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Region of Peel
Working for you

REPORT
Meeting Date: November 24, 2011
Regional Council

DATE: November 14, 2011

REPORT TITLE: **LONG TERM WASTE DISPOSAL STUDY - RESULTS OF EVALUATION TO DETERMINE PREFERRED OPTION AND RECOMMENDED NEXT STEPS**

FROM: Dan Labrecque, Commissioner of Public Works

RECOMMENDATION

That a Request for Prequalification be issued in early 2012 to pre-qualify vendors of established thermal conversion technologies;

And further, that staff report back to the Waste Management Committee and Regional Council, with an update on the results of the Request for Prequalification;

And further, that the Chief Financial Officer be authorized to approve directly negotiated contracts for such professional and/or technical services as may be required to review, analyze and/or implement the recommended Long Term Waste Disposal options.

REPORT HIGHLIGHTS

- The Region of Peel currently produces approximately 250,000 tonnes per year of residual waste, of which approximately 160,000 tonnes per year is sent to the Algonquin Power Energy from Waste Facility with the rest sent to landfill under a 25 year disposal contract.
- The Region's current contract with Algonquin Power expires on April 24, 2012.
- After the implementation of waste reduction and reuse initiatives, the Region will be required to dispose of at least 200,000 tonnes per year of residual waste.
- In 2010 HDR Corporation was hired to assess available waste disposal technologies and recommend a preferred long term solution.
- Established and Emerging residual waste disposal systems have been identified and evaluated. Based on this evaluation the preferred waste disposal system is an established waste to energy technology combined with landfill. A new mass burn energy from waste facility is the top ranked waste to energy technology.
- In order to evaluate individual vendors and to ensure no innovative pairing of technologies is missed and to ensure no viable established thermal conversion technology vendor is disadvantaged, staff is recommending a two-step Request for Prequalification / Request for Proposals process.

DISCUSSION

1. Background

The Region of Peel currently produces approximately 250,000 tonnes per year of residual waste, of which approximately 160,000 tonnes per year is sent to the Algonquin Power Energy-from-Waste Facility in Brampton and the rest to the Twin Creeks landfill in Warwick, Ontario under a 25 year disposal contract with the site's owner, Waste Management of Canada Corporation. The Region's current contract with Algonquin Power expires on April 24, 2012.

In 2010, staff was directed to review available waste disposal options and technologies and to recommend a preferred disposal solution.

In 2010, Peel retained HDR Corporation through a competitive Request for Proposal process to review Peel's long term waste disposal options and recommend a technology or combination of technologies to dispose of Peel's residual waste.

2. Findings

a) Residual Waste Projections

While the ultimate amount of residual waste will depend on the ultimate choice and timing of reduction, reuse and recycling (3R's) initiatives, staff estimates that even with enhanced 3R's initiatives in place, the Region will still have to manage at least 200,000 tonnes per year of residual waste. Figure 1 in Appendix I shows the quantities of residual waste to be managed under different scenarios.

b) Waste Disposal Technology Classes

At the April 7, 2011 meeting of Waste Management Committee, staff presented the list of available waste disposal technology classes that process or make claim to process municipal solid waste and the criteria that would be used to evaluate the technology classes.

At the June 23, 2011 meeting of Regional Council, staff presented a list of established and emerging technology classes. The list along with details of the screening process used to develop the list is contained in Appendix II.

3. Development and Evaluation of Waste Disposal System Options

a) Waste Disposal System Options

Following the screening of available waste disposal technology classes, a number of systems were developed using of Established and/or Emerging technology classes.

An example of a system comprised of Established technology classes is the establishment of a mass burn energy from waste (EFW) facility combined with landfill.

An example of a system comprised of Emerging technology classes is the establishment of an Emerging thermal technology (Gasification, Pyrolysis or Plasma Arc) combined with landfill.

An example of mixed system is the establishment of a mass burn EFW facility for the majority of the residual waste with the remainder to an Emerging thermal technology (Gasification, Pyrolysis or Plasma Arc) combined with landfill.

A number of Established and Emerging systems were evaluated. The Region's current System (Algonquin Power Energy from Waste facility combined with landfillI) was also evaluated.

The Established and Emerging residual waste disposal systems are described in Appendix III.

b) Evaluation Criteria and Methodology

The residual waste disposal systems were evaluated using comparative evaluation criteria (presented at the April 7, 2011 meeting of Waste Management Committee) as detailed in Appendix III.

The systems were compared and for each criterion, were assigned a grade of major advantage, advantage, neutral, disadvantage or major disadvantage.

The evaluation methodology is explained in more detail in Appendix III.

c) Results of Evaluation of Waste Disposal System Options

Table 2 in Appendix III summarizes of the results of the evaluation of the residual waste disposal system options using the major advantage to major disadvantage ranking system.

Table 3 in Appendix III tabulates the results by assigning scores to major advantage through major disadvantage.

Based on this evaluation, the preferred waste disposal system is an established waste to energy technology combined with landfill. A new mass burn energy from waste (EFW) facility is the top ranked waste to energy technology.

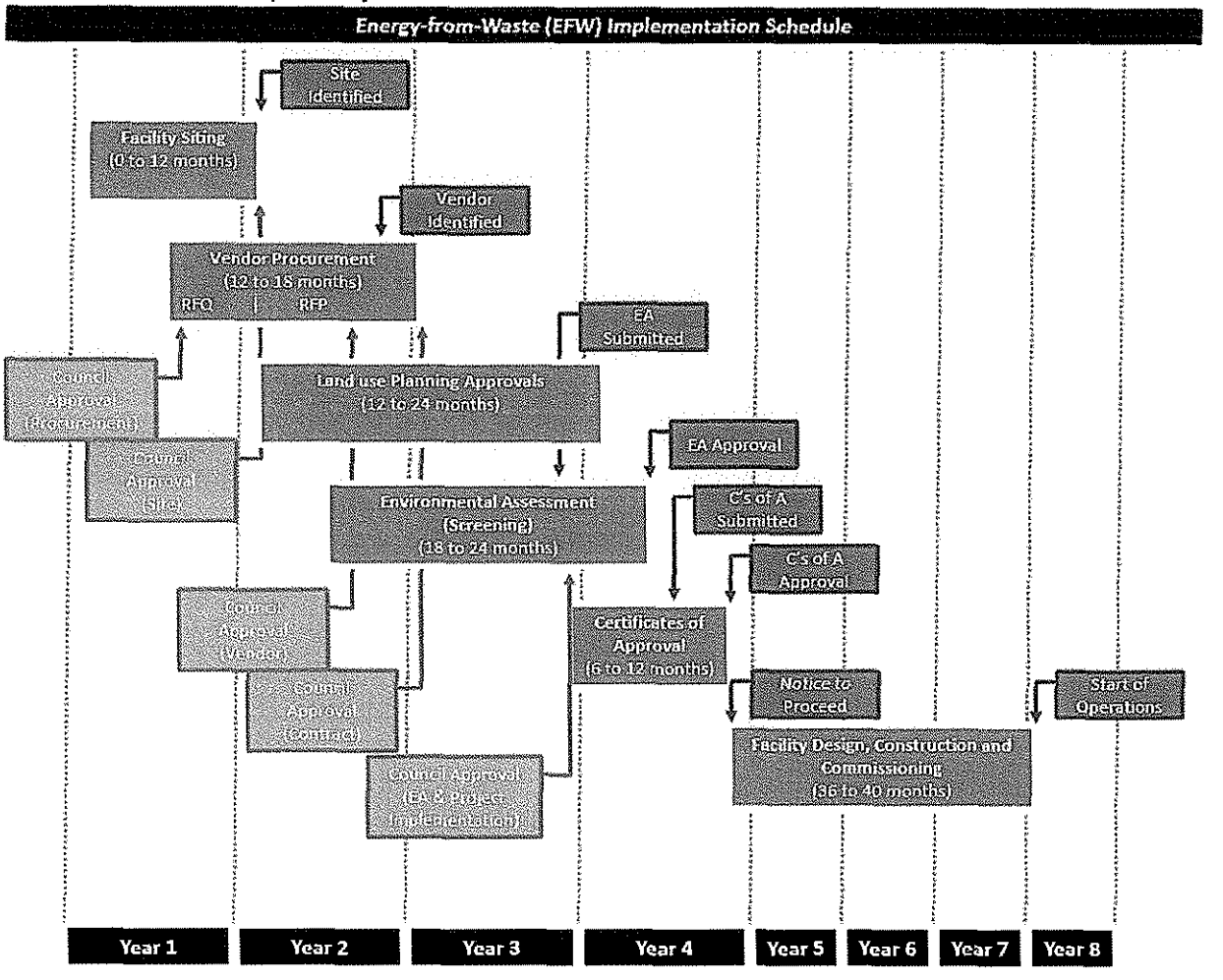
It should be noted that, with the exception of Peel's current system (Algonquin Power EFW Facility combined with landfill) all evaluations were of generic technology classes and not individual vendors. It is also important to note that evaluations were based on available information.

In order to evaluate individual vendors and to ensure no innovative pairing of technologies is missed and no viable established thermal conversion technology vendor is disadvantaged, staff is recommending a two-step Request for Prequalification / Request for Proposals process.

4. Proposed Direction and Next Steps

The proposed next step is to issue a Request for Prequalification to solicit the information required to prequalify a short list of established thermal conversion technology vendors who would be invited to participate in a competitive Request for Proposals process.

The following chart provides an overview of the development timelines for the long term residual waste disposal system:



In order to move forward in a timely and efficient manner staff is requesting that the Chief Financial Officer be authorized to approve directly negotiated contracts for professional technical services required to review, analyze, and implement the recommended Long Term Waste Disposal options.

CONCLUSION

This report presents the results of the evaluation of waste disposal system options. As a result of this evaluation the preferred waste disposal system is an established thermal conversion technology combined with landfill. The highest ranked thermal conversion technology is a new mass burn energy from waste facility.

It is proposed that a Request for Prequalification be issued in early 2012 to pre-qualify vendors of established thermal conversion technologies.

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Commissioner of Public Works

Approved for Submission:

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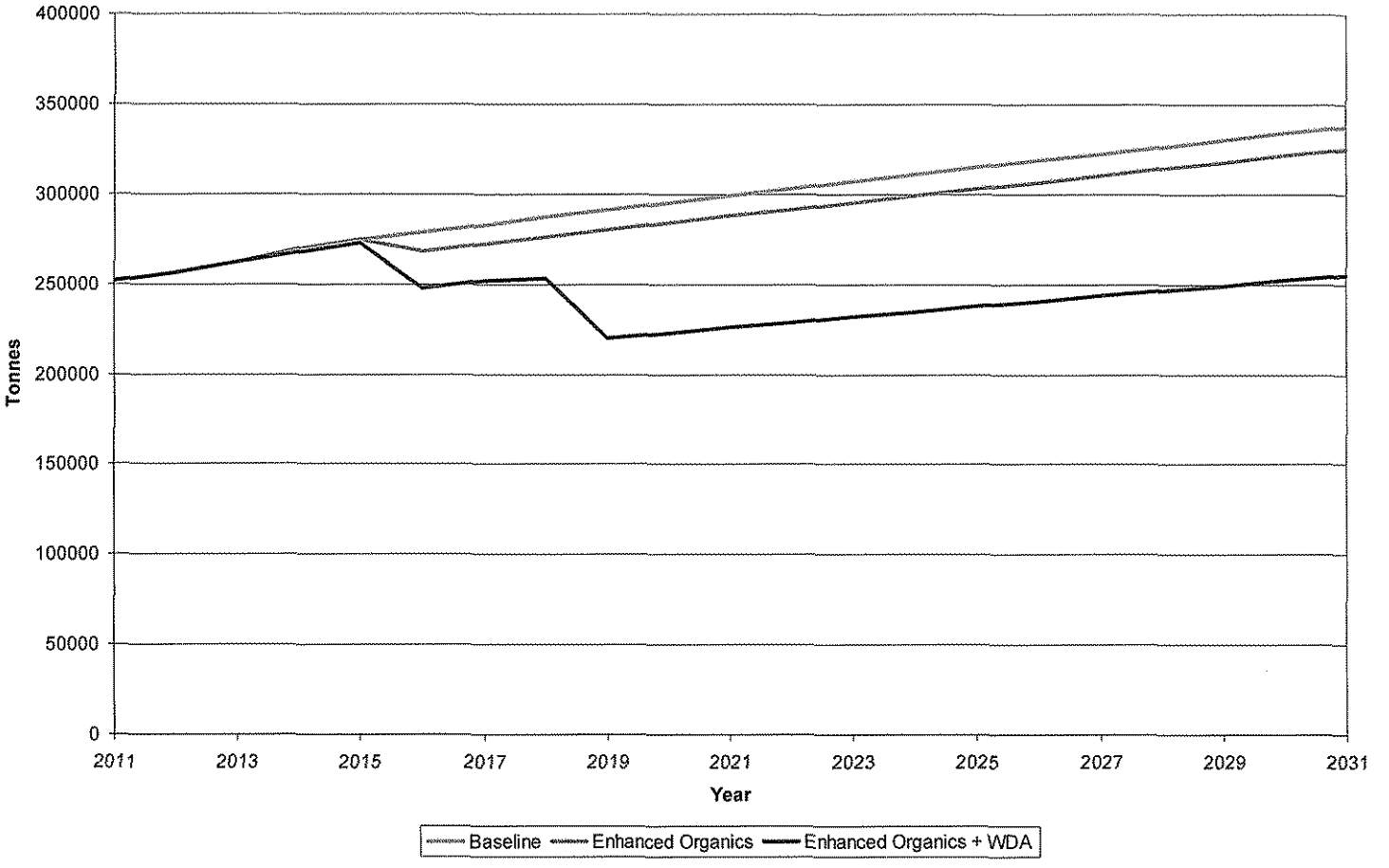
APPENDIX I



Note: Projections include garbage collected at the five existing and two future Community Recycling Centres but not Material Recovery Facility and Organics processing residues.

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APPENDIX II

Waste Disposal Technology Screening Process

The available waste disposal technology classes were screened and those that passed were categorized as either "Established" or "Emerging" to be subsequently used to develop waste disposal systems.

a) Available Waste Disposal Technology Classes

An overview of the following available waste disposal technology classes that process or claim to process municipal solid waste was presented at the April 7, 2011 meeting of Waste Management Committee. An overview was provided on the following technologies:

- Thermal
  - Mass Burn Combustion (Grate Based and Modular)
  - Refuse Derived Fuel – Direct Combustion
  - Fluidized Bed Combustion
  - Gasification
  - Pyrolysis
  - Plasma Arc
- Mechanical
  - Material Separation and Recovery
  - Steam Classification
  - Mechanical Biological Treatment
  - Refuse Derived Fuel – to Market
- Biological
  - Composting
  - Anaerobic Digestion
- Chemical
  - Hydrolysis
  - Catalytic Depolymerization
- Landfill
  - Traditional
  - Bioreactor

b) Screening Criteria and Principles

The following principles and criteria were used to screen the long list of available waste disposal technology classes into "Established" and "Emerging" categories:

- Commercial readiness;
- Applicability to the Region's waste stream;
- Ability to compliment existing waste diversion efforts; and,
- Consistency with Regional Planning Policy.

i) Commercial readiness – the degree to which the technology and the proposed components have been demonstrated on mixed Municipal Solid Waste (MSW), including status of reference or demonstration facilities (i.e., where else is this being done for a similar application?);

ii) Applicability to Region's waste stream – the degree to which the proposed technology is suitable for the Region's residual waste stream.

iii) Ability to compliment existing waste diversion efforts – the degree to which the proposed technology does not compete with and can potentially enhance existing Regional waste diversion programs.

iv) Consistency with Regional Planning Principles – the degree to which the technology supports the Regional Planning Principles and a "Made in Peel" solution.

A pass/fail approach was used to screen the technology classes and those that did not meet the threshold (failed one or more of the criteria) were eliminated from further consideration.

c) Screened Established and Emerging Waste Disposal Technology Classes

Technology classes that failed to meet the screening criteria were eliminated.

Technology classes that met the screening criteria were screened in as follows:

- Technology classes that were able to demonstrate its ability to meet minimum performance criteria, including operating history and scale of operation were classified as "Established".
- Technology classes that met all criteria except commercial readiness but were currently implemented at a pilot scale, with operational data that suggests a possibility of full-scale implementation and operation were classified as "Emerging".

Established (Pass)	**Emerging (Conditional Pass)**
Mass Burn Combustion	Gasification
Refuse Derived Fuel (RDF) Production and Combustion in a Dedicated RDF Combustion Facility	Pyrolysis
Fluidized Bed Combustion	Plasma Arc
Existing Out-of-Region Landfill	RDF to Market

RDF Production to a dedicated RDF Gasification Facility to produce liquid fuel falls somewhat in between Emerging and Established and should be considered more fully in the Request for Qualifications process.

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a) Waste Disposal System Options

i) Established Disposal Systems

Based on the screened technology classes identified in Appendix II, the following residual waste disposal systems comprised of Established Technology Classes were identified:

- Landfill disposal;
- Continued use of the existing Algonquin Power Energy from Waste facility (i.e. new agreement) combined with landfill;
- Establishment of a mass burn energy from waste (EFW) facility combined with landfill; and,
- Establishment of a Refuse Derived Fuel (RDF) production facility coupled with a dedicated RDF combustion facility (including RDF production to a dedicated, established, RDF gasification facility) combined with landfill.

ii) Emerging Disposal Systems

The following residual waste disposal systems comprised of Emerging Technology Classes were identified:

- Establishment of a RDF production facility with RDF to an external market; and,
- Establishment of an Emerging Thermal Technology (Gasification, Pyrolysis or Plasma Arc) combined with landfill.

iii) Mixed Disposal Systems

The following residual waste disposal system comprised of Established and Emerging Technology classes was identified:

- Establishment of a mass burn EFW facility for the majority of the residual waste with the remainder to an Emerging Thermal Technology combined with landfill.

Specific examples, based on input of 200,000 tonnes per year of residual waste, with mass balance diagrams showing the movement of waste materials through the various system components including the flow of material from the initial receipt of waste to the recovery of materials and energy and management of any resulting process residues can be found in Figures 1 through 6, appended.

b) Evaluation Criteria and Methodology

i) Evaluation Criteria

The waste disposal systems identified above were evaluated using comparative evaluation criteria divided into the following categories:

- Technical;
- Environmental;

- Social;
- Economic/Financial; and,
- Legal.

These criteria are further divided into the following sub-criteria:

- **Technical Criteria**

    - Flexibility – flexibility to handle a variety of wastes of differing quantity, compositions and quality (i.e. energy content); need for contingency landfill capacity and flexibility of the technology to handle changing (i.e. more stringent) environmental regulations.

    - Energy Recovery – energy Recovery (e.g. kWh/tonne; kilograms steam/tonne waste; Megawatts thermal; cubic meters biogas/tonne waste, etc.)

    - By-product/Residue Management – types and quantities of marketable by-products generated by process (both marketable and those that will require disposal)

    - Resource Utilization – The amount of incoming waste converted by the process and the reuse potential of pre- and post-processed materials

    - Additional Infrastructure Requirements – waste/material transfer and transportation requirements

    - Scalability – ability of the facility to be expanded should additional capacity be required

    - Risk Potential – risks associated with overall system reliability/resiliency and changes in waste composition and environmental standards

- **Environmental Criteria**

    - Emissions to Air, Land and Water – priority air pollutant emissions, including transportation emissions and potential emissions of greenhouse gases; quantities and type of process and non-process wastewater discharges

    - Consumption of Natural Resources – the need to use additional natural resource materials such as potable water

    - Residue Management – quantities and types of solid residues for disposal

    - Avoidance of Fossil Fuel Consumption

    - Siting Requirements – including but not limited to the potential site footprint of technology or system

    - Risk Potential – Potential for the technology to negatively impact the surrounding environment, potential impacts to public and ecological health

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- **Social Criteria**
  - Potential Noise Impacts
  - Potential Odour Impacts
  - Potential Visual Impacts
  - Land requirements/impacts – potential to displace other land uses, potential for land use conflicts
  - Nuisance Impacts – Other nuisance impacts (vector, vermin, etc.)
  - System Transportation Impacts – local traffic volumes, long-haul disposal requirements, etc.
  - Risk Potential – Risk associated with siting, host community implications, consultation, etc.
- **Economic/Financial Criteria**
  - Capital Costs – Capital costs, including debt servicing costs amortized over the life of the asset
  - Operating Costs – Operating costs, including but not limited to potential long-term major maintenance costs (this will depend in part on the ownership structure)
  - Revenue Generation Ability – Predicted revenues from energy/product recovery (e.g. electricity, biofuels, recyclables, fertilizer, greenhouse gas credits, tax credits, etc.)
  - Climate Change Costs – Potential costs per tonne of greenhouse gases prevented or produced
  - Long-term perpetual care costs – Potential costs required to monitor and remediate sites post closure
  - Sensitivity to external factors – sensitivity to changes in price of electricity, materials market, disposal market, etc.
  - Ability to attract additional industry/business – economic development opportunities
  - Residue Disposal Costs – Pre-existence of market for residues or by-products produced by the technology or system option, or the feasibility of a market developing if one currently does not exist
  - Employment Potential – Potential number of local and non-local jobs created (both during construction and normal operations) including direct, indirect and induced employment

- Risk Potential – The potential financial impacts of the risks associated with implementing the technology or system, including the risks associated with the following: construction; operations and maintenance; end product markets for by-products (i.e., energy, recovered materials, etc.); ability to obtain financing and residuals management requirements

- **Legal Criteria**

  - Regulatory/Permitting requirements – complexity associated with approvals process

  - Number and Complexity of Required Contracts – Contract development, negotiation and administration requirements

  - Ownership Opportunity/Control

  - Risk Potential – Risk associated with approvals and permitting processes, ability to secure approvals, business arrangements (ownership versus waste supply agreement), Force Majeure/change in law, etc.

ii) Evaluation Methodology

The evaluation methodology included a qualitative evaluation which compared the relative ability of each system to satisfy each criterion. Under each criterion, systems were graded as to whether they offer a major advantage, advantage, neutral, disadvantage or major disadvantage when compared against the other systems. Table 1 below describes each grade in more detail.

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Table 1 – Description of Grades Assigned to Systems for each Evaluation Criteria

Grade	Description	Example
Major Advantage	The Technology/System would have minimal impact based on the criteria/indicator being applied and could potentially result in a net benefit as a result of the Facility development.	A facility that could be developed and offer low cost thermal energy (i.e., steam and/or hot water) that would attract new industry to the area would be considered a Major Advantage over a system that does not provide the same economic benefit.
Advantage	Development of the Technology/System would have manageable impact based on the criteria/indicator being applied and in some cases a net benefit could potentially result from Facility development.	In comparison to the above example, a Technology/System that produces a thermal energy, but in much smaller quantities, would still be considered advantaged, however, when compared to another system with a greater thermal or electrical output to market, it would not be considered a Major Advantage.
Neutral	The Technology/System development would have no potential impacts (positive or negative) based on the criteria/indicator being applied.	A situation where all facilities would require obtaining the same permits and the same permitting risk would be considered neutral in that there is no substantial difference between any of the Technology/System options.
Disadvantage	Development of the Technology/System would have some negative impacts based on the criteria/indicator being applied and would likely require some mitigation measures to reduce the potential impact.	In comparison to the below example, a Technology/System that produces a wastewater discharge, but in much smaller quantities, would still be considered disadvantaged (when compared to a zero wastewater discharge facility), however, when compared to another system with a relatively greater wastewater discharge, it would not be considered a Major Disadvantage.
Major Disadvantage	Development of the Technology/System would have a significant negative impact based on the criteria/indicator being applied and would require extensive mitigation measures to reduce the potential impact.	A Technology/System with a relatively large wastewater discharge would be considered a major disadvantage over a system with a minimal or no wastewater discharge.

c) Results of Evaluation of Waste Disposal System Options

Table 2 is a summary of the results of the evaluation of the system options using the major advantage to major disadvantage ranking. As indicated in the table, each of the proposed system alternatives has associated with it differing degrees of advantage and disadvantage across the spectrum of criteria examined.

Points were assigned for each grade (e.g. negative two for Major Disadvantage, negative one for Disadvantage, zero for Neutral, positive one for Advantage and positive two for Major Advantage) to arrive at a total score for each Waste Disposal System. Scores were added with equal weight given to each criterion. Based on this evaluation, the preferred waste disposal system option is a new grate based mass burn energy from waste (EFW) facility.

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Table 2 – Results of Evaluation of Waste Disposal System Options

	Waste Disposal System Option						
	Established				Emerging		
	Existing Out of Region Landfill	Algonquin Power EFW	New Mass Burn EFW Facility	Refuse Derived Fuel (RDF) with Dedicated RDF Combustion Facility	RDF to External Market	Emerging Thermal Technology	New Mass Burn EFW with Small Scale Emerging Thermal Technology
Criteria							
Technical							
Timeline	Advantage	Advantage	Disadvantage	Disadvantage	Neutral	Disadvantage	Disadvantage
Flexibility	Neutral	Advantage	Advantage	Advantage	Neutral	Disadvantage	Disadvantage
Energy Recovery	Disadvantage	Neutral	Advantage	Advantage	Neutral	Neutral	Advantage/Neutral
By-product/Residue Management	Disadvantage	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Resource Utilization	Major Disadvantage	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Additional Infrastructure Requirements	Disadvantage	Advantage	Disadvantage	Disadvantage	Disadvantage	Disadvantage	Disadvantage
Scalability	Disadvantage	Disadvantage	Advantage	Advantage	Advantage	Advantage	Advantage
Risk Potential	Disadvantage	Disadvantage	Advantage	Advantage	Disadvantage	Disadvantage	Neutral/ Disadvantage
Environmental							
Emissions to Air, Land and Water	Neutral	Neutral	Advantage	Advantage	Neutral	Advantage	Advantage
Consumption of Natural Resources	Advantage	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Residue Management	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Avoidance of Fossil Fuel Consumption	Disadvantage	Advantage	Advantage	Advantage	Advantage	Advantage	Advantage
Other Utility Usage	Advantage	Neutral	Neutral	Neutral	Disadvantage	Neutral	Neutral
Siting Requirements	Disadvantage	Advantage	Disadvantage	Disadvantage	Disadvantage	Disadvantage	Disadvantage
GHG Emissions	Major Disadvantage	Neutral	Major Advantage	Advantage	Advantage	Advantage	Major Advantage
Risk Potential	Disadvantage	Neutral	Neutral	Neutral	Disadvantage	Disadvantage	Neutral/Disadvantage
Social							
Potential Noise Impacts	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Potential Odour Impacts	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Potential Visual Impacts	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Land requirements/impacts – potential to displace other land uses, potential for land use conflicts	Neutral	Advantage	Disadvantage	Disadvantage	Neutral	Disadvantage	Disadvantage
Nuisance Impacts – Other nuisance impacts (dust, vector, vermin, etc.)	Disadvantage	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
System Transportation Impacts – local traffic volumes, long-haul disposal requirements, etc.	Disadvantage	Neutral	Neutral	Neutral	Disadvantage	Neutral	Neutral
Risk Potential – Risk associated with siting, host community implications, consultation, etc.	Disadvantage	Neutral	Disadvantage	Disadvantage	Disadvantage	Disadvantage	Disadvantage

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Table 2 continued

	Waste Disposal System Option						
	Established				Emerging		
Criteria	**Existing Out of Region Landfill**	**Algonquin Power EFW**	**New Mass Burn EFW Facility**	**Refuse Derived Fuel (RDF) with Dedicated RDF Combustion Facility**	**RDF to External Market**	**Emerging Thermal Technology**	**New Mass Burn EFW with Small Scale Emerging Thermal Technology**
Economic/Financial Requirements							
Capital Costs	Major Advantage	Neutral	Disadvantage	Disadvantage	Advantage	Disadvantage	Disadvantage
Operating and Maintenance Costs	Advantage	Disadvantage	Advantage	Advantage	Advantage	Disadvantage	Disadvantage
Revenue Generation Ability	Disadvantage	Neutral	Advantage	Advantage	Neutral	Neutral	Advantage/Neutral
Climate Change Costs	Disadvantage	Neutral	Advantage	Advantage	Advantage	Advantage	Advantage
Long-term perpetual care costs	Disadvantage	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Sensitivity to external factors	Neutral	Disadvantage	Neutral	Neutral	Disadvantage	Neutral	Neutral
Ability to attract industry/business	Disadvantage	Advantage	Advantage	Advantage	Neutral	Advantage	Advantage
Residue Disposal Costs	Advantage	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Employment Potential	Disadvantage	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Net Life Cycle Costs	Major Disadvantage	Neutral	Major Advantage	Neutral	Advantage	Major Disadvantage	Neutral
Risk Potential	Neutral	Neutral	Neutral	Neutral	Disadvantage	Disadvantage	Neutral/Disadvantage
Legal Requirements							
Regulatory/ Permitting requirements	Advantage	Advantage	Neutral	Neutral	Disadvantage	Neutral	Neutral
Number/Complexity of Required Contracts	Advantage	Neutral	Neutral	Neutral	Disadvantage	Neutral	Neutral
Ownership Opportunity/Control	Disadvantage	Disadvantage	Advantage	Advantage	Advantage	Advantage	Advantage
Risk Potential	Disadvantage	Neutral	Neutral	Neutral	Disadvantage	Disadvantage	Neutral/Disadvantage

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LONG TERM WASTE DISPOSAL STUDY - RESULTS OF EVALUATION TO DETERMINE PREFERRED OPTION AND RECOMMENDED NEXT STEPS

Table 3 – Summary of Criteria Rankings for the Waste Disposal System Options

Waste Disposal System	Number of Criteria scored as Major Advantage at 2 points each	Number of Criteria scored as Advantage at 1 points each	Number of Criteria scored as Advantage/ Neutral at 0.5 points each	Number of Criteria scored as Neutral at 0 points each	Number of Criteria scored as Neutral/Disadvantage at -0.5 points each	Number of Criteria scored as Disadvantage at -1 points each	Number of Criteria scored as Major Disadvantage at -2 points each	Total Score	Rankin
New Mass Burn EFW	2 x 2 = 4	11 x 1 = 11	0	19 x 0 = 0	0	6 x -1 = -6	0	9	**1**
Refuse Derived Fuel (RDF) with Dedicated RDF Combustion Facility	0	12 x 1 = 12	0	20 x 0 = 0	0	6 x -1 = -6	0	6	**2**
Algonquin Power EFW	0	8 x 1 = 8	0	25 x 0 = 0	0	5 x -1 = -5	0	3	**3**
New Mass Burn with Small Scale Emerging Thermal Technology[1]	1 x 2 = 2	6 x 1 = 6	2 x 0.5 = 1	17 x 0 = 0	4 x -0.5 = -2	8 x -1 = -8	0	-1	**4**
RDF to External Market	0	8 x 1 = 8	0	18 x 0 = 0	0	12 x -1 = -12	0	-4	**5**
Emerging Thermal Technology	0	7 x 1 = 7	0	18 x 0 = 0	0	12 x -1 = -12	1 x -2 = -2	-7	**6**
Existing Out of Region Landfill	1 x 2 = 2	7 x 1 = 7	0	9 x 0 = 0	0	18 x -1 = -18	3 x -2 = -6	-15	**7**

Notes:

1) New Mass Burn EFW with Small Scale Emerging Thermal Technology earned half marks under some criteria due to the fact that it is a combination of Established and Emerging technology classes.

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Waste Disposal System Options Diagrams

Figure 1 – Algonquin Power Energy from Waste Facility

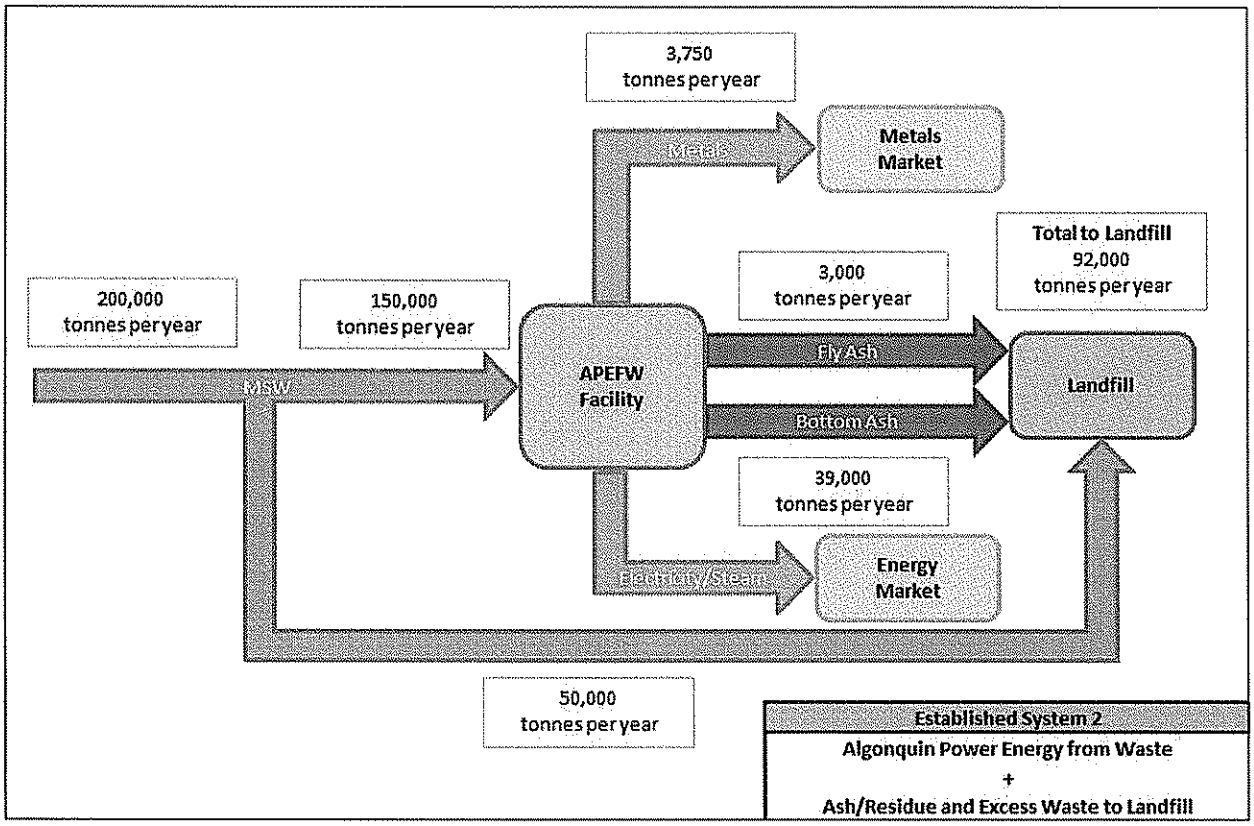

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Figure 2 – New Mass Burn Energy from Waste Facility

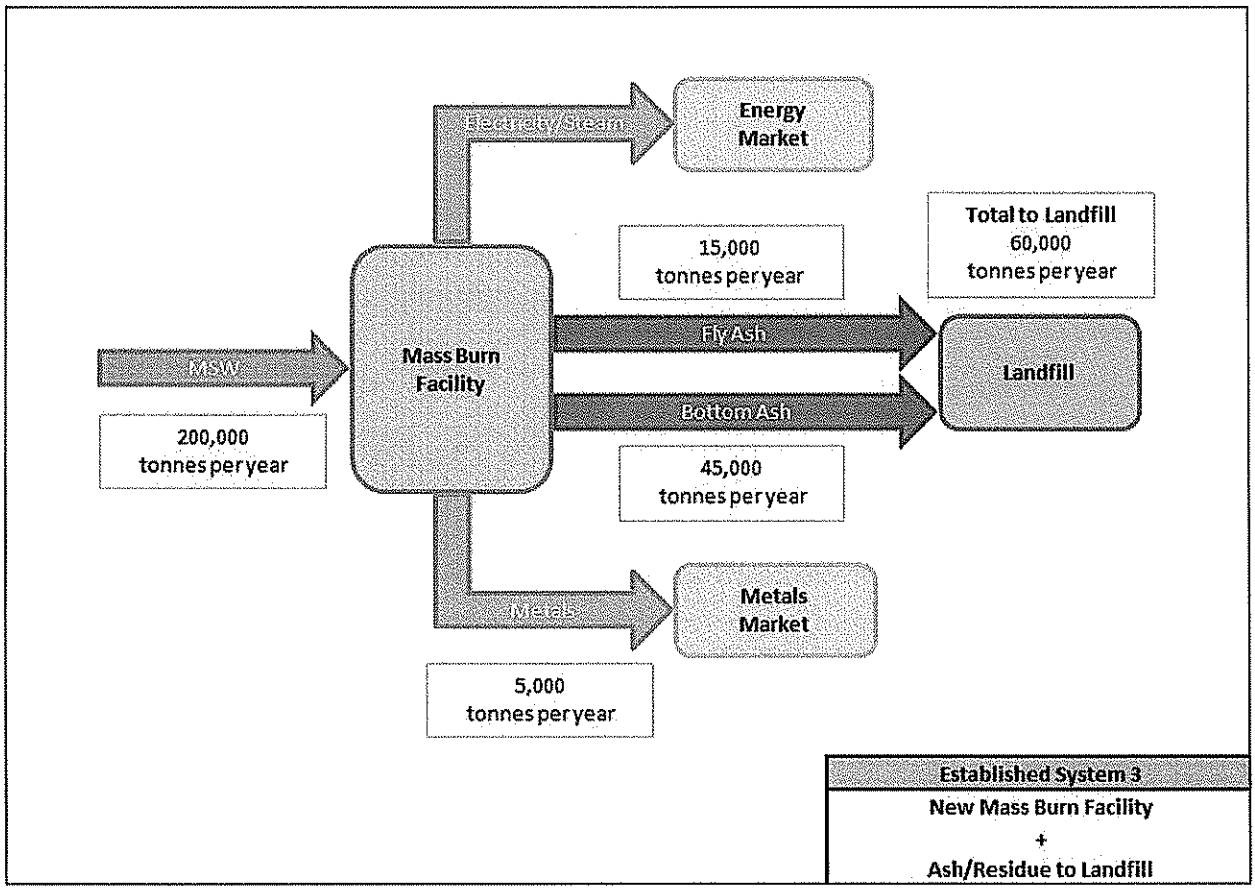

Figure 3 – Refuse Derived Fuel Combustion with a Dedicated Boiler

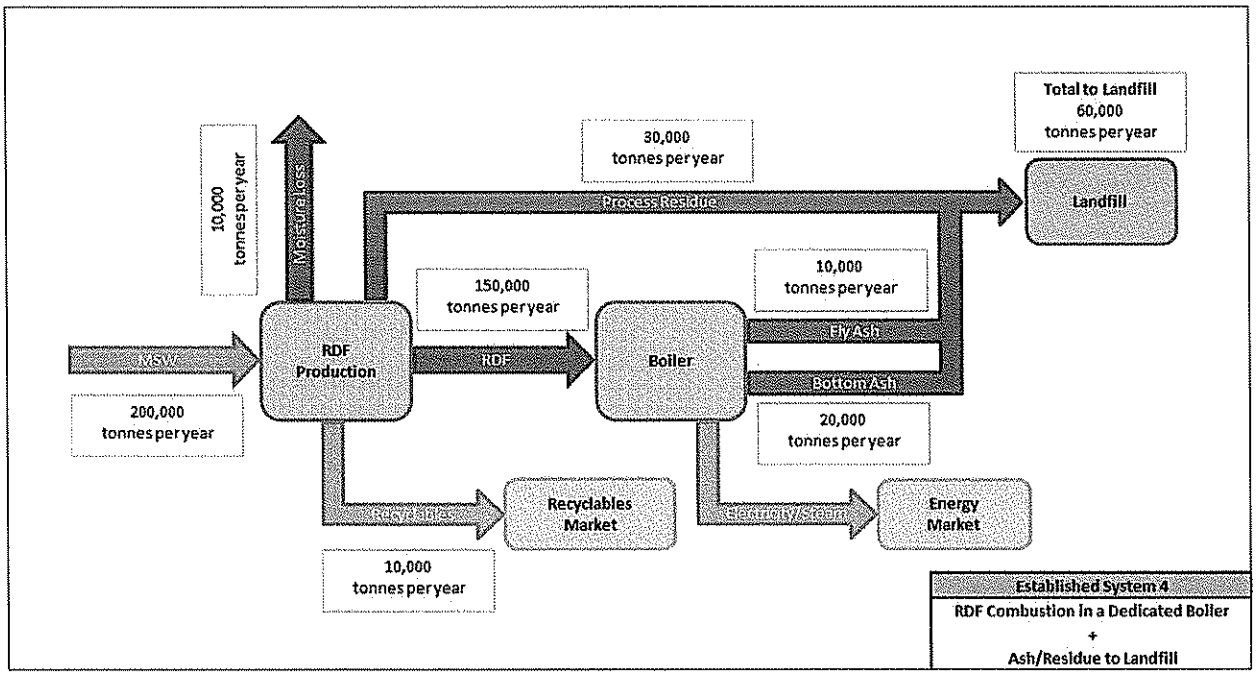

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Figure 4 – Refuse Derived Fuel Production to an External Market

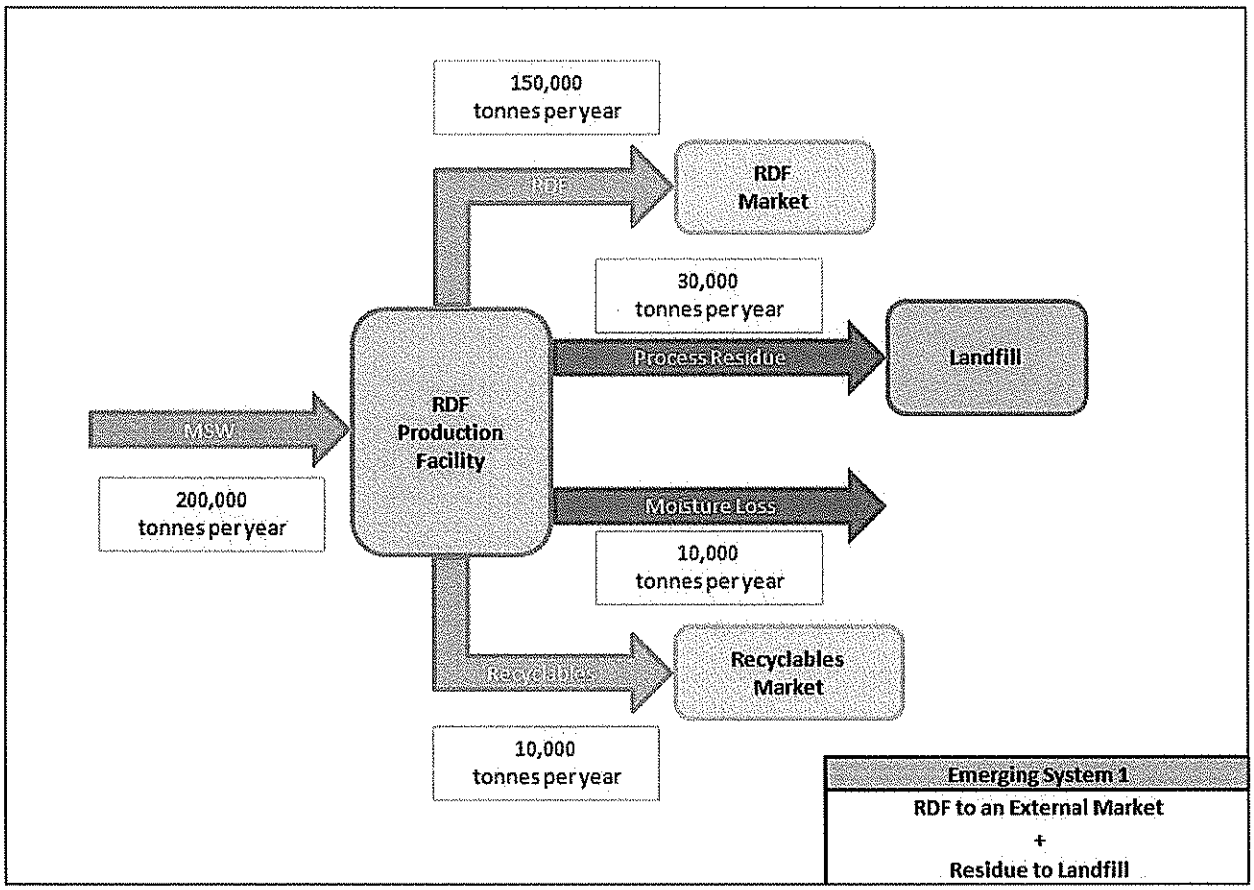
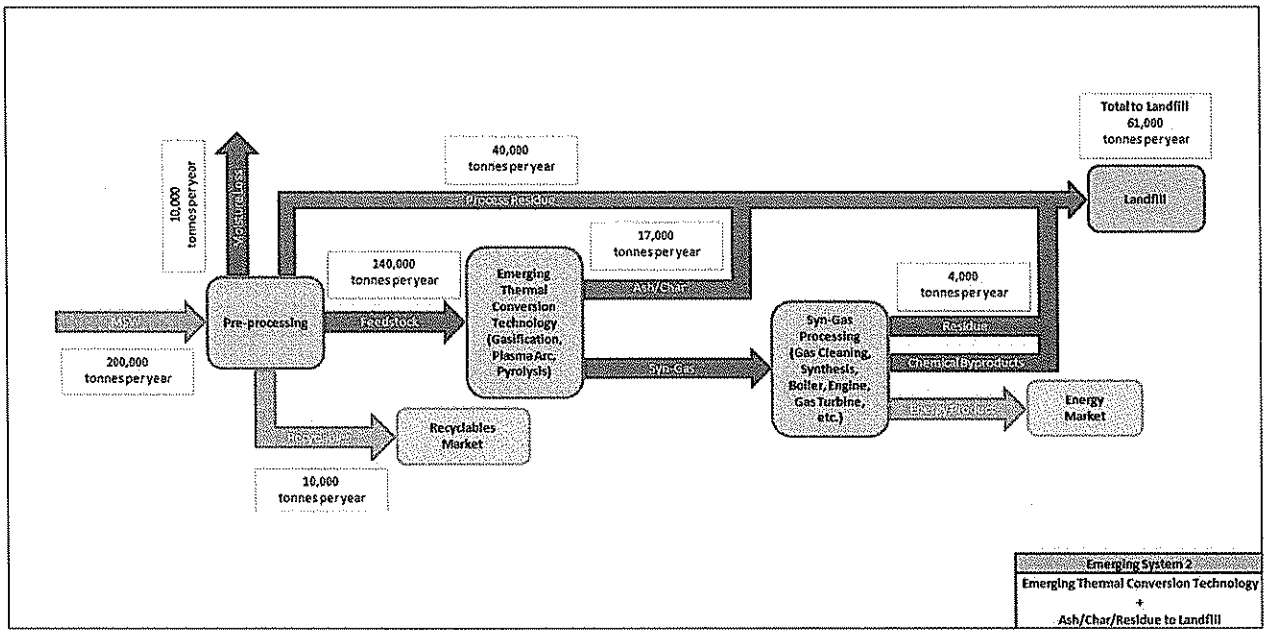


Figure 5 – Emerging Thermal Technology



LONG TERM WASTE DISPOSAL STUDY - RESULTS OF EVALUATION TO DETERMINE PREFERRED OPTION AND RECOMMENDED NEXT STEPS

Figure 6 – Mass Burn EFW with Small Scale Emerging Thermal Technology