Report

Life Cycle Financial Analysis

Ramsey/Washington Counties Resource Recovery Board

Project I.D.: 15R002.00

Prepared For Ramsey/Washington Counties Resource Recovery Board
Maplewood, Minnesota

February 2015

RAMSEY/WASHINGTON COUNTY
RESOURCE RECOVERY PROJECT
RAMSEY AND WASHINGTON COUNTIES, MINNESOTA

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February 18, 2015

Zack Hansen
Judy Hunter
Kate Bartelt
Ramsey Washington County Resource Recovery Project
2785 White Bear Ave N
Maplewood, MN 55109

Dear Zack, Judy, and Kate:

RE: Life Cycle Financial Analysis

This letter transmits the report titled *Life Cycle Financial Analysis* – February 2015. The text presented in this report provides a high level explanation of the detailed Life Cycle Financial Analysis spreadsheets that are provided as a separate document due to the level of detail and extent of the data.

The purpose of this analysis is to compare the annual costs of seven potential scenarios to each other. This analysis provides information for future waste processing decisions along with other considerations provided in other reports such as the analyses for greenhouse gas emissions, potential risks, technology issues, waste assurance, and ownership that are being considered as part of the decision making process for future waste processing options.

Sincerely,

Foth Infrastructure & Environment, LLC

Nathan Klett
Project Engineer

Warren Shuros
Client Director

Life Cycle Financial Analysis

Distribution

No. of Copies	Sent To
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Life Cycle Financial Analysis

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Executive Summary

This report provides preliminary annual cost estimates of the different waste diversion scenarios under consideration by the Ramsey/Washington Counties Resource Recovery Project Board (Project Board). The detailed life cycle financial analyses provide a comparison of the preliminary projections of potential costs of the various waste processing systems. The analysis serves to provide comparisons based on certain assumptions and is a flexible modeling tool to project costs of a variety of scenarios.

A key assumption of each scenario analyzed is that the Counties own and operate the Newport Resource Recovery Facility (Newport Facility) except for the analysis of the "Existing System - Extended." The life-cycle financial analysis covers the life of debt (assumed to be 25 years) associated with the purchase. Other key assumptions include:

- 400,000 tons of MSW per year in each scenario.
- 2017 is the first full year of implementation.
- Newport Facility is publicly owned and operated (including mixed waste processing).
- Anaerobic Digestion and Gasification facilities are privately owned and operated.

The different scenarios covered in this financial analysis parallel the scenarios covered in the *Greenhouse Gas Systems Analysis*, to be completed in April 2015. The scenarios include:

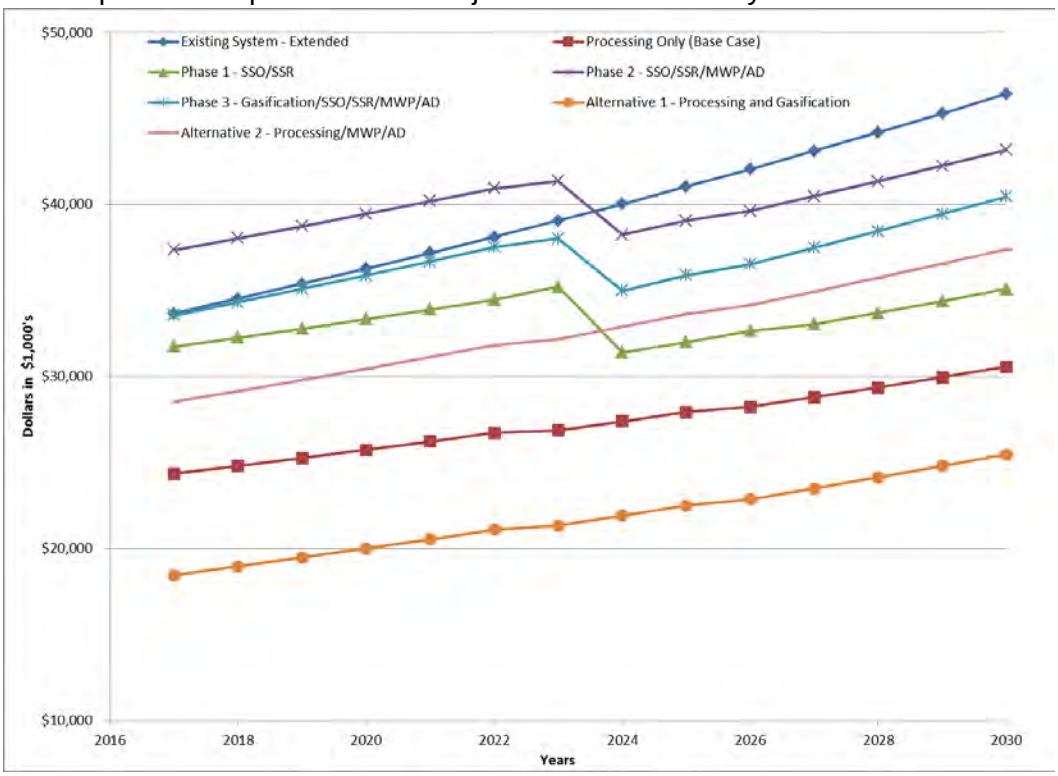
- **Processing Only** (Base Case) – Illustrates the current system of processing all MSW (400,000 tons) into RDF and all RDF going to Xcel for combustion;
- **Phase 1-SSO/SSR** – Increased Source Separated Recycling (SSR) and Source Separated Organics (SSO), with all MSW (remaining tons of the 400,000) delivered to the Facility for processing RDF to combustion by Xcel;
- **Phase 2-SSO/SSR/MWP/AD** – Phase 1 plus the use of Mixed Waste Processing (MWP) and sending the organics to an Anaerobic Digester;
- **Phase 3-Gasification/SSO/SSR/MWP/AD** – Phase 1 and 2 plus the use of Gasification to manage all RDF instead of combustion by Xcel;
- **Alternative 1 – Processing and Gasification Only** – Illustrates the economics of the system processing RDF going to Gasification (does not include SSO/SSR, MWP, and AD);
- **Existing System – Extended** – "status quo" for waste delivery, managed in same manner at the Newport Facility – processed RDF to combustion by Xcel, with an assumed contract extension;
- **Alternative 2-Processing, AD, and MWP** – Illustrate the economics of the system processing, using Mixed Waste Processing (MWP) and Anaerobic Digestion (does not include SSO/SSR).

Table ES-1 provides a summary of the total annual costs (in 1,000's) for all scenarios described in this report. Figure ES -1 provides a graphic comparison of the preliminary cost estimates.

Table ES-1
Total Annual Costs

Scenarios (All costs are in $1,000s)	2017	2020	2025	2030
Existing System - Extended	$33,676	$36,265	$41,030	$46,422
Processing Only (Base Case)	$24,358	$25,738	$27,933	$30,552
Phase 1 - SSO/SSR	$31,738	$33,335	$32,012	$35,083
Phase 2 - SSO/SSR/MWP/AD	$37,356	$39,452	$39,049	$43,160
Phase 3 - Gasification/SSO/SSR/MWP/AD	$33,550	$35,870	$35,878	$40,455
Alternative 1 - Processing and Gasification	$18,453	$20,002	$22,508	$25,479
Alternative 2 - Processing/MWP/AD	$28,545	$30,462	$33,646	$37,383

Figure ES-1
Graphic Comparison of Projected Preliminary Cost Estimates



Alternative 1 – Processing and Gasification results in the lowest total annual cost, but is dependent on yet to be proven success of the gasification technology and the negotiated revenue share associated with gasification.

The Existing System - Extended resulted in the highest total annual cost over time, which is mainly due to the Resource Recovery Technologies, LLC (RRT) tipping fee. This system cost estimate was completed prior to any contract extension negotiation discussions between the Project Board and RRT.

List of Abbreviations, Acronyms, and Symbols

AD	Anaerobic Digestion
Foth	Foth Infrastructure & Environment, LLC
HDPE	High Density Polyethylene
MWP	Mixed Waste Processing
Newport Facility	Newport Resource Recovery Facility
PET	Polyethylene Terephthalate
Project Board	Ramsey/Washington Counties Resource Recovery Project Board
RDF	Refuse Derived Fuel
RRT	Resource Recovery Technologies, LLC
SSO	Source Separated Organics
SSR	Source Separated Recycling
tpy	Tons Per Year

1 Introduction

1.1 Purpose

The purpose of this report is to provide preliminary annual cost estimates of the different waste diversion scenarios under consideration by the Ramsey/Washington Counties Resource Recovery Project Board (Project Board).

Detailed life cycle financial analyses were prepared for each of the different potential scenarios. This report summarizes the input data and key assumptions in the analysis and provides a financial comparison of the different scenarios.

1.2 Background

The life-cycle financial analysis serves to provide a comparison of the preliminary projections of potential costs of the various waste processing systems and the potential impact of changes to the scenarios being evaluated. The analysis serves to provide comparisons based on certain assumptions and is a flexible modeling tool to project costs of a variety of scenarios.

A key assumption of each system analyzed is that the Counties own and operate the Newport Resource Recovery Facility (Newport Facility) except for the analysis of the "Existing System - Extended." The life-cycle financial analysis covers the life of debt (assumed to be 25 years) associated with the purchase. Other key assumptions include:

- 400,000 tons of MSW per year in each scenario.
- 2017 is the first full year of implementation.
- Newport Facility is publicly owned and operated (including mixed waste processing).
- Anaerobic Digestion and Gasification facilities are privately owned and operated.

The different scenarios covered in this financial analysis parallel the scenarios covered in the *Greenhouse Gas Systems Analysis*, to be completed in April, 2015. The scenarios include:

- **Processing Only** (Base Case) – Illustrate the current system of processing all MSW (400,000 tons) into RDF and all RDF going to Xcel for combustion;
- **Phase 1-SSO/SSR** – Increased Source Separated Recycling (SSR) and Source Separated Organics (SSO), with all MSW (remaining tons of the 400,000) delivered to the Facility for processing RDF to combustion by Xcel;
- **Phase 2-SSO/SSR/MWP/AD** – Phase 1 plus the use of Mixed Waste Processing (MWP) and sending the organics to an Anaerobic Digester;
- **Phase 3-Gasification/SSO/SSR/MWP/AD** – Phase 1 and 2 plus the use of Gasification to manage all RDF instead of combustion by Xcel;
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- **Existing System – Extended** – "status quo" for waste delivery, managed in same manner at the Newport Facility – processed RDF to combustion by Xcel, with an assumed contract extension;
- **Alternative 2-Processing, AD, and MWP** – Illustrate the economics of the system processing, using Mixed Waste Processing (MWP) and Anaerobic Digestion (does not include SSO/SSR).

The different components of each of these life-cycles include the following spreadsheet tables:

- Projected Waste/Resource Flows
- Operating Expenses
- Capital Expenses
- Summary

Each of the different phases has a set of each of these tables. The tables are actually spreadsheets that cover twenty-five (25) years of operations and are therefore quite lengthy. The actual tables are provided separately from this document.

The following report sections provide a summary of key data or assumptions in each of the various table spreadsheets.

2 Processing Only (Base Case)

2.1 Projected Waste/Resource Flows

The waste quantity projections used are the 400,000 tons of MSW per year (tpy) currently projected to be generated in the Counties after recycling, organics, and yard wastes are recovered. The 400,000 represents only the MSW that is projected to be available for processing. This total quantity is used consistently for each system. The direct delivered tons are brought directly to Newport and the transferred tons are first delivered to a transfer station in St. Paul and then to Newport. The projected tons direct delivered represent 80% of the total and the transferred tons represent the remaining 20%. The projected refuse-derived fuel (RDF) and recovered metal tons are based on existing plant performance history.

2.2 Operating Expenses

The estimated operating expenses are detailed and cover Labor, Supplies and Services, Transportation, Disposal, and the Xcel Contract. RRT has consistently refused to provide exact costs for operations nor the associated labor agreements, Xcel contracts, etc. that would provide actual operating cost data. The costs shown assume County(ies) operation.

The estimated costs were originally developed as estimates for a private operator that have been developed over time as pertinent and more current information became available. Data has been provided during discussions with RRT, equipment manufacturers, utilities, Foth's industry database and cost models, and the previous Xcel contract. A ten percent (10%) contingency was added to labor and operating supplies & services. The cost estimates have been updated

regularly and are based upon the best information known to Foth at this time. Most of the line item costs are escalated annually at 2.5%.

The Total Annual Expenses for selected years is provided in Table 2-1 at the end of this section.

2.3 Capital Expenses

The arbitrated capital cost of the Newport Facility is $26.4M and was used as the purchase price in this analysis. The first line of Table 3 provides the 25 year debt service estimate for purchasing the Newport Facility provided by Springsted. Based on 400,000 tpy, the cost per ton for this purchase is estimated to be $3.91 per ton.

Three additional initial capital costs have been identified as necessary to continue the existing operation. These include thirty new transfer trailers, resurfacing the tipping floor, and remodeling the trash load out system. The debt service associated with these upfront capital costs are modeled based upon their useful life.

Other capital expenses to replace processing and mobile equipment are included along with a ten percent (10%) contingency. The Total Capital Expenses for selected years are provided in Table 2-1 at the end of this section.

2.4 Summary

The Summary Table 2-1 shows the total annual operating expenses per year with the total capital expenses per year. Subtracted from the Total Expenses are the material market revenues for the ferrous and non-ferrous metals separated during the process. The metal revenues are calculated by the estimated tons of each metal multiplied by the average price per ton, which is 70% of the average market price. Total Metal Revenues are not escalated, but rather assumed to be based on an average market price that varies from year to year. The Net Cost per ton of MSW Delivered reflects the Net Annual Cost divided by the assumed Total Tons Delivered of 400,000 each year. A summary of the Processing Only costs, revenues, and cost per ton for selected years is provided in Table 2-1.

Table 2-1
Processing Only (Base Case) - Summary

Calendar Year	**2017**	**2020**	**2025**	**2030**
Operating Expenses	$23,276,496	$24,656,312	$27,195,776	$30,068,945
Capital Expenses	$3,020,285	$3,020,285	$2,676,180	$2,421,400
Total Expenses	**$26,296,781**	**$27,676,597**	**$29,871,956**	**$32,490,345**
Marketed Materials				
Non Ferrous	$814,000	$814,000	$814,000	$814,000
Ferrous	$1,124,800	$1,124,800	$1,124,800	$1,124,800
Total Metal Revenues	**$1,938,800**	***$1,938,800***	***$1,938,800***	***$1,938,800***
Net Annual Cost	**$24,357,981**	**$25,737,797**	**$27,933,156**	**$30,551,545**
NET cost per ton MSW Delivered	$60.89	$64.34	$69.83	$76.38

The Net Cost per Ton MSW Delivered is the estimated amount the Counties would need to charge per ton as a tipping fee to "break even."

3 Phase 1-SSO/SSR

This analysis represents adding the costs associated with increasing the source separated organics and recycling program as well as a reduction in the number of tons processed at the Newport Facility and the RDF to combustion at Xcel.

3.1 Projected Waste/Resource Flows

Increased source separation of organics and recyclables reduces the waste quantity delivered to Newport by an estimated 37,410 tons. The SSR/SSO tons recovered prior to delivery to the Newport Facility were determined based on the "new" tons available as presented in the *Estimated Calculations of Additional SSR/SSO Tons* memorandum dated September 15, 2014 by Foth. The projected RDF and separated material tons are also based on existing plant performance history and reduced tons delivered.

3.2 Operating Expenses

As with the Processing Only (Base Case), the estimated operating expenses include Labor, Supplies and Services, Transportation, Disposal, and the Xcel Contract expenses. However, an additional item titled SSO/SSR Costs was added to the operating expenses. This line item is the estimated cost for implementing an increased SSO/SSR program based on data provided by the Project Board and accounting for the difference in the total tons managed (921,500) versus tons available for processing (400,000). This increases the annual operating expenses by $3.3M. Most of the line items are escalated annually at 2.5%.

The Total Annual Operating Costs for selected years are provided in Table 3-1 at the end of this section.

3.3 Capital Expenses

The Newport Facility purchase price and additional capital expenses presented for the Processing Only scenario remain necessary with increased SSO/SSR and are included in the capital costs for this scenario. Additionally, a line item is included for the "system upgrade" costs associated with implementation of an increased SSO/SSR program. Based on data provided by the Project Board and accounting for the difference in the total tons managed (921,500) versus tons available for processing (400,000), the capital expense is estimated to be $20.4M. This cost is amortized over 7 years at 8% interest. This "system upgrade" cost is shown as a capital cost over 7 years for this analysis. However, in reality this cost would not be the Counties cost, but rather a customer cost.

3.4 Summary

Increased SSO/SSR significantly reduces the amount of marketable material available in the waste stream that is historically recovered during processing. This results in a decrease in the revenues for marketed materials from the Newport Facility.

In addition to the decrease in marketed materials, there is an increase in the operating and capital expenses associated with implementation of an increased SSO/SSR program, which results in a higher net cost per ton of MSW delivered.

A summary of the Phase 1-SSO/SSR scenario costs, revenues, and cost per ton for selected years is provided in Table 3-1.

Table 3-1
Phase 1 - SSO/SSR - Summary

Calendar Year	**2017**	**2020**	**2025**	**2030**
Operating Expenses	$25,639,620	$27,236,871	$30,176,508	$33,502,436
Capital Expenses	$6,938,562	$6,938,562	$2,676,180	$2,421,400
Total Expenses	**$32,578,182**	**$34,175,433**	**$32,852,688**	**$35,923,836**
Marketed Materials				
Non Ferrous	*$368,500*	$368,500	$368,500	$368,500
Ferrous	*$472,000*	$472,000	$472,000	$472,000
Total Metal Revenues	**$840,500**	***$840,500***	***$840,500***	***$840,500***
Net Annual Cost	**$31,737,682**	**$33,334,933**	**$32,012,188**	**$35,083,336**
NET cost per ton MSW Delivered	$87.53	$91.94	$88.29	$96.76

The Net Cost per Ton MSW Delivered shown is the estimated amount the Counties would need to charge per ton as a tipping fee to "break even" (with the caveat that this cost estimate includes the capital cost for increased SSO/SSR which will most likely be an upfront cost for generators).

4 Phase 2-SSO/SSR/MWP/AD

This analysis includes increased SSO/SSR plus adding MWP equipment at Newport to remove additional marketable materials and organics. The organics are assumed to go to a private AD facility for this analysis.

4.1 Projected Waste/Resource Flows

In addition to a reduction in the waste quantity delivered to Newport, this phase includes additional separated materials (i.e. ferrous, nonferrous, organics, PET, HDPE, and cardboard). The result is a decrease in the quantity of RDF produced and an increase in the quantity of recyclable and compostable separated materials.

4.2 Operating Expenses

The estimated operating expenses associated with the increased SSO/SSR remain the same as presented for Phase 1, with additional operating costs associated with the MWP system. The Disposal costs increase significantly with the addition of organics disposal.

A range of anaerobic digestion cost per ton of $40 to $60 in previous reports was estimated with the disposal cost midrange of $50 per ton for organics shown assumed to include transportation costs. Also, the current Xcel contract has a penalty clause which takes effect when the RDF delivered is less than 320,000 tons.

The Total Annual Operating Costs for Phase 2 for selected years are provided in Table 4-1 at the end of this section.

4.3 Capital Expenses

In addition to the capital costs described previously there are capital costs associated with renovations necessary to install the MWP equipment as well as the actual MWP equipment. The Total Capital Expenses for selected years are provided in Table 4-1.

4.4 Summary

The addition of MWP increases the operating expenses as well as the capital expenses, but also increases the number and quantity of marketed materials (revenue). A summary of the Phase 2-SSO/SSR/MWP/AD scenario costs, revenues, and cost per ton for selected years is provided in Table 4-1.

Table 4-1
Phase 2 - SSO/SSR/MWP/AD/Processing - Summary

Calendar Year	**2017**	**2020**	**2025**	**2030**
Operating Expenses	$31,737,944	$33,834,719	$37,693,698	$42,059,778
Capital Expenses	$8,476,085	$8,476,085	$4,213,703	$3,958,923
Total Expenses	**$40,214,029**	**$42,310,804**	**$41,907,401**	**$46,018,701**
Marketed Materials				
Non Ferrous	*$1,397,000*	$1,397,000	$1,397,000	$1,397,000
Ferrous	*$472,000*	$472,000	$472,000	$472,000
PET	*$481,250*	$481,250	$481,250	$481,250
HDPE	*$403,650*	$403,650	$403,650	$403,650
OCC	*$104,500*	$104,500	$104,500	$104,500
Total Marketed Materials	**$2,858,400**	***$2,858,400***	***$2,858,400***	***$2,858,400***
Net Annual Cost	**$37,355,629**	**$39,452,404**	**$39,049,001**	**$43,160,301**
NET cost per ton MSW Delivered	$103.02	$108.81	$107.69	$119.03

The Net Cost per Ton MSW Delivered is the estimated amount the Counties would need to charge per ton as a tipping fee to "break even" (caveat regarding upfront cost of SSO/SSR applies).

5 Phase 3-Gasification/SSO/SSR/MWP/AD

This analysis includes increased SSO/SSR, adding MWP equipment at Newport (organics to an AD facility) and delivering the RDF to a gasification facility rather than to the Xcel facilities.

5.1 Projected Waste/Resource Flows

The main change resulting from the addition of Gasification to the previous phase (Phase 2 – SSO/SSR/MWP/AD) is that all tons of RDF produced are delivered to a gasification facility instead of the two Xcel combustion facilities.

5.2 Operating Expenses

The estimated operating expenses for Labor, Supplies and Services, and SSO/SSR costs are the same for Phases 2 and 3. The Transportation costs decline significantly when all RDF is delivered to a gasification facility assumed to be located within 10 miles of Newport. Similarly to the cost of AD, for purposes of including a gasification operating cost, a line item was added to the disposal costs to account for the costs associated with paying someone to take the RDF generated.

This is somewhat similar to the current system where Xcel is paid to take the RDF. The overall disposal cost line item increases significantly since the cost to manage RDF is considered a cost for this financial analysis. However, the Xcel Contract expenses are no longer included in the operating expenses since all RDF will be delivered to a gasification facility. The costs to transport the RDF and to pay Xcel to burn the RDF are not incurred in this scenario.

The Total Annual Operating Cost for Phase 3 for selected years is provided in Table 5-1 at the end of this section.

5.3 Capital Expenses

All capital costs for Phase 3 are assumed to be the same as for Phase 2. The Total Capital Expenses for selected years are provided in Table 5-1 at the end of this section.

5.4 Summary

The addition of gasification to Phase 2 decreases the operating expenses while maintaining the capital expenses. Additionally, the number and quantity of marketed materials is the same for Phase 2 and 3. There is currently very limited data available about how the economics of gasification will work out for the Counties. The technology is still being developed and appears to be viable, but there are very limited commercial scale facilities to draw real data.

To obtain specific data for the Project Board will likely require a formal procurement process. For purposes of this preliminary analysis, an allowance of $15 per ton of MSW was included in the operating costs.

A line item is also in Table 4-1 for a "Revenue Share", which is set at 10% of the estimated profit for gasification. All cost analyses that include gasification need to be developed via a competitive process prior to proceeding with gasification.

A summary of the Phase 2-SSO/SSR/MWP/AD scenario costs, revenues, and cost per ton for selected years is provided in Table 5-1.

Table 5-1
Phase 3 - Gasification/SSO/SSR/MWP/AD - Capital Expenses

Calendar Year	**2017**	**2020**	**2025**	**2030**
Operating Expenses	$30,545,033	$32,865,363	$37,135,784	$41,967,373
Capital Expenses	$8,476,085	$8,476,085	$4,213,703	$3,958,923
Total Expenses	**$39,021,118**	**$41,341,448**	**$41,349,487**	**$45,926,296**
Marketed Materials				
Non Ferrous	*$1,397,000*	$1,397,000	$1,397,000	$1,397,000
Ferrous	*$472,000*	$472,000	$472,000	$472,000
PET	*$481,250*	$481,250	$481,250	$481,250
HDPE	*$403,650*	$403,650	$403,650	$403,650
OCC	*$104,500*	$104,500	$104,500	$104,500
Ethanol Revenue Share	*$2,613,140*	$2,613,140	$2,613,140	$2,613,140
Total Marketed Materials	**$5,471,540**	***$5,471,540***	***$5,471,540***	***$5,471,540***
Net Annual Cost	**$33,549,577**	**$35,869,908**	**$35,877,946**	**$40,454,755**
NET cost per ton MSW Delivered	$92.53	$98.93	$98.95	$111.57

The Net Cost per Ton MSW Delivered is the estimated amount the Counties would need to charge per ton as a tipping fee to "break even" (caveat regarding upfront cost of SSO/SSR applies).

6 Alternative 1 - Processing and Gasification Only

6.1 Projected Waste/Resource Flows

The waste quantity projections used for Alternative 1 are the same as those used for the Processing Only (Base Case) scenario discussed previously with one exception. The RDF produced is delivered to a gasification facility as opposed to the two Xcel combustion facilities.

6.2 Operating Expenses

The estimated operating expenses for Labor and Supplies and Services for Alternative 1 remain the same as for the Processing Only (Base Case) scenario. There is a significant decrease in transportation expenses since all RDF is assumed to be delivered to a single gasification facility within 10 miles of the Newport Facility. There is a significant increase in Disposal costs for this scenario because the RDF going to a gasification facility is assumed to be a cost to the County and is included as a disposal cost. There are no costs associated with the Xcel Contract expenses.

The Total Annual Operating Costs for selected years are provided in Table 6-1.

6.3 Capital Expenses

All capital costs for Alternative 1are assumed to be the same as for the Processing Only (Base Case) scenario. The Total Capital Expenses for selected years are provided in Table 6-1 at the end of this section.

6.4 Summary

The addition of gasification to the Processing Only (Base Case) scenario results in lower operating costs, no change in capital costs and an increase in marketed materials. As noted previously, the revenue share associated with gasification is assumed to be 10%, but will be dependent on specific contract details negotiated with a gasification vendor.

A summary of the costs, revenues, and cost per ton for selected years is provided in Table 6-1.

Table 6-1
Alternate 1 - Processing (Base Case)/Gasification - Summary

Calendar Year	**2017**	**2020**	**2025**	**2030**
Operating Expenses	$21,125,711	$22,721,787	$25,659,263	$28,982,746
Capital Expenses	$3,020,285	$3,020,285	$2,676,180	$2,421,400
Total Expenses	**$24,145,996**	**$25,742,072**	**$28,335,443**	**$31,404,146**
Marketed Materials				
Non Ferrous	*$814,000*	$814,000	$814,000	$814,000
Ferrous	*$1,124,800*	$1,124,800	$1,124,800	$1,124,800
Revenue Share	*$3,754,040*	$3,801,328	$3,888,358	$3,986,824
Total Recyclables Revenues	**$5,692,840**	***$5,740,128***	***$5,827,158***	***$5,925,624***
Net Annual Cost	**$18,453,156**	**$20,001,945**	**$22,508,285**	**$25,478,522**
NET cost per ton MSW Delivered	$46.13	$50.00	$56.27	$63.70

The Net Cost per Ton MSW Delivered is the amount the Counties would need to charge per ton as a tipping fee to "break even."

7 Existing System – Extended – Private Ownership

7.1 Projected Waste/Resource Flows

The waste quantity projections used for the Existing System - Extended scenario assumes that of the 400,000 tpy of waste currently projected to be generated in the Counties, 322,000 tons are delivered to the Newport Facility and 78,000 tons are landfilled.

The projected RDF and separated material tons are based on existing plant performance history as applied to the tons delivered to the Newport Facility (322,000 tons). This system assumes continued private ownership.

7.2 Operating Expenses

The operating expenses are assumed to be the 2015 Newport tipping fee ($86.22/ton) and the landfill tip fee (assumed to be $55/ton). Currently, this Newport Facility tipping fee is paid by haulers, but the Counties rebate $28 per ton to the haulers to support processing.

It should be noted that the costs included in this projection are only based on the current tipping fee price being extended with the same escalation rate as the other analyses. A contract extension would need to be reached which could result in different pricing.

7.3 Capital Expenses

There are no capital costs associated with the Existing System Extended.

7.4 Summary

The Existing System Extended scenario only includes operating expenses associated with the Newport Facility tipping fee and the assumed landfill tipping fee. A summary of the Existing System -Extended scenario costs and cost per ton for selected years are provided in Table 7-1.

Table 7-1
Existing System Extended - Summary

Calendar Year	**2017**	**2020**	**2025**	**2030**
Operating Expenses	$33,675,515	$36,264,846	$41,030,345	$46,422,069
Total Expenses	**$33,675,515**	**$36,264,846**	**$41,030,345**	**$46,422,069**
Net Annual Cost	**$33,675,515**	**$36,264,846**	**$41,030,345**	**$46,422,069**
NET cost per ton MSW Delivered	$84.19	$90.66	$102.58	$116.06

This system would continue to require a rebate subsidy from the Counties to reduce the haulers net cost down to landfill pricing.

8 Alternative 2-Processing/MWP/AD

8.1 Projected Waste/Resource Flows

The waste quantity projections used are the 400,000 tons of MSW per year (tpy) currently projected to be generated in the Counties

The MWP equipment is assumed to target ferrous, nonferrous, organics, PET, HDPE, and cardboard (cardboard from commercial waste only). The projected tpy of RDF are based on existing plant performance history after additional material recovery with the MWP equipment. The result is a decrease in the quantity of RDF produced and an increase in the quantity of separated materials.

8.2 Operating Expenses

The estimated operating expenses for Labor and Supplies and Services for Alternative 2 are the same as Phases 2 and 3, which include MWP. There is a slight decrease in the transportation costs as compared to the Processing Only (Base Case) scenario due to reduced RDF quantities. There is an increase in the disposal costs associated with disposal of the organics from MWP as compared to the Processing Only (Base Case) scenario.

The Total Annual Operating Costs for selected years are provided in Table 8-1 at the end of this section.

8.3 Capital Expenses

The capital expenses associated with Alternative 2 are the same as those for Phases 2 and 3.

8.4 Summary

The addition of MWP/AD to Processing Only (Base Case) increases the operating costs, capital costs and the marketed material revenues.

A summary of the Alternative 2 – Processing/MWP/AD scenario costs, revenues, and cost per ton for selected years is provided in Table 8-1.

Table 8-1
Alternate 2: Processing/MWP/AD - Summary

Calendar Year	**2017**	**2020**	**2025**	**2030**
Operating Expenses	$29,475,885	$31,392,907	$34,921,061	$38,912,844
Capital Expenses	$4,557,808	$4,557,808	$4,213,703	$3,958,923
Total Expenses	**$34,033,693**	**$35,950,715**	**$39,134,764**	**$42,871,767**
Marketed Materials				
Non Ferrous	*$2,766,500*	$2,766,500	$2,766,500	$2,766,500
Ferrous	*$1,124,800*	$1,124,800	$1,124,800	$1,124,800
PET	*$701,250*	$701,250	$701,250	$701,250
HDPE	*$596,700*	$596,700	$596,700	$596,700
OCC	*$299,250*	$299,250	$299,250	$299,250
Total Marketed Materials	**$5,488,500**	***$5,488,500***	***$5,488,500***	***$5,488,500***
Net Annual Cost	**$28,545,193**	**$30,462,215**	**$33,646,264**	**$37,383,267**
NET cost per ton MSW Delivered	$71.36	$76.16	$84.12	$93.46

The Net Cost per Ton MSW Delivered is the amount the Counties would need to charge per ton as a tipping fee to "break even."

9 Summary

Table 9-1 is a summary of the total annual costs (in 1,000's) for all scenarios described in this report.

Table 9-1
Total Annual Costs

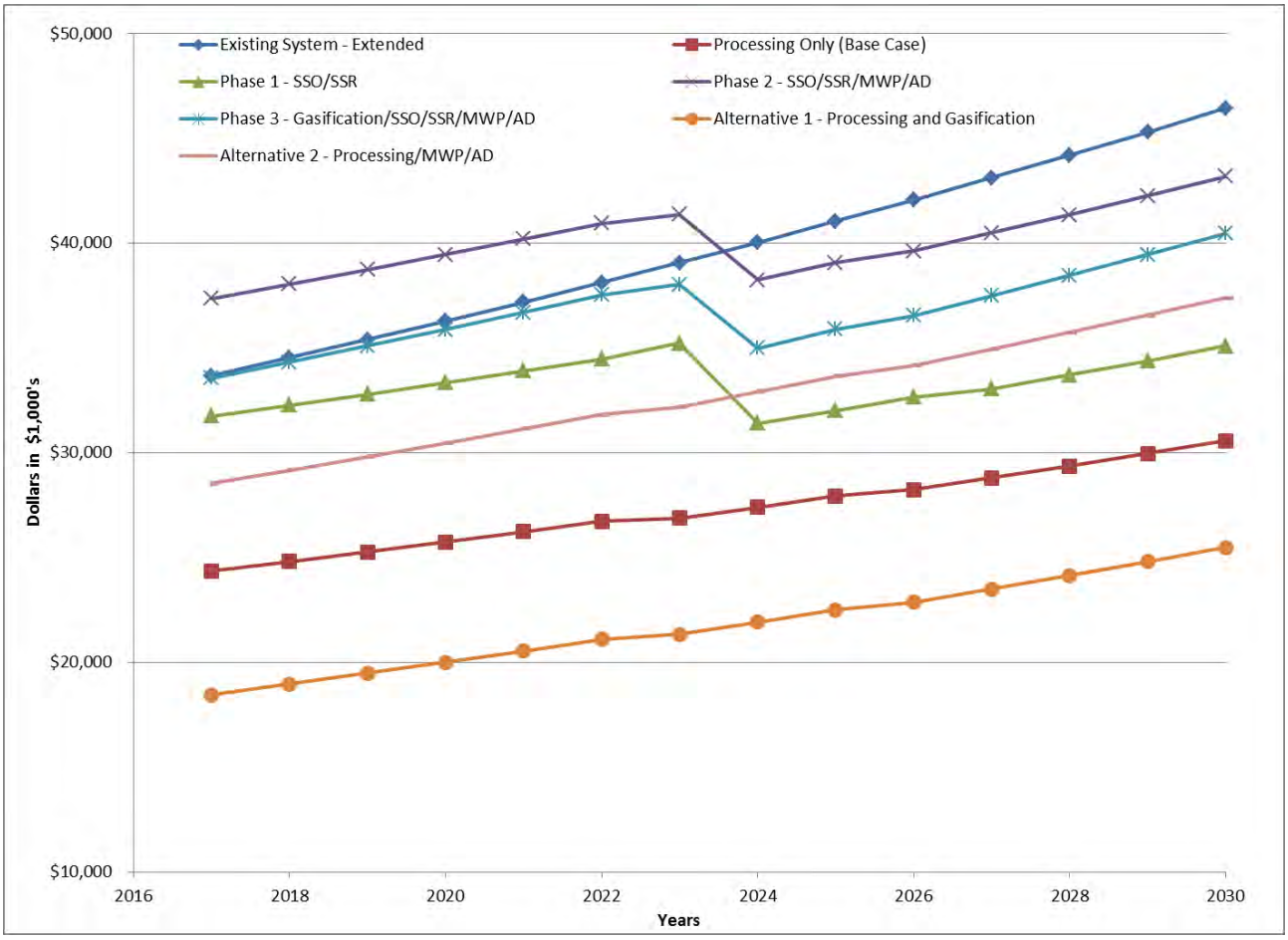
Scenarios	2017	2020	2025	2030
Existing System Extended	$33,676	$36,265	$41,030	$46,422
Processing Only (Base Case)	$24,358	$25,738	$27,933	$30,552
Phase 1 - SSO/SSR	$31,738	$33,335	$32,012	$35,083
Phase 2 - SSO/SSR/MWP/AD	$37,356	$39,452	$39,049	$43,160
Phase 3 - Gasification/SSO/SSR/MWP/AD	$33,550	$35,870	$35,878	$40,455
Alternative 1 - Processing and Gasification	$18,453	$20,002	$22,508	$25,479
Alternative 2 - Processing/MWP/AD	$28,545	$30,462	$33,646	$37,383

Alternative 1 – Processing and Gasification results in the lowest total annual cost, but is dependent on yet to be proven success of the technology and the negotiated revenue share associated with gasification.

The Existing System - Extended resulted in the highest total annual cost over time, which is mainly due to the RRT tipping fee. This system cost estimate was completed prior to any contract extension negotiation discussions between the Counties and RRT.

Figure 9-1 provides a graphic comparison of the Life Cycle Total Annual Costs of each of the scenarios.

Figure 9-1
Life Cycle Total Annual Costs Graphic Comparison



Processing Only (Base Case) - Summary

Calendar Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Expenses (T-2)	$22,838,809	$23,276,496	$23,725,126	$24,184,971	$24,656,312	$25,139,437	$25,634,640	$26,142,223	$26,662,496	$27,195,776	$27,742,387	$28,302,664	$28,876,947	$29,465,588	$30,068,945
Capital Expenses (T-3)	$1,720,285	$3,020,285	$3,020,285	$3,020,285	$3,020,285	$3,020,285	$3,020,285	$2,676,180	$2,676,180	$2,676,180	$2,421,400	$2,421,400	$2,421,400	$2,421,400	$2,421,400
Total Expenses (T-2 & T-3)	**$24,559,094**	**$26,296,781**	**$26,745,411**	**$27,205,256**	**$27,676,597**	**$28,159,722**	**$28,654,925**	**$28,818,403**	**$29,338,676**	**$29,871,956**	**$30,163,787**	**$30,724,064**	**$31,298,347**	**$31,886,988**	**$32,490,345**
Marketed Materials															
Non Ferrous	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000
Ferrous	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800
Total Metal Revenues	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***	***$1,938,800***
Net Annual Cost	**$22,620,294**	**$24,357,981**	**$24,806,611**	**$25,266,456**	**$25,737,797**	**$26,220,922**	**$26,716,125**	**$26,879,603**	**$27,399,876**	**$27,933,156**	**$28,224,987**	**$28,785,264**	**$29,359,547**	**$29,948,188**	**$30,551,545**
NET cost per ton MSW Delivered	$56.55	$60.89	$62.02	$63.17	$64.34	$65.55	$66.79	$67.20	$68.50	$69.83	$70.56	$71.96	$73.40	$74.87	$76.38

Phase 1 - SSO/SSR - Summary

Calendar Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Expenses (T-2)	$25,639,620	$26,158,946	$26,691,255	$27,236,871	$27,796,128	$28,369,366	$28,956,935	$29,559,193	$30,176,508	$30,809,255	$31,457,821	$32,122,602	$32,804,001	$33,502,436
Capital Expenses (T-3)	$6.938.562	$6.938.562	$6.938.562	$6.938.562	$6.938.562	$6.938.562	$7.103.562	$2.676.180	$2.676.180	$2.676.180	$2.421.400	$2.421.400	$2.421.400	$2.421.400
Total Expenses (T-2 & T-3)	**$32,578,182**	**$33,097,508**	**$33,629,817**	**$34,175,433**	**$34,734,690**	**$35,307,928**	**$36,060,497**	**$32,235,373**	**$32,852,688**	**$33,485,435**	**$33,879,221**	**$34,544,002**	**$35,225,401**	**$35,923,836**
Marketed Materials														
Non Ferrous	$368,500	$368,500	$368,500	$368,500	$368,500	$368,500	$368,500	$368,500	$368,500	$368,500	$368,500	$368,500	$368,500	$368,500
Ferrous	$472.000	$472.000	$472.000	$472.000	$472.000	$472.000	$472.000	$472.000	$472.000	$472.000	$472.000	$472.000	$472.000	$472.000
Total Metal Revenues	***$840,500***	***$840,500***	***$840,500***	***$840,500***	***$840,500***	***$840,500***	***$840,500***	***$840,500***	***$840,500***	***$840,500***	***$840,500***	***$840,500***	***$840,500***	***$840,500***
Net Annual Cost	**$31,737,682.44**	**$32,257,008**	**$32,789,317**	**$33,334,933**	**$33,894,190**	**$34,467,428**	**$35,219,997**	**$31,394,873**	**$32,012,188**	**$32,644,935**	**$33,038,721**	**$33,703,502**	**$34,384,901**	**$35,083,336**
NET cost per ton MSW Delivered	$87.53	$88.96	$90.43	$91.94	$93.48	$95.06	$97.13	$86.59	$88.29	$90.03	$91.12	$92.95	$94.83	$96.76

Phase 2 - SSO/SSR/MWP/AD - Summary

Calendar Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Expenses (T-2)	$31,737,944	$32,419,683	$33,118,466	$33,834,719	$34,568,877	$35,321,390	$36,092,716	$36,883,324	$37,693,698	$38,524,331	$39,375,730	$40,248,414	$41,142,915	$42,059,778
Capital Expenses (T-3)	$8,476,085	$8,476,085	$8,476,085	$8,476,085	$8,476,085	$8,476,085	$8,131,980	$4,213,703	$4,213,703	$3,958,923	$3,958,923	$3,958,923	$3,958,923	$3,958,923
Total Expenses (T-2 & T-3)	**$40,214,029**	**$40,895,768**	**$41,594,551**	**$42,310,804**	**$43,044,962**	**$43,797,475**	**$44,224,696**	**$41,097,027**	**$41,907,401**	**$42,483,254**	**$43,334,653**	**$44,207,337**	**$45,101,838**	**$46,018,701**
Marketed Materials														
Marketed Materials														
Non Ferrous	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000
Ferrous	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000
PET	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250
HDPE	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650
OCC	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500
Total Marketed Materials	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***	***$2,858,400***
Net Annual Cost	**$37,355,629**	**$38,037,368**	**$38,736,151**	**$39,452,404**	**$40,186,562**	**$40,939,075**	**$41,366,296**	**$38,238,627**	**$39,049,001**	**$39,624,854**	**$40,476,253**	**$41,348,937**	**$42,243,438**	**$43,160,301**
NET cost per ton MSW Delivered	$103.02	$104.90	$106.83	$108.81	$110.83	$112.91	$114.09	$105.46	$107.69	$109.28	$111.63	$114.04	$116.50	$119.03

Phase 3 - Gasification/SSO/SSR/MWP/AD - Summary

Calendar Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Expenses (T-2)	$29,809,007	$30,545,033	$31,299,458	$32,072,745	$32,865,363	$33,677,798	$34,510,542	$35,364,106	$36,239,009	$37,135,784	$38,054,978	$38,997,153	$39,962,882	$40,952,754	$41,967,373
Capital Expenses (T-3)	$7,176,085	$8,476,085	$8,476,085	$8,476,085	$8,476,085	$8,476,085	$8,476,085	$8,131,980	$4,213,703	$4,213,703	$3,958,923	$3,958,923	$3,958,923	$3,958,923	$3,958,923
Total Expenses (T-2 & T-3)	**$36,985,092**	**$39,021,118**	**$39,775,543**	**$40,548,830**	**$41,341,448**	**$42,153,883**	**$42,986,627**	**$43,496,086**	**$40,452,712**	**$41,349,487**	**$42,013,901**	**$42,956,076**	**$43,921,805**	**$44,911,677**	**$45,926,296**
Marketed Materials															
Marketed Materials															
Non Ferrous	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000	$1,397,000
Ferrous	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000	$472,000
PET	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250	$481,250
HDPE	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650	$403,650
OCC	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500	$104,500
Ethanol Revenue Share	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140	$2,613,140
Total Recyclables Revenues	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***	***$5,471,540***
Net Annual Cost	**$31,513,552**	**$33,549,577**	**$34,304,003**	**$35,077,289**	**$35,869,908**	**$36,682,342**	**$37,515,087**	**$38,024,546**	**$34,981,171**	**$35,877,946**	**$36,542,361**	**$37,484,536**	**$38,450,264**	**$39,440,136**	**$40,454,755**
NET cost per ton MSW Delivered	$86.91	$92.53	$94.61	$96.74	$98.93	$101.17	$103.46	$104.87	$96.48	$98.95	$100.78	$103.38	$106.04	$108.77	$111.57

Existing System - Extended - Summary

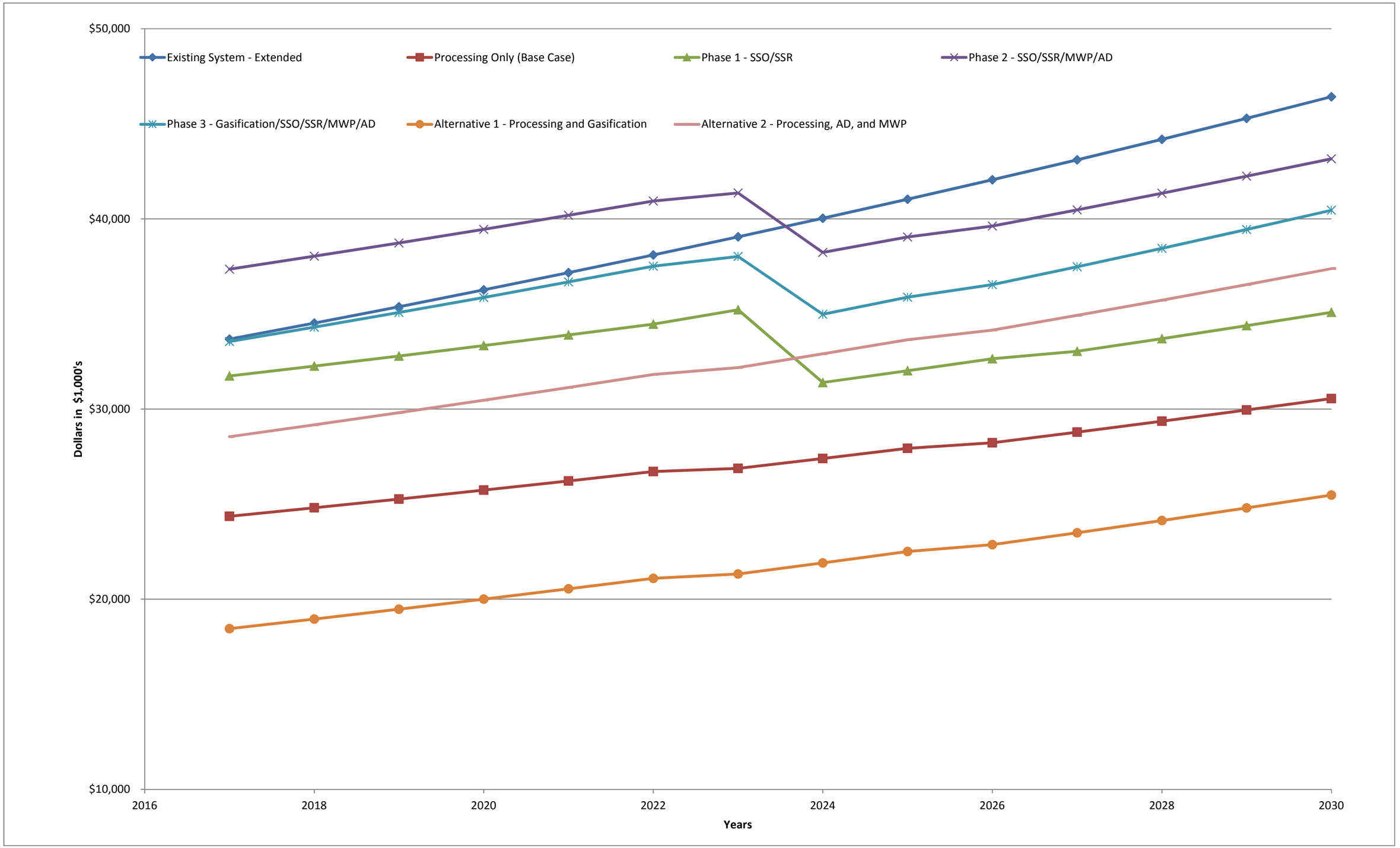
Calendar Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Expenses (T-2)	$32,854,161	$33,675,515	$34,517,403	$35,380,338	$36,264,846	$37,171,468	$38,100,754	$39,053,273	$40,029,605	$41,030,345	$42,056,104	$43,107,506	$44,185,194	$45,289,824	$46,422,069
Total Expenses (T-2)	**$32,854,161**	**$33,675,515**	**$34,517,403**	**$35,380,338**	**$36,264,846**	**$37,171,468**	**$38,100,754**	**$39,053,273**	**$40,029,605**	**$41,030,345**	**$42,056,104**	**$43,107,506**	**$44,185,194**	**$45,289,824**	**$46,422,069**
Net Annual Cost	**$32,854,161**	**$33,675,515**	**$34,517,403**	**$35,380,338**	**$36,264,846**	**$37,171,468**	**$38,100,754**	**$39,053,273**	**$40,029,605**	**$41,030,345**	**$42,056,104**	**$43,107,506**	**$44,185,194**	**$45,289,824**	**$46,422,069**
NET cost per ton MSW Delivered	$82.14	$84.19	$86.29	$88.45	$90.66	$92.93	$95.25	$97.63	$100.07	$102.58	$105.14	$107.77	$110.46	$113.22	$116.06

Alternate 1 - Processing and Gasification - Summary

Calendar Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Expenses (T-2)	$20,619,424	$21,125,711	$21,644,655	$22,176,572	$22,721,787	$23,280,633	$23,853,450	$24,440,587	$25,042,402	$25,659,263	$26,291,545	$26,939,635	$27,603,926	$28,284,825	$28,982,746
Capital Expenses (T-3)	$1,720,285	$3,020,285	$3,020,285	$3,020,285	$3,020,285	$3,020,285	$3,020,285	$2,676,180	$2,676,180	$2,676,180	$2,421,400	$2,421,400	$2,421,400	$2,421,400	$2,421,400
Total Expenses (T-2 & T-3)	**$22,339,709**	**$24,145,996**	**$24,664,940**	**$25,196,857**	**$25,742,072**	**$26,300,918**	**$26,873,735**	**$27,116,767**	**$27,718,582**	**$28,335,443**	**$28,712,945**	**$29,361,035**	**$30,025,326**	**$30,706,225**	**$31,404,146**
Marketed Materials															
Non Ferrous	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000	$814,000
Ferrous	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800
Revenue Share	$3,739,040	$3,754,040	$3,769,415	$3,785,174	$3,801,328	$3,817,885	$3,834,856	$3,852,251	$3,870,082	$3,888,358	$3,907,091	$3,926,292	$3,945,973	$3,966,147	$3,986,824
Total Recyclables Revenues	***$5,677,840***	***$5,692,840***	***$5,708,215***	***$5,723,974***	***$5,740,128***	***$5,756,685***	***$5,773,656***	***$5,791,051***	***$5,808,882***	***$5,827,158***	***$5,845,891***	***$5,865,092***	***$5,884,773***	***$5,904,947***	***$5,925,624***
Net Annual Cost	**$16,661,869**	**$18,453,156**	**$18,956,725**	**$19,472,883**	**$20,001,945**	**$20,544,233**	**$21,100,078**	**$21,325,715**	**$21,909,700**	**$22,508,285**	**$22,867,055**	**$23,495,943**	**$24,140,553**	**$24,801,279**	**$25,478,522**
NET cost per ton MSW Delivered	$41.65	$46.13	$47.39	$48.68	$50.00	$51.36	$52.75	$53.31	$54.77	$56.27	$57.17	$58.74	$60.35	$62.00	$63.70

Alternative 2 - Processing, AD, and MWP - Summary

Calendar Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Expenses (T-2)	$28,867,793	$29,475,885	$30,099,180	$30,738,057	$31,392,907	$32,064,127	$32,752,128	$33,457,329	$34,180,160	$34,921,061	$35,680,486	$36,458,895	$37,256,765	$38,074,582	$38,912,844
Capital Expenses (T-3)	$3,257,808	$4,557,808	$4,557,808	$4,557,808	$4,557,808	$4,557,808	$4,557,808	$4,213,703	$4,213,703	$4,213,703	$3,958,923	$3,958,923	$3,958,923	$3,958,923	$3,958,923
Total Expenses (T-2 & T-3)	**$32,125,601**	**$34,033,693**	**$34,656,988**	**$35,295,865**	**$35,950,715**	**$36,621,935**	**$37,309,936**	**$37,671,032**	**$38,393,863**	**$39,134,764**	**$39,639,409**	**$40,417,818**	**$41,215,688**	**$42,033,505**	**$42,871,767**
Marketed Materials															
Marketed Materials															
Non Ferrous	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500	$2,766,500
Ferrous	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800	$1,124,800
PET	$701,250	$701,250	$701,250	$701,250	$701,250	$701,250	$701,250	$701,250	$701,250	$701,250	$701,250	$701,250	$701,250	$701,250	$701,250
HDPE	$596,700	$596,700	$596,700	$596,700	$596,700	$596,700	$596,700	$596,700	$596,700	$596,700	$596,700	$596,700	$596,700	$596,700	$596,700
OCC	$299,250	$299,250	$299,250	$299,250	$299,250	$299,250	$299,250	$299,250	$299,250	$299,250	$299,250	$299,250	$299,250	$299,250	$299,250
Total Marketed Materials	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***	***$5,488,500***
Net Annual Cost	**$26,637,101.38**	**$28,545,193**	**$29,168,488**	**$29,807,365**	**$30,462,215**	**$31,133,435**	**$31,821,436**	**$32,182,532**	**$32,905,363**	**$33,646,264**	**$34,150,909**	**$34,929,318**	**$35,727,188**	**$36,545,005**	**$37,383,267**
NET cost per ton MSW Delivered	$66.59	$71.36	$72.92	$74.52	$76.16	$77.83	$79.55	$80.46	$82.26	$84.12	$85.38	$87.32	$89.32	$91.36	$93.46


$50,000
$40,000
$30,000
$20,000
$10,000
Dollars in $1,000's
2016
2018
2020
2022
2024
2026
2028
2030
Years
Existing System - Extended
Processing Only (Base Case)
Phase 1 - SSO/SSR
Phase 2 - SSO/SSR/MWP/AD
Phase 3 - Gasification/SSO/SSR/MWP/AD
Alternative 1 - Processing and Gasification
Alternative 2 - Processing, AD, and MWP