



Durham/York Residual Waste Study

Application of Short-List Evaluation Criteria

Economic and Financial Considerations:

Annex G -

Report on Capital Costs, Operation and
Maintenance Costs

September, 2007





Application of Short-List Evaluation Criteria

Economic and Financial Considerations:
Annex G -
Report on Capital Costs, Operation and
Maintenance Costs

August, 2007

prepared by:



GENIVAR Ontario Inc.
600 Cochrane Drive, Suite 500
Markham, Ontario, Canada
L3R 5K3



Jacques Whitford Limited
3430 South Service Road,
Burlington, Ontario, Canada
L7N 3T9

This report has been prepared for the sole benefit of the Regions of Durham and York, and may not be used by any third party without the express written consent of GENIVAR/ Jacques Whitford Limited and Durham and York Regions. Any use that a third party makes of this report is the responsibility of that third party.

Table of Contents

1. Introduction.....	1-1
1.1 Overview of the Durham/York Residual Waste EA Study	1-1
1.2 The Environmental Assessment Act.....	1-1
1.2.1 The EA Terms of Reference.....	1-2
1.2.2 The Evaluation of “Alternatives To” (i.e. Technologies).....	1-2
1.3 The Evaluation of “Alternative Methods” (i.e. Facility Siting).....	1-4
1.4 The Short-List of Sites.....	1-5
1.4.1 Short-List Site: Clarington 01	1-6
1.4.2 Short-List Site: Clarington 04	1-6
1.4.3 Short-List Site: Clarington 05	1-6
1.4.4 Short-List Site: East Gwillimbury 01	1-6
1.5 Step 7: Evaluation of the Short-List Sites.....	1-6
1.6 Overview of Preferred Site Supporting Documentation.....	1-8
1.7 Purpose of this Report	1-9
2. Methodology for Study.....	2-1
2.1 Study Approach and Key Assumptions	2-1
2.2 Investigations and Research	2-1
2.3 Identification of Site Advantages and Disadvantages	2-2
3. Results and Findings.....	3-1
3.1 Capital Costs.....	3-1
3.1.1 Base Facility Capital Costs.....	3-1
3.1.2 Capital Cost for Site Services.....	3-1
3.1.3 Storm Water Management Costs.....	3-3
3.1.4 Land Costs.....	3-3
3.1.5 Other Capital Costs	3-3
3.1.6 Summary of Site-Specific Capital Costs	3-4
3.2 Operating Costs	3-5
3.2.1 Base Facility Operating and Maintenance Costs	3-5
3.2.2 Annual Haul Costs	3-6
3.2.3 Mitigation and Monitoring Requirements	3-7
3.2.4 Distance from Potential Markets	3-7
4. Identification of Preliminary Site Advantages and Disadvantages.....	4-1
5. Summary and Conclusion.....	5-1

List of Tables

Table 1.1	Comparative Evaluation Criteria to be used in the Evaluation of the Short-List of Sites and Applicable Reports.....	1-9
Table 1.2	Economic/Financial Considerations: Criteria and Indicators	1-10
Table 2.1	Ranking System for Advantages and Disadvantages.....	2-3
Table 3.1	Base Facility Capital Costs Estimates.....	3-1
Table 3.2	Cost of Road Improvements (from <i>Report on Potential Traffic Impacts</i>)	3-1

Table 3.3	Cost of Water Supply Connections (from <i>Appendix B to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility</i>) 3-2
Table 3.4	Cost of Sewer Connections (from <i>Appendix B to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility</i>) 3-2
Table 3.5	Cost of Natural Gas Connection (from <i>Appendix C to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility</i>) 3-2
Table 3.6	Cost of Electrical Grid Connection (from <i>Appendix A to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility</i>) 3-2
Table 3.7	Storm Water Management Costs (from the <i>Report on Potential Water Quality Impacts</i>) 3-3
Table 3.8	Land Acquisition Costs..... 3-3
Table 3.9	Summary of Site Specific Capital Costs – Lower Cost Assumptions 3-4
Table 3.10	Summary of Site Specific Capital Costs – Higher Cost Assumptions..... 3-5
Table 3.11	Base Facility Operating Cost Estimates..... 3-6
Table 3.12	Relative Cost Savings: Annual Haul Costs for 150,000 tpy Residual Waste 3-6
Table 3.13	Relative Cost Savings: Annual Haul Costs for 250,000 tpy Residual Waste 3-6
Table 4.1	Summary of Technical Considerations – Application of Short List Evaluation Criteria. 4-1
Table 5.1	Summary Table — <i>Economic and Financial Considerations: Capital Costs, Operation and Maintenance Costs</i> - Relative Advantages and Disadvantages 5-1

List of Figures

Figure 1-1	Overview of the Facility Siting Process..... 1-5
------------	--

Appendices

Appendix A	Technical Memorandum on Haul Cost Analysis
------------	--

1. Introduction

1.1 Overview of the Durham/York Residual Waste EA Study

Durham and York Regions (the Regions) have partnered to undertake a joint Residual Waste Planning Study. Both municipalities are in need of a solution to manage the solid waste that remains for disposal after diversion (residual or post-diversion waste). The Regions are working together to address the social, economic, and environmental concerns of residents through an Environmental Assessment (EA) Study process to examine potential long-term residual waste management alternatives.

Shared Issues

Even with the expanded diversion efforts, Durham and York continue to face the challenge of managing residual waste that cannot be currently diverted. Both Regions face a shortage of available landfill capacity over the long term. In response to the closing of existing landfill sites in the Greater Toronto Area (GTA) and the inability to develop new landfill capacity, Durham and York, along with other GTA municipalities, were forced to enter into contracts for the export of their residential waste to disposal facilities located primarily in the State of Michigan. On August 31, 2006 Michigan Senators announced they had reached an agreement with the Province of Ontario to end shipments of Municipal Solid Waste (MSW) to Michigan by 2010. Following 2010, Ontario Municipalities including Durham and York will no longer have the option of disposal of MSW in Michigan landfills.

Shared Opportunities

Facing common waste disposal issues, the Regions are acting to implement, as quickly as possible, a Durham/York based solution that: is socially and politically acceptable to both communities; maximizes environmental protection; and, fosters the wise management of potential resources which are currently lost by way of landfill in Michigan. In addition to solving long-term, residual waste management issues, Durham and York recognize the growing need for additional sources of energy generation in Ontario. Both Regions recognize that there is an opportunity associated with the utilization of the waste stream as a fuel source to produce energy and have identified this opportunity as a key benefit associated with the subject waste disposal EA Study.

1.2 The Environmental Assessment Act

An EA Study provides a planning approach where environmental constraints or opportunities are considered in the context of the broadly defined environment (i.e. the natural environment as well as the social, economic and heritage and other environments relevant to the undertaking) and potential effects are understood and addressed before development occurs. Since the enactment of the Environmental Assessment Act (EAA) in the 1970s, the environmental assessment (EA) process has evolved into the completion of a decision-making process that is carried out in consultation with the public and other interested parties. The EA process evaluates: alternatives considering potential effects on the environment; the availability of mitigative measures that address, in whole or in part, the potential effects; and, the comparison of the advantages and disadvantages of the remaining or net effects. The result of this process provides

the planning rationale and support for a preferred approach and method to implement the undertaking.

This process can be considered as consisting of three parts:

PART A – The EA Terms of Reference

PART B – The Evaluation of “Alternatives To” the Undertaking

PART C – The Evaluation of “Alternative Methods” of Implementing the Undertaking

1.2.1 The EA Terms of Reference

Under the EA Act, an Environmental Assessment (EA) Terms of Reference must be prepared and submitted to the Minister of the Environment for approval before an EA Study can be undertaken. The purpose of the EA Terms of Reference is to describe in a clear and concise manner the purpose of the proposed undertaking and how the proponent intends to carry out an environmental assessment. This description includes the proposed evaluation methodology and criteria for the evaluation of alternatives, including, in this case, the process to be applied in the identification of a preferred site. The EA Terms of Reference, once finalized and approved by the Minister of the Environment, becomes the guiding document for the completion of the environmental assessment study and the EA documentation. On March 31, 2006, the Durham/York Residual Waste EA Terms of Reference¹ was approved by the Minister of the Environment.

The purpose of the undertaking (i.e. what the outcome of this EA Study is intended to do) as described in the approved EA Terms of Reference is:

“To process - physically, biologically and/or thermally - the waste that remains after the application of both Regions’ at-source waste diversion programs in order to recover resources - both material and energy - and to minimize the amount of material requiring landfill disposal.

In proceeding with this undertaking only those approaches that will meet or exceed all regulatory requirements will be considered.”

The following report has been prepared as part of a series of supporting documentation, to document the process followed and analysis undertaken in support of the identification of a preferred “Alternative Method”. A copy of the approved EA Terms of Reference document may be obtained from the study website, www.durhamyorkwaste.ca.

1.2.2 The Evaluation of “Alternatives To” (i.e. Technologies)

The evaluation of “Alternatives To” the undertaking serves as the first step in the completion of the Durham/York Residual Waste EA. “Alternatives To” are defined as fundamentally different ways of managing waste and achieving the purpose of the undertaking. To fully address the purpose of the undertaking, different waste management approaches capable of processing and recovering resources from post-diversion waste were combined into alternative residuals

¹ Durham/York Residual Waste Study - Approved Environmental Assessment Terms of Reference, March 31, 2006.

processing systems. The Study EA Terms of Reference established that alternative systems comprised of the following approaches and technologies would be formulated and evaluated:

- Mechanical Treatment;
- Biological Treatment; and
- Thermal Treatment.

The following four alternative systems were formulated using the alternative processing approaches from the approved EA Terms of Reference:

- System 1 - Mechanical and Biological Treatment with Biogas Recovery.

This system includes mechanical processing of the post-diversion waste to recover any remaining recyclable materials and to separate out the organic fraction for biogas generation via anaerobic digestion. The biogas would be combusted to produce electricity and heat. The stabilized residue from this system would be disposed in a landfill.

- System 2(a) – Thermal Treatment of Mixed Waste with Recovery of Materials from the Ash / Char.

This system involves the thermal treatment (by combustion, gasification or pyrolysis) of the post diversion waste to produce electricity and heat. The resulting ash would be processed to recover metals for recycling, with the remaining ash disposed in a landfill.

- System 2(b) – Thermal Treatment of Solid Recovered Fuel

This system includes mechanical and possibly biological processing (composting) of the post diversion waste to recover recyclable materials and produce a solid recovered fuel (SRF). The SRF is then thermally treated (by combustion, gasification or pyrolysis) to produce electricity and heat. The residues from the processing of the residual waste and ash/char from the thermal treatment process would be disposed in a landfill.

- System 2(c) – Thermal Treatment of Solid Recovered Fuel with Biogas Recovery

This system includes mechanical processing of the post diversion waste to recover recyclable materials, to separate out the organic fraction for biogas generation via anaerobic digestion and to produce a solid recovered fuel (SRF). Electricity and heat are produced through combustion of the biogas and thermal treatment of the SRF. The residues from the processing of the residual waste, stabilized anaerobic digestion residue and ash/char from the thermal treatment process would be disposed in a landfill.

On May 30, 2006 the report entitled the “Evaluation of “Alternatives To” and Identification of the Preferred Residuals Processing System” was released, documenting the results of the evaluation of the alternative systems. Based on the consideration of relative advantages and disadvantages and the environmental priorities established through public and agency consultation, the preferred long-term residuals processing system was identified as *System 2(a) – Thermal Treatment of MSW and Recovery of Energy followed by Recovery of Materials from the Ash/Char.*

System 2(b) also exhibited an acceptable range of advantages and disadvantages. For some of the criteria where System 2(b) did not rank equivalent to 2(a), (technical risks, costs and legal/contractual risks for example), the determination of the relative advantages and disadvantages was based upon the information that was readily available on both the mechanical and biological processes that are being used to recover solid fuel in other jurisdictions and on the thermal technologies that can process this fuel. Many of the technologies that could be used to thermally treat the solid recovered fuel (e.g., gasification) in System 2(b) are regarded as new technologies, with active research and development, but are less proven than the technologies that are currently available to combust residual waste in System 2(a).

In June 2006, Durham and York Regional Councils approved System 2(a) as the preferred residuals processing system and determined the competitive process should allow for the submission of proposals to implement either System 2(a) or System 2(b), and that the final decision on the technologies be based on the results of this competitive process.

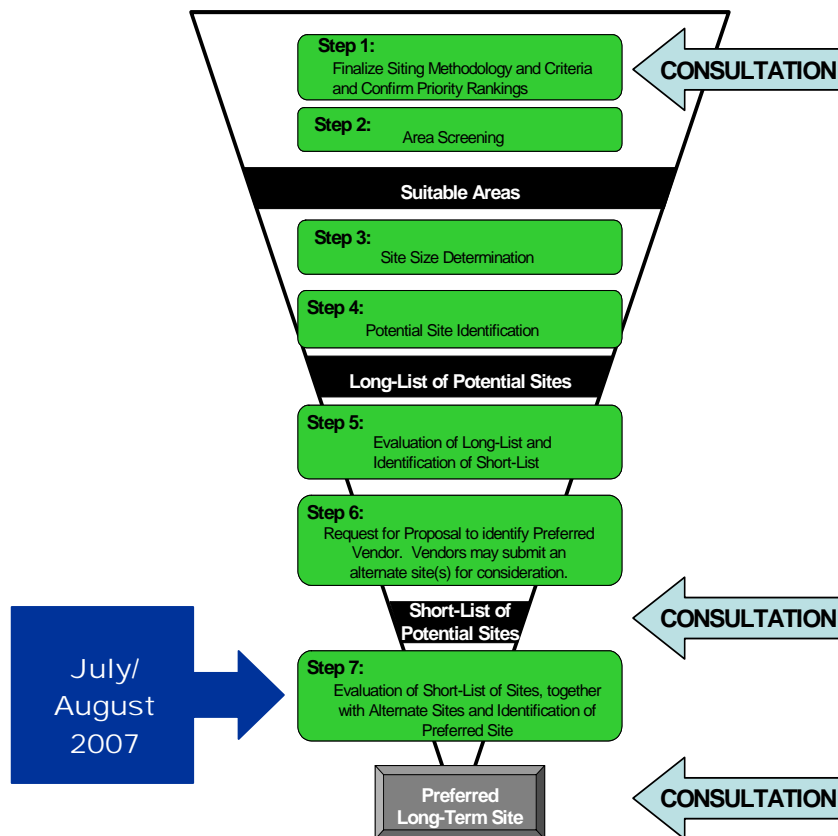
1.3 The Evaluation of “Alternative Methods” (i.e. Facility Siting)

Following the identification of a preferred technology, a seven-step facility site selection process, outlined in Figure 1-1 below was initiated to identify a preferred site for development of the preferred Durham/York residual waste processing system (i.e. a new thermal treatment facility). The step-by-step methodology for siting a residual waste processing facility was originally presented in approved EA Terms of Reference and Background Document 2-3² (prepared as supporting documentation to the approved EA Terms of Reference).

The proposed methodology and criteria were confirmed with agencies, stakeholders and the public through a series of information sessions, workshops, and polling activities in September 2006. Generally, the site selection methodology and criteria, outlined in the approved EA Terms of Reference, were confirmed by the consultation participants.

² Durham/York Residual Waste Study - Background Document 2-3 “Consideration of Alternative Methods of Implementing the Undertaking”, December 16, 2005.

Figure 1-1 Overview of the Facility Siting Process



Completion of Steps 1 thru 5 of the above siting process resulted in the identification of six (6) Short-List sites to undergo a further detailed evaluation process. For a more detailed account of the steps taken to identify a Short-List of sites, please refer to the report entitled “Draft Report - Thermal Facility Site Selection Process Results of Steps 1-5 Identification of the “Short-List” of Alternative Sites, March 2007”³ available at www.durhamyorkwaste.ca.

Following issuance of the draft report identifying the Short-List of sites, two of the six sites were removed from consideration. Site Clarington 02 was removed from the Short-List as the land use designation for the property changed in late March 2007 such that the site no longer met Step 2 evaluation criteria. Site Clarington 03 was removed from the Short-List as the site was withdrawn from consideration by the private owner of the property, such that this site could no longer be considered a willing seller property.

1.4 The Short-List of Sites

The following provides a more detailed description of each of the remaining four (4) alternative sites on the Short-List.

³ Draft Report - Thermal Facility Site Selection Process Results of Steps 1-5 Identification of the “Short-List” of Alternative Sites, March 2007

1.4.1 Short-List Site: Clarington 01

Site Clarington 01 is undeveloped land owned by the Region of Durham, south of Hwy 401 in the Municipality of Clarington. The site is located on the west side of Osbourne Road north of a CN Rail corridor. There are commercial properties north of the site. The lands east and west of the site are undeveloped and are currently used for agricultural purposes. The Courtice Water Pollution Control Plant, which is scheduled to be completed in 2007, is being built just south of the site. The Darlington Nuclear Generating Station is located approximately 0.5 km to the east. The nearest major intersection is Hwy 401 and Courtice Road, which is approximately 1.7 km from the site. The site is approximately 12.4 hectares in area and is located in the Clarington Energy Park.

1.4.2 Short-List Site: Clarington 04

Site Clarington 04 is privately owned undeveloped land, south of Hwy 401 between Bennett road and South Service Road, in the Municipality of Clarington. The lands east and west of the site are undeveloped and are currently used for agricultural purposes. A CN Rail corridor is located south of the site. There are commercial properties located on east and west, non-adjacent sides of the property. A number of residences and farms are located north of the property on the north side of Hwy 401. The nearest major intersection is Hwy 401 and Bennett Road, which is approximately 1.1 km from the site. The site size is approximately 14.8 hectares.

1.4.3 Short-List Site: Clarington 05

Site Clarington 05 is privately owned undeveloped land, south of Hwy 401 between Courtice Road and Osbourne Road, in the Municipality of Clarington. Commercial properties are located north of the site, north of Hwy 401. A CN Rail corridor is located south of the site. The lands east and west of the site are undeveloped and are currently used for agricultural purposes. The nearest major intersection is Hwy 401 and Courtice Road, which is approximately 0.2 km from the site. The site size is approximately 27.2 hectares. This site is located in the Clarington Energy Park.

1.4.4 Short-List Site: East Gwillimbury 01

Site East Gwillimbury 01 is owned by York Region and is located in the Town of East Gwillimbury, 2.6 km from the nearest major intersection – Hwy 404 and Davis Drive. The site is undeveloped land surrounded by commercial/ industrial properties to the West, East, and South. The York Region Waste Management Centre consists of a new Materials Recycling Facility and Waste Transfer Station, and is located immediately West of the site. York Region also owns the lands immediately east of the site. The Household Hazardous Waste and Recycling Depot are situated south of the site. The land north of the site is undeveloped and is currently used for agricultural purposes. The site is approximately 11.5 hectares in size.

1.5 Step 7: Evaluation of the Short-List Sites

Following consultation on the Short-List of sites, a detailed comparative evaluation of the sites was initiated. This assessment considers the sites as well as the haul routes, transfer requirements and requirements for additional infrastructure to develop the sites.

Step 7 entails a comparative evaluation of the identified sites utilizing criteria and indicators to measure potential effects within the above categories. There are different methods (qualitative, quantitative or a combination of both) that can be used to evaluate the sites. There is no requirement to apply any specific methodology except that the process must be rational, traceable and replicable and must consider advantages and disadvantages based on a net effects analysis of alternatives. This methodology is commonly applied to address the approval requirements of the EAA and promotes the selection of siting preferences considering relative advantages and disadvantages based on net effects after the application of reasonably available mitigative measures.

The evaluation criteria applied at this Step have been assembled under 5 categories:

1. Public Health and Safety and Natural Environment (High Priority);
2. Social and Cultural (Medium Priority);
3. Economic / Financial (Medium Priority);
4. Technical Suitability (Medium Priority); and
5. Legal (Low Priority).

The priorities for each category of criteria were determined based on the results of consultation in Step 1 of the facility siting process.

This net effects analysis consists of the following steps:

1. Undertake data collection and apply the comparative evaluation criteria to each of the Short-List sites. Potential effects to the environment would be identified based on the application of the comparative evaluation criteria. The net effects analysis will initially be carried out based on secondary data sources (i.e., Official Plans, aerial photographs, existing base maps and limited field reconnaissance).
2. Consider measures that may be reasonably applied to mitigate potential effects identified in the previous step for each site. The result of this step will be the identification of net or post-mitigation effects for each of the sites.
3. Compare the net effects associated with each site and establish the relative advantages and disadvantages of each site. Under each criterion, sites would receive a ranking based on the comparative analysis against the other sites, ranging as follows:
 - Major Advantage
 - Advantage
 - Neutral
 - Disadvantage
 - Major Disadvantage.

The site that best meets the objective of the criterion would be identified as having a major advantage and the site that least meets the objective of the criterion a major disadvantage. It is not intended that specific ranges would be predetermined for the

ranking; instead they will be developed based on a comparison between the Short-List sites. For this study, a qualitative evaluation methodology will be applied which considers tradeoffs between sites using professional judgment in the context of priorities set by the community.

4. The rankings will be recorded in a summary table and overall rankings for each of the five categories of criteria will be established based on the advantages and disadvantages of the sites. The preferred site will be the one with the preferred balance of advantages and disadvantages relative to the established category priorities and rankings. This decision will be based on the priorities and professional judgment exercised by both Regions and in consideration of the technical database, advice from technical experts and input received from stakeholders (i.e., public, neighbours, agencies, etc.).

Ultimately the selection of the preferred site will be subject to approval by both Regional Councils.

1.6 Overview of Preferred Site Supporting Documentation

A series of documents are being prepared to provide the necessary background and rationale in support of the identification of the Preferred Site. Each of these documents address one or more of the Short-List Evaluation Criteria as set out in Table 1.1.

Table 1.1 Comparative Evaluation Criteria to be used in the Evaluation of the Short-List of Sites and Applicable Reports

Environmental Considerations	Evaluation Criteria	Applicable Report
Public Health & Safety and Natural Environment Considerations	Potential Air Quality Impacts	Report on Potential Air Quality Impacts
	Potential Water Quality Impacts (Surface Water and Groundwater)	Report on Potential Water Quality Impacts (Surface Water and Groundwater)
	Potential Environmentally Sensitive Areas and Species Impacts Potential Aquatic and Terrestrial Ecology Impacts	Potential Environmentally Sensitive Areas and Species Impacts and Potential Aquatic and Terrestrial Ecology Impacts
Social and Cultural Considerations	Compatibility with Existing and/or Proposed Land Uses Potential Impact on Residential Areas Potential Impact on Parks and Recreational Areas Potential Impact on Institutional Facilities or Areas	Report on Compatibility with Existing and/or Proposed Land Uses
	Potential Impact on Archaeological and Cultural Resources	Report on Archaeological and Cultural Resources
	Potential Traffic Impacts	Report on Potential Traffic Impacts
Economic / Financial Considerations	Operation and Maintenance Costs for Facility(ies) Capital Costs to develop Facility(ies)	Report on Capital Costs, Operation and Maintenance Costs
Technical Considerations	Compatibility with Existing Infrastructure Design/operational flexibility provided by site	Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility
Legal Considerations	Complexity of Required Approvals Complexity of Required Agreements	Report on Complexity of Required Approvals and Agreements

Indicators have been identified for each of the above criteria and have been used to determine the advantages and disadvantages for each of the sites. Applicable indicators for the criteria addressed in this report are noted in section 1.7.

1.7 Purpose of this Report

This draft report entitled *Application of Short-List Evaluation Criteria – Economic/Financial Considerations - Capital costs, Operation and Maintenance costs* has been prepared to identify the capital and operating costs, unique to each Short-List site, associated with building and operating a thermal treatment facility on that site. These site-specific costs are in addition to the basic costs of building and operating the facility, which are common to all sites.

This report will form part of the supporting documentation and materials for stakeholder consultation in the evaluation of Alternative Methods and identification of the preferred facility location for the Durham/York Residual Waste Study. Public and agency input received on this

draft report will be considered when moving forward in the process and when preparing the EA approval documentation.

Specifically, this document addresses the Economic/Financial requirements as identified in the approved EA Terms of Reference⁴, Appendix F, Table F-3 under the category of Environmental Considerations –Economic/Financial Considerations and the Preliminary Evaluation Criteria – Operation and Maintenance costs for Facility(ies) and Capital Costs to develop Facility(ies) as indicated below.

Table 1.2 Economic/Financial Considerations: Criteria and Indicators

Economic / Financial		
Criteria	Indicator	Rationale
Capital Costs	Site development costs, including: infrastructure required, upgrades to existing infrastructure (roads, sewers, etc.), property acquisition and possible site remediation.	Sites with lower development costs would be more economically feasible.
Operation and Maintenance Costs	Distance from waste generation points, transfer stations (e.g., length of haul route), annual operating costs and maintenance costs.	Impact of facility on Durham and York's financial resources must be assessed and deemed affordable.
	Mitigation requirements	Anticipated costs with respect to the mitigation of potential impacts. (i.e., may include site development costs, site maintenance costs, etc).
	Monitoring requirements	Anticipated costs to maintain required monitoring programs. (i.e., sites closer to environmentally sensitive features in a rural environment may require additional monitoring efforts than sites located in a developed urban/industrial area.)
	Distance from potential markets for sale of marketable materials (i.e. heat, electricity, recovered metals, etc.).	Sites that are closer to potential markets have the potential for reduced Operations and Maintenance costs.

⁴ Durham/York Residual Waste Study - Approved Environmental Assessment Terms of Reference, March 31, 2006.

2. Methodology for Study

2.1 Study Approach and Key Assumptions

The new Durham/York thermal treatment facility is expected to manage either 150,000 tonnes per year (tpy) or 250,000 tpy of residual waste at the beginning of the planning period depending on the residual waste disposal needs of both municipalities and the availability of waste from neighboring municipal jurisdictions. The maximum tonnage scenario for a Durham/York thermal facility is 400,000 tpy, and represents potential waste quantities and future expansion requirements towards the end of the 35-year planning period.

The site-specific capital, operating and maintenance costs, for the comparison and evaluation of the Short-List sites, were determined based on the following assumptions:

- The capital costs for site servicing requirements (water supply, sanitary sewer connection, natural gas and electrical grid connections) were based on the initial construction of a facility processing up to 250,000 tonnes per year. This facility size represents the most likely level of servicing that would be sought to implement the Durham/York thermal treatment facility at the beginning of the planning period. The need for infrastructure improvements to service a 400,000 tpy facility will be assessed in the future at the time such an expansion is being considered.
- The capital costs for stormwater management were based on the maximum potential facility size of 400,000 tonnes per year, as during initial construction the incremental cost to develop the required stormwater infrastructure for this facility size is reasonable.
- The capital costs for the purchase of the sites (if applicable) were based on purchase of the entire area of the sites. Only a portion of the sites may be required for the first phase of the thermal treatment facility at the beginning of the planning period, however, the entire site area will be required for expansion to 400,000 tpy.
- Estimates for the capital costs associated with necessary road upgrades to accommodate truck traffic for the sites would apply to any of the facility site scenarios, in order to accommodate future traffic requirements in the area.
- The annual operating cost savings associated with the haul of residual waste to each of the Short-List sites, compared to hauling it to remote landfills and other facilities, was estimated for the management of 150,000 and 250,000 tpy of residual waste. Appendix A to this report provides details on the haul cost analysis. The haul cost analysis depended on factors such as, where the waste is coming from and the type of truck used to deliver the waste. These factors were known for the 150,000 and 250,000 facility sizes, however as they were unknown for a 400,000 tpy facility, an accurate prediction of the haul costs for this size of facility could not be made.

2.2 Investigations and Research

The following site-specific capital costs items were addressed in this evaluation:

- Road improvements, derived from the *Report on Potential Traffic Impacts*;

- Water supply connection, derived from *Appendix B to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility*;
- Sewer connection, derived from *Appendix B to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility*;
- Natural gas connection, derived from *Appendix C to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility*;
- Electrical grid connection, derived from *Appendix A to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility*;
- Stormwater management infrastructure, derived from the *Report on Potential Water Quality Impacts*; and
- Land acquisition (for privately owned) sites calculated based on facility site sizes and investigations into property values in the Town of Clarington.

In general terms these capital costs were estimated by determining an appropriate unit cost (e.g., cost per metre of road improvement) and then multiplying this unit cost by the length/size of the required infrastructure (e.g. metres of road improvement). Details regarding the methodology used to determine the appropriate unit costs are included in the relevant supporting documents that provide details on these costs.

In regards to site-specific operations and maintenance costs:

- Site-specific cost savings associated with the reduced haul of waste were determined, and documented in detail in Appendix A to this report “Technical Memorandum: Haul Cost Analysis”;
- The supporting documentation for the comparative evaluation of sites was reviewed to determine if there were site-specific issues related to mitigation or monitoring requirements or the distance to potential markets for the sale of products from a thermal treatment facility.

2.3 Identification of Site Advantages and Disadvantages

The Short-List evaluation process involved a ‘net effects analysis’ of the four (4) Short-List siting alternatives. A ‘net effects analysis’, which is a requirement of the Environmental Assessment Act, was identified in the methodology (see Section 1.5 of this report) and included in the approved EA Terms of Reference. The methodology involves the following:

- First, the comparative evaluation criteria (identified in Table 2.1) are applied to the alternatives and the range of potential effects resulting from this application is identified.
- Second, each potential effect is reviewed and where applicable a determination made, as to whether or not mitigative measures exist that could be applied to offset or eliminate the potential effect. In the case of a positive effect, enhancement measures may be considered to increase the benefit.
- Finally, the remaining, or ‘net’ effects are tabulated for consideration further in the evaluation process.

The intent of this exercise is to ensure that all alternatives are being reviewed in the context of best practices or best available technology – provided these measures are reasonably available and can be reasonably applied to the undertaking.

Step 7 of the evaluation process focused on the identification of relative advantages and disadvantages for each of the four (4) Short-List sites. These were identified based on the net effects for each site identified and a comparison of these net effects is intended to, in essence, establish a ranking of systems under each comparative consideration. The process of differentiating between what constitutes an advantage or disadvantage is outlined below:

Table 2.1 Ranking System for Advantages and Disadvantages

Ranking	Description
Major Advantage	A major advantage was identified for any site with the significant ability to meet the evaluation criteria when compared with the other sites.
Advantage	An advantage was identified for any site with the ability to meet the evaluation criteria when compared with the other sites.
Neutral	Neutral was identified for any sites that showed no advantage or disadvantage after the application of the evaluation criteria when compared with the other sites.
Disadvantage	A disadvantage was identified for any site with the inability to meet the evaluation criteria when compared with the other sites.
Major Disadvantage	A major disadvantage was identified for any site with the significant inability to meet the evaluation criteria when compared with the other sites.

The rankings for the sites in regards to their potential economic and financial impacts were developed based on the relative comparison of the Short-List sites.

3. Results and Findings

3.1 Capital Costs

3.1.1 Base Facility Capital Costs

Presently two initial sizes for the initial facility are presently being considered a 150,000 and a 250,000 tonnes per year facility. In order to put the site-specific capital cost estimates into perspective a first order estimate of the base facility capital costs, that would be common to all the sites presently being considered is provided in Table 3.1. These costs are based on an assumed mass burn combustion technology for which recent capital cost data is available. These capital cost estimates were developed by GENIVAR, based on the range of capital cost information provided by Ramboll of Denmark and several technology vendors. These capital cost estimates are not specific to any one technology vendor or company.

Table 3.1 Base Facility Capital Costs Estimates

Item	150,000 Tonnes per year Facility	250,000 Tonnes per year Facility
General Site Works	\$4,410,000	\$6,560,000
Building	\$13,240,000	\$19,690,000
Thermal Processing Equipment	\$74,170,000	\$110,250,000
Energy Production Equipment	\$21,190,000	\$31,500,000
Flue Gas Cleaning System	\$35,320,000	\$52,500,000
Ash Processing System	\$6,180,000	\$9,190,000
Total	\$154,510,000	\$229,690,000

3.1.2 Capital Cost for Site Services

The capital costs for site services include costs associated with road improvements, water and sewer connections, natural gas supply, and connections to the electrical grid. Details on the provision of most of these servicing requirements are provided in Appendices A to C to the *Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility*. Details on the required road improvements are provided in the *Report on Potential Traffic Impacts*.

The capital costs estimated for site services are provided in the following Tables 3.2 through 3.6.

Table 3.2 Cost of Road Improvements (from Report on Potential Traffic Impacts)

Short-List Site	Length of Required Road Improvement (m)	Estimated Cost of Road Improvement
Clarington 01	1,200	\$900,000
Clarington 04	500	\$375,000
Clarington 05	400	\$300,000
East Gwillimbury 01	0	\$0

Table 3.3 Cost of Water Supply Connections (from Appendix B to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility)

Short-List Site	Length of Required Water Connection (m)	Estimated Cost of Water Connection
Clarington 01	4,000	\$2,300,000
Clarington 04	2,000	\$2,235,000
Clarington 05	4,500	\$2,588,000
East Gwillimbury 01	50	\$50,000

Table 3.4 Cost of Sewer Connections (from Appendix B to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility)

Short-List Site	Length of Potential Sewer Connection (m)	Cost of Potential Sewer Connection*
Clarington 01	300	\$300,000
Clarington 04	2,500	\$2,125,000
Clarington 05	1,300	\$1,105,000
East Gwillimbury 01	7,000	\$7,570,000

* Note: sanitary sewer connections may not be required for any of the sites if the facility design is based on the use of 'dry' air pollution control technologies and zero process wastewater discharge.

Table 3.5 Cost of Natural Gas Connection (from Appendix C to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility)

Short-List Site	Length of Required Natural Gas Connection (m)	Low Cost for Natural Gas Connection	High Cost for Natural Gas Connection
Clarington 01	3,000	675,000	\$1,350,000
Clarington 04	4,000	750,000	\$1,500,000
Clarington 05	2,600	600,000	\$1,200,000
East Gwillimbury 01	0	50,000	\$50,000

Table 3.6 Cost of Electrical Grid Connection (from Appendix A to the Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility)

Short-List Site	Cost of basic connection to 44 kV circuit at site	Length of additional 44 KV transmission line possibly required (m)**	Cost of additional 44 kV transmission line possibly required**
Clarington 01	\$3,350,000	13,500	\$2,700,000
Clarington 04	\$3,350,000	22,500	\$4,500,000
Clarington 05	\$3,350,000	12,500	\$2,500,000
East Gwillimbury 01	\$3,350,000	0	\$0

**Note: although there are 44 KV circuits running past all the sites, wind projects are being developed in proximity to the Clarington sites and the existing circuits may not have sufficient capacity to receive all the power from the thermal treatment facility. If this is the case a new circuit will be required to connect the facility to the Wilson Transformer Station.

3.1.3 Storm Water Management Costs

Surface water run-off at each of the Short-List sites must be managed in accordance with specific requirements. Details on these requirements and cost estimates for the required stormwater management infrastructure are provided in the *Report on Potential Water Quality Impacts*. The estimated capital cost of the required stormwater management facilities is summarized in Table 3.7.

Table 3.7 Storm Water Management Costs (from the *Report on Potential Water Quality Impacts*)

Short-List Site	Cost of Stormwater Management Infrastructure
Clarington 01	\$400,000
Clarington 04	\$350,000
Clarington 05	\$370,000
East Gwillimbury 01	\$370,000

3.1.4 Land Costs

The Clarington 04 and 05 sites are privately owned and if selected as the preferred site would have to be purchased. Region of Durham staff, based on a discussion with a real estate appraiser/broker, estimate that the purchase price for these lands would be approximately \$50,000 to \$60,000 per acre. Table 3.8 provides an estimate of the potential land acquisition costs.

Table 3.8 Land Acquisition Costs

Short-List Site	Site Area	Land Cost at \$50k per Acre	Land Cost at \$60k per Acre
Clarington 01	12.4 ha (30.6 acres)	\$0	\$0
Clarington 04	14.8 ha (36.6 acres)	\$1,853,000	\$2,223,000
Clarington 05	27.2 ha (67.2 acres)	\$3,384,000	\$4,061,000
East Gwillimbury 01	11.5 ha (28.4 acres)	\$0	\$0

3.1.5 Other Capital Costs

At certain sites, particularly the Clarington 01 and Clarington 05 sites, it may be possible to develop a district heating system and supply heat to neighbouring buildings. This potential is discussed in qualitative terms in the *Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility*. This possibility is not sufficiently well defined at this time to develop site-specific cost estimates.

The *Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility* also identifies the potential for shared infrastructure:

- For Clarington 01 and 05 in regards to the surrounding energy park development regarding interconnections for electricity, natural gas, potable water and wastewater; and

- For East Gwillimbury 01 in regards to using the weigh scales, some of the onsite roads and visitor parking areas at the blue box material recovery facility (MRF) located at the adjacent York Region’s Waste Management Centre.

The potential costs or savings associated with shared infrastructure have not been sufficiently well defined at this time to develop site-specific cost estimates.

No other site-specific capital costs have been identified at this stage in the environmental assessment.

It should be noted that once a preferred site is selected and specific site servicing plans are developed, the provision of services to other potential developments will likely also be considered. These broader considerations may lead to the construction of infrastructure that is different from that assumed in the study. These differences (e.g. the installation of larger pipes) may lead to actual costs that are different from those identified in the report.

3.1.6 Summary of Site-Specific Capital Costs

Table 3.9 provides a summary of site-specific capital cost estimates under a low-cost set of assumptions including:

- The facility is designed to have zero process waste water discharge and a sewer connection is not required (alternatively additional facility capital costs may be incurred to build a facility with zero waste water discharge);
- A portion of the natural gas supply pipeline costs would be recovered by Enbridge through gas rates and only half of the estimated pipeline costs would be incurred directly by Durham/York;
- An additional 44KV transmission line is not required to connect the Clarington sites to the electrical grid; and
- Land is priced at the lower price per acre estimate.

Table 3.9 Summary of Site Specific Capital Costs – Lower Cost Assumptions

Item	Clarington 01	Clarington 04	Clarington 05	East Gwillimbury 01
Road Construction	\$900,000	\$375,000	\$300,000	\$0
Water Connection	\$2,300,000	\$2,235,000	\$2,588,000	\$50,000
Sewer Connection	\$0	\$0	\$0	\$0
Natural Gas Connection	\$675,000	\$750,000	\$600,000	\$50,000
Base Electrical Connection	\$3,350,000	\$3,350,000	\$3,350,000	\$3,350,000
Additional 44kV Transmission Line	\$0	\$0	\$0	\$0
Storm Water Management Facility	\$400,000	\$350,000	\$370,000	\$370,000
Land Acquisition @\$50,000 per acre	\$0	\$1,853,000	\$3,384,000	\$0
Other Site Specific Costs	\$0	\$0	\$0	\$0
Total Site Specific Capital Costs	\$7,625,000	\$ 8,913,000	\$ 10,592,000	\$ 3,820,000

Table 3.10 provides the corresponding site-specific capital cost estimates under more conservative higher capital cost assumptions including:

- Sanitary sewer connections are required at all sites;
- An additional 44kV transmission line is required to connect the Clarington sites to the electrical grid; and
- Higher land price estimates.

Table 3.10 Summary of Site Specific Capital Costs – Higher Cost Assumptions

Item	Clarington 01	Clarington 04	Clarington 05	East Gwillimbury 01
Road Construction	\$900,000	\$375,000	\$300,000	\$0
Water Connection	\$2,300,000	\$2,235,000	\$2,588,000	\$50,000
Sewer Connection	\$300,000	\$2,125,000	\$1,150,000	\$7,570,000
Natural Gas Connection	\$1,350,000	\$1,500,000	\$1,200,000	\$50,000
Base Electrical Connection	\$3,350,000	\$3,350,000	\$3,350,000	\$3,350,000
Additional 44kV Transmission Line	\$2,700,000	\$4,500,000	\$2,500,000	\$0
Storm Water Management Facility	\$400,000	\$350,000	\$370,000	\$370,000
Land Acquisition @\$60,000 per acre	\$0	\$2,223,000	\$4,061,000	\$0
Other Site Specific Costs	\$0	\$0	\$0	\$0
Total Site Specific Capital Costs	\$11,300,000	\$16,658,000	\$15,474,000	\$11,390,000

3.2 Operating Costs

3.2.1 Base Facility Operating and Maintenance Costs

Table 3.11 provides a first order estimate of the base annual facility operating and maintenance costs that would be common to all the sites presently being considered, for a thermal treatment facility processing 150,000 tpy and 250,000 tpy of residual waste. These operating costs are based on mass burn combustion technologies for which there is recent data on operating costs. The operating and maintenance cost estimates were developed by GENIVAR based on a range of information provided by Ramboll of Denmark and several technology vendors. These operating and maintenance cost estimates are not specific to any one technology vendor or company.

This information is provided to put the identified site-specific costs into perspective. These are gross annual costs and will be offset in part, by revenues from the sale of energy and recovered metals.

Table 3.11 Base Facility Operating Cost Estimates

Annual Operating Costs	150,000 Tonnes per year Facility	250,000 Tonnes per year Facility
Labour & Administration	\$2,245,000	\$3,337,000
Utilities & Supplies	\$3,143,000	\$4,672,000
Routine Maintenance	\$2,694,000	\$4,005,000
Major Repair Fund	\$898,000	\$1,335,000
Total Direct O & M Cost	\$8,980,000	\$13,349,000
Bottom Ash Haul & Disposal*	\$1,800,000	\$3,000,000
APC Residue Haul & Disposal**	\$1,350,000	\$2,250,000
Total Annual Operating Cost	\$12,130,000	\$18,599,000

* Estimated at \$50/tonne ** Estimated at \$300/tonne

3.2.2 Annual Haul Costs

Operating costs are presently incurred to haul residual waste from existing transfer stations and collection areas to remote landfill sites such as Green Lane. The development of a thermal treatment facility in Durham or York will result in a reduction in annual haul costs relative to the cost of haul to these remote facilities.

A detailed estimate of the relative haul cost savings is provided in Appendix A of this report. Tables 3.12 and 3.13 summarize the relative cost savings for the haul of 150,000 and 250,000 tpy of residual waste.

Table 3.12 Relative Cost Savings: Annual Haul Costs for 150,000 tpy Residual Waste

Short-List Site	Durham Cost Savings	York Cost Savings	Other Municipalities Cost Savings	Overall System Cost Savings
Clarington 01	\$2,492,000	\$268,000	-\$43,000	\$2,717,000
Clarington 04	\$2,451,000	\$251,000	-\$26,000	\$2,676,000
Clarington 05	\$2,492,000	\$268,000	-\$43,000	\$2,717,000
East Gwillimbury 01	\$1,980,000	\$294,000	-\$95,000	\$2,179,000

Table 3.13 Relative Cost Savings: Annual Haul Costs for 250,000 tpy Residual Waste

Short-List Site	Durham Cost Savings	York Cost Savings	Other Municipalities Cost Savings	Overall System Cost Savings
Clarington 01	\$2,492,000	\$1,468,000	-\$43,000	\$3,917,000
Clarington 04	\$2,451,000	\$1,365,000	-\$26,000	\$3,790,000
Clarington 05	\$2,492,000	\$1,468,000	-\$43,000	\$3,917,000
East Gwillimbury 01	\$1,980,000	\$1,961,400	-\$95,000	\$3,846,400

3.2.3 Mitigation and Monitoring Requirements

As noted in Section 1.6 of this report, a series of reports have been prepared to support the comparative evaluation of the Short-List sites. These reports address issues such as air quality, surface water/groundwater, environmentally sensitive areas, land use, traffic, infrastructure requirements and approvals/agreements.

The technical analysis documented in these reports has not identified any unique or site-specific mitigation or monitoring requirements that would have an impact on the operating or maintenance costs for a Durham/York thermal treatment facility. The base operating and maintenance cost estimates provided in Section 3.2.1 of this report, include mitigation and monitoring requirements that would be common to all sites. For example, these operating and maintenance costs include those associated with the Air Pollution Control system that would be required to mitigate potential air emissions.

Conventional mitigation requirements have also been addressed in the capital cost analysis, which include the potential costs associated with stormwater management and road improvements.

3.2.4 Distance from Potential Markets

There are three primary marketable products from a thermal treatment facility:

- Electricity;
- Thermal energy (heat); and
- Recyclable materials (metals).

For the purpose of considering operation and maintenance costs all of the Short-List sites are considered equal with respect to the sale of electricity and recyclable materials.

The Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility discusses the proximity of the sites to potential markets for the thermal energy or heat loads.

The Clarington 01 and 05 sites are located in the Clarington energy park, just north of the Courtice Water Pollution Control Plant (WPCP) and could potentially market heat to industries that are located in the energy park and/or the Courtice WPCP.

The Clarington 04 site is located approximately 1 km east of the Port Darlington WPCP, and could potentially market some heat to this facility, although as noted in the *Report on Compatibility with Existing Infrastructure and Design/Operational Flexibility* this is a less viable market. There is limited potential to market heat to industrial and/or commercial developments in the surrounding area.

The East Gwillimbury 01 site is located immediately east of the York Region Materials Recycling Facility (MRF) on Garfield Wright Boulevard. There is limited potential to market heat to surrounding businesses and industries.

4. Identification of Preliminary Site Advantages and Disadvantages

In order to evaluate the four Short-List sites and determine which site is best suited for the proposed undertaking, the net effects associated with each site were compared through the application of indicators reflecting capital costs, operations and maintenance costs. This evaluation was used to establish the relative advantages and disadvantages for each site.

These advantages and disadvantages presented in Table 4.1 are based on the professional judgement of the Review Team.

Table 4.1 Summary of Technical Considerations – Application of Short List Evaluation Criteria

Criteria	Indicator	Clarington 01	Clarington 04	Clarington 05	East Gwillimbury 01
Capital Costs	Site development costs, including: infrastructure required, upgrades to existing infrastructure (roads, sewers, etc.), property acquisition and possible site remediation.	<u>NEUTRAL</u> <ul style="list-style-type: none"> Site-specific capital costs range from \$7.6 to \$11.3 million 	<u>DISADVANTAGE</u> <ul style="list-style-type: none"> Site-specific capital costs range from \$8.9 to \$16.7 million 	<u>DISADVANTAGE</u> <ul style="list-style-type: none"> Site-specific capital costs range from \$10.6 to \$15.5 million 	<u>ADVANTAGE</u> <ul style="list-style-type: none"> Site-specific capital costs range from \$3.8 to \$11.4 million
	OVERALL	NEUTRAL	DISADVANTAGE	DISADVANTAGE	ADVANTAGE
Operation and Maintenance Costs	Distance from waste generation points, transfer stations (e.g., length of haul route), annual operating costs and maintenance costs.	<u>ADVANTAGE</u> <ul style="list-style-type: none"> Annual haul cost savings of \$2.72 to \$3.92 million 	<u>ADVANTAGE</u> <ul style="list-style-type: none"> Annual haul cost savings of \$2.68 to \$3.79 million 	<u>ADVANTAGE</u> <ul style="list-style-type: none"> Annual haul cost savings of \$2.72 to \$3.92 million 	<u>NEUTRAL</u> <ul style="list-style-type: none"> Annual Haul cost savings of \$2.18 to \$3.85 million
	Mitigation requirements	<u>NEUTRAL</u> <ul style="list-style-type: none"> No site-specific mitigation requirements identified 	<u>NEUTRAL</u> <ul style="list-style-type: none"> No site-specific mitigation requirements identified 	<u>NEUTRAL</u> <ul style="list-style-type: none"> No site-specific mitigation requirements identified 	<u>NEUTRAL</u> <ul style="list-style-type: none"> No site-specific mitigation requirements identified
	Monitoring requirements	<u>NEUTRAL</u> <ul style="list-style-type: none"> No site-specific monitoring requirements identified 	<u>NEUTRAL</u> <ul style="list-style-type: none"> No site-specific monitoring requirements identified 	<u>NEUTRAL</u> <ul style="list-style-type: none"> No site-specific monitoring requirements identified 	<u>NEUTRAL</u> <ul style="list-style-type: none"> No site-specific monitoring requirements identified

Criteria	Indicator	Clarington 01	Clarington 04	Clarington 05	East Gwillimbury 01
	Distance from potential markets for sale of marketable materials (i.e. heat, electricity, recovered metals, etc.).	<u>ADVANTAGE</u> <ul style="list-style-type: none"> • Comparable to other sites in distance to electricity and recyclables markets • Close to potential market for heat 	<u>DISADVANTAGE</u> <ul style="list-style-type: none"> • Comparable to other sites in distance to electricity and recyclables markets • Limited potential market for heat 	<u>ADVANTAGE</u> <ul style="list-style-type: none"> • Comparable to other sites in distance to electricity and recyclables markets • Close to potential market for heat 	<u>DISADVANTAGE</u> <ul style="list-style-type: none"> • Comparable to other sites in distance to electricity and recyclables markets • Limited potential market for heat
	OVERALL	ADVANTAGE (advantages associated with haul cost savings and proximity to market for heat)	NEUTRAL (advantage associated with haul cost savings offset by limited market for heat)	ADVANTAGE (advantages associated with haul cost savings and proximity to market for heat)	DISADVANTAGE (no advantages to offset disadvantage related to limited market for heat)
SUMMARY		ADVANTAGE	DISADVANTAGE	NEUTRAL	NEUTRAL

5. Summary and Conclusion

In summary, the sites are listed below with associated advantages and disadvantages based on the evaluation of their suitability for the proposed project.

Clarington 01: The site-specific capital cost requirements for this site fall approximately mid-way in the range of low to high capital costs for the other sites, being generally lower than the other Clarington sites and higher than those for East Gwillimbury 01. This site has one of the highest range of haul cost savings and it is close to potential markets for heat.

Clarington 04: This site is disadvantaged in that the range of site-specific capital cost requirements for this site is one of the highest. While this site does have one of the highest range of haul cost savings, the potential markets for heat close to the site are limited.

Clarington 05: This site is disadvantaged in that the range of site-specific capital cost requirements for this site is one of the highest. In regards to operating/maintenance costs however, this site has the advantage of one of the highest range of haul cost savings and it is close to potential markets for heat.

East Gwillimbury 01: This site is advantaged in that the range of site-specific capital cost requirements for this site is the lowest. In regards to operating/maintenance costs however, this site has the disadvantage of having the lowest range of haul cost savings and limited potential markets for heat.

Clarington 01 is the only site with an overall advantage in regards to economic and financial considerations.

In regards to *Economic and Financial Considerations: Capital Costs, Operation and Maintenance Costs*, based on the results of the assessment described above, it is proposed that the relative advantages and disadvantages of the Short-List sites be as outlined in Table 5.1 below.

Table 5.1 Summary Table — Economic and Financial Considerations: Capital Costs, Operation and Maintenance Costs - Relative Advantages and Disadvantages

Criteria	Clarington 01	Clarington 04	Clarington 05	East Gwillimbury 01
Capital Costs	NEUTRAL	DISADVANTAGE	DISADVANTAGE	ADVANTAGE
Operation and Maintenance Costs	ADVANTAGE	NEUTRAL	ADVANTAGE	DISADVANTAGE
SUMMARY	ADVANTAGE	DISADVANTAGE	NEUTRAL	NEUTRAL

APPENDIX A

TECHNICAL MEMORANDUM ON HAUL COST ANALYSIS

1. Introduction

1.1 Purpose of This Technical Memorandum

The purpose of the technical memorandum on haul cost analysis is to compare the costs to haul residual waste to remote landfills (status quo scenario) with the costs to haul residual waste to a thermal treatment facility (TTF). There are four scenarios that are considered in this analysis including the status quo scenario and three location scenarios where the TTF could potentially be sited:

- Scenario 1 – Status Quo: No TTF facility is built and residual waste continues to be disposed of in remote landfills (however, landfills are assumed to be located in south western Ontario at the beginning of the planning period).
- Scenario 2 – Clarington 01/05: TTF facility located at Clarington Site 01 or Site 05 located near Highway 401 and Courtice Road. (Note: there are two Short-List sites that are located in this area).
- Scenario 3 – Clarington 04: TTF facility located at Clarington Site 04 located near Highway 401 and Bennett Road.
- Scenario 4 – East Gwillimbury 01: TTF facility located at East Gwillimbury 01, adjacent to York Region’s Waste Management Centre (WMC) near Woodbine Avenue and Davis Drive.

The haul cost was calculated for two facility sizes: the base case of 150,000 tonnes per year (tpy) and the alternate case of 250,000 tpy.

The potential future capacity of the TTF facility is 400,000 tpy. The haul cost analysis depends on factors such as, where the waste is coming from and the type of truck used to deliver the waste. Since those factors are unknown at this time, an accurate prediction on the haul costs cannot be made. A detailed haul cost analysis would be completed at the time any future expansion is considered.

2. Methodology for Individual Study

2.1 Approach and Methodology

The overall approach to considering haul costs is to estimate the annual costs of transporting the waste to a particular site and then compare this to the cost of the status quo option (Scenario 1). By subtracting the annual costs of transporting the waste to remote landfills from the cost of transporting it to a TTF site, the annual savings in haul costs associated with each Short-List site is determined.

Given this approach, only the haul costs that change because of the potential development of the TTF facility at a particular Short-List site are estimated. The corresponding cost of hauling the same quantity of waste to remote landfills is also estimated. For example, in all scenarios (both status quo and TTF scenarios) packer trucks in Whitby will always transport residual waste from

the curbside to the Miller Waste Transfer Station in Whitby. Another example is the curbside collected waste in Markham will always be directly hauled to the Miller Waste Transfer Station in Markham. Since these costs will be the same across all four scenarios, they are not included in this analysis. Therefore, the haul costs presented are not a representation of the total overall system haul costs but are an estimate of the difference in overall system haul costs between the various scenarios. This is a reasonable approach for incorporating these costs into the business case since the costs not included are equal for all scenarios.

The steps required to estimate the haul costs for a scenario are as follows:

1. Identify the various haulage components that comprise the scenario. A haulage component is the haul of a particular annual quantity of waste from a particular location to a particular destination in a particular type of truck. Each scenario is therefore defined in terms of a number of components, where each component is specified in terms of:
 - The source and destination of the waste;
 - The type of truck employed; and
 - The annual quantity of waste hauled
2. Estimate the round trip cycle time for each component of the haul system. Cycle time is an estimate of the time required to:
 - Load a truck;
 - Drive to a destination;
 - Unload the truck; and
 - Drive back to the starting point.
3. Estimate the unit haul costs for each type of truck used. The unit haul costs are expressed in terms of dollars per tonne minute of truck operation and include the conservative cost of contracting the collection services to a private company.

Based on the above information, the annual costs for each component of haul are determined by multiplying the unit haul cost by the annual tonnes hauled by the round trip cycle time.

The costs for a particular haul scenario are then determined by adding up the haul costs for the individual components.

As discussed at the outset, the savings in annual haul costs associated with each TTF site location are determined by subtracting the annual costs of transporting the waste to a site from the annual cost of transporting the same quantity of waste to a remote landfill.

2.2 Data Collection

The haul cost analysis uses assumptions and data from the “*Traffic Impacts Report, Appendix E Report on Estimate of Number of Additional Vehicles*”. The Regions of Durham and York provided information on the current flow of waste which is summarized below.

Durham Region

Presently residual solid waste is collected from the curbside in packer trucks and taken to several transfer stations. At these transfer stations, waste is loaded into transfer trailers and hauled to remote landfills in Michigan for disposal.

Waste from the Townships of Uxbridge and Scugog, the Towns of Pickering and Ajax and the Regional Waste Management Facilities (WMF) in Port Perry and Oshawa is taken to the Miller Waste Transfer Station in Pickering, located south of Bayly Street and east of Brock Road. Waste from the Town of Whitby and the City of Oshawa is taken to the Miller Waste Transfer Station in Whitby, located on Wentworth Street, east of Thickson Road South. Waste from the Municipality of Clarington is taken to the Waste Management Transfer Station in Courtice, located north of Highway 401 and east of Courtice Road. Waste from the Township of Brock and the Brock Regional WMF is disposed at the Brock landfill site.

York Region

Residual solid waste in York Region is collected from the curbside in packer trucks and taken to several transfer stations. At the transfer stations, it is loaded into transfer trailers and hauled to remote landfills in Michigan and south western Ontario for disposal.

Waste from the Town of Georgina is taken to the Georgina Transfer Station located at Warden Avenue and Ravenshoe Road. Waste from the northern municipalities including, the Township of King and the Towns of Aurora, Newmarket, East Gwillimbury, and Whitchurch Stouffville, is taken to the Region's Waste Management Centre (WMC) located in the Davis Drive and Woodbine Avenue area. The balance of the solid waste from the southern municipalities including, the City of Vaughan and the Towns of Richmond Hill and Markham, is taken to the Miller Waste transfer station located off Woodbine Avenue, south of Highway 404.

In the future, York is planning to increase its diversion efforts to reduce the overall quantity of waste requiring disposal and send 20,000 tonnes per year (tpy) to the proposed TTF facility, 100,000 tonnes per year to the proposed Dongara facility in Vaughan and send the balance to the Green Lane landfill in south western Ontario.

Other Municipalities

The planning process allows for an additional 20,000 tpy of municipal post-diversion residual waste from neighbouring non-Greater Toronto Area (GTA) municipalities (i.e., City of Peterborough) to be received at the TTF facility for processing. This waste is currently disposed at local landfills.

3. Results and Findings

3.1 Components of Haul for Each Scenario

The first step in the haul cost analysis involves identifying the various components of haul that comprise the haul scenario. As previously mentioned, the components of haul include:

- The source and destination of the waste;
- The type of truck employed; and

- The annual quantity of waste hauled

The source and quantity of residual waste to be managed by the base case and alternative case is summarized in Table 3.1.1 below. In both cases, the Region of Durham will send 110,000 tpy of residual waste to the TTF facility.

In the base case facility size scenario, York Region will send 20,000 tonnes per year to the TTF facility. In the alternate case, which assumes that the Dongara project does not proceed, York will send 120,000 tonnes per year to the TTF facility.

In both cases, other non-GTA municipalities will send 20,000 tpy of residual waste to the TTF facility.

Table 3.1.1 Quantity of Residual Waste to be Managed by the TTF Facility Size Scenarios

Source of Waste	Base Case Quantity	Alternative Case
Durham	110,000	110,000
York	20,000	120,000
Other Municipalities	20,000	20,000
Total	150,000	250,000

Waste Supply Truck Capacities

The following describes general information and assumptions on the capacities of waste supply vehicles that form the basis for this analysis.

Waste is collected from the curbside in packer trucks. Based on actual weigh scale data from both Durham and York, packer trucks can hold approximately 9 tonnes of waste. Depending on where the TTF facility is located, packer trucks will either transport waste to a transfer station or directly haul the waste to the TTF facility.

At a transfer station, waste is transferred from packer trucks to transfer trailer trucks. Based on actual weigh scale data weights from both Durham and York, transfer trailer trucks can hold approximately 32 tonnes of waste. From a transfer station, waste is transported to the TTF facility or to landfill.

Currently, waste from Durham's Regional Waste Management Facilities (i.e., drop-off depots) is transported to transfer stations in roll off trucks. At the start of planning period, it is assumed that residual waste will be collected from the Oshawa Waste Management Facility (WMF) in top loading transfer trailers. It is estimated that these transfer trailers will hold approximately 24 tonnes of waste.

Tables 3.1.2 through 3.1.5 show the source and destination of the waste, the type of vehicle employed, and the annual quantity of waste hauled.

Table 3.1.2 Summary of Systems and Quantity of Waste Transported for Scenario 1 – Status Quo

Source	Destination	Truck Type	Annual Tonnes to Transfer Station	Annual Tonnes to TTF	Annual Tonnes to Other Disposal
DURHAM					
Clarington Curbside	WM - Courtice TS	Packer	15,786	-	-
Oshawa WMF	Miller Waste Pickering TS	Top Loading Transfer Trailer	12,315	-	-
Brock Curbside	Miller Waste Pickering TS	Packer	2,687	-	-
Uxbridge Curbside	Miller Waste Pickering TS	Packer	3,866	-	-
Miller Waste Pickering Transfer Station (TS)	Remote LF	Transfer Trailer	-	-	55,546
Miller Waste Whitby TS	Remote LF	Transfer Trailer	-	-	38,669
Waste Management Courtice TS	Remote LF	Transfer Trailer	-	-	15,786
TOTAL DURHAM			34,654	0	110,000
YORK					
WMC TS	Green Lane LF	Transfer Trailer	-	-	36,373
Miller Waste Markham TS - to DG	Dongara (DG)	Transfer Trailer	-	-	100,000
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	-	-	6,637
Georgina TS	Green Lane LF	Transfer Trailer	-	-	6,990
TOTAL YORK			0	0	150,000
OTHER MUNICIPALITIES					
	Local LF	Packer	0	0	20,000

Table 3.1.3 Summary of Systems and Quantity of Waste Transported for Scenario 2 – Clarington 01/05 (150,000 tpy)

Source	Destination	Truck Type	Annual Tonnes to Transfer Station	Annual Tonnes to TTF	Annual Tonnes to Other Disposal
DURHAM					
Clarington Curbside	Clarington 01/05 TTF	Packer	-	15,786	-
Oshawa WMF	Clarington 01/05 TTF	Top Loading Transfer Trailer	-	12,315	-
Brock Curbside	Miller Waste Pickering TS	Packer	2,687	-	-
Uxbridge Curbside	Miller Waste Pickering TS	Packer	3,866	-	-
Miller Waste Pickering TS	Clarington 01/05 TTF	Transfer Trailer	-	43,231	-
Miller Waste Whitby TS	Clarington 01/05 TTF	Transfer Trailer	-	38,669	-
Waste Management Courtice TS	n/a	n/a	n/a	n/a	-
TOTAL DURHAM			6,553	110,000	0
YORK					
WMC TS - to LF	Green Lane LF	Transfer Trailer	-	-	23,010
WMC TS - to DG	Dongara	Transfer Trailer	-	-	13,363
Miller Waste Markham TS - to TTF	Clarington 01/05 TTF	Transfer Trailer	-	20,000	-
Miller Waste Markham TS - to DG	Dongara	Transfer Trailer	-	-	86,637
Georgina TS	Green Lane LF	Transfer Trailer	-	-	6,990
TOTAL YORK			0	20,000	130,000
OTHER MUNICIPALITIES					
	Clarington 01/05 TTF	Transfer Trailer	0	20,000	0

Table 3.1.4 Summary of Systems and Quantity of Waste Transported for Scenario 3 – Clarington 04 (150,000 tpy)

Source	Destination	Truck Type	Annual Tonnes to Transfer Station	Annual Tonnes to TTF	Annual Tonnes to Other Disposal
DURHAM					
Clarington Curbside	Clarington 04 TTF	Packer	-	15,786	-
Oshawa WMF	Clarington 04 TTF	Top Loading Transfer Trailer	-	12,315	-
Brock Curbside	Miller Waste Pickering TS	Packer	2,687	-	-
Uxbridge Curbside	Miller Waste Pickering TS	Packer	3,866	-	-
Miller Waste Pickering TS	Clarington 04 TTF	Transfer Trailer	-	43,231	-
Miller Waste Whitby TS	Clarington 04 TTF	Transfer Trailer	-	38,669	-
Waste Management Courtice TS	n/a	n/a	n/a	n/a	-
TOTAL DURHAM			6,553	110,000	0
YORK					
WMC TS - to LF	Green Lane LF	Transfer Trailer	-	-	23,010
WMC TS - to DG	Dongara	Transfer Trailer	-	-	13,363
Miller Waste Markham TS - to TTF	Clarington 04 TTF	Transfer Trailer	-	20,000	-
Miller Waste Markham TS - to DG	Dongara	Transfer Trailer	-	-	86,637
Georgina TS	Green Lane LF	Transfer Trailer	-	-	6,990
TOTAL YORK			0	20,000	130,000
OTHER MUNICIPALITIES					
	Clarington 04 TTF	Transfer Trailer	0	20,000	0

Table 3.1.5 Summary of Systems and Quantity of Waste Transported for Scenario 4 – East Gwillimbury 01 (150,000 tpy)

Source	Destination	Truck Type	Annual Tonnes to Transfer Station	Annual Tonnes to TTF	Annual Tonnes to Other Disposal
DURHAM					
Clarington Curbside	WM - Courtice TS	Packer	15,786	-	-
Oshawa WMF	EG TTF	Top Loading Transfer Trailer	-	12,315	-
Brock Curbside	EG TTF	Packer	-	2,687	-
Uxbridge Curbside	EG TTF	Packer	-	3,866	-
Miller Waste Pickering TS	EG TTF	Transfer Trailer	-	36,678	-
Miller Waste Whitby TS	EG TTF	Transfer Trailer	-	38,669	-
Waste Management Courtice TS	EG TTF	Transfer Trailer	-	15,786	-
TOTAL DURHAM			15,786	110,000	0
YORK					
WMC TS	Green Lane LF	Transfer Trailer	-	-	16,373
WMC TTF*	EG TTF	Packer	-	20,000	-
Miller Waste Markham TS - to DG	Dongara	Transfer Trailer	-	-	100,000
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	-	-	6,637
Georgina TS - to LF	Green Lane LF	Transfer Trailer	-	-	6,990
TOTAL YORK*			0	20,000	130,000
OTHER MUNICIPALITIES					
	EG TTF	Transfer Trailer	0	20,000	0

3.2 Total Round Trip Cycle Time

This section describes how the total round trip cycle time was calculated.

Google Maps Canada™ was used to estimate the one-way distance travelled by the packer and transfer trailer trucks from the various points of origin to the Short-List sites. For the status quo scenario, the average distance from the transfer stations to two representative remote landfills, both located in south western Ontario, was calculated.

It is assumed that on average, packer trucks will travel primarily on local roads at an average speed of 40 km/hr, transfer trailer trucks will travel primarily on the 400 series highways at an average speed of 90 km/hr, and transfer trailer trucks from Durham’s Waste Management Facilities will travel on a combination of local roads and on Highway 401 at an average speed of 70 km/hr.

It is estimated that it takes approximately 20 minutes to load and 20 minutes to unload a truck, regardless of type.

The total round trip cycle time was calculated by determining the time to load the truck, transport the residual waste to the disposal facility, unload the truck, and drive the empty truck back to its point of origin. These estimates are shown in Tables 3.2.1 through 3.2.4.

Table 3.2.1 Total Round Trip Cycle Time for Scenario 1 – Status Quo

Source	Destination	Truck Type	1 Way Distance Travelled (km)	Average Speed Onroute (km/hr)	1 Way Travel Time (min)	Load / Unload Time (min)	Round Trip Cycle Time (min)
Calculation			A	B	$C = (A / B) * 60$	D	$E = 2 * (C + D)$
DURHAM							
Clarington Curbside	WM - Courtice TS	Packer	11	40	17	20	73
Oshawa WMF	Miller Waste Pickering TS	Top Loading Transfer Trailer	30	70	26	20	91
Brock Curbside	Miller Waste Pickering TS	Packer	75	40	113	20	265
Uxbridge Curbside	Miller Waste Pickering TS	Packer	35	40	53	20	145
Miller Waste Pickering TS	Remote LF	Transfer Trailer	259	90	173	20	385
Miller Waste Whitby TS	Remote LF	Transfer Trailer	273	90	182	20	404
Waste Management Courtice TS	Remote LF	Transfer Trailer	284	90	189	20	419
TOTAL DURHAM							
YORK							
WMC TS	Green Lane LF	Transfer Trailer	242	90	161	20	363
Miller Waste Markham TS - to DG	Dongara (DG)	Transfer Trailer	26	90	17	20	75
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	215	90	143	20	327
Georgina TS	Green Lane LF	Transfer Trailer	260	90	173	20	387
TOTAL YORK							
OTHER MUNICIPALITIES							
	Local LF	Packer	20	40	30	20	100

Table 3.2.2 Total Round Trip Cycle Time for Scenario 2 – Clarington 01/05 (150,000 tpy)

Source	Destination	Truck Type	1 Way Distance Travelled (km)	Average Speed Onroute (km/hr)	1 Way Travel Time (min)	Load / Unload Time (min)	Round Trip Cycle Time (min)
Calculation			A	B	$C = (A / B) * 60$	D	$E = 2 * (C + D)$
DURHAM							
Clarington Curbside	Clarington 01/05 TTF	Packer	10	40	15	20	70
Oshawa WMF	Clarington 01/05 TTF	Top Loading Transfer Trailer	15	70	13	20	66
Brock Curbside	Miller Waste Pickering TS	Packer	75	40	113	20	265
Uxbridge Curbside	Miller Waste Pickering TS	Packer	35	40	53	20	145
Miller Waste Pickering TS	Clarington 01/05 TTF	Transfer Trailer	30	90	20	20	80
Miller Waste Whitby TS	Clarington 01/05 TTF	Transfer Trailer	10	90	7	20	53
Waste Management Courtice TS	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL DURHAM							
YORK							
WMC TS - to LF	Green Lane LF	Transfer Trailer	242	90	161	20	363
WMC TS - to DG	Dongara	Transfer Trailer	52	90	35	20	109
Miller Waste Markham TS - to TTF	Clarington 01/05 TTF	Transfer Trailer	60	90	40	20	120
Miller Waste Markham TS - to DG	Dongara	Transfer Trailer	26	90	17	20	75
Georgina TS	Green Lane LF	Transfer Trailer	260	90	173	20	387
TOTAL YORK							
OTHER MUNICIPALITIES	Clarington 01/05 TTF	Transfer Trailer	70	90	47	20	133

Table 3.2.3 Total Round Trip Cycle Time for Scenario 3 – Clarington 04 (150,000 tpy)

Source	Destination	Truck Type	1 Way Distance Travelled (km)	Average Speed Onroute (km/hr)	1 Way Travel Time (min)	Load / Unload Time (min)	Round Trip Cycle Time (min)
Calculation			A	B	$C = (A / B) * 60$	D	$E = 2 * (C + D)$
DURHAM							
Clarington Curbside	Clarington 04 TTF	Packer	5	40	8	20	55
Oshawa WMF	Clarington 04 TTF	Top Loading Transfer Trailer	25	70	21	20	83
Brock Curbside	Miller Waste Pickering TS	Packer	75	40	113	20	265
Uxbridge Curbside	Miller Waste Pickering TS	Packer	35	40	53	20	145
Miller Waste Pickering TS	Clarington 04 TTF	Transfer Trailer	40	90	27	20	93
Miller Waste Whitby TS	Clarington 04 TTF	Transfer Trailer	20	90	13	20	67
Waste Management Courtice TS	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL DURHAM							
YORK							
WMC TS - to LF	Green Lane LF	Transfer Trailer	242	90	161	20	363
WMC TS - to DG	Dongara	Transfer Trailer	52	90	35	20	109
Miller Waste Markham TS - to TTF	Clarington 04 TTF	Transfer Trailer	70	90	47	20	133
Miller Waste Markham TS - to DG	Dongara	Transfer Trailer	26	90	17	20	75
Georgina TS	Green Lane LF	Transfer Trailer	260	90	173	20	387
TOTAL YORK							
OTHER MUNICIPALITIES	Clarington 04 TTF	Transfer Trailer	60	90	40	20	120

Table 3.2.4 Total Round Trip Cycle Time for Scenario 4 – East Gwillimbury 01 (150,000 tpy)

Source	Destination	Truck Type	1 Way Distance Travelled (km)	Average Speed Onroute (km/hr)	1 Way Travel Time (min)	Load / Unload Time (min)	Round Trip Cycle Time (min)
Calculation			A	B	$C = (A / B) * 60$	D	$E = 2 * (C + D)$
DURHAM							
Clarington Curbside	WM - Courtice TS	Packer	11	40	17	20	73
Oshawa WMF	EG TTF	Top Loading Transfer Trailer	75	90	50	20	140
Brock Curbside	EG TTF	Packer	60	40	90	20	220
Uxbridge Curbside	EG TTF	Packer	25	40	38	20	115
Miller Waste Pickering TS	EG TTF	Transfer Trailer	65	90	43	20	127
Miller Waste Whitby TS	EG TTF	Transfer Trailer	80	90	53	20	147
Waste Management Courtice TS	EG TTF	Transfer Trailer	90	90	60	20	160
TOTAL DURHAM							
YORK							
WMC TS	Green Lane LF	Transfer Trailer	242	90	161	20	363
WMC TTF*	EG TTF	Packer	0	40	0	0	0
Miller Waste Markham TS - to DG	Dongara	Transfer Trailer	26	90	17	20	75
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	215	90	143	20	327
Georgina TS	Green Lane LF	Transfer Trailer	260	90	173	20	387
TOTAL YORK*							
OTHER MUNICIPALITIES							
	EG TTF	Transfer Trailer	100	90	67	20	173

* Waste from northern York municipalities is currently being transported to the Garfield Wright Waste Management Centre (WMC) for transfer. In this scenario, some of these packer trucks will be diverted from the WMC and re-directed to the adjacent TTF facility.

3.3 Annual Unit Haul Cost

The cost to transport waste varies for packer and transfer trailer trucks. As mentioned above, packer trucks typically collect waste from the curbside and can either directly haul the waste to the facility or to the nearest transfer station. Transfer trailer trucks transport waste from both transfer stations and waste management facilities to the disposal facility.

Both direct and transfer haul costs, expressed in cost per tonne-minute, were estimated on the following basis:

- *Labour Rate*– it is estimated that the drivers labour rate, including benefits, is \$40 per hour.
- *Fuel Consumption* – the fuel consumption for packer trucks is estimated to be 16 litres per hour of operation and 24 litres per hour of operation for transfer trailer trucks.
- *Annual Truck Maintenance* – assumed to be 10% of the vehicle capital cost.
- *Amortized Capital* – the estimated capital cost for a split side loading packer truck in 2011 is \$245,000 and is amortized at 15% over 7 years; the capital cost for a tractor in 2011 is about \$150,000 and is amortized at 15% over 5 years and the trailer capital cost in 2011 is \$115,000 and is amortized at 15% over 8 years. A 15% private sector cost of capital is assumed. The capital cost for packer trucks is an average of the costs received as part of a 2007 tender for collection services from a southern Ontario municipality. The costs for the tractor trailer were based on professional judgement. The costs were inflated by approximately 3.5% per year to reflect the estimated capital costs at the start of the planning period.
- *Administration and Profit Allowance* – is estimated to be 10% of the total costs. To be conservative, this addition of 10% for administration and profit allowance assumes that all of the Regional collection services are contracted to the private sector.

The total estimated cost per minute of truck operation and the cost per tonne-minute for direct haul and transfer haul trucks are shown in Tables 3.3.1 and 3.3.2 below.

The cost per tonne-minute is dependent on the average payload that each truck can carry. The average payload for packer trucks and transfer trailer trucks are 9, 24 and 32 tonnes, respectively. Therefore, the resulting unit haul cost per tonne-minute is \$0.20 for packer trucks, \$0.09 for the 24-tonne transfer trailer trucks and \$0.06 for 32-tonne transfer trailer trucks.

Table 3.3.1 Packer Direct Haul Unit Cost

Item	Calculation	\$/Minute of Operation
Labour	\$40/hr x 1 hr / 60 minutes	\$0.67
Fuel	16 L/hr (avg.) x \$1.00/L x 1 hr / 60 minutes	\$0.27
Amortized Capital	\$245,000 @ 15% over 7 years = \$59,000 / yr x 1 yr / 250 days x 1 day / 8 hrs x 1 hr / 60 minutes	\$0.49
Annual Maintenance (at 10% Capital)	\$245,000 x 10% x 1 yr / 250 days x 1 day / 8 hrs x 1 hr / 60 minutes	\$0.20
Administration and Profit Allowance	10% of above costs	\$0.16
TOTAL per TRUCK MINUTE		\$1.79

Item	Calculation	\$/Minute of Operation
Total Cost per Tonne Minute of Haul	\$1.58 / truck minute ÷ 9 tonnes / packer truck	\$0.20

Table 3.3.2 Transfer Trailer Haul Unit Cost

Item	Calculation	\$/Minute of Operation
Labour	\$40/hr x 1 hr / 60 minutes	\$0.67
Fuel	24 L/hr (avg.) x \$1.00/L x 1 hr / 60 minutes	\$0.40
Amortized Tractor Capital (5 year life)	\$150,000 @ 15% over 5 years = \$44,750 / yr x 1 yr / 250 days x 1 day / 8 hrs x 1 hr / 60 minutes	\$0.37
Amortized Trailer Capital (8 year life)	\$115,000 @ 15% over 8 years = \$25,600 / yr x 1 yr / 250 days x 1 day / 8 hrs x 1 hr / 60 minutes	\$0.21
Annual Maintenance (at 10% Capital)	\$230,000 x 10% x 1 yr / 260 days x 1 day / 8 hrs x 1 hr / 60 minutes	\$0.22
Administration and Profit Allowance	10% of above costs	\$0.19
TOTAL per TRUCK MINUTE		\$2.06
Total Cost per Tonne Minute of Haul	\$1.91 / truck minute ÷ 32 tonnes / transfer trailer	\$0.06
Total Cost per Tonne Minute of Haul	\$1.91 / truck minute ÷ 24 tonnes / transfer trailer	\$0.09

3.4 Annual Haul Costs

To calculate the estimated annual haul cost, the cost per tonne-minute was multiplied by the annual quantity of waste transported and the round trip cycle time expressed in minutes. These annual haul cost estimates are shown in Tables 3.4.1 through 3.4.4 below.

Table 3.4.1 Annual Haul Cost for Scenario 1 – Status Quo

Source	Destination	Truck Type	Unit Haul Cost (\$/tonne-min)	Annual Tonnes ⁽¹⁾	Round Trip Cycle Time (min)	Annual Haul Cost (\$)
DURHAM						
Clarington Curbside	WM - Courtice TS	Packer	\$0.20	15,786	73	\$229,325
Oshawa WMF	Miller Waste Pickering TS	Top Loading Transfer Trailer	\$0.09	12,315	91	\$96,705
Brock Curbside	Miller Waste Pickering TS	Packer	\$0.20	2,687	265	\$141,703
Uxbridge Curbside	Miller Waste Pickering TS	Packer	\$0.20	3,866	145	\$111,569
Miller Waste Pickering TS	Remote LF	Transfer Trailer	\$0.06	55,546	385	\$1,378,767
Miller Waste Whitby TS	Remote LF	Transfer Trailer	\$0.06	38,669	404	\$1,006,341
Waste Management Courtice TS	Remote LF	Transfer Trailer	\$0.06	15,786	419	\$425,730
TOTAL DURHAM						\$3,390,140
YORK						
WMC TS	Green Lane LF	Transfer Trailer	\$0.06	36,373	363	\$849,749
Miller Waste Markham TS - to DG	Dongara (DG)	Transfer Trailer	\$0.06	100,000	75	\$480,984
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	\$0.06	6,637	327	\$139,663
Georgina TS	Green Lane LF	Transfer Trailer	\$0.06	6,990	387	\$174,108
TOTAL YORK						\$1,470,396
OTHER MUNICIPALITIES						
	Local LF	Transfer Trailer	\$0.06	20,000	100	\$128,835
TOTAL FOR SYSTEM						\$4,989,372

(1) Tonnage includes some waste that is hauled on multiple legs.

Table 3.4.2 Annual Haul Cost for Scenario 2 – Clarington 01/05 (150,000 tpy)

Source	Destination	Truck Type	Unit Haul Cost (\$/tonne-min)	Annual Tonnes ⁽¹⁾	Round Trip Cycle Time (min)	Annual Haul Cost (\$)
DURHAM						
Clarington Curbside	Clarington 01/05 TTF	Packer	\$0.20	15,786	70	\$219,901
Oshawa WMF	Clarington 01/05 TTF	Top Loading Transfer Trailer	\$0.09	12,315	66	\$69,507
Brock Curbside	Miller Waste Pickering TS	Packer	\$0.20	2,687	265	\$141,703
Uxbridge Curbside	Miller Waste Pickering TS	Packer	\$0.20	3,866	145	\$111,569
Miller Waste Pickering TS	Clarington 01/05 TTF	Transfer Trailer	\$0.06	43,231	80	\$222,786
Miller Waste Whitby TS	Clarington 01/05 TTF	Transfer Trailer	\$0.06	38,669	53	\$132,850
Waste Management Courtice TS	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL DURHAM						\$898,316
YORK						
WMC TS - to LF	Green Lane LF	Transfer Trailer	\$0.06	23,010	363	\$537,562
WMC TS - to DG	Dongara	Transfer Trailer	\$0.06	13,363	109	\$94,115
Miller Waste Markham TS - to TTF	Clarington 01/05 TTF	Transfer Trailer	\$0.06	20,000	120	\$154,602
Miller Waste Markham TS - to DG	Dongara	Transfer Trailer	\$0.06	86,637	75	\$416,710
Georgina TS	Green Lane LF	Transfer Trailer	\$0.06	6,990	387	\$174,108
TOTAL YORK						\$1,202,990
OTHER MUNICIPALITIES						
	Clarington 01/05 TTF	Transfer Trailer	\$0.06	20,000	133	\$171,780
TOTAL FOR SYSTEM						\$2,273,086

(1) Tonnage includes some waste that is hauled on multiple legs

Table 3.4.3 Annual Haul Cost for Scenario 3 – Clarington 04 (150,000 tpy)

Source	Destination	Truck Type	Unit Haul Cost (\$/tonne-min)	Annual Tonnes ⁽¹⁾	Round Trip Cycle Time (min)	Annual Haul Cost (\$)
DURHAM						
Clarington Curbside	Clarington 04 TTF	Packer	\$0.20	15,786	55	\$172,779
Oshawa WMF	Clarington 04 TTF	Top Loading Transfer Trailer	\$0.09	12,315	83	\$87,639
Brock Curbside	Miller Waste Pickering TS	Packer	\$0.20	2,687	265	\$141,703
Uxbridge Curbside	Miller Waste Pickering TS	Packer	\$0.20	3,866	145	\$111,569
Miller Waste Pickering TS	Clarington 04 TTF	Transfer Trailer	\$0.06	43,231	93	\$259,917
Miller Waste Whitby TS	Clarington 04 TTF	Transfer Trailer	\$0.06	38,669	67	\$166,063
Waste Management Courtice TS	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL DURHAM						\$939,671
YORK						
WMC TS - to LF	Green Lane LF	Transfer Trailer	\$0.06	23,010	363	\$537,562
WMC TS - to DG	Dongara	Transfer Trailer	\$0.06	13,363	109	\$94,115
Miller Waste Markham TS - to TTF	Clarington 04 TTF	Transfer Trailer	\$0.06	20,000	133	\$171,780
Miller Waste Markham TS - to DG	Dongara	Transfer Trailer	\$0.06	86,637	75	\$416,710
Georgina TS	Green Lane LF	Transfer Trailer	\$0.06	6,990	387	\$174,108
TOTAL YORK						\$1,220,168
OTHER MUNICIPALITIES						
	Clarington 04 TTF	Transfer Trailer	\$0.06	20,000	120	\$154,602
TOTAL FOR SYSTEM						\$2,314,440

(1) Tonnage includes some waste that is hauled on multiple legs

Table 3.4.4 Annual Haul Cost for Scenario 4 – East Gwillimbury 01 (150,000 tpy)

Source	Destination	Truck Type	Unit Haul Cost (\$/tonne-min)	Annual Tonnes ⁽¹⁾	Round Trip Cycle Time (min)	Annual Haul Cost (\$)
DURHAM						
Clarington Curbside	WM - Courtice TS	Packer	\$0.20	15,786	73	\$229,325
Oshawa WMF	EG TTF	Top Loading Transfer Trailer	\$0.09	12,315	140	\$148,080
Brock Curbside	EG TTF	Packer	\$0.20	2,687	220	\$117,640
Uxbridge Curbside	EG TTF	Packer	\$0.20	3,866	115	\$88,486
Miller Waste Pickering TS	EG TTF	Transfer Trailer	\$0.06	36,678	127	\$299,272
Miller Waste Whitby TS	EG TTF	Transfer Trailer	\$0.06	38,669	147	\$365,338
Waste Management Courtice TS	EG TTF	Transfer Trailer	\$0.06	15,786	160	\$162,699
TOTAL DURHAM						\$1,410,841
YORK						
WMC TS	Green Lane LF	Transfer Trailer	\$0.06	16,373	363	\$382,508
WMC TS - to TTF ⁽²⁾	EG TTF	Packer	\$0.18	20,000	0	\$0
Miller Waste Markham TS - to DG	Dongara	Transfer Trailer	\$0.06	100,000	75	\$480,984
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	\$0.06	6,637	327	\$139,663
Georgina TS	Green Lane LF	Transfer Trailer	\$0.06	6,990	387	\$174,108
TOTAL YORK⁽²⁾						\$1,177,262
OTHER MUNICIPALITIES						
	EG TTF	Transfer Trailer	\$0.06	20,000	173	\$223,314
TOTAL FOR SYSTEM						\$2,811,417

(1) Tonnage includes some waste that is hauled on multiple legs

(2) Waste from northern York municipalities is currently being transported to the Garfield Wright Waste Management Centre (WMC) for transfer. In this scenario, some of these packer trucks will be diverted from the WMC and re-directed to the adjacent TTF facility.

3.5 Alternate Case – 250,000 tpy

The analysis was also completed for the alternate case scenario (250,000 tonnes per year TTF facility). Attachment A contains the same set of tables for the components of haul, round trip cycle time and annual haul costs.

4. Haul Cost Savings

4.1 Base Case Haul Cost Savings Relative to Status Quo Scenario

The relative haul cost for Durham, York and other municipalities to send its residual waste to any of the three possible TTF facility locations was compared to sending the waste to remote landfills (status quo scenario). As previously mentioned, the haul cost analysis considered only those haul costs that changed between Scenarios. As a result, the system costs presented are not representative of the total overall system costs. However, the relative cost savings between the status quo and TTF Scenarios are calculated and can be directly compared. Table 4.1.1 summarizes the relative annual haul cost savings for the base case (150,000 tpy) scenario.

Table 4.1.1 Base Case (150,000 tpy) Annual Haul Cost Savings Relative to Status Quo Scenario

TTF Site Location	Durham Cost Savings	York Cost Savings	Other Municipalities Cost Savings	Annual Overall System Cost Savings
Clarington 01/05	\$2,492,000	\$268,000	-\$43,000	\$2,717,000
Clarington 04	\$2,451,000	\$251,000	-\$26,000	\$2,676,000
East Gwillimbury	\$1,980,000	\$294,000	-\$95,000	\$2,179,000

4.2 Alternate Case Haul Cost Savings Relative to Status Quo Scenario

Table 4.2.1 summarizes the relative annual haul cost savings for the alternate case (250,000 tpy) scenario.

Table 4.2.1 Alternate Case (250,000 tpy) Annual Haul Cost Savings Relative to Status Quo Scenario

TTF Site Location	Durham Cost Savings	York Cost Savings	Other Municipalities Cost Savings	Annual Overall System Cost Savings
Clarington 01/05	\$2,492,000	\$1,468,000	-\$43,000	\$3,917,000
Clarington 04	\$2,451,000	\$1,365,000	-\$26,000	\$3,790,000
East Gwillimbury	\$1,980,000	\$1,961,400	-\$95,000	\$3,846,400

Attachment A

Table 3.1.1 Summary of Systems and Quantity of Waste Transported for Scenario 1 - Status Quo

Source	Destination	Truck Type	Annual Tonnes to Transfer Station	Annual Tonnes to TTF	Annual Tonnes to Other Disposal
DURHAM					
Clarington Curbside	WM - Courtice TS	Packer	15,786	-	-
Oshawa WMF	Miller Waste Pickering TS	Top Loading Transfer Trailer	12,315	-	-
Brock Curbside	Miller Waste Pickering TS	Packer	2,687	-	-
Uxbridge Curbside	Miller Waste Pickering TS	Packer	3,866	-	-
Miller Waste Pickering TS	Remote LF	Transfer Trailer	-	-	55,546
Miller Waste Whitby TS	Remote LF	Transfer Trailer	-	-	38,669
Waste Management Courtice TS	Remote LF	Transfer Trailer	-	-	15,786
TOTAL DURHAM			34,654	0	110,000
YORK					
Georgina Curbside	Georgina TS	Packer	6,990	-	-
WMC TS	Green Lane LF	Transfer Trailer	-	-	36,373
Miller Waste Markham TS	Green Lane LF	Transfer Trailer	-	-	106,637
Georgina TS	Green Lane LF	Transfer Trailer	-	-	6,990
TOTAL YORK			6,990	0	150,000
OTHER MUNICIPALITIES	Local LF	Packer	6,990	0	20,000

Table 3.1.2 Summary of Systems and Quantity of Waste Transported for Scenario 2 - Clarington 01/05 (250,000 tpy)

Source	Destination	Truck Type	Annual Tonnes to Transfer Station	Annual Tonnes to TTF	Annual Tonnes to Other Disposal
DURHAM					
Clarington Curbside	Clarington 01/05 TTF	Packer	-	15,786	-
Oshawa WMF	Clarington 01/05 TTF	Top Loading Transfer Trailer	-	12,315	-
Brock Curbside	Miller Waste Pickering TS	Packer	2,687	-	-
Uxbridge Curbside	Miller Waste Pickering TS	Packer	3,866	-	-
Miller Waste Pickering TS	Clarington 01/05 TTF	Transfer Trailer	-	43,231	-
Miller Waste Whitby TS	Clarington 01/05 TTF	Transfer Trailer	-	38,669	-
Waste Management Courtice TS	n/a	n/a	n/a	n/a	-
TOTAL DURHAM			6,553	110,000	0

Table 3.1.2 Summary of Systems and Quantity of Waste Transported for Scenario 2 - Clarington 01/05 (250,000 tpy)

Source	Destination	Truck Type	Annual Tonnes to Transfer Station	Annual Tonnes to TTF	Annual Tonnes to Other Disposal
YORK					
Georgina Curbside	Georgina TS	Packer	6,990	-	-
WMC TS - to LF	Green Lane LF	Transfer Trailer	-	-	23,010
WMC TS - to TTF	Clarington 01/05 TTF	Transfer Trailer	-	13,363	-
Miller Waste Markham TS - to TTF	Clarington 01/05 TTF	Transfer Trailer	-	106,637	-
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	-	-	0
Georgina TS	Green Lane LF	Transfer Trailer	-	-	6,990
TOTAL YORK			6,990	120,000	30,000
OTHER MUNICIPALITIES	Clarington 01/05 TTF	Transfer Trailer	0	20,000	0

Table 3.1.3 Summary of Systems and Quantity of Waste Transported for Scenario 3 - Clarington 04 (250,000 tpy)

Source	Destination	Truck Type	Annual Tonnes to Transfer Station	Annual Tonnes to TTF	Annual Tonnes to Other Disposal
DURHAM					
Clarington Curbside	Clarington 04 TTF	Packer	-	15,786	-
Oshawa WMF	Clarington 04 TTF	Top Loading Transfer Trailer	-	12,315	-
Brock Curbside	Miller Waste Pickering TS	Packer	2,687	-	-
Uxbridge Curbside	Miller Waste Pickering TS	Packer	3,866	-	-
Miller Waste Pickering TS	Clarington 04 TTF	Transfer Trailer	-	43,231	-
Miller Waste Whitby TS	Clarington 04 TTF	Transfer Trailer	-	38,669	-
Waste Management Courtice TS	n/a	n/a	n/a	n/a	-
TOTAL DURHAM			6,553	110,000	0
YORK					
Georgina Curbside	Georgina TS	Packer	6,990	-	-
WMC TS - to LF	Green Lane LF	Transfer Trailer	-	-	23,010
WMC TS - to TTF	Clarington 04 TTF	Transfer Trailer	-	13,363	-
Miller Waste Markham TS - to TTF	Clarington 04 TTF	Transfer Trailer	-	106,637	-
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	-	-	-
Georgina TS	Green Lane LF	Transfer Trailer	-	-	6,990
TOTAL YORK			6,990	120,000	30,000
OTHER MUNICIPALITIES	Clarington 04 TTF	Transfer Trailer	0	20,000	0

Table 3.1.4 Summary of Systems and Quantity of Waste Transported for Scenario 4 - East Gwillimbury 01 (250,000 tpy)

Source	Destination	Truck Type	Annual Tonnes to Transfer Station	Annual Tonnes to TTF	Annual Tonnes to Other Disposal
DURHAM					
Clarington Curbside	WM - Courtice TS	Packer	15,786	-	-
Oshawa WMF	EG TTF	Top Loading Transfer Trailer	-	12,315	-
Brock Curbside	EG TTF	Packer	-	2,687	-
Uxbridge Curbside	EG TTF	Packer	-	3,866	-
Miller Waste Pickering TS	EG TTF	Transfer Trailer	-	36,678	-
Miller Waste Whitby TS	EG TTF	Transfer Trailer	-	38,669	-
Waste Management Courtice TS	EG TTF	Transfer Trailer	-	15,786	-
TOTAL DURHAM			15,786	110,000	0
YORK					
Georgina Curbside	EG TTF	Packer(1)	-	6,990	-
WMC TS - to LF	Green Lane LF	Transfer Trailer	-	-	-
WMC TS* - to TTF	EG TTF	Packer	-	36,373	-
Miller Waste Markham TS - to TTF	EG TTF	Transfer Trailer	-	76,637	-
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	-	-	30,000
Georgina TS	Green Lane LF	Transfer Trailer	-	-	-
TOTAL YORK*			0	120,000	30,000
OTHER MUNICIPALITIES					
	EG TTF	Transfer Trailer	0	20,000	0

(1) Curbside waste in Georgina is currently transferred at the Georgina Transfer Station to transfer trailer trucks. This approach may continue but the assumption of packer trucks directly hauling waste to the EG TTF is made to be conservative. Should the assumption of packers prove to be a distinguishing factor in the evaluation of the sites, the assumption may be revised to reflect haul in transfer trailers.

(2) Waste from northern York municipalities is currently being transported to the Garfield Wright Waste Management Centre (WMC) for transfer. In this scenario, these packer trucks will be diverted from the WMC and re-directed to the adjacent TTF facility.

Table 3.2.1 Total Round Trip Cycle Time for Scenario 1 - Status Quo

Source	Destination	Truck Type	1 Way Distance Travelled (km)	Average Speed Onroute (km/hr)	1 Way Travel Time (min)	Load / Unload Time (min)	Round Trip Cycle Time (min)
Calculation			A	B	$C = (A / B) * 60$	D	$E = 2 * (C + D)$
DURHAM							
Clarington Curbside	WM - Courtice TS	Packer	11	40	17	20	73
Oshawa WMF	Miller Waste Pickering TS	Top Loading Transfer Trailer	30	70	26	20	91
Brock Curbside	Miller Waste Pickering TS	Packer	75	40	113	20	265
Uxbridge Curbside	Miller Waste Pickering TS	Packer	35	40	53	20	145
Miller Waste Pickering TS	Remote LF	Transfer Trailer	259	90	173	20	385
Miller Waste Whitby TS	Remote LF	Transfer Trailer	273	90	182	20	404
Waste Management Courtice TS	Remote LF	Transfer Trailer	284	90	189	20	419
TOTAL DURHAM							
YORK							
Georgina Curbside	Georgina TS	Packer	25	90	17	20	73
WMC TS	Green Lane LF	Transfer Trailer	242	90	161	20	363
Miller Waste Markham TS	Green Lane LF	Transfer Trailer	215	90	143	20	327
Georgina TS	Green Lane LF	Transfer Trailer	260	90	173	20	387
TOTAL YORK							
OTHER MUNICIPALITIES							
	Local LF	Packer	20	40	30	20	100

Table 3.2.2 Total Round Trip Cycle Time for Scenario 2 - Clarington 01/05 (250,000 tpy)

Source	Destination	Truck Type	1 Way Distance Travelled (km)	Average Speed Onroute (km/hr)	1 Way Travel Time (min)	Load / Unload Time (min)	Round Trip Cycle Time (min)
Calculation			A	B	$C = (A / B) * 60$	D	$E = 2 * (C + D)$
DURHAM							
Clarington Curbside	Clarington 01/05 TTF	Packer	10	40	15	20	70
Oshawa WMF	Clarington 01/05 TTF	Top Loading Transfer Trailer	15	70	13	20	66
Brock Curbside	Miller Waste Pickering	Packer	75	40	113	20	265
Uxbridge Curbside	Miller Waste Pickering	Packer	35	40	53	20	145
Miller Waste Pickering TS	Clarington 01/05 TTF	Transfer Trailer	30	90	20	20	80
Miller Waste Whitby TS	Clarington 01/05 TTF	Transfer Trailer	10	90	7	20	53
Waste Management Courtice TS	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL DURHAM							
YORK							
Georgina Curbside	Georgina TS	Packer	25	40	38	20	115
WMC TS - to LF	Green Lane LF	Transfer Trailer	242	90	161	20	363
WMC TS - to TTF	Clarington 01/05 TTF	Transfer Trailer	90	90	60	20	160
Miller Waste Markham TS - to TTF	Clarington 01/05 TTF	Transfer Trailer	60	90	40	20	120
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	215	90	143	20	327
Georgina TS	Green Lane LF	Transfer Trailer	260	90	173	20	387
TOTAL YORK							
OTHER MUNICIPALITIES							
	Clarington 01/05 TTF	Transfer Trailer	70	90	47	20	133

Table 3.2.3 Total Round Trip Cycle Time for Scenario 3 - Clarington 04 (250,000 tpy)

Source	Destination	Truck Type	1 Way Distance Travelled (km)	Average Speed Onroute (km/hr)	1 Way Travel Time (min)	Load / Unload Time (min)	Round Trip Cycle Time (min)
Calculation			A	B	C = (A / B) * 60	D	E = 2 * (C + D)
DURHAM							
Clarington Curbside	Clarington 04 TTF	Packer	5	40	8	20	55
Oshawa WMF	Clarington 04 TTF	Top Loading Transfer Trailer	25	70	21	20	83
Brock Curbside	Miller Waste Pickering	Packer	75	40	113	20	265
Uxbridge Curbside	Miller Waste Pickering	Packer	35	40	53	20	145
Miller Waste Pickering TS	Clarington 04 TTF	Transfer Trailer	40	90	27	20	93
Miller Waste Whitby TS	Clarington 04 TTF	Transfer Trailer	20	90	13	20	67
Waste Management Courtice TS	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL DURHAM							
YORK							
Georgina Curbside	Georgina TS	Packer	25	40	38	20	115
WMC TS - to LF	Green Lane LF	Transfer Trailer	242	90	161	20	363
WMC TS - to TTF	Clarington 04 TTF	Transfer Trailer	100	90	67	20	173
Miller Waste Markham TS - to TTF	Clarington 04 TTF	Transfer Trailer	70	90	47	20	133
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	215	90	143	20	327
Georgina TS	Green Lane LF	Transfer Trailer	260	90	173	20	387
TOTAL YORK							
OTHER MUNICIPALITIES	Clarington 04 TTF	Transfer Trailer	60	90	40	20	120

Table 3.2.4 Total Round Trip Cycle Time for Scenario 4 - East Gwillimbury 01 (250,000 tpy)

Source	Destination	Truck Type	1 Way Distance Travelled (km)	Average Speed Onroute (km/hr)	1 Way Travel Time (min)	Load / Unload Time (min)	Round Trip Cycle Time (min)
Calculation			A	B	$C = (A / B) * 60$	D	$E = 2 * (C + D)$
DURHAM							
Clarington Curbside	WM - Courtice	Packer	11	40	17	20	73
Oshawa WMF	EG TTF	Top Loading Transfer Trailer	75	90	50	20	140
Brock Curbside	EG TTF	Packer	60	40	90	20	220
Uxbridge Curbside	EG TTF	Packer	25	40	38	20	115
Miller Waste Pickering TS	EG TTF	Transfer Trailer	65	90	43	20	127
Miller Waste Whitby TS	EG TTF	Transfer Trailer	80	90	53	20	147
Waste Management Courtice TS	EG TTF	Transfer Trailer	90	90	60	20	160
TOTAL DURHAM							
YORK							
Georgina Curbside	EG TTF	Packer(1)	20	40	30	20	100
WMC TS - to LF	Green Lane LF	Transfer Trailer	242	90	161	20	363
WMC TS(2) - to TTF	EG TTF	Packer	0	40	0	0	0
Miller Waste Markham TS - to TTF	EG TTF	Transfer Trailer	30	90	20	20	80
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	215	90	143	20	327
Georgina TS	Green Lane LF	Transfer Trailer	260	90	173	20	387
TOTAL YORK(2)							
OTHER MUNICIPALITIES							
	EG TTF	Transfer Trailer	100	90	67	20	173

(1) Curbside waste in Georgina is currently transferred at the Georgina Transfer Station to transfer trailer trucks. This approach may continue but the assumption of packer trucks directly hauling waste to the EG TTF is made to be conservative. Should the assumption of packers prove to be a distinguishing factor in the evaluation of the sites, the assumption may be revised to reflect haul in transfer trailers.

(2) Waste from northern York municipalities is currently being transported to the Garfield Wright Waste Management Centre (WMC) for transfer. In this scenario, these packer trucks will be diverted from the WMC and re-directed to the adjacent TTF facility.

Table 3.4.1 Annual Haul Cost for Scenario 1 - Status Quo

Source	Destination	Truck Type	Unit Haul Cost (\$/tonne-min)	Annual Tonnes ⁽¹⁾	Round Trip Cycle Time (min)	Annual Haul Cost (\$)
DURHAM						
Clarington Curbside	WM - Courtice TS	Packer	\$0.20	15,786	73	\$229,325
Oshawa WMF	Miller Waste Pickering TS	Top Loading Transfer Trailer	\$0.09	12,315	91	\$96,705
Brock Curbside	Miller Waste Pickering TS	Packer	\$0.20	2,687	265	\$141,703
Uxbridge Curbside	Miller Waste Pickering TS	Packer	\$0.20	3,866	145	\$111,569
Miller Waste Pickering TS	Remote LF	Transfer Trailer	\$0.06	55,546	385	\$1,378,767
Miller Waste Whitby TS	Remote LF	Transfer Trailer	\$0.06	38,669	404	\$1,006,341
Waste Management Courtice TS	Remote LF	Transfer Trailer	\$0.06	15,786	419	\$425,730
TOTAL DURHAM						\$3,390,140
YORK						
Georgina Curbside	Georgina TS	Packer	\$0.06	6,990	73	\$33,020
WMC TS	Green Lane LF	Transfer Trailer	\$0.06	36,373	363	\$849,749
Miller Waste Markham TS	Green Lane LF	Transfer Trailer	\$0.06	106,637	327	\$2,243,969
Georgina TS	Green Lane LF	Transfer Trailer	\$0.06	6,990	387	\$174,108
TOTAL YORK						\$3,126,739
OTHER MUNICIPALITIES						
	Local LF	Transfer Trailer	\$0.06	20,000	100	\$128,835
TOTAL FOR SYSTEM						\$6,645,714

(1) Tonnage includes some waste that is hauled on multiple legs

Table 3.4.2 Annual Haul Cost for Scenario 2 - Clarington 01/05 (250,000 tpy)

Source	Destination	Truck Type	Unit \$ / tonne-min	Annual Tonnes ⁽¹⁾	Round Trip Cycle Time (min)	Annual Haul Cost (\$)	
DURHAM							
Clarington Curbside	Clarington 01/05 TTF	Packer	\$0.20	15,786	70	\$219,901	
Oshawa WMF	Clarington 01/05 TTF	Top Loading Transfer Trailer	\$0.09	12,315	66	\$69,507	
Brock Curbside	Miller Waste Pickering	Packer	\$0.20	2,687	265	\$141,703	
Uxbridge Curbside	Miller Waste Pickering	Packer	\$0.20	3,866	145	\$111,569	
Miller Waste Pickering TS	Clarington 01/05 TTF	Transfer Trailer	\$0.06	43,231	80	\$222,786	
Miller Waste Whitby TS	Clarington 01/05 TTF	Transfer Trailer	\$0.06	38,669	53	\$132,850	
Waste Management Courtice TS	n/a	n/a	n/a	n/a	n/a	n/a	
TOTAL DURHAM						\$898,316	
YORK							
Georgina Curbside	Georgina TS	Packer	\$0.20	6,990	115	\$159,971	
WMC TS - to LF	Green Lane LF	Transfer Trailer	\$0.06	23,010	363	\$537,562	
WMC TS - to TTF	Clarington 01/05 TTF	Transfer Trailer	\$0.06	13,363	160	\$137,730	
Miller Waste Markham TS - to TTF	Clarington 01/05 TTF	Transfer Trailer	\$0.06	106,637	120	\$824,315	
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	\$0.06	0	327	\$0	
Georgina TS	Green Lane LF	Transfer Trailer	\$0.06	6,990	387	\$174,108	
TOTAL YORK						\$1,659,578	
OTHER MUNICIPALITIES		Clarington 01/05 TTF	Transfer Trailer	\$0.06	20,000	133	\$171,780
TOTAL FOR SYSTEM						\$2,729,674	

Table 3.4.3 Annual Haul Cost for Scenario 3 - Clarington 04 (250,000 tpy)

Source	Destination	Truck Type	Unit \$ / tonne- min	Annual Tonnes ⁽¹⁾	Round Trip Cycle Time (min)	Annual Haul Cost (\$)
DURHAM						
Clarington Curbside	Clarington 04 TTF	Packer	\$0.20	15,786	55	\$172,779
Oshawa WMF	Clarington 04 TTF	Top Loading Transfer Trailer	\$0.09	12,315	83	\$87,639
Brock Curbside	Miller Waste Pickering	Packer	\$0.20	2,687	265	\$141,703
Uxbridge Curbside	Miller Waste Pickering	Packer	\$0.20	3,866	145	\$111,569
Miller Waste Pickering TS	Clarington 04 TTF	Transfer Trailer	\$0.06	43,231	93	\$259,917
Miller Waste Whitby TS	Clarington 04 TTF	Transfer Trailer	\$0.06	38,669	67	\$166,063
Waste Management Courtice TS	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL DURHAM						\$939,671
YORK						
Georgina Curbside	Georgina TS	Packer	\$0.20	6,990	115	\$159,971
WMC TS - to LF	Green Lane LF	Transfer Trailer	\$0.06	23,010	363	\$537,562
WMC TS - to TTF	Clarington 04 TTF	Transfer Trailer	\$0.06	13,363	173	\$149,207
Miller Waste Markham TS - to TTF	Clarington 04 TTF	Transfer Trailer	\$0.06	106,637	133	\$915,906
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	\$0.06	0	327	\$0
Georgina TS	Green Lane LF	Transfer Trailer	\$0.06	6,990	387	\$174,108
TOTAL YORK						\$1,762,646
OTHER MUNICIPALITIES						
	Clarington 04 TTF	Transfer Trailer	\$0.06	20,000	120	\$154,602
TOTAL FOR SYSTEM						\$2,856,919

Table 3.4.4 Annual Haul Cost for Scenario 4 - East Gwillimbury 01 (250,000 tpy)

Source	Destination		Unit \$ / tonne-min	Annual Tonnes ⁽¹⁾	Round Trip Cycle Time (min)	Annual Haul Cost (\$)
DURHAM						
Clarington Curbside	WM - Courtice	Packer	\$0.20	15,786	73	\$229,325
Oshawa WMF	EG TTF	Top Loading Transfer Trailer	\$0.09	12,315	140	\$148,080
Brock Curbside	EG TTF	Packer	\$0.20	2,687	220	\$117,640
Uxbridge Curbside	EG TTF	Packer	\$0.20	3,866	115	\$88,486
Miller Waste Pickering TS	EG TTF	Transfer Trailer	\$0.06	36,678	127	\$299,272
Miller Waste Whitby TS	EG TTF	Transfer Trailer	\$0.06	38,669	147	\$365,338
Waste Management Courtice TS	EG TTF	Transfer Trailer	\$0.06	15,786	160	\$162,699
TOTAL DURHAM						\$1,410,841
YORK						
Georgina Curbside	EG TTF	Packer(2)	\$0.20	6,990	100	\$139,106
WMC TS - to LF	Green Lane LF	Transfer Trailer	\$0.06	0	363	\$0
WMC TS - to TTF(3)	EG TTF	Packer	\$0.18	36,373	0	\$0
Miller Waste Markham TS - to TTF	EG TTF	Transfer Trailer	\$0.06	76,637	80	\$394,941
Miller Waste Markham TS - to LF	Green Lane LF	Transfer Trailer	\$0.06	30,000	327	\$631,292
Georgina TS	Green Lane LF	Transfer Trailer	\$0.06	0	387	\$0
TOTAL YORK(3)						\$1,165,339
OTHER MUNICIPALITIES						
	EG TTF	Transfer Trailer	\$0.06	20,000	173	\$223,314
TOTAL FOR SYSTEM						\$2,799,494

(1) Tonnage includes some waste that is hauled on multiple legs

(2) Curbside waste in Georgina is currently transferred at the Georgina Transfer Station to transfer trailer trucks. This approach may continue but the assumption of packer trucks directly hauling waste to the EG TTF is made to be conservative. Should the assumption of packers prove to be a distinguishing factor in the evaluation of the sites, the assumption may be revised to reflect haul in transfer trailers.

(3) Waste from northern York municipalities is currently being transported to the Garfield Wright Waste Management Centre (WMC) for transfer. In this scenario, these packer trucks will be diverted from the WMC and re-directed to the adjacent TTF facility.