddy current separators use electric power to create eddy currents in the process stream to separate the non-ferrous material from the processed material. The non-ferrous material is then sent to the baler, where it is baled, and sold, providing an additional revenue stream.

2. **<u>Maintenance History:</u>**
   Typical maintenance for the eddy current separator includes nightly cleaning during the maintenance shift, visual observation of the belt and lubricating oil reservoir. Other maintenance is performed on an as needed basis.

3. **<u>Impact on RDF Production</u>:**
   Non-ferrous material should be removed from the MSW to produce an acceptable RDF product. Failure to do this will reduce revenue from the marketable material and could create problems for the Xcel plants if non-ferrous was in the RDF for an extended period of time.

4. **<u>Plant Failure Risk:</u>**
   The eddy current separator can be bypassed if the eddy current separator is not operational. However, the RDF produced without the eddy current separator will contain non-ferrous material that may not be acceptable at the Xcel facilities. Failure of the eddy current separator as a plant failure risk is considered low as it would not completely stop production.

5. **<u>Mitigations:</u>**
   Continuing to visually inspect the eddy current separator and repair as necessary as well as maintaining any wear parts is considered adequate mitigation to a plant failure. Additionally, minimal modifications have been performed on the eddy current separator so spare parts should be easily accessible.

2.4.15 Aluminum Baler

Aluminum materials sorted out of the RDF processing stream on each line are conveyed to a common baler for compacting into a bale. The baler at the Facility is a Max-pak horizontal baler and is shown in photograph 15.

Photograph 15
Aluminum Baler

1. **<u>Description and Purpose:</u>**
   Aluminum removed from the processed material is conveyed to an in-feed hopper on the top of the aluminum baler. Once there is enough aluminum in the baler, a hydraulic ram pushes a plate against a fixed portion to compact the aluminum into a bale. The bales must be manually tied with wire to hold the bales together. The bale is removed and is stored, ready for sale.

2. **<u>Maintenance History:</u>**
   Typical maintenance for the aluminum baler includes nightly cleaning during the maintenance shift, visual observation baler and periodic lubrication. Other maintenance is performed on an as needed basis.

3. **<u>Impact on RDF Production</u>:**
   The aluminum baler has almost no impact on fuel production. RDF can continue to be produced if the baler is not operating. However, the aluminum removed by the eddy current will need to be managed if the baler is not operating.

4. **<u>Plant Failure Risk:</u>**
   The aluminum baler is not a plant failure risk. If it is not functioning, RDF can still be produced. However, aluminum will need to be managed in an alternate manner if the baler is not repaired or replaced. Alternately, a diverter gate can be activated to divert non-ferrous back into the RDF as a management strategy. It was reported that very minor modifications were performed to the baler so replacement is consider available "off the shelf".

5. **<u>Mitigations:</u>**
   Continuing to visually inspect the aluminum baler and repair as necessary as well as maintaining any known wear parts is considered adequate mitigation to a plant failure.

2.4.16 Maintenance Shop and Associated Equipment

1. **<u>Description and Purpose:</u>**
   The maintenance shop is used for general maintenance on both mobile and stationary equipment throughout the facility. It is used to house tools and personnel necessary to perform maintenance and repairs. Additionally, the wash bay is associated with the maintenance shop and is used to power wash any equipment (loaders, yard trucks, etc.).

2. **<u>Impact on RDF Production</u>:**
   The maintenance shop has very little immediate impact on RDF production. RDF can continue to be produced if the maintenance shop is unavailable for a period of time. However, if maintenance of equipment is necessary, the process will be hindered without a functional maintenance shop. Also, added wear to the mobile equipment may result if the wash bay is unavailable.

3. **<u>Plant Failure Risk:</u>**
   The maintenance shop is not considered a plant failure risk. If it is not available, RDF can still be produced.

4. **<u>Mitigations:</u>**
   Maintaining the necessary tools and associated equipment to perform any necessary maintenance and repair to equipment is considered adequate mitigation.

2.4.17 Electrical Equipment

The Newport Facility is served by Xcel Energy at 13.8KV through a Facility owned 13.8KV-4160V transformer. One 5MVA transformer is normally in-service with the second 7.5MVA transformer as an available alternate if the main transformer fails or is removed from service. This transformer supplies the 4160V switchgear which then supplies two 480V unit-substations and a 4160V motor control lineup.

Each 480V substation consists of a 2000KVA dry-type transformer and 480/277V distribution switchgear with a bustie breaker available between the two unit-substations. Several industry standard motor control centers are supplied from the 480V substations along with smaller dry-type transformers and lower voltage distribution panels. Four large motors are supplied from the 4160V lineup (two secondary shredders 800HP, two hammer mills 1200HP) with the remaining facility equipment supplied at 480V and lower voltages. A small standby generator supplies the scale house and the fire protection air compressor through a transfer switch. Facility lighting is mostly high bay high pressure sodium fixtures with additional fluorescent fixtures located in selected areas.

2.4.17.1 Service/Maintenance History

Main and alternate transformers – for oil cooled transformers, recommended preventive maintenance consists of visual monitoring for oil leakage, routine monitoring of oil level, oil temperature and winding temperature, periodic oil sample analysis and verification of cooling fan function. RRT stated the oil sample analysis has been performed with all test results reported to be acceptable in terms of moisture and nitrogen concentrations and PCB concentrations were well below regulated concentrations. The Main transformer temperature gauge peak temperature indication shows that the temperature of this transformer has not increased to the fan-start set point since this peak indicator was last reset – this indicates that the Main transformer is being operated well below its design rating which should lead to an increased lifetime.

4160 Switchgear	Recommended preventive maintenance for equipment of this type would include annual cleaning, testing of protective relaying and function verification. RRT indicated that no preventive or corrective maintenance has been performed for the last two years.
4160V Motor Starters	The original 4160V motor starters have been replaced with Cutler Hammer Ampguard vacuum contactor starters. These starters are relatively new and are of recent design for equipment of this type. No maintenance history was available for this equipment. Recommended preventive maintenance for equipment of this type would include annual cleaning, testing of protective relaying and function verification.
480V Transformer	Preventive maintenance is planned on an as needed basis. Maintenance records show preventive maintenance was last performed in 2011 which included cleaning, testing of protective relaying and function verification. This equipment is no longer being manufactured by Siemens-Allis, however spare parts are readily available and the Facility has one spare breaker. Breaker trip units have been replaced with electronic trip devices.

Motor Control Centers	Annual thermographic scans are performed on accessible MCC components and corrective maintenance is performed upon failure. Preventive maintenance consisting of thermographic scans, cleaning and function testing is recommended for this type of equipment. The thermographic scan and corrective maintenance approach is consistent with most industrial facilities.
Low Voltage Distribution	No maintenance records were available; maintenance is performed upon failure. Preventive maintenance consisting of annual breaker cycling is recommended for this type of equipment. The corrective maintenance approach is consistent with most industrial facilities.
Large Motors	No maintenance records were available; maintenance is performed upon failure with one spare of each large motor maintained onsite. Motor heaters are energized on the spare motors and the shaft is rotated periodically as recommended. The corrective maintenance approach is consistent with most industrial facilities.
480V Motors	No maintenance records were available; maintenance is performed upon failure. The corrective maintenance approach is consistent with most industrial facilities.
Lighting	No maintenance records were available; maintenance is performed upon failure. The corrective maintenance approach is consistent with most industrial facilities
Standby Generator	The standby generator is inspected weekly and tested annually at the Facility. Maintenance records were provided for approximately the past 10 years.

2.4.17.2 Physical Condition

Main Transformer	The general physical condition is as expected for equipment of this age and amount of use. Maintenance records provided by RRT staff indicate that oil sample analysis has been performed at least 3 times in the past - no sampling was performed since the 2013 site visit, but was subsequently completed with satisfactory results.
Alternate Transformer	Some corrosion is evident on the tank. While this tank corrosion may be superficial it is not unusual for transformers of this age, the extended time period without loading experienced by this transformer (which helps to keep the transformer internal insulation dry) may contribute to a reduction in lifetime.
4160V Switchgear and Motor Starters	The 4160V switchgear and motor starters are located in an electrical area which is cleaner than the process areas. The switchgear is in general good condition. The starters are newer and are of recent design for equipment of this type. Routine preventative maintenance is continued on this equipment, failures with significant financial impact are not expected.

480V Transformer	The 480V transformers are located in an electrical area which is cleaner than the process areas. Consequently, this equipment is generally is good physical condition. Failure of removable breaker elements has occurred and is likely to continue to occur with the failure rate consistent with that experience at other industrial facilities. Provided routine preventative maintenance is continued on the breakers, failures with significant financial impact are not expected.
Motor Control Centers	The motor control centers are located in an electrical area which is generally cleaner than the process areas. Consequently, this equipment is generally is good physical condition. While component failures have and will continue to occur, there are no indications that the failure rate is higher than general industrial failure rates. Routine maintenance will allow continued operation of this equipment.
Low Voltage Distribution	The physical condition of the low voltage (480V and below) distribution panels is consistent with their age. Routine maintenance, which may include replacement of failed breakers as necessary, will allow continued operation of this equipment.
Large Motors	Winding temperature for each of the four large motors is monitored using embedded RTD's with alarming on high temperature. Trending of these temperatures for a 48 hour period was reviewed which shows expected heat-up as the motor is started and cool down when the motor is shutdown. All motor temperatures are within an expected range although there is a difference between winding temperature of the two Flail Mill motors that appears to be due to RTD location or calibration.
480V Motors	The physical condition of smaller motors is consistent with their operation in damp and dusty conditions. Motor failures will occur at a higher rate than general industrial experience due to the environment however records do not show an unusually high failure rate. Since these motors are small and widely available, small motor failures is not likely to present a significant financial risk.
Lighting	The general physical condition is as expected for equipment of this age and amount of use and routine maintenance will enable continued operation of this equipment. Lighting levels throughout the facility are lower than the IESNA recommended levels.
Standby Generator	With the exception of corrosion evident on the exhaust pipe welds, the physical condition is as expected for equipment of this age. Maintenance or replacement of a generator of this size is a routine maintenance activity without significant financial impact.

2.4.17.3 Potential Risks and Mitigations

Main Transformer and Backup Transformer	Based in the age of the main transformer, its useful life may be questionable, but RRT noted they are only using a fraction of the transformers capable load which can extend the useful life. The observed condition of the backup transformer along with it being deenergized for a significant time period increases the risk that this transformer may not function when required.
4160V and 480V Switchgear	The 480V switchgear receives annual thermographic scans for routine maintenance and the 4160V switch gear receives maintenance on an as needed basis. While some spare parts are available, the 480V switchgear in particular is no longer manufactured and repair or replacement following a failure could be extensive.

2.5 Building Site and Related Facilities

The Facility was originally constructed in 1986-87 and has not received major renovations since that time. Periodic maintenance has been performed throughout the years and the Facility appears to be in a physical condition that is expected for its age and use. Continued routine maintenance and repair will be required.

2.5.1 Maintenance History

RRT uses the MP2 program to track maintenance that is performed at the site, not only for equipment, but also for building maintenance items. General building and equipment maintenance is performed on a daily basis as needed. In 2012 and 2013 there were updates to the HVAC system for the office portions of the Newport Facility.

The parking lots and roads within the site boundary are generally in a physical condition that is expected for the age and amount of use and have received periodic maintenance/replacement as needed. Cracks in the asphalt appear to have been repaired in a timely manner based on visual observations. Small stained areas where vehicles/equipment/trailers are parked are apparent, but are typical of parking areas of this age.

The computer systems used to operate the equipment are generally replaced on a three year replacement schedule based on the harsh/dusty environment in which they are used as well as the advances in technology. Additional information pertaining to the computer system used to operate the equipment is contained in Appendix B.

2.5.2 Physical Condition

RRT indicated that when the Facility was first constructed the tipping floor had a specialty designed topping (EmeryTop or AnvilTop), which failed (delaminated) within the first few years. According to RRT, the tipping floor has been resurfaced with a high compressive strength concrete (similar to the concrete used on parking ramps). The cost per installed square foot of concrete was reported by RRT as $11. During discussions, Foth determined that when the tipping floor is resurfaced, it typically lasts approximately ten (10) to twelve (12) years with minor areas needing patching starting at year six (6) or seven (7). RRT indicated that when the tipping floor is resurfaced, approximately ten (10) feet around the perimeter does not get resurfaced, which is reasonable considering these areas do not have significant wear. The facility appears to be reasonably well maintained for a facility that receives and processes MSW and was constructed approximately 28 years ago. The main entrances to the receiving area of the Facility for MSW trucks remain open at all times.

3 Employee Experience and Knowledge of Facility Operations and Performance

Foth conducted multiple interviews with current staff at the Newport Facility to determine their experience and how that could potentially impact the production of RDF in the future. Based on interviews and Newport Facility reviews, Foth concludes that employee stability is important to short term (1 year) operation of the Newport Facility. Currently, RRT hires approximately 1-2 employees annually, which is indicative of the low turnover of employees. In the long term, it is recommended a program be developed to document the intellectual capital from the long term employees at the Newport Facility. This will provide documentation of key processes, procedures, maintenance and repair activities to limit plant downtime and transfer knowledge to new employees.

Much of the operations, maintenance and repair processes and procedures are based on specific knowledge gained over time. Many of the employees at the Newport Facility have been employed for over 10 years with some employees being employed since the Newport Facility opened in 1987. This knowledge gained over time is needed during the transition and operation of the Facility by the R&E Board. While there is no current employee that knows everything, there appears to be 2-3 key employees that contain much of the knowledge base for the continued operation of the RDF production process. The key staff members are designated as the current maintenance and operations supervisors.

These employees are considered needed as much as the machinery in the production of RDF to meet the existing Fuel Supply Agreement. Given their history at the Newport Facility, their ability to troubleshoot machinery and plant issues and resolve the issues quickly provides only minimal impacts to RDF production. The key employees as well as the processors are all cross-trained to perform most if not all of the functions at the Newport Facility, which allows for flexibility.

Foth also identified at the Newport Facility a particular culture has developed. This culture is based on getting the RDF produced to meet the Fuel Supply Agreement and is led by the key employees discussed previously. The culture of ensuring the RDF is being produced, keeping the lines operating, and getting the lines operational as rapidly as possible when a piece of equipment needs repair is part of the reason the Newport Facility continues to meet the Fuel Supply Agreement.

The culture and ability to meet the requirements of the Fuel Supply Agreement are dependent on providing the key supervisors some latitude to maintain, repair and operate the production system with mimimal oversight or delays in getting key parts or suppliers to the Newport

Facility. This culture is based and focused on the production of RDF. It appears all employees at the Newport Facility have embraced this culture and Foth did not witness employee discontent or grumbling. The team assembled to operate the plant appears to work together constructively and collaboratively to maintain and repair the equipment efficiently and effectively. It is likely there may be some shift in the processes and procedures as the R&E Board takes over the Newport Facility. Foth recommends adequate change management processes be developed to implement the change with minimal impacts to RDF production.

4 Inventory of Spare Parts and Suppliers

Foth conducted a review of the spare parts inventory and concludes the inventory is extensive and needed to continue to produce RDF at the Newport Facility. While the inventory is generally kept electronically, the actual location of the spare part is known intuitively by employees. That is to say, the inventory identifies the specific part is on site, but the actual location may only be known by a few employees. Foth observed spare parts located under conveyors and in small cubby areas throughout the Newport Facility. Many of the spare parts do have significant lead times so there is a requirement the spare parts be on site to prevent extended delays in repairs and replacement of critical components. RRT stated they continue to order needed spare parts that may not actually be delivered until after January 1, 2016 with payment due net 30 days.

Appendix C contains an inventory of the spare parts as generated from the MP2 program. This inventory is a snapshot in time of what was on hand at the Newport Facility in late-June 2015. As spare parts are needed and installed the spare parts are typically re-ordered. Occasionally, spare parts are not re-ordered if a piece of equipment is modified and the original spare part is no longer necessary. Maintaining an adequate supply of spare parts will affect operations in the short (1 year) and long term (5 years and beyond).

Foth also identified the importance of suppliers to the Newport Facility's continued operation. Many of the suppliers have specific experience with the custom nature of the equipment and the modification made to produce RDF more efficiently. Furthermore, the suppliers respond promptly to requests because they understand the critical needs of the Newport Facility. Additionally, some suppliers like the machine shop that rebuilds the hammer mill, requires special skills and understanding that is not common in the greater market. Much of work and spare parts are sole source items because of the custom nature of the machinery and needs of the Newport Facility.

A complete list of suppliers is recommended to be developed so that purchase agreements can be established to ensure continued RDF production. For many items, an extended delay in obtaining spare parts or repairs from select suppliers would impact RDF production and continued delays could jeopardize the ability of the Newport Facility to meet the Fuel Supply Agreement.

5 Conclusions

The RRT Newport Facility has been operational for approximately 28 years. During that time much of the processing equipment has gone through significant modifications based on operational experience gained by management, supervisors, and staff. These modifications are reported to be necessary to continue to produce RDF while also minimizing maintenance. Foth's review of the processing equipment, facility, and site indicates that the equipment has been adequately maintained on an as needed basis. For the continued production of RDF, the equipment maintenance and repair is required to continue in a manner that has historically been completed.

Foth's review of the Newport Facility and discussion with employees concluded the number of modifications to the processing equipment has declined, which RRT believes to be a result of achieving the "best" modifications based on experience and equipment availability. Although much of the processing equipment has been modified and could be considered "custom", most of the modified equipment components are still "off the shelf" parts so equipment repair costs should not be extraordinary. It is important that an adequate spare parts inventory be maintained as well as maintaining the current supplier relationships to ensure repairs and maintenance can be conducted in a timely manner to not severely impact RDF production.

Operations at the Facility have consistently improved performance as indicated by the consistent production of RDF to meet the Fuel Supply Agreement even though there was a steady decline in the MSW received at the Facility. The ability to keep the Facility operating in an efficient manner and operating with minimal down time is attributed to not only the improvements/modification to the equipment, but is also significantly related to the experience and knowledge of the existing staff.

Continued operation of the Newport Facility to meet the RDF production requirements for the Fuel Supply Agreement requires consistency in MSW deliveries above 380,000 tons per year (based on historical performance data), equipment repair, maintenance and spare parts inventory as has been historically completed, stability in Newport Facility staff and continued supplier relationships. Should these items be maintained, the continued production of RDF is expected to meet the Fuel Supply Agreement for the foreseeable future.

Operational safety of the Facility is discussed in detail in the "*Safety Assessment Site Visit – September 15-16, 2015 Resource Recovery Technologies (RRT) Facility*" submitted under separate cover. Based on the Safety Assessment and improvements being undertaken by RRT, it is Foth's opinion that the Newport Facility can be operated safely to meet the Fuel Supply Agreement.

Limitations identified based on review of historical performance and observations made by Foth include insufficient MSW deliveries, immediate loss of key employees with significant knowledge of operations, inadequate maintenance and repairs, or insufficient spare parts inventory. These limitations have the potential to affect the Facility at start-up (1 year) through long term (5 years and beyond) operations.

Facility hardware and software are discussed in detail in the "*Resource Recovery Technology, LLC (RRT) Newport Resource Recovery Facility IT Assessment*" submitted under separate cover. It is Foth's opinion that the hardware and software systems at the Newport Facility are adequate, based on historic performance, to meet the requirements of the Fuel Supply Agreement if the conditions presented are met.