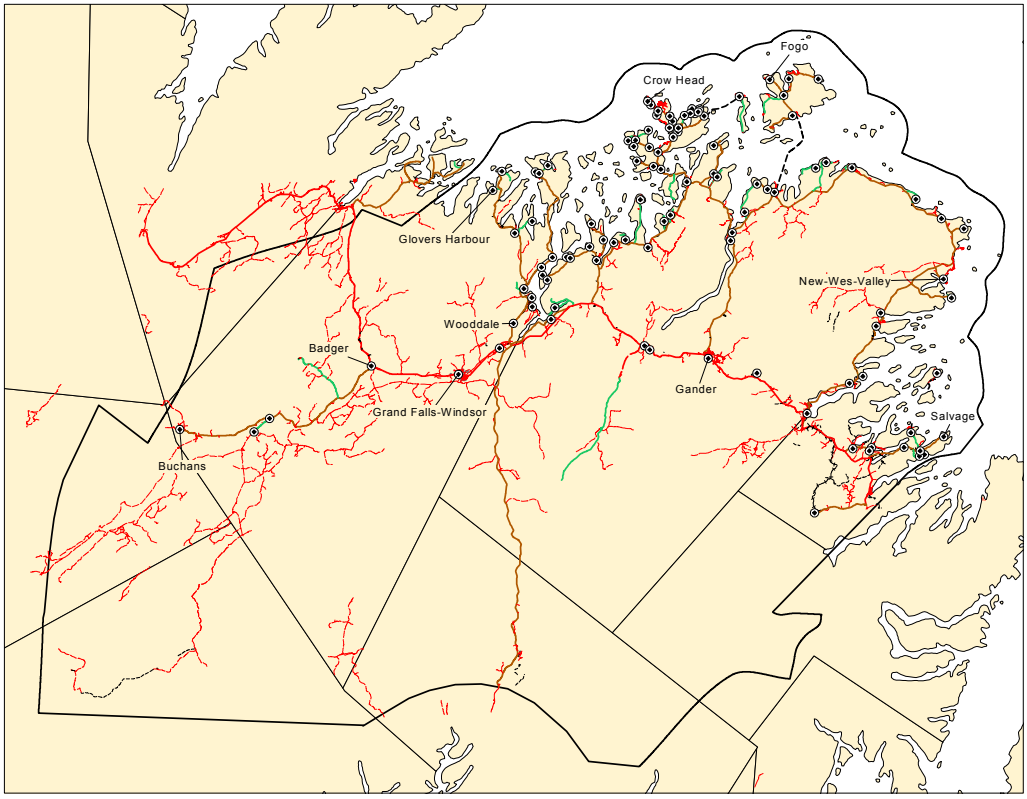
CENTRAL NEWFOUNDLAND SOLID WASTE MANAGEMENT PLAN

Phase II Report

Progress Report #1 Submitted to

Central Newfoundland Waste Management Committee

BNG PROJECT # 722021



BAE ◆ NEWPLAN GROUP

CENTRAL NEWFOUNDLAND
SOLID WASTE MANAGEMENT PLAN

Phase II Report
Progress Report #1

Draft Report Submitted to:

Central Newfoundland Waste Management Committee
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Title: CENTRAL NEWFOUNDLAND SOLID WASTE MANAGEMENT PLAN

Phase II Report - Draft

Client: Central Newfoundland Waste Management Committee

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Rev.	Date yyyy/mm/dd	Page No.	Description	Prepared By	Reviewed By	Approved By

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EXECUTIVE SUMARY

The Solid Waste Management Plan has been developed using a very interactive process between the BAE-Newplan Group (BNG) and the Central Newfoundland Solid Waste Management Committee (CNSWMC). The CNSWMC is an umbrella organization made up of representative of the community councils within the Central Region of Newfoundland. In October 2002, BNG submitted Phase I of the Solid Waste Management Plan to the CNSWMC. The Phase 1 Report provided the committee with information on the following topics:

- boundary of the study area;
- waste generation rates;
- population projections;
- waste generation centriod;
- waste characteristics for Central Newfoundland;
- a description of waste collection and transportation;
- transfer stations and potential locations throughout the study area;
- a review of comparable waste management systems,
- a review of existing recycling and composting facilities;
- analysis of various recyclable processing options;
- alternatives approaches to engineered landfill;
- cost estimates for transfer stations; and
- selection of potential waste management facility.

Based on the findings presented to the CNSWMC in the Phase I Report, the committee decided to adopt a two-stream (wet/dry) waste collection system with transfer stations located in Buchan's Junction, Botwood, Virgin's Arm - Carter's Cove, Seldom - Little Seldom, Gander Bay South, Indian Bay, and Terra Nova.

Phase 2 of the Waste Management Plan will include the investigation of landfill alternatives, investigation of transfer station options, investigation of materials recycling facility and composting facility alternatives, construction and demolition alternatives, conceptual design of the Regional Waste Management System, develop tipping fee, and, determine close out requirements for all existing waste disposal sites within the study area.

1.0 INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

The Province of Newfoundland and Labrador has developed a comprehensive strategy[1] with a goal of 50% diversion of materials currently going to landfills by the year 2010. The strategy includes a reduction in the number of disposal sites, the elimination of open burning, and the phase out of unlined landfills.

The Central Newfoundland Waste Management Committee is an umbrella organization made up of representative of the community councils within the Central Region of Newfoundland. In keeping with the goals of this strategy, the Central Newfoundland Waste Management Committee has undertaken the task to oversee the development of a Solid Waste Management Plan for the Central Newfoundland Region. BAE♦Newplan Group was retained in April 2002 to assist the committee with the development of the plan. The Central Newfoundland Waste Management Committee, under the direction of Allan Scott, has a mandate to:

> "To study and recommend a cost effective, environmentally acceptable solid waste management system for Central Newfoundland."

The guiding principles for this mandate are clearly documented in the Terms of Reference[2] provided to BAE♦Newplan Group by the Central Newfoundland Waste Management Committee. They include:

- Evaluate the solid waste management needs, including recycling programs;
- Identify existing problems and determine the most feasible means of improvement; and
- Provide the region with an acceptable solid waste management plan for a design period of 50 years.

In October, 2002, BAE♦Newplan Group completed Phase I of the Central Newfoundland Solid Waste Management Plan. Based on the findings presented to the CNSWMC in the Phase I Report, the committee decided to adopt a two-stream (wet/dry) waste collection system with transfer stations / staging areas located in Buchan's Junction, Botwood, Virgin's Arm - Carter's Cove, Seldom - Little Seldom, Gander Bay South, Indian Bay, and Terra Nova.

[1] Government of Newfoundland and Labrador, Department of the Environment. *Newfoundland and Labrador Waste Management Strategy.* April 2002.
[2] Terms of Reference, Central Newfoundland Waste Management Study. February 22, 2002.

The objects for the Phase II Report are clearly documented in the Proposal[3] provided to the Central Newfoundland Waste Management Committee by BAE♦Newplan Group in August 2002. Based on BAE♦Newplan Groups' previous experience as well as conducting Phase I of the Solid Waste Management Plan, the Phase II investigation has been broken down into several tasks, which include the following:

- Investigation of Landfill Alternatives;
- Investigation of Transfer Station Options;
- Investigation of Materials Recycling Facility and Composting Facility Alternatives;
- Construction and Demolition Alternatives;
- Conceptual Design of the Regional Waste Management System;
- Develop Tipping Fee; and
- Determine Close Out Requirements for all Existing Waste Disposal Sites.

[3] Proposal for Central Newfoundland Solid Waste Management Study, Phase II. August, 2002.

2.0 IDENTIFICATION OF POTENTIAL LOCATIONS FOR WASTE MANAGEMENT FACILITY

The following sections provide the results of the phased site selection process. The Terms of Reference required the project team to consider existing sites for future use and, to undertake a site selection process for a new Regional Solid Waste Management Facility.

The phases included in the assessment of site suitability include:

1. Phase 1 - Preliminary Identification (Constraint Mapping)
2. Phase 2 - Site Screening (Ranking)
3. Phase 3 - Financial Investigation
4. Phase 4 - Detailed Investigations

2.1 PRELIMINARY IDENTIFICATION

The optimal landfill location is the one that minimize the total transportation from communities / transfer stations to the landfill site. To find the optimal landfill site, the waste generation centroid by road distance was calculated based on the transportation road network and the waste generation data. the waste generation centroid by road distance is defined as a point on the Trans Canada Highway (TCH) of which the waste tonnage-distance from both side of it are same.

The waste generation centroid of the Central Newfoundland Region is found to be 34.7 km west of Gander at the TCH / Lewisporte Bypass junction. The impacts of including Bonavista, South Brook and Baie Verte regions (Figure 2-1) on the landfill location had been investigated as well. The centroids for various scenarios are presented in Table 2-1 and are shown in Figure 2-2.

Table 2.1: Centroid Locations for Various Scenarios.

Regions Served	No. of Communities	Population	Waste Volume (T/Year)	Centroid (km)
All - Central, Bonavista, South Brook and Baie Verte	119	109,290	62,012	36.8
Central, South Brook and Baie Verte	97	92370	53,984	47.1
Central, South Brook	81	85,482	50,715	43.3
Central only	66	76,583	45,493	34.7
Central, Bonavista, South Brook	103	102,402	58,744	22.9
Central, Bonavista	88	93,503	54,521	8.9

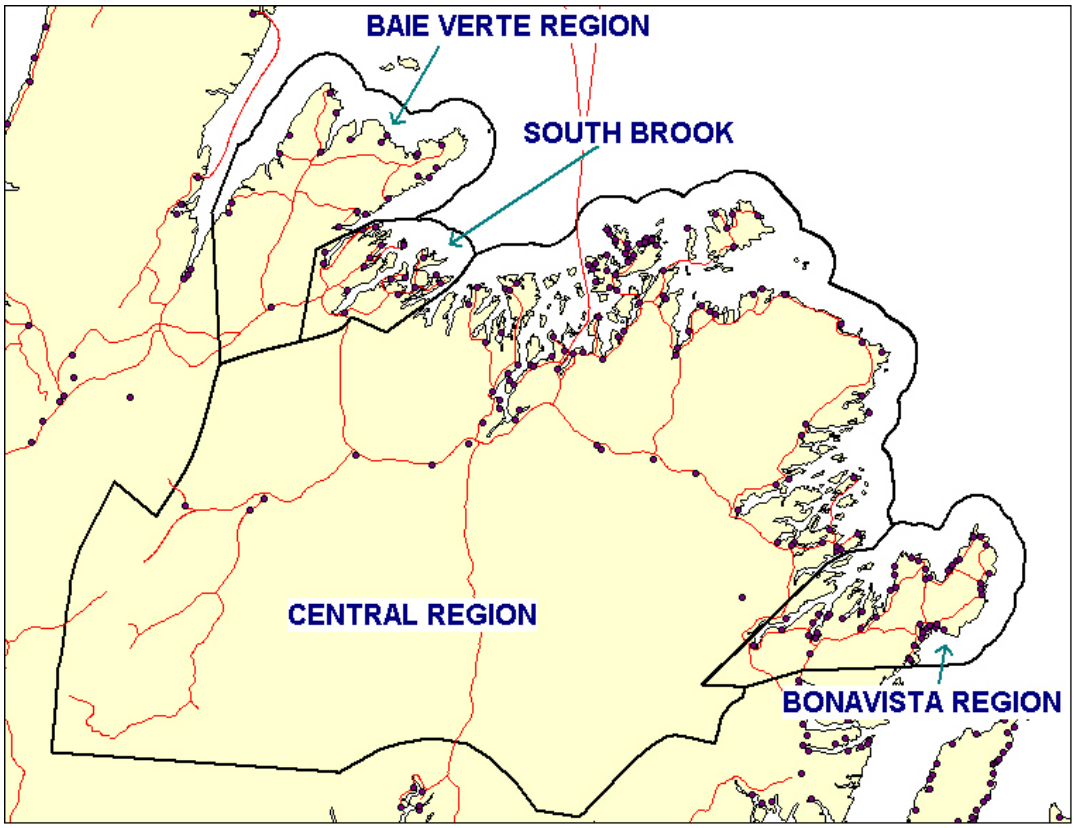

Figure 2-1: Central, Bonavista, South Brook and Baie Verte Regions.

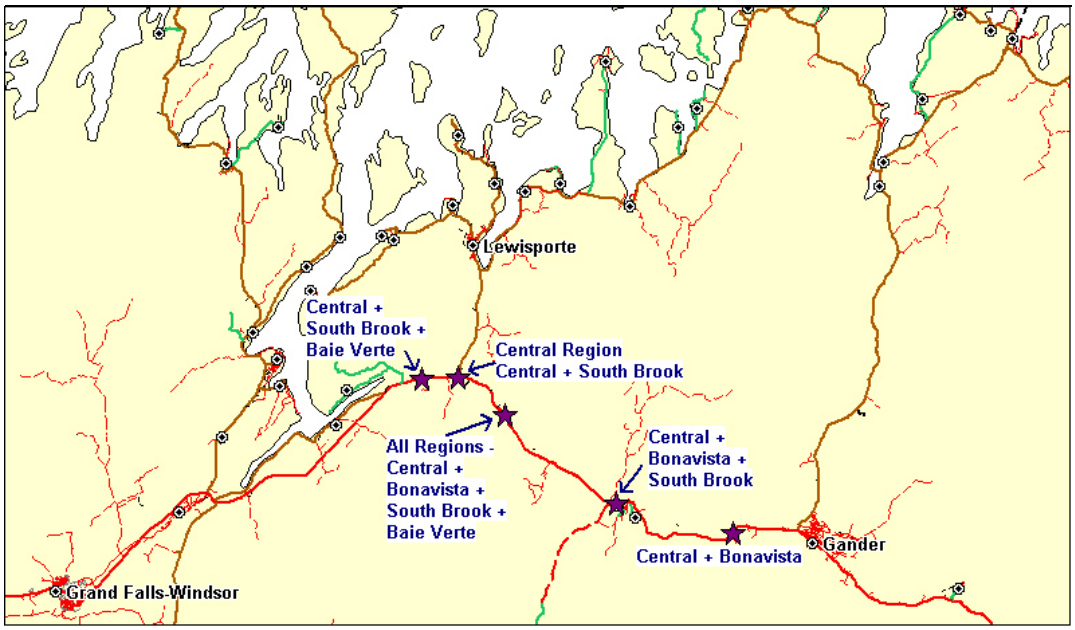

Figure 2-2: Centroid Locations of Various Scenarios.

The analysis shows that including South Brook and Baie Verte will not impact the optimal landfill site much. But Bonavista will have a significant impact on the landfill site selection. And thus decision should be make in an early stage if Bonavista should be serviced by the Central Waste Management facility.

The sections below are for the Central Region only.

Phase 1 – Preliminary Identification was completed during Phase 1 of the Solid Waste Management Plan. The site selection process applied regulatory and community based constraints to a GIS model. Topographic maps (1:50,000) and the Department of Government Services and Lands provincial land use atlas were used in conjunction with site selection criteria and constraints. Each constraint and criteria were layered on a base map in the GIS model.

Locations that fell within the constraint areas were excluded form the site selection process. Only the areas that fell within the less than 12 percent land slope and soil covered criteria were considered as suitable sites for the waste management facility. This process identified five possible locations where the waste management facility could be located. Figure 2.3 highlights these locations.

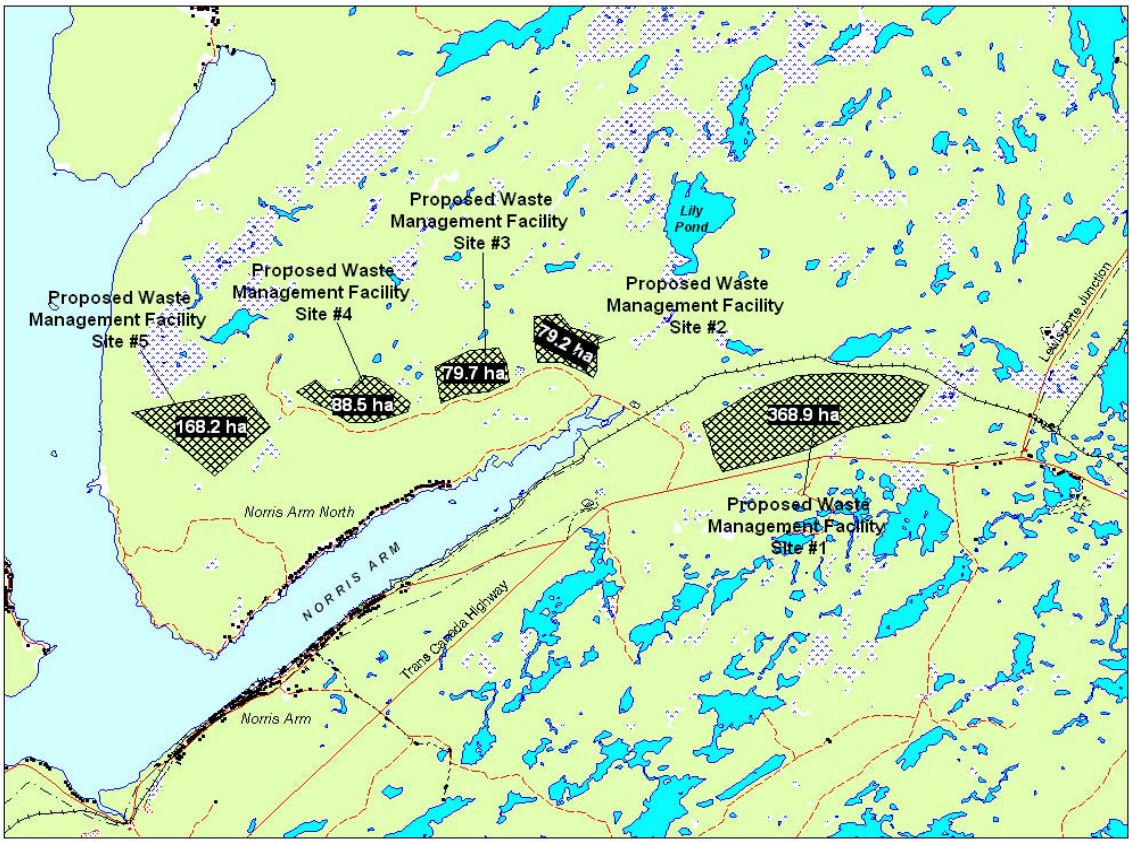

Figure 2.3: Five Proposed Waste Management Facility Locations.

2.2 PHASE 2 - SITE SCREENING - RANKING

A comprehensive set of evaluation criteria has been developed for the site screening process. Following the identification of the five potential sites, an assessment to rank each location was undertaken. In addition to physical parameters, the ranking system considered the potential impact of a deficiency in the landfill system; for example, impact on water resources. The objective of this phase was to identify, in order of priority, several preferred sites.

Each of the site evaluation factors was assigned a weight based on a scale of 1 to 10. This weight reflects the relative importance of the factor in the development of the site for waste disposal. Each site factor was also designated with a range of scores based on a scale of 1 to 10. The following outline represents the rationale for the weighting and scoring of each site factor. The figures shown for scoring are guidelines, and actual scores may fall between the average scores shown.

2.2.1 FACTORS RELATED TO PUBLIC ACCEPTABILITY & AESTHETICS

Site Visibility (Weight=6)

Ideally, a disposal site should be totally screened from the community, highway, cabins, etc. However, the degree of remoteness and the operating methods lessen the importance of total screening of the site.

Range	Ranking
Not Visible	10
Partially Visible	5
Mostly Visible	1

Forest Coverage (Weight = 3)

Heavy tree cover obviously affects clearing and development costs of the site, and destruction of a forest is not desirable. On the other hand, tree cover surrounding the site can be desirable in reducing visibility, which has advantages from an aesthetic point of view.

Range	Ranking
No Cover	10
Some Cover	5
Heavy Cover	1

Exposure to Climatic Conditions (Weight = 5)

Site exposure requires consideration because the degree of exposure to climatic conditions will affect the efficiency and cleanliness of the operations. To some extent, the degree of exposure can also affect the availability of overburden during winter months. In addition, sites should not be located in areas subject to storm erosion, or sites in close proximity to shoreline features, particularly near bluffs or high shore banks. Also, in-filling of flood plain areas is not acceptable.

Range	Ranking
Sheltered	10
Some Exposure	5
Exposed	1

Prevailing Winds (Weight = 3)

Prevailing winds is an important factor in the selection of a waste disposal site. Many complaints could be expected from residents if prevailing winds are in the direction of populated areas. While this applies more particularly to incineration as opposed to landfill only, potential changes in technologies and long-term methods of disposal at the site require that it be considered in long term planning. The weighting factor would be increased if incineration were included in the waste disposal process.

Range	Ranking
Generally away from developed areas	10
Partially in direction of developed areas	5
Generally in direction of developed areas	1

Conflicting Land Use (Weight = 4)

Present environmental guidelines require that a waste disposal site be at least 1.6 km from existing or proposed developments. This is a very sensitive issue, and increased distance is very desirable when selecting a site that will create minimal impact on adjacent land use. When evaluating this aspect, other conflicting uses such as recreational facilities, cottages, nature parks, etc. must be given consideration.

Range	Ranking
Greater than 2 km	10
Between 1.6 km to 2 km	5
Less than 1.6 km	1

End Use Potential (Weight = 2)

It is being increasingly recognized that selecting, planning and designing a landfill in a manner that would prove compatible with, and be beneficial to its intended end use, is the most cost effective method of preparing the land for future development. For example, closed landfill sites have been converted into municipal golf courses, baseball diamonds, soccer fields, parks, ski and sled runs, etc. An assessment of the end use potential of a site is therefore a consideration.

Range	Ranking
Defined Potential Use	10
Possible Use	5
No potential Use	1

2.2.2 FACTORS RELATED TO COST OF DEVELOPMENT, OPERATIONS & LONG TERM SITE FLEXIBILITY

Haul Distance (Weight = 8)

Realizing the financial restraints of most municipalities in this province, haul distance to the site is very important. Haulage distances should be as time and cost efficient as possible. Sites were pro-rated based on distance from the waste generation centroid.

Range	Ranking
Closest	10
Furthest	1

Site Access (Weight = 6)

The difficulty of constructing an access to the site has a great effect of the capital costs required in initial site construction. The available route and its exposure also affect the maintenance and upkeep of the road, especially during the winter months.

Range	Ranking
Good	10
Fair	5
Difficult	1

Availability of Suitable Cover Material (Weight = 10)

The depth and availability of suitable cover material is of great importance in the selection of a landfill site. Depth of material is a determining factor in calculating the space requirements of the site, and plays a major role in capital and operating cost.

Range	Ranking
Greater than 3 m	10
Between 1.5 m to 3 m	5
Less than 1.5 m	1

Life Expectancy (Weight = 10)

Care must be taken in the selection of a waste disposal site to ensure that sufficient area is available for long-term usage. Estimates of cumulative waste volumes would be necessary to ensure adequate land area is available.

Range	Ranking
50 years	10
20 years	5
5 years or less	1

Land Ownership (Weight = 8)

Ownership of lands being considered for a waste disposal site and those within a 1.6 km radius may introduce significant development costs. Land value and extent of private ownership requires assessment. Preferable, sufficient crown or municipal lands can be sourced to meet long-term needs.

Range	Ranking
Crown/Municipal Lands	10
Partial Private Lands	5
Majority Private Land of High Value	1

Fire Protection (Weight = 4)

Ideally, the site should be accessible to a small stream or pond to facilitate possible fire fighting which may be required. The proximity to water must be carefully weighed in conjunction with the environmental factors, and the ideal situation would be to have a water body that is higher in elevation than the disposal area.

Range	Ranking
Good	10
Fair	5
Poor	1

Slope (Weight =10)

Average slopes across the land area are an important factor when considering the proper development and management of a sanitary landfill site. Excessive slopes greater than 10% – 12% would cause drainage and erosion problems and make control of any leachates difficult. Also, steep slopes can increase operational and visual problems.

Range	Ranking
1% to 6%	10
6% to 12 %	5
Over 12%	1

Site Drainage Considerations (Weight = 10)

Minimizing and controlling leachates must be a high priority in the selection and operation of a site. Precipitation provides the major transport phase for leachate and contaminant migration from a landfill site. Although some moisture may be derived from the wastes that are being handled, the primary precursor to leachate formation is the infiltration from rainfall or snowmelt. Therefore, controlling the amount of infiltration into the refuse has the greatest effect on leachate production. Controlling surface drainage can control by carefully selecting cover material, cover slope, final cover and vegetation, and infiltration. The degree of compaction also affects leachate generation. However, it is imperative that off-site surface water be diverted away from the site.

Range	Ranking
Good Diversion of Off-Site Drainage	10
Somewhat Difficult Diversion of Off-Site Drainage	5
Difficult Diversion of Off-Site Drainage	1

2.2.3 RESULTS OF THE SITE SCREENING

Tables 2.1 to 2.5 on the following pages, provide the resulting scores for the five (5) sites under consideration. Table 2.6 provides an overall summary comparison and ranking of all six potential sites. Proposed sites 1, 2, and 4 scored the highest at 736, 634 and 605, respectively. Based on these scores it is recommended that these three sites warrant financial investigation to determine which site is most cost effective.

Table 2.2: Proposed Waste Management Facility Site # 1

CRITERIA	DESCRIPTION	SCORE
Visibility	Site may be partially visible from the Trans Canada Highway.	5
Forest Coverage	A review of the aerial photography revealed that approximately 70% of the site is forested.	3
Exposure	Forest coverage in areas. Partially sheltered.	7
Prevailing Winds	Prevailing winds in South West direction. Blowing away from the communities of Norris Arm and Norris Arm North. Winds blowing toward Lewisporte which is approximately 10 km away. Limited problem.	10
Conflicting Land Use	Located approximately 4 km from Norris Arm North.	10
End Use Potential	Due to the remoteness of the site, there is limited potential for future development of the decommissioned landfill.	1
Haul Distance	Haul distance from the centroid was weighted for all five site. This site was deemed to be ranked 1 out of 5, therefore received a score of 10.	10
Site Access	The site can be accessed by the construction of a 0.5 km access road from an existing Norris Arm North road.	10
Cover Material	2.0 – 3.0 m.	5
Life Expectancy	50 years.	10
Land Ownership	The site is located on crown lands.	10
Fire Protection	There is a pond available slightly downgrade of the site.	5
Slope	The overall slope of the site is between 1% to 6%.	10
Drainage	Offsite drainage is generally away from the site. Most drainage is intercepted by the Trans Canada Highway.	10
	TOTAL	**736**

Table 2.3: Proposed Waste Management Facility Site # 2

CRITERIA	DESCRIPTION	SCORE
Visibility	Site maybe partially visible from the existing Norris Arm North Road.	1
Forest Coverage	A review of the aerial photography revealed that approximately 80% of the site is forested.	2
Exposure	Mostly forested. Mainly sheltered.	8
Prevailing Winds	Prevailing winds in South West direction. Blowing away from the communities of Norris Arm and Norris Arm North. Winds blowing toward Lewisporte which is approximately 14 km away. Limited problem.	10
Conflicting Land Use	Located approximately 3.2 km from Norris Arm North.	10
End Use Potential	Due to the remoteness of the site, there is limited potential for future development of the decommissioned landfill.	1
Haul Distance	Haul distance from the centroid was weighted for all five site. This site was deemed to be ranked 2 out of 5, therefore received a score of 8.	8
Site Access	The site can be accessed by the construction of a 0.2 km access road from an existing 0.5 km gravel road and a 2.5 km paved road.	10
Cover Material	2.0 – 3.0 m.	5
Life Expectancy	50 years.	9
Land Ownership	The site is located on crown lands.	10
Fire Protection	There is a stream available slightly downgrade of the site.	4
Slope	The overall slope of the site is between 1% to 6%.	10
Drainage	The site is located on the side of a hill. Some drainage through the site.	5
	TOTAL	**634**

Table 2.4: Proposed Waste Management Facility Site # 3

CRITERIA	DESCRIPTION	SCORE
Visibility	Site not visible from the existing Norris Arm North Road. Norris Arm North approximately 2.0 km from site.	4
Forest Coverage	A review of the aerial photography revealed that approximately 80% of the site is forested.	2
Exposure	Mostly forested. Mainly sheltered.	8
Prevailing Winds	Prevailing winds in South West direction. Blowing away from the communities of Norris Arm and Norris Arm North. Winds blowing toward Lewisporte which is approximately 14 km away. Limited problem.	10
Conflicting Land Use	Located approximately 2 km from Norris Arm North.	5
End Use Potential	Due to the remoteness of the site, there is limited potential for future development of the decommissioned landfill.	1
Haul Distance	Haul distance from the centroid was weighted for all five site. This site was deemed to be ranked 3 out of 5, therefore received a score of 6.	6
Site Access	The site can be accessed by the construction of a 0.15 km access road from an existing 2.8 km gravel road and a 2.5 m paved road. The 2.8 km gravel road would require some upgrade construction.	6
Cover Material	2.0 – 3.0 m.	5
Life Expectancy	50 years.	9
Land Ownership	The site is located on crown lands.	10
Fire Protection	There are some small ponds available at the same elevation.	7
Slope	The overall slope of the site is between 1% to 6%.	10
Drainage	The site is located on the side of a hill. Drainage would be through the site.	4
	TOTAL	**594**

Table 2.5: Proposed Waste Management Facility Site # 4

CRITERIA	DESCRIPTION	SCORE
Visibility	Site not visible from the existing Norris Arm North Road. Norris Arm North approximately 2.0 km from site.	3
Forest Coverage	A review of the aerial photography revealed that approximately 75% of the site is forested.	3
Exposure	Mostly forested. Mainly sheltered.	8
Prevailing Winds	Prevailing winds in South West direction. Blowing away from the communities of Norris Arm and Norris Arm North. Winds blowing toward Lewisporte which is approximately 16.5 km away. Limited problem.	10
Conflicting Land Use	Located approximately 2 km from Norris Arm North.	5
End Use Potential	Due to the remoteness of the site, there is limited potential for future development of the decommissioned landfill.	1
Haul Distance	Haul distance from the centroid was weighted for all five site. This site was deemed to be ranked 4 out of 5, therefore received a rank of 4.	4
Site Access	The site can be accessed by the construction of a 0.23 km access road from an existing 3.5 km gravel road and 2.5 m paved road. The 3.5 km gravel road would require some upgrade construction.	4
Cover Material	2.0 – 3.0 m.	5
Life Expectancy	50 years.	8
Land Ownership	The site is located on crown lands.	10
Fire Protection	There are several small ponds available at a slightly lower elevation.	5
Slope	The overall slope of the site is between 1% to 6%.	10
Drainage	Offsite drainage is generally away from the site.	10
	TOTAL	**605**

Table 2.6: Proposed Waste Management Facility Site # 5

CRITERIA	DESCRIPTION	SCORE
Visibility	Site not visible from the existing Norris Arm North Road. Norris Arm North approximately 2.2 km from site.	2
Forest Coverage	A review of the aerial photography revealed that approximately 80% of the site is forested.	2
Exposure	Mostly forested. Mainly sheltered.	8
Prevailing Winds	Prevailing winds in South West direction. Blowing away from the communities of Norris Arm and Norris Arm North. Winds blowing toward Lewisporte which is approximately 19 km away. Limited problem.	10
Conflicting Land Use	Located greater the 2 km from Norris Arm North.	10
End Use Potential	Due to the remoteness of the site, there is limited potential for future development of the decommissioned landfill.	1
Haul Distance	Haul distance from the centroid was weighted for all five site. This site was deemed to be ranked 5 out of 5, therefore received a score of 2.	2
Site Access	Furthest site from the Trans Canada Highway. Would require upgrade of 4.5 km of gravel road and construction of 0.5 km of road.	2
Cover Material	2.0 – 3.0 m.	5
Life Expectancy	50 years.	8
Land Ownership	The site is located on crown lands.	10
Fire Protection	Nearest source of water is approximately 1 km downgrade of the site.	5
Slope	The overall slope of the site is between 1% to 6%.	10
Drainage	Offsite drainage is generally away from the site.	8
	TOTAL	**568**

Table 2.7: Preliminary Site Screening of Potential Landfill Sites

	Factors	Weight	Site # 1		Site # 2		Site # 3		Site # 4		Site # 5	
			Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Related to Public Acceptability and Aesthetics												
1	Visibility	6	5	30	1	6	4	24	3	18	2	12
2	Forest Coverage	3	3	9	2	6	2	6	3	9	2	6
3	Exposure	5	7	35	8	40	8	40	8	40	8	40
4	Prevailing Winds	3	10	30	10	30	10	30	10	30	10	30
5	Conflicting Land Use	4	10	40	10	40	5	20	5	20	10	40
6	End Use Potential	2	1	2	1	2	1	2	1	2	1	2
Related to Cost of Development, Operations and Long Term Site Flexibility												
7	Haul Distance	8	10	80	8	64	6	48	4	32	2	16
8	Site Access	6	10	60	10	60	6	36	4	24	2	12
9	Cover Material	10	5	50	5	50	5	50	5	50	5	50
10	Life Expectancy	10	10	100	9	90	9	90	8	80	8	80
11	Land Ownership	8	10	80	10	80	10	80	10	80	10	80
12	Fire Protection	4	5	20	4	16	7	28	5	20	5	20
13	Slope	10	10	100	10	100	10	100	10	100	10	100
14	Drainage	10	10	100	5	50	4	40	10	100	8	80
	TOTAL SCORES			736		634		594		605		568
	SITE RANKING		1		2		4		3		5	

Example: Evaluation of Site #3 for haul distance indicates a score of 6 on a scale of 1 to 10. Since haul distance was assigned a weight of 8 on a scale of 1 to 10 the weighted score of the Site #3 for haul distance is 6 x 8=48. The weighted score for each factor is added to obtain the total weighted score for each site.

2.3 PHASE 3 – PRELIMINARY FINANCIAL INVESTIGATION

Based on the results of the preliminary site ranking, it is recommended that proposed sites 1, 2, and 4 warrant financial investigation to determine which sites are most cost effective. The objective of this phase is to identify the two most feasible sites for the location of the waste management facility.

A comprehensive set of evaluation criteria has been developed for the financial site screening process. Following the identification of the three potential sites, an assessment to rank the feasibility of each location was undertaken. The financial ranking system considered such criteria as the costs associated with the construction of the access road, stream crossings, drainage diversion, connecting site to three-phased power and telephone lines, pump house and waterlines required for fire protection, and etc. Infrastructure costs associated with the construction of the landfill cells, public drop-off areas, composting facility, materials recovery facility and etc. were not included as part of the financial investigation. These costs were considered to be equal for all three proposed sites.

2.3.1 PROPOSED SITE # 1

Proposed site #1 is located approximately 2.0 km east of Norris Arm Harbour and covers an area of 368.9 ha. It was ranked the highest during the Phase II ranking process with a score of 736. Table 2.7 provides the results of the financial analysis for site #1.

Table 2.8: Financial Analysis for Proposed Waste Management Facility Site #1.

CRITERIA	DESCRIPTION	ESTIMATED COST
Site Access Road	The site can be accessed by the construction of a 0.5 km access road from an existing 0.750 km Norris Arm North paved road. It was assumed that the cost of constructing and paving of the access road is $100,000/km.	$50,000
Stream Crossings	A review of topographic maps and aerial photographs revealed that there are no streams in the vicinity of the proposed access road.	$0
Tree Clearing	A review of the aerial photography revealed that approximately 70% of the site is forested. It was assumed that the size of the WMF will be approximately 50 ha and the cost of tree clearing will be $2,500/ha. Since approximately 70% of the site is considered to be tree covered, 35 ha will need to be cleared.	$87,500
Three-Phase Power	Three-phased power is available at Norris Arm North at a distance of 2.42 km from the site. The cost estimate is based on a 20 KW Load.	$99,000

CRITERIA	DESCRIPTION	ESTIMATED COST
Telephone Lines	Aliant Telecom was contacted to provide an estimate of providing telephone services to the site. The cheapest alternative was to provide the service from the Lewisporte Junction Region. The quote was based on a distance of 5 km from the nearest telephone connection.	$53,300
Fire Protection (Pump House and Waterline)	There is a pond available slightly downgrade (1.3 km) of the site. The site will likely require a pump house and approximately 1.5 km of waterline to provide adequate water for fire protection. It is assumed that the cost of the pump house will be approximately $350,000 and the waterline $250/m.	$675,000
Drainage Diversion	Offsite drainage is generally away from the site. Most drainage is intercepted by the Trans Canada Highway. To prevent onsite drainage, the site will require approximately 1.15 km of drainage channels at a estimated cost of 100,000/km.	$115,000
Annual Transportation Cost	The cost provided includes the total transportation cost of transporting waste from the transfer stations to the WMF using **53 ft trailers.** Costs comparisons of using roll-off bins, transtor bins, and 53 ft trailers, are provided in Section 5.2.	$414,186
	Total	**$1,493,986**

2.3.2 PROPOSED SITE # 2

Proposed site #2 is located approximately 1.0 km north of Norris Arm Harbour and covers an area of 79.2 ha. It was ranked second highest during the Phase II ranking process with a score of 634. Table 2.8 provides the results of the financial analysis for site #2.

Table 2.9: Financial Analysis for Proposed Waste Management Facility Site #2.

CRITERIA	DESCRIPTION	ESTIMATED COST
Site Access Road	The site can be accessed by the construction of a 0.2 km access road from an existing 0.5 km gravel road and 2.5 km paved road. It was assumed that the cost of constructing and paving of the access road is $100,000/km and the cost of upgrading and paving the existing gravel road is $75,000/km.	$57,500
Stream Crossings	A review of topographic maps and aerial photographs revealed that there are no streams in the vicinity of the proposed access road.	$0
Tree Clearing	A review of the aerial photography revealed that approximately 80% of the site is forested. It was assumed that the size of the WMF will be approximately 50 ha and the cost of tree clearing will be $2,500/ha. Since approximately 80% of the site is considered to be tree covered, 40 ha will need to be cleared.	$100,000
Three-Phase Power	Three-phased power is available at Norris Arm North at a distance of 2.34 km from the site. The cost estimate is based on a 20 KW Load.	$95,000
Telephone Lines	Aliant Telecom was contacted to provide an estimate of providing telephone services to the site. The cheapest alternative was to provide the service from the Lewisporte Junction Region. The quote was based on a distance of 7 km from the nearest telephone connection.	$125,000
Fire Protection (Pump House and Waterline)	The site is located 1 km upgrade of Norris Arm Harbour. The site will require a pump house and approximately 1 km of stainless steel waterline to provide adequate water for fire protection. It is assumed that the cost of the pump house will be approximately $350,000 and the waterline $270,000/km.	$620,000
Drainage Diversion	The site is located on the side of a hill. There is some drainage through the site. To prevent onsite drainage, the site will require approximately 1.2 km of drainage channels at a estimated cost of 100,000/km.	$120,000
Annual Transportation Cost	The cost provided includes the total transportation cost of transporting waste from the transfer stations to the WMF using **53 ft trailers.** Costs comparisons of using roll-off bins, transtor bins, and 53 ft trailers, are provided in Section 5.2.	$423,650
	Total	**$1,541,150**

2.3.3 PROPOSED SITE # 4

Proposed site #4 is located approximately 2.0 km north of Norris Arm Harbour and covers an area of 88.5 ha. It was ranked third highest during the Phase II ranking process with a score of 605. Table 2.9 provides the results of the financial analysis for site #4.

Table 2.10: Financial Analysis for Proposed Waste Management Facility Site #4.

CRITERIA	DESCRIPTION	ESTIMATED COST
Site Access Road	The site can be accessed by the construction of a 0.23 km access road from an existing 3.5 km gravel road and 2.5 km paved road. It was assumed that the cost of constructing and paving of the access road is $100,000/km and the cost of upgrading and paving the existing gravel road is $75,000/km.	$285,500
Stream Crossings	A review of topographic maps and aerial photographs revealed that there are no streams in the vicinity of the proposed access road.	$0
Tree Clearing	A review of the aerial photography revealed that approximately 75% of the site is forested. It was assumed that the size of the WMF will be approximately 50 ha and the cost of tree clearing will be $2,500/ha. Since approximately 75% of the site is considered to be tree covered, 37.5 ha will need to be cleared.	$93,750
Three-Phase Power	Three-phased power is available at Norris Arm North at a distance of 1.55 km from the site. The cost estimate is based on a 20 KW Load.	$64,000
Telephone Lines	Aliant Telecom was contacted to provide an estimate of providing telephone services to the site. The cheapest alternative was to provide the service from the Lewisporte Junction Region. The quote was based on a distance of 9 km from the nearest connection.	$160,000
Fire Protection (Pump House and Waterline)	There are several small ponds available slightly downgrade (0.8 km) from the site. The site will require a pump house and approximately 0.8 km of waterline to provide adequate water for fire protection. It is assumed that the cost of the pump house will be approximately $350,000 and the waterline $250,000/km.	$550,000
Drainage Diversion	Drainage is generally away from the site with little onsite drainage. To prevent onsite drainage, the site will require approximately 1.2 km of drainage channels at a estimated cost of 100,000/km.	$120,000

CRITERIA	DESCRIPTION	ESTIMATED COST
Annual Transportation Cost	The cost provided includes the total transportation cost of transporting waste from the transfer stations to the WMF using **53 ft trailers.** Costs comparisons of using roll-off bins, transtor bins, and 53 ft trailers, are provided in Section 5.2.	$438,356
	Total	**$1,711,606**

Summary of Financial Investigation:

- Site #1 = **$1,493,986**
- Site #2 = **$1,541,150**
- Site #3 = **$1,711,606**

Based on the results of the preliminary financial investigation, it is recommended that proposed sites #1 and #2, warrant further detailed investigation to determine which site will be sited as the preferred site for the Waste Management Facility. The objective of the detailed investigations will be to identify any physical or ecological factors that may preclude the sites from further consideration and support the selection of a preferred site. The components of the investigation are listed below:

- Site Development Concept;
- Land Use / Social Issues;
- Archaeological;
- Receiving Water;
- Geotechnical; and
- Hydrogeology.

This investigation will also include the confirmation of information collected during the site screening and ranking process, and review the information gathered from published sources on regional characteristics. Discussions with municipal and provincial representatives will take place to gather information on site development issues and land use. Other information will be collected from mapping and provincial databases, and the intrusive sampling of site soils and waters.

3.0 ALTERNATIVE APPROACHES TO ENGINEERED LANDFILL

This section includes a discussion on alternative approaches to an engineered landfill including such factors as: amount of land needed for a 50 year capacity, high water table, cover material, bale fill or in-cell compaction, and other designs, construction and operational parameters. Appendix A provides supporting information gathered from suppliers and manufacturers on technologies being applied to landfill operations.

3.1 LANDFILL DESIGN ALTERNATIVES

Landfills are designed to maximize the disposal volume and minimize the landfill area. Increasing the density of the refuse, minimizing the cover systems, and optimizing the design of the landfill to utilize site-specific topographic conditions achieve maximizing disposal volume. Conventional fill and cover landfills are the most common approaches. The compaction of refuse may be achieved by the normal traffic over the site, or by mechanical compaction equipment designed for this purpose. Compaction equipment includes rollers fitted with sheep foot or pad compactors. Mechanical compaction is effective and typically increases refuse density to approximately 700 kg/cubic meter[4].

Bale-fill systems, daily cover alternatives, and the size of individual cells can provide reduction of volume in engineered landfills. These options also offer other potential benefits such as reduced transportation costs, easier handling and storage, reduction of leachate and landfill gas generation, and reduction of odour and vector problems. The following sections provide a summary of landfill design alternatives.

3.2 BALE-FILL LANDFILLING

Conventional landfills require large land areas to accommodate the volume requirements associated with uncompacted waste. In addition, these landfills have historically been associated with odour problems, fire risk, and unacceptable environmental conditions. Bale-fill landfills can reduce and/or eliminate many of these problems.

Bale-filling systems can be used for both inorganic and organic wastes. Bale filling reduces the volume of wastes by compaction. The reduced waste volume and the uniform brick shape of the bales allows for the greater utilization of landfill space, which translates into potential cost savings. In a typical bale system, the waste is compressed mechanically in a processing building into airtight bales and then wrapped with stretch plastic film. The film lowers oxygen and water intake into solid waste, thereby reducing the potential for

[4] Per. Com. Otter Lake Landfill Operations.

leachate production within the landfill from fermentation and degradation. Other operational advantages of bale-fill landfills include:

- Preservation of waste material properties;
- Reduction of odour and landfill gas;
- Less fire risk;
- Reduction of landfill leachate generation;
- Easy handling and storage; and
- No landfill compaction equipment required.

Other potential financial benefits arising from the use of a bale-fill system include:

- Savings in waste grading and compaction costs;
- Reduction in overall land requirements;
- Possible elimination of daily cover requirement if plastic wrap is used;
- More efficient development of the working face; and
- Reduction in traffic vector problems.

Disadvantages of the system include:

- Higher capital cost, when compared to traditional in-place compaction;
- Does not offer significant volume savings;
- An on-site building would be required to accommodate the processing unit;
- Individual bales accommodate approximately 1 tonne of waste, this requires transportation and storage of 250-300 bails/day;
- Although vehicle compaction equipment would not be required, the purchase of a specialized landfill equipment would be needed to store the bails within landfill cells; and
- Lifespan of baler is approximately 10-15 years.

Bale fill systems offer the greatest potential benefit where land area is at a premium and where transportation and storage are high priorities. According to industry sources (Machinex Recycling Technologies), the greatest volume reduction is achieved in wastes with high organic content, a bale fill system is not expected to offer significant volume savings (when compared to compaction values in a conventional landfill) after the organic content of the MSW is removed. Bale fill technologies also require higher capital investment compared to fill and cover systems; conversely, bale fill operational costs are typically lower.

Where land is available at a reasonable cost, research and practical experience supports a conclusion that the marginal volume reduction offered by bale fill technologies would not translate into a significant capital cost savings over the 50-year life of the landfill. Information received from Machinex Recycling Technologies is presented in Appendix A.

3.3 ALTERNATIVE DAILY COVER SYSTEMS

Alternative cover systems offer significant volume reduction compared to conventional soil cover. These systems increase the available disposal volume, extending the life of the landfill, and offer potential cost savings. Typical alternative cover systems include: synthetic covers, stabilized organic waste, lime and organic slurries, and various tarping options.

Synthetic Covers

Synthetic materials such as polystyrene and polymer plastics similar in nature to typical household plastic food wraps, have been used successfully as a daily cover on municipal landfills. Synthetic covers are manufactured specifically for this purpose. The synthetic covers are typically manufactured from recycled plastics and degrade readily in the landfill. The synthetic covers are available in bulk roles that are applied by special rollers attached to the compaction equipment. The synthetic covers are designed as a temporary daily cover and are not suitable for material segregation, hydraulic barriers, or for long-term exposed cover. Synthetic covers are prone to puncture by sharp waste materials are easily breached by vectors. Synthetic covers are most useful where landfill volumes are at a premium, where active cells are small, and where final landfill grading includes a soil liner.

Stabilized Organic Waste

The utilization of stabilized organic waste (compost) for landfill cover has proven successful at several large municipal facilities. The Otter Lake facility in Nova Scotia (Halifax Regional Municipality) uses stabilized organic municipal waste as cover material. The organic waste is separated from the general municipal garbage and composted on-site. In Nova Scotia, the separated organic waste material is considered a recycled material and counts towards waste diversion objectives. The stabilized organic material is a very poor quality compost but has little odour and does not attract vectors. The material serves as an excellent cover material, effectively reducing odours, wind blown garbage, and provided very good erosion control. Factors influencing the selection of a stabilized organic landfill cover include the availability and cost of suitable soil cover materials, and the overall benefit of increasing waste diversion. Information from Halifax suggests a direct waste diversion of 15-30% is possible from organic separation and composting.

Lime and Organic Slurry Systems

Lime slurry has been used at municipal landfills to reduce odours and encapsulate waste materials. In those cases studied the slurry itself was a waste product from industrial processes. The application of a lime or other slurry with pozzolanic characteristics would require dedicated mixing and application equipment. The slurry would be applied hydrated and dry to form a barrier over the waste. It is not suitable for daily cover. The cost is expected to be higher than synthetic barrier systems but may be an option in areas where suitable industrial wastes are available.

Organic slurries are typically composed of cellulose fibre mulch and form a cementous binder when applied as a daily cover. Typically, the slurry is water-based and applied with a portable hydro-mulch vehicle. Many slurry systems include odour and dust control materials while offering a reduction in infiltration.

Although the initial capital cost of implementing a slurry system involves the purchase of a specialized truck, slurries offer savings from a reduction in labour costs due to a fast application rate. Slurries eliminate the transportation and fuel costs associated with soil borrow; however, the unit cost of slurry mix tends to be higher than soil borrow, which is assumed to be available at the site.

Tarping systems utilize self-contained tarping units, which attaches to heavy machinery such as the blades of bulldozers. The tarping unit unrolls and retrieves the synthetic fabric, which is used to cover solid waste and reduce infiltration. The associated tarp is weighted with cable pockets and/or ballast chains to prevent dislodgement.

Tarping Systems

Tarping systems would typically have the lowest labour costs. Material costs are estimated to be the same magnitude as the slurry system. These systems offer the best reduction of infiltration of all conventional methods investigated, as well as minimizing cover volume. The tarps offer superior erosion control than other methods, degrade within the landfill, and allow for free movement of leachate and landfill gas.

However, these systems, which are randomly anchored by ballasts, tend to be vulnerable to inclement weather conditions such as high wind. They have the potential to tear and are prone to abrasion through shifting. These systems will reduce but not prevent rodents and birds from direct contact with the waste cells. Waste condensation may cause tarp damage over time.

The use of synthetic tarps warrants serious consideration at locations where natural cover material limited and/or where space is at a premium.

3.4 CELL LIFE

Experience at traditional fill and cover landfills suggests that a cell designed to accommodate two years of waste provides the greatest flexibility from an operational perspective. The feasibility of designing individual landfill cells with a 2-year life expectancy was investigated. Based on preliminary calculations, the overall cost of a 2 year cell design criteria is greater than developing individual cells with a life expectancy of 5 years. Costs to develop berms to accommodate the projected waste volumes over 50 years. With 25 individual cells would increase by approximately 25-30% due to the increase in soil borrow and labour required to development the intermediate berms shared by adjacent cells. For example, a 2-year individual cell configuration over a 50-year life would require 24 intermediate berms, as compared to 9 intermediate berms in a 5-year individual cell configuration. Subsequently, these increases in soil borrow also increases the footprint required to contain the waste by a similar magnitude.

The primary advantage of a 2-year cell is that the active footprint of the landfill would be reduced. In addition, erosion and leachate volumes would decrease from this configuration. Leachate treatment costs would subsequently decrease; however, the collection network would be more costly to develop as a result of additional piping connections and grading requirements. Further minimization of erosion and leachate generation is not seen to be a cost effective when compared to the implications on overall capital cost. Design parameters, such as a leachate treatment plant and interceptor ditches must be constructed to accommodate the maximum flow volumes. These mitigative measures can easily be implemented into the footprint of both the 2-year and 5 year landfill options.

Reduction of capital cost can most easily be achieved by consideration of additional height to the landfill. By keeping both length and width constant, the additional height would present an opportunity for additional waste containment. At a particular height, the landfill design will experience the law of diminishing return. At this height, the cost of developing a structurally sound containment berm out ways the resulting increases in capacity. It should be noted that this type of detailed engineering analysis was not part of the scope of work in this phase of the project.

Operational and maintenance costs are expected to be of the same magnitude for both options, therefore, their evaluation will not impact the overall feasibility of the analysis. Also, the analysis assumes similar landfill equipment with a 10-year replacement cost. Salvage values were not taken into account.

3.5 LINER SYSTEMS

A containment landfill will be required for the Central Newfoundland Region. A containment landfill is designed to control the discharge of effluent. The design requires the installation of one or more impermeable liners. The design of the liner system is an engineering function. The liner system may be designed with leachate collection, a leak detection layer, and a second liner to serve as a contingency against failure. The cost of the liner system will vary depending upon the topography of the site, site hydrology, and hydraulic complexity, and the risk management factors built into the system.

Site conditions will impact engineering designs. A containment landfill requires the collection and management of leachate. The leachate will be collected in a piping network and directed to a treatment system. There are no alternatives to leachate collection, however there are alternatives in the methods used to collect leachate.

The Newfoundland and Labrador Department of Environment are currently in the process of developing technical requirements for landfill liner systems, compost facilities, close out of existing landfills. The standards are to be released in the near future.

3.6 HERHOF – DRY STABILAT METHOD

The Herhof (Dry-Stabilate) Method is an alternative to landfill and incineration that enabled effective and efficient separation of waste for recycling and fuel production. This method fully meets the statutory requirements for maximizing waste recycling while at the same time conserving natural resources. Metals, mineral and glass fractions are reused as substitutes for natural raw materials. Plastics can also be separated out, dispensing with separate collection and recycled to new products. The fuel product (Stabilate), a bi-product of the system can be substituted for fossil fuels. The method is safe, clean, environmentally friendly, and may result in disposal sites become a relic of the past.

The system, which only commenced production in 1997, has rapidly gained widespread acceptance and will, by Spring 2001, be treating the waste of approximately 2 million people in Germany and Italy. It is believed that the Herhof (Dry-Stabilate) Method can make a vital contribution to Ireland's waste problem in a way that is environmentally friendly and economically sound. It will enable Ireland to substantially reduce its dependence on landfill without having to introduce municipal waste incineration. The Herhof (Dry Stabilate) Method offers Ireland the opportunity to lead Europe in the introduction of a system of Waste Management, which maximizes recycling possibilities and transforms waste from being a problem for the community into valuable products. The basic idea has been copied from nature. The result is a 100% material recycling or closed loop system. All waste products are re-used in the Economic Process either as raw material or fuel - no landfill.

For more information on the Herhof (Dry-Stabilate) Method, see information in Appendix A of this report.

3.7 NATURAL ATTENUATION

Natural attenuation is a naturally-occurring process in soil and groundwater environments that acts without human intervention to reduce the mass, toxicity, volume, or concentration of contaminants. Natural attenuation processes are classified as destructive or non-destructive. Destructive processes include chemical and biological degradation reactions. Non-destructive processes include adsorption, dispersion, dilution, and volatilization. Natural attenuation is a non-intrusive process that allows continuing use of infrastructure during remediation. It is not subject to the limitations of mechanical equipment, and is often less costly since no energy source is required. Natural attenuation processes are subject to natural changes in local conditions, such as groundwater velocity and pH. The time frame for remediation is usually longer than other technologies.

The Newfoundland and Labrador Waste Management Strategy (2002) provides minimum requirements for new facilities. All landfill sites require a properly designed and constructed impermeable liner system with a leachate collection system, and an approved leachate (disposal or treatment) system. Therefore, natural attenuation is not a viable option.

4.0 TRANSFER STATIONS

4.1 TRANSFER STATION LOCATIONS

The project team developed a detailed collection and transportation model that allowed the Committee an opportunity to study the advantages and disadvantages of several potential transfer station locations. The preferred system was selected based upon the objectives of the waste management strategy, the convenience to the users, and the overall cost. The model can be used in the future to optimize the collection and transportation routes. It may also be used to calculate the specific capital and operating costs of the individual transfer station sites.

The assessment of the collection and transportation requirements of the new system has resulted in selecting a collection and transfer station system that includes the following components:

- Buchan's Junction Transfer Station (524 tonnes / year)
- Point Leamington Transfer Station (1,282 tonnes / year)
- Virgin's Arm – Carter's Cove Transfer Station (3,638 tonnes / year)
- Fogo Island Transfer Station (1,429 tonnes / year)
- Gander Bay South Transfer Station (2,727 tonnes / year)
- Indian Bay Transfer Station (3,396 tonnes / year)
- Terra Nova Transfer Station (3,040 tonnes / year)

In accordance with the objectives of the Terms of Reference the preferred collection and transportation system has been selected to minimize the impact on the existing collection system (see Appendix B or Figure 4-1 for Proposed Transfer Station Locations). The two-stream (wet/dry) collection system will also allow municipalities to continue to use current collection contractors. Provided below is a summary of the preferred collection system. Table 4.1 provides information on the population and projected waste volumes for the preferred collection and transportation system.

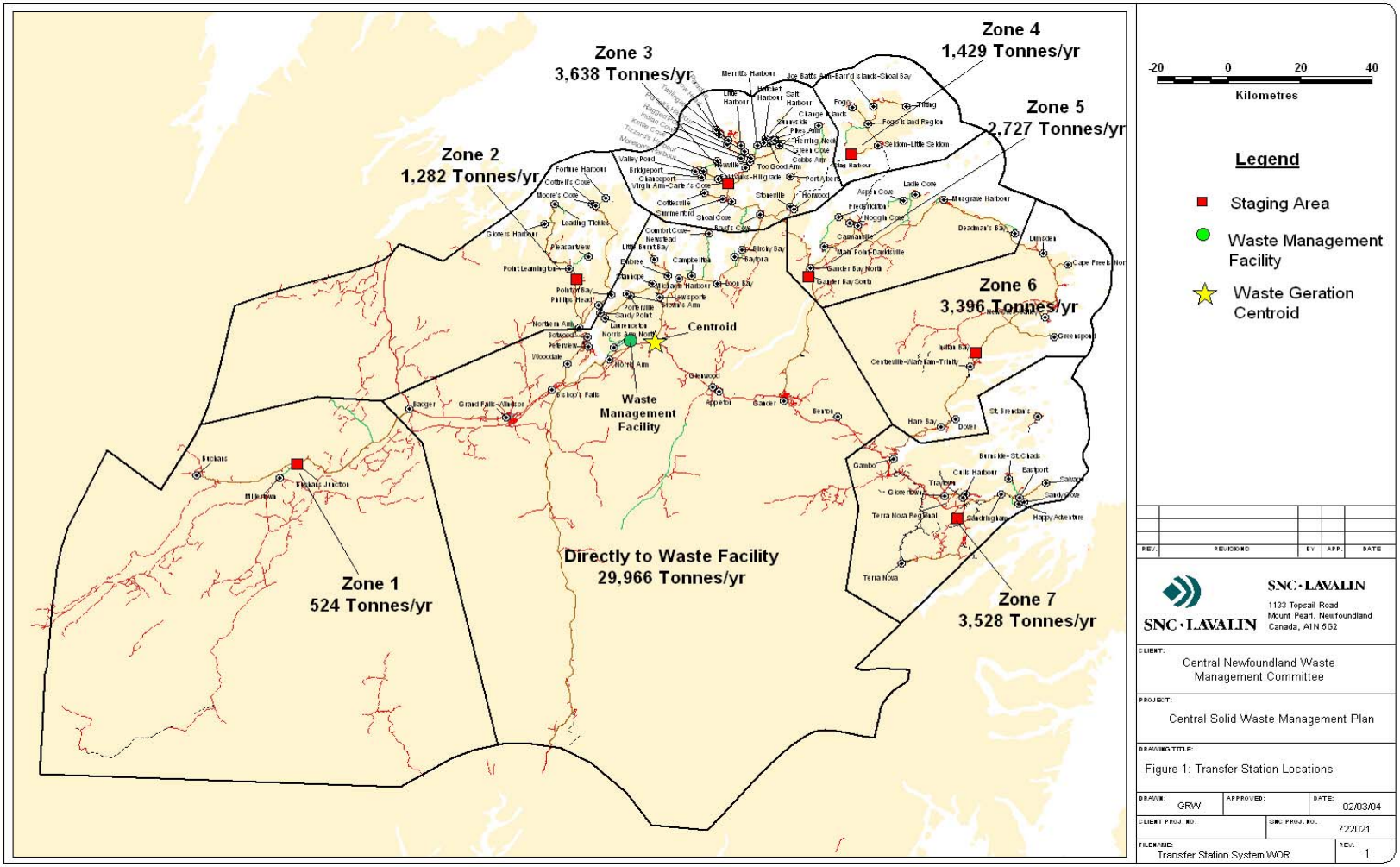

Figure 4.1: Proposed Transfer Station Locations for Central Newfoundland.

Table 4.1: Tonnages for Seven Transfer Station System.

Proposed Transfer Station Location	Zone	Population Served		Estimated Amount of Waste per Zone (Tonnes)	
		2001	2052	2001	2052
Buchan's Junction	1	1,105	962	524	456
Point Leamington	2	2,702	2,352	1,282	1,116
Virgin's Arm – Carter's Cove	3	7,660	6,655	3,638	3,158
Fogo Island	4	3,018	2,626	1,429	1,246
Gander Bay South	5	5,748	4,992	2,727	2,369
Indian Bay	6	7,158	6,223	3,396	2,953
Terra Nova*	7	7,448	6,616	3,528	3,139
Directly to Landfill		41,754	36,251	29,966	26,012
Total		**76,593**	**66,677**	**46,490**	**40,449**

* An estimated population for the Terra Nova National Park was determined based on the annual amount of solid waste generated at the park divided by 1.3 kg/person/day.
* The estimated population for the Terra Nova National Park was assumed to stay constant over the 50 yr period.

Each of the regional transfer stations will be designed to cost effectively accommodate the current and projected waste volumes from the collection area. The facilities have been sited to provide a convenient and visible transfer station location.

4.2 TRANSFER STATION ALTERNATIVES

4.2.1 ROLL-ON/ROLL-OFF COMPACTION BINS

Using the roll-on/roll-off bin compactor transfer station, the waste is unloaded or pushed into the hopper of a stationary compactor and then transported into a completely enclosed transfer trailer or roll-off container.

The compactor station's advantages are:
1) it minimizes wind-blown litter during dumping and
2) it allows a smaller transfer trailer to be used.

The primary disadvantages are the lack of alternative loading when the compactor fails, and the limited hopper capacity which may cause a backup of vehicles waiting to unload.

4.2.2 TRANSTOR BINS

The transtor bin station is a relatively low capital cost transfer station and can service communities of up to about 1,000 people. Major components consist of a 40 cubic yard steel box, an unloading ramp that slopes up to the top of the box and a concrete pad to support the box. Transtor bins do not compact waste. To reduce wind blown litter, the boxes can be covered with lids and hatches. A truck with a special hydraulic hoist is required to remove the box and haul it to a landfill. The primary advantage to the roll-off type of transfer station is its low capital cost. The primary disadvantage is that it is limited to rather small amounts of household wastes.

4.2.3 TIPPING FLOOR

A tipping floor transfer station is similar to a direct dumping station except it has additional space for trucks to discharge their waste on a concrete tipping floor for inspection and emergency storage. A front loader with a bucket is required to push the waste from the floor into the transfer trailer. The primary disadvantage of the floor dumping system is the cost of the tipping floor and a tractor to push the waste from the floor into the transfer trailer. Because of the risk of someone falling into the transfer trailer, some communities require all small vehicles to dump on the tipping floor.

5.0 CAPITAL, OPERATING, AND TRANSPORTATION COSTS FOR EACH ALTERNATIVE

This section of the report provides a description and cost of the proposed transfer station facility options as well as providing alternatives based upon overall system costing. Costing for these facilities, based on annual tonnages received, is provided below. These include:

- Buchan's Junction Transfer Station (524 tonnes / year)
- Point Leamington Transfer Station (1,282 tonnes / year)
- Virgin's Arm – Carter's Cove Transfer Station (3,638 tonnes / year)
- Fogo Island Transfer Station (1,429 tonnes / year)
- Gander Bay South Transfer Station (2,727 tonnes / year)
- Indian Bay Transfer Station (3,396 tonnes / year)
- Terra Nova Transfer Station (3,040 tonnes / year)

The following section describes each of the proposed transfer station facilities, including the location, conceptual site layouts, and design. Each facility will also incorporate storage areas for construction and demolition debris, hazardous materials, and white goods.

5.1 CAPITAL AND OPERATING COSTS

5.1.1 BUCHAN'S JUNCTION WASTE MANAGEMENT CENTRE

Approximately 524 metric tonnes of solid waste will be delivered to the Buchan's Junction Waste Management Centre on a yearly basis. Of the 524 metric tonnes of waste delivered, 344 T will be dry waste and 180 T will be wet waste. Several assumptions were made, with respect to the costing and design of this facility. These include:

- Enclosed loading area (pre-engineered structure);
- Grade separated floor
- Upgraded paved access road;
- Onsite paving is required;
- 12.2 m weigh scale is required;
- Large volumes of water are not required, therefore water storage is not included in the costing.

A separate area is also included for construction/demolition materials, metal/white goods storage, and hazardous materials.

Design Option 1: Roll-Off Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 50 m x 60 m fenced enclosure with a building measuring 16 m x 24 m. As a result of 524 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 5.29 m^3 (density = 250 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of once per week you require 1 - 30 m^3 compaction roll-off bin. Since glass will break at a density of 300 kg/m^3, the limit for the compaction density of dry waste is 250 kg/m^3. A density of 250 kg/m^3 will not affect the quality of the dry waste stream.

2. Approximately 3.47 m^3 (density = 200 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of once every two weeks you require 1 - 38 m^3 open top bin. With the low amounts of wet waste and the extended collection times if compaction roll-off bins were used odours would become a problem at the facility, therefore the project team determined that the use of open top bins would be more suitable. Due to the low volume of wet waste only one bin is required.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 10 m x 10 m.

Capital Cost

Refer to Table 5.1 for a detailed description of the estimated capital costs.

Table 5.1: Capital Costs for the Roll-off Bins for the Buchan's Junction WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 45 m x 55 m. Assumed an average of 1 m excavation and backfill for the site at $10/ m^3.	$24,750
Pre-Engineered Building - To accommodate two rolloff bins, unloading and loading operations it was assumed the building would have to be approximately 12 m x 22 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$211,200
Office/Trailer	$8,000
Access Road - Site is located on a 500 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$50,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Concrete Pad – 67.5 m^2 of reinforced concrete, 0.15 m thickness, at a cost of $450/$m^3$	$4,556
Rolloff Bins – One 30 m^3 compactor bins at $16,000/unit and two open top bin @ $6000/unit	$28,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. Due to the low volume of waste it is assumed that large volumes of water are not required, therefore, storage will not be required.	$10,000
Power Supply - It was assumed that the nearest power supply is approximately 500 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$14,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 220 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$14,400
Landscaping	$5,000
Sub-Total	$435,406
Contingency (10%)	$43,541
Engineering (15%)	$65,311
TOTAL	$544,258

Operational Costs

The estimated operational cost for the Buchan's Junction Waste Management Centre is $89,220/year. Refer to Table 5.2 for a detailed description of the estimated operational costs.

Table 5.2: Operational Costs for the Roll-off Bins for the Buchan's Junction WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 2: Transtor Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a building measuring 13 m x 30 m. As a result of 524 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 8.81 m^3 (density = 150 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on collection schedule of once every four days you require 1 - 40 m^3 transtor bins. Compaction units can not be integrated into the hydraulically tippable bins.

2. Approximately 3.47 m^3 (density = 200 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of once every two weeks you require 1 - 40 m^3 transtor bins. Compaction units can not be integrated into the hydraulically tippable bins.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 10 m x 10 m.

Capital Cost

Refer to Table 5.3 for a detailed description of the estimated capital costs.

Table 5.3: Capital Costs for the Transtor Bins for the Buchan's Junction WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate two transtor bins, unloading operations, and loading operations it was assumed the building would have to be approximately 13 m x 30 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$312,000
Office/Trailer	$8,000
Access Road - Site is located on a 500 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$50,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$. (SEE NOTE 4)	$10,000
Transtor Bins – Two 40 m^3 transtor bins at $33,000/unit.	$66,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. Due to the low volume of waste it is assumed that large volumes of water are not required, therefore, storage will not be required.	$10,000
Power Supply - It was assumed that the nearest power supply is approximately 500 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$14,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$595,100
Contingency (10%)	$59,510
Engineering (15%)	$89,265
TOTAL	$743,875

Operational Costs

The estimated operational cost for the Buchan's Junction Waste Management Centre is $89,220/year. Refer to Table 5.4 for a detailed description of the estimated operational costs.

Table 5.4: Operational Costs for the Transtor Bins for the Buchan's Junction WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 3: Tipping Floor with Loading Bay

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a 10 m X 30 m building. The site design accommodates a 53 ft compaction trailer which will be used to transport the waste. The trailer will be left onsite and the delivered waste will be placed directly into the trailer. Municipal collectors can access and dump waste directly into the trailer.

Within the fenced facility, a separate dumping area (containing bins) is designated for public dumping. A separate area is also designed for construction/demolition materials, metal/white goods storage, and hazardous materials. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

The Buchan's Junction Waste Management Facility will receive 26.43 m^3/week (6.61 T/week) of dry waste and 17.35 m^3/week (3.47 T/week) of wet waste. As a result of the 49.5 maximum payload under the *Highway Traffic Act,* a 53-foot trailer can conservatively accommodate approximately 29 T of waste. A trailer will make 1 trip every two weeks to the transfer station with the dry waste and the wet waste.

On the trip from the waste management centre to the transfer station, the trailer will always carry an empty container. It will connect to the loaded container and leave the empty one there for loading, so there will be no wait for loading.

Capital Cost

Refer to Table 5.5 for a detailed description of the estimated capital costs.

Table 5.5: Capital Costs for the Tipping Floor for the Buchan's Junction WMC.

Item	Cost ($)
Land Purchase - Assumed Avalon Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate a 53 foot compaction trailer it was assumed the building would have to be approximately 10 m x 30 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$240,000
53 ft Transfer Trailer	$80,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Office/Trailer	$8,000
Access Road - Site is located on a 500 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$50,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply – A water supply will be needed for employee use, washroom facilities, and facility washdown. It was assumed you don't need large volumes of water and therefore do not require storage. Due to the location of the current landfill, an artesian well is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m.	$10,000
Power Supply - It was assumed that the nearest power supply is approximately 500 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$14,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$537,100
Contingency (10%)	$53,710
Engineering (15%)	$80,565
TOTAL	$671,375

Operational Costs

The estimated operational cost for the Buchan's Junction Waste Management Centre is $89,220/year. Refer to Table 5.6 for a detailed description of the estimated operational costs.

Table 5.6: Operational Costs for the Tipping Floor for the Buchan's Junction WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

5.1.2 POINT LEAMINGTON WASTE MANAGEMENT CENTRE

Approximately 1,282 metric tonnes of solid waste will be delivered to the Point Leamington Waste Management Centre on a yearly basis. Of the 1,282 metric tonnes of waste delivered, 840 T will be dry waste and 442 T will be wet waste. Several assumptions were made, with respect to the costing and design of this facility. These include:

- Enclosed loading area (pre-engineered structure);
- Grade separated floor
- Upgraded paved access road;
- Onsite paving is required;
- 12.2 m weigh scale is required;
- Large volumes of water are not required, therefore water storage is not included in the costing.

A separate area is also included for construction/demolition materials, metal/white goods storage, and hazardous materials.

Design Option 1: Roll-off Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 50 m x 60 m fenced enclosure with a building measuring 20 m x 24 m. As a result of 1,282 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 12.93 m^3 (density = 250 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a weekly collection schedule, you require 2 – 38 m^3 compaction roll-off bin. Since glass will break at a density of 300 kg/m^3, the limit for the compaction density of dry waste is 250 kg/m^3. A density of 250 kg/m^3 will not affect the quality of the dry waste stream.;

2. Approximately 1.89 m^3 (density = 900 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of once every two weeks you require 1 – 30 m^3 compaction roll-off bin. Due to the low volume of wet waste only one bin is required;

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 10 m x 10 m.

Capital Cost

Refer to Table 5.7 for a detailed description of the estimated capital costs.

Table 5.7: Capital Costs for the Roll-off Bins for the Point Leamington WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 50 m x 60 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$30,000
Pre-Engineered Building - To accommodate three rolloff bins, unloading operations, and loading operations it was assumed the building would have to be approximately 16 m x 22 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$281,600
Office/Trailer	$8,000
Access Road - Site is located on a 0.5 km gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$50,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Concrete Pad – 91.5 m^2 of reinforced concrete, 0.15 m thickness, at a cost of $450/$m^3$	$6,176
Rolloff Bins – One 30 m^3 compactor bin and two 38 m^3 compactor bin at $16,000/unit and one 38 m^3 open top bin @ $6000/unit	$54,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply – A water supply will be needed for employee use, washroom facilities, and facility washdown. It was assumed you don't need large volumes of water and therefore do not require storage. Due to the location of the current landfill, an artesian well is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m.	$10,000
Power Supply - It was assumed that the nearest power supply is approximately 0.5 km from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$14,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 220 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$14,400
Landscaping	$5,000
Sub-Total	$538,676
Contingency (10%)	$53,868
Engineering (15%)	$80,801
TOTAL	$673,345

Operational Costs

The estimated operational cost for the Point Leamington Waste Management Centre is $89,220/year. Refer to Table 5.8 for a detailed description of the estimated operational costs.

Table 5.8: Operational Costs for the Roll-off Bins for the Point Leamington WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 2: Transtor Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a building measuring 13 m x 30 m. As a result of 1,282 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 21.55 m^3 (density = 150 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of twice per week you require 2 - 31 m^3 transtor bins. Compaction units can not be integrated into the hydraulically tippable bins.

2. Approximately 8.49 m^3 (density = 200 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of once every four days you require 1 - 40 m^3 transtor bin. Compaction units can not be integrated into the hydraulically tippable bins.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 10 m x 10 m.

Capital Cost

Refer to Table 5.9 for a detailed description of the estimated capital costs.

Table 5.9: Capital Costs for the Transtor Bins for the Point Leamington WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 50 m x 70 m. Assumed an average of 1 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate three transtor bins, unloading operations, and loading operations it was assumed the building would have to be approximately 13m x 30m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$312,000
Office/Trailer	$8,000
Access Road - Site is located on a 0.5 km gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$50,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Transtor Bins – 2 - 31 m^3 transtor bins and 1 - 40 m^3 transtor bin at $33,000/unit	$99,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply – A water supply will be needed for employee use, washroom facilities, and facility washdown. It was assumed you don't need large volumes of water and therefore do not require storage. Due to the location of the current landfill, an artesian well is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m.	$10,000
Power Supply - It was assumed that the nearest power supply is approximately 0.5 km from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$14,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$628,100
Contingency (10%)	$62,810
Engineering (15%)	$94,215
TOTAL	$785,125

Operational Costs

The estimated operational cost for the Point Leamington Waste Management Centre is $89,220/year. Refer to Table 5.10 for a detailed description of the estimated operational costs.

Table 5.10: Operational Costs for the Transtor Bins for the Point Leamington WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 3: Tipping Floor with Loading Bay

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a building measuring 13 m x 30 m. The site design accommodates a 53 ft compaction trailer which will be used to transport the waste. The trailer will be left onsite and the delivered waste will be placed directly into the trailer. Municipal collectors can access and dump waste directly into the trailer.

Within the fenced facility, a separate dumping area (containing bins) is designated for public dumping. A separate area is also designed for construction/demolition materials, metal/white goods storage, and hazardous materials. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

The Point Leamington Waste Management Facility will receive 64.65 m^3/week (16.16 T/week) of dry waste and 9.43 m^3/week (8.49 T/week) of wet waste. As a result of the 49.5 maximum payload under the *Highway Traffic Act,* a 53-foot trailer can conservatively accommodate approximately 29 T of waste. A trailer will make 1 trip in one day per week to the transfer station with the dry and wet waste.

On the trip from the waste management centre to the transfer station, the trailer will always carry an empty container. It will connect to the loaded container and leave the empty one there for loading, so there will be no wait for loading.

Capital Cost

Refer to Table 5.11 for a detailed description of the estimated capital costs.

Table 5.11: Capital Costs for the Tipping Floor for the Point Leamington WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate a 53 ft transfer trailer it was assumed the building would have to be approximately 10m x 30m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$240,000
Office/Trailer	$8,000
53 ft Transfer Trailer	$80,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Access Road - Site is located on a 0.5 km gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$50,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply – A water supply will be needed for employee use, washroom facilities, and facility washdown. It was assumed you don't need large volumes of water and therefore do not require storage. Due to the location of the current landfill, an artesian well is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m.	$10,000
Power Supply - It was assumed that the nearest power supply is approximately 2 km from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$14,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$537,100
Contingency (10%)	$53,710
Engineering (15%)	$80,565
TOTAL	$671,375

Operational Costs

The estimated operational cost for the Point Leamington Waste Management Centre is $89,220/year. Refer to Table 5.12 for a detailed description of the estimated operational costs.

Table 5.12: Operational Costs for the Tipping Floor for the Point Leamington WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

5.1.3 FOGO WASTE MANAGEMENT CENTRE

Approximately 1,429 metric tonnes of solid waste will be delivered to the Fogo Waste Management Centre on a yearly basis. Of the 1,429 metric tonnes of waste delivered, 937 T will be dry waste and 492 T will be wet waste. Several assumptions were made, with respect to the costing and design of this facility. These include:

- Enclosed loading area (pre-engineered structure);
- Grade separated floor
- Upgraded paved access road;
- Onsite paving is required;
- 12.2 m weigh scale is required;
- Large volumes of water are not required, therefore water storage is not included in the costing.

A separate area is also included for construction/demolition materials, metal/white goods storage, and hazardous materials.

Design Option 1: Roll-off Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 50 m x 60 m fenced enclosure with a building measuring 20 m x 24 m. As a result of 1,429 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 14.41 m^3 (density = 250 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of once/week, you require 2 – 38 m^3 compaction roll-off bins. Since glass will break at a density of 300 kg/m^3, the limit for the compaction density of dry waste is 250 kg/m^3. A density of 250 kg/m^3 will not affect the quality of the dry waste stream.

2. Approximately 2.10 m^3 (density = 900 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of once every two weeks, you require 1 – 30 m^3 compaction roll-off bin.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 10 m x 10 m.

Capital Cost

Refer to Table 5.13 for a detailed description of the estimated capital costs.

Table 5.13: Capital Costs for the Roll-off Bins for the Fogo WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 50 m x 60 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$30,000
Pre-Engineered Building - To accommodate three rolloff bins, unloading operations, and loading operations it was assumed the building would have to be approximately 16 m x 22 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$281,600
Office/Trailer	$8,000
Access Road - Site is located on a 500 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m. (SEE NOTE 3)	$50,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Concrete Pad – 91.5 m^2 of reinforced concrete, 0.15 m thickness, at a cost of $450/$m^3$	$6,176
Rolloff Bins – One 30 m^3 compactor bin and two 38 m^3 compaction bin at $16,000/unit and one 38 m^3 open top bin @ $6000/unit	$54,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. Due to the low volume of waste it is assumed that large volumes of water are not required, therefore, storage will not be required.	$10,000
Power Supply - It was assumed that the nearest power supply is approximately 500 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$14,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 220 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$14,400
Landscaping	$5,000
Sub-Total	$538,676
Contingency (10%)	$53,868
Engineering (15%)	$80,801
TOTAL	$673,345

Operational Costs

The estimated operational cost for the Fogo Waste Management Centre is $89,220/year. Refer to Table 5.14 for a detailed description of the estimated operational costs.

Table 5.14: Operational Costs for the Roll-off Bins for the Fogo WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 2: Transtor Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a building measuring 10 m x 30 m. As a result of 1,429 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 24.02 m^3 (density = 150 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of twice per week you require 2 - 31 m^3 transtor bin Compaction units can not be integrated into the hydraulically tippable bins, however the waste can be collected using compaction vehicles.

2. Approximately 9.46 m^3 (density = 200 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of twice per week you require 1 - 31 m^3 transtor bin. Compaction units can not be integrated into the hydraulically tippable bins, however the waste can be collected using compaction vehicles.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 10 m x 10 m.

Capital Cost

Refer to Table 5.15 for a detailed description of the estimated capital costs.

Table 5.15: Capital Costs for the Transtor Bins for the Fogo WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate two transtor bins, unloading operations, and loading operations it was assumed the building would have to be approximately 10m x 30m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$312,000
Office/Trailer	$8,000
Access Road - Site is located on a 500 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$50,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Transtor Bins – 3 - 31 m^3 transtor bin at $33,000/unit	$99,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. Due to the low volume of waste it is assumed that large volumes of water are not required, therefore, storage will not be required.	$10,000
Power Supply - It was assumed that the nearest power supply is approximately 500 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$14,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 136 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$9,780
Landscaping	$5,000
Sub-Total	$628,100
Contingency (10%)	$62,810
Engineering (15%)	$94,215
TOTAL	$785,125

Operational Costs

The estimated operational cost for the Fogo Waste Management Centre is $89,220/year. Refer to Table 5.16 for a detailed description of the estimated operational costs.

Table 5.16: Operational Costs for the Transtor Bins for the Fogo WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 3: Tipping Floor with Loading Bay

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a building measuring 10 m x 30 m. The site design accommodates a 53 ft compaction trailer which will be used to transport the waste. The trailer will be left onsite and the delivered waste will be placed directly into the trailer. Municipal collectors can access and dump waste directly into the trailer.

Within the fenced facility, a separate dumping area (containing bins) is designated for public dumping. A separate area is also designed for construction/demolition materials, metal/white goods storage, and hazardous materials. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

The Fogo Waste Management Facility will receive 72.07 m^3/week (18.02 T/week) of dry waste and 10.52 m^3/week (9.46 T/week) of wet waste. As a result of the 49.5 maximum payload under the *Highway Traffic Act,* a 53-foot trailer can conservatively accommodate approximately 29 T of waste. A trailer will make one trip every week to deliver the wet and dry waste to the Regional Waste Management Facility.

On the trip from the waste management centre to the transfer station, the trailer will always carry an empty container. It will connect to the loaded container and leave the empty one there for loading, so there will be no wait for loading.

Capital Cost

Refer to Table 5.17 for a detailed description of the estimated capital costs.

Table 5.17: Capital Costs for the Tipping Floor for the Fogo WMC.

Item	Cost ($)
Land Purchase - Assumed Avalon Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate two transtor bins, unloading operations, and loading operations it was assumed the building would have to be approximately 10 m x 30 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$240,000
Office/Trailer	$8,000
52 ft Transfer Trailer	$80,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Access Road - Site is located on a 500 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$50,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply – A water supply will be needed for employee use, washroom facilities, and facility washdown. It was assumed you don't need large volumes of water and therefore do not require storage. Due to the location of the current landfill, an artesian well is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m.	$10,000
Power Supply - It was assumed that the nearest power supply is approximately 500 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$14,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$537,100
Contingency (10%)	$53,710
Engineering (15%)	$80,565
TOTAL	$671,375

Operational Costs

The estimated operational cost for the Fogo Waste Management Centre is $89,220/year. Refer to Table 5.18 for a detailed description of the estimated operational costs.

Table 5.18: Operational Costs for the Tipping Floor for the Fogo WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

5.1.4 GANDER BAY SOUTH WASTE MANAGEMENT CENTRE

Approximately 2,727 metric tonnes of solid waste will be delivered to the Gander Bay South Waste Management Centre on a yearly basis. Of the 2,727 metric tonnes of waste delivered, 1,788 T will be dry waste and 939 T will be wet waste. Several assumptions were made, with respect to the costing and design of this facility. These include:

- Enclosed loading area (pre-engineered structure);
- Grade separated floor
- Upgraded paved access road;
- Onsite paving is required;
- 12.2 m weigh scale is required;
- Due to the potential volumes of water which would be required, water storage was incorporated into the water system.

A separate area is also included for construction/demolition materials, metal/white goods storage, and hazardous materials.

Design Option 1: Roll-off Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 50 m x 60 m fenced enclosure with a building measuring 20 m x 24 m. As a result of 2,727 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 27.50 m^3 (density = 250 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of twice per week you require 2 - 38 m^3 compaction roll-off bins. Since glass will break at a density of 300 kg/m^3, the limit for the compaction density of dry waste is 250 kg/m^3. A density of 250 kg/m^3 will not affect the quality of the dry waste stream.

2. Approximately 4.01 m^3 (density = 900 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a weekly collection schedule you require 1 - 38 m^3 compaction roll-off bin.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 15 m x 15 m.

Capital Cost

Refer to Table 5.19 for a detailed description of the estimated capital costs.

Table 5.19: Capital Costs for the Roll-off Bins for the Gander Bay South WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 50 m x 60 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$30,000
Pre-Engineered Building - To accommodate three rolloff bins, unloading operations, and loading operations it was assumed the building would have to be approximately 16 m x 22 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$281,600
Office/Trailer	$8,000
Access Road - Site is located on a 150 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$15,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Concrete Pad – 91.5 m^2 of reinforced concrete, 0.15 m thickness, at a cost of $450/$m^3$	$6,176
Rolloff Bins – One 30 m^3 compactor bins and two 38 m^3 compactor bins at $16,000/unit. One open top 38 m^3 bins @ $6000/unit	$54,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 150 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$5,750
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 220 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$14,400
Landscaping	$5,000
Sub-Total	$544,926
Contingency (10%)	$54,493
Engineering (15%)	$81,739
TOTAL	$681,158

Operational Costs

The estimated operational cost for the Gander Bay South Waste Management Centre is $89,220/year. Refer to Table 5.20 for a detailed description of the estimated operational costs.

Table 5.20: Operational Costs for the Roll-off Bins for the Gander Bay South WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 2: Transtor Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a building measuring 13 m x 30 m. As a result of 2,727 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 45.84 m^3 (density = 150 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of every second day, you require 3 – 31 m^3 transtor bins. Compaction units can not be integrated into the hydraulically tippable bins.

2. Approximately 18.06 m^3 (density = 200 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of every second day you require 1 - 40 m^3 transtor bin. Compaction units can not be integrated into the hydraulically tippable bins.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 15 m x 15 m.

Capital Cost

Refer to Table 5.21 for a detailed description of the estimated capital costs.

Table 5.21: Capital Costs for the Transtor Bins for the Gander Bay South WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate three transtor bins, unloading operations, and loading operations it was assumed the building would have to be approximately 13m x 30m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$312,000
Office/Trailer	$8,000
Access Road - Site is located on a 150 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$15,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Transtor Bins – 3 - 31 m^3 transtor bins and 1 - 40 m^3 transtor bin at $33,000/unit	$132,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 150 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$5,750
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$667,350
Contingency (10%)	$66,735
Engineering (15%)	$100,103
TOTAL	$834,188

Operational Costs

The estimated operational cost for the Gander Bay South Waste Management Centre is $89,220/year. Refer to Table 5.22 for a detailed description of the estimated operational costs.

Table 5.22: Operational Costs for the Transtor Bins for the Gander Bay South WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 3: Tipping Floor with Loading Bay

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a building measuring 10 m x 30 m. The site design accommodates a 53 ft compaction trailer which will be used to transport the waste. The loading area will be enclosed with a pre-engineered structure which will have a grade separated tipping floor. Municipal collectors can access and dump waste on the wet/dry tipping floor for loading and shipment.

Within the fenced facility, a separate dumping area (containing bins) is designated for public dumping. A separate area is also designed for construction/demolition materials, metal/white goods storage, and hazardous materials. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

The Gander Bay South Waste Management Facility will receive 137.52m^3/week (34.83 T/week) of dry waste and 20.07 m^3/week (18.06 T/week) of wet waste. As a result of the 49.5 maximum payload under the *Highway Traffic Act,* a 53-foot trailer can conservatively accommodate approximately 29 T of waste. Based on a weekly collection schedule, there will be 2 trips to the WMF per week.

On the trip from the waste management centre to the transfer station, the trailer will always carry an empty container. It will connect to the loaded container and leave the empty one there for loading, so there will be no wait for loading.

Capital Cost

Refer to Table 5.23 for a detailed description of the estimated capital costs.

Table 5.23: Capital Costs for the Tipping Floor for the Gander Bay South WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate a tipping floor, one loading bay, and loader operations it was assumed the building would have to be approximately 10m x 30m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$240,000
Office/Trailer	$8,000
53 ft Transfer Trailer	$80,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Access Road - Site is located on a 150 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$15,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 150 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$5,750
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$543,350
Contingency (10%)	$54,335
Engineering (15%)	$81,503
TOTAL	$679,188

Operational Costs

The estimated operational cost for the Gander Bay South Waste Management Centre is $89,220/year. Refer to Table 5.24 for a detailed description of the estimated operational costs.

Table 5.24: Operational Costs for the Tipping Floor for the Gander Bay South WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

5.1.5 INDIAN BAY WASTE MANAGEMENT CENTRE

Approximately 3,396 metric tonnes of solid waste will be delivered to the Indian Bay Waste Management Centre on a yearly basis. Of the 3,396 metric tonnes of waste delivered, 2,226 T will be dry waste and 1,170 T will be wet waste. Several assumptions were made, with respect to the costing and design of this facility. These include:

- Enclosed loading area (pre-engineered structure);
- Grade separated floor
- Upgraded paved access road;
- Onsite paving is required;
- 12.2 m weigh scale is required;
- Due to the potential volumes of water which would be required, water storage was incorporated into the water system.

A separate area is also included for construction/demolition materials, metal/white goods storage, and hazardous materials.

Design Option 1: Roll-off Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 50 m x 60 m fenced enclosure with a 20 m x 24 m building. As a result of 3,396 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 34.25 m^3 (density = 250 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of every second day you require 2 - 38 m^3 compaction roll-off bins. Since glass will break at a density of 300 kg/m^3, the limit for the compaction density of dry waste is 250 kg/m^3. A density of 250 kg/m^3 will not affect the quality of the dry waste stream.

2. Approximately 5.00 m^3 (density = 900 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a weekly collection schedule you require 1 - 30 m^3 compaction roll-off bins.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 15 m x 15 m.

Capital Cost

Refer to Table 5.25 for a detailed description of the estimated capital costs.

Table 5.25: Capital Costs for the Roll-off Bins for the Indian Bay WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 50 m x 60 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$30,000
Pre-Engineered Building - To accommodate three rolloff bins, unloading operations, and loading operations it was assumed the building would have to be approximately 16 m x 22 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$281,600
Office/Trailer	$8,000
Access Road - Site is located on a 3 km gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$300,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Concrete Pad – 91.5 m^2 of reinforced concrete, 0.15 m thickness, at a cost of $450/$m^3$	$6,176
Rolloff Bins – One 30 m^3 compactor bin and two 38 m^3 compactor bins at $16,000/unit and one 38 m^3 open top bin @ $6000/unit	$54,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 3 km from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$77,000
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 220 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$14,400
Landscaping	$5,000
Sub-Total	$901,176
Contingency (10%)	$90,118
Engineering (15%)	$135,176
TOTAL	$1,126,470

Operational Costs

The estimated operational cost for the Indian Bay Waste Management Centre is $94,220/year. Refer to Table 5.26 for a detailed description of the estimated operational costs.

Table 5.26: Operational Costs for the Roll-off Bins for the Indian Bay WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$10,000
Power Lighting, misc	$2,000
TOTAL	$94,220

Design Option 2: Transtor Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a 13 m x 30 m building. As a result of 3,396 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 57.09 m^3 (density = 150 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a daily collection schedule you require 2 - 31 m^3 transtor bins. Compaction units can not be integrated into the hydraulically tippable bins.

2. Approximately 22.49 m^3 (density = 200 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of twice per week you require 2 - 31 m^3 transtor bins. Compaction units can not be integrated into the hydraulically tippable bins.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 15 m x 15 m.

Capital Cost

Refer to Table 5.27 for a detailed description of the estimated capital costs.

Table 5.27: Capital Costs for the Transtor Bins for the Indian Bay WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate three transtor bins, unloading operations, and loading operations it was assumed the building would have to be approximately 13m x 30m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$. (SEE NOTE 2)	$312,000
Office/Trailer	$8,000
Access Road - Site is located on a 3 km gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m. (SEE NOTE 3)	$300,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$ (SEE NOTE 4)	$10,000
Transtor Bins – 4 - 31 m^3 transtor bins at $33,000/unit	$132,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 3 km from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$77,000
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$1,023,600
Contingency (10%)	$102,360
Engineering (15%)	$153,540
TOTAL	$1,279,500

Operational Costs

The estimated operational cost for the Indian Bay Waste Management Centre is $94,220/year. Refer to Table 5.28 for a detailed description of the estimated operational costs.

Table 5.28: Operational Costs for the Transtor Bins for the Indian Bay WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$10,000
Power Lighting, misc	$2,000
TOTAL	$94,220

Design Option 3: Tipping Floor with Loading Bay

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a 10 m x 30 m building. The site design accommodates a 53 ft compaction trailer which will be used to transport the waste. The loading area will be enclosed with a pre-engineered structure which will have a grade separated tipping floor. Municipal collectors can access and dump waste on the wet/dry tipping floor for loading and shipment.

Within the fenced facility, a separate dumping area (containing bins) is designated for public dumping. A separate area is also designed for construction/demolition materials, metal/white goods storage, and hazardous materials. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

The Indian Bay Waste Management Facility will receive 171.26 m^3/week (42.82 T/week) of dry waste and 24.99 m^3/week (22.49 T/week) of wet waste. As a result of the 49.5 maximum payload under the *Highway Traffic Act,* a 53-foot trailer can conservatively accommodate approximately 29 T of waste. A trailer will make 3 trips per week to the Waste Management Facility.

On the trip from the waste management centre to the transfer station, the trailer will always carry an empty container. It will connect to the loaded container and leave the empty one there for loading, so there will be no wait for loading.

Capital Cost

Refer to Table 5.29 for a detailed description of the estimated capital costs.

Table 5.29: Capital Costs for the Tipping Floor for the Indian Bay WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate a tipping floor, one loading bay, and loader operations it was assumed the building would have to be approximately 10m x 30m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$240,000
Office/Trailer	$8,000
53 ft Transfer Trailer	$80,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Access Road - Site is located on a 3 km gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$300,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 3 km from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$77,000
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$899,600
Contingency (10%)	$89,960
Engineering (15%)	$134,940
TOTAL	$1,124,500

Operational Costs

The estimated operational cost for the Indian Bay Waste Management Centre is $94,220/year. Refer to Table 5.30 for a detailed description of the estimated operational costs.

Table 5.30: Operational Costs for the Tipping Floor for the Indian Bay WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$10,000
Power Lighting, misc	$2,000
TOTAL	$94,220

5.1.6 TERRA NOVA WASTE MANAGEMENT CENTRE

Approximately 3,528 metric tonnes of solid waste will be delivered to the Terra Nova Waste Management Centre on a yearly basis. Of the 3,528 metric tonnes of waste delivered, 2,313 T will be dry waste and 1,215 T will be wet waste. Several assumptions were made, with respect to the costing and design of this facility. These include:

- Enclosed loading area (pre-engineered structure);
- Grade separated floor
- Upgraded paved access road;
- Onsite paving is required;
- 12.2 m weigh scale is required;
- Due to the potential volumes of water which would be required, water storage was incorporated into the water system.

A separate area is also included for construction/demolition materials, metal/white goods storage, and hazardous materials.

Design Option 1: Roll-off Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 50 m x 60 m fenced enclosure with a 20 m x 24 m building. As a result of 3,528 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 35.58 m^3 (density = 250 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of every second day you require 2 - 38 m^3 compaction roll-off bins Since glass will break at a density of 300 kg/m^3, the limit for the compaction density of dry waste is 250 kg/m^3. A density of 250 kg/m^3 will not affect the quality of the dry waste stream.

2. Approximately 5.19 m^3 (density = 900 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a weekly collection schedule you require 1 - 30 m^3 compaction roll-off bin.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 15 m x 15 m.

Capital Cost

Refer to Table 5.31 for a detailed description of the estimated capital costs.

Table 5.31: Capital Costs for the Roll-off Bins for the Terra Nova WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 50 m x 60 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$30,000
Pre-Engineered Building - To accommodate three rolloff bins, unloading operations, and loading operations it was assumed the building would have to be approximately 16 m x 22 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$281,600
Office/Trailer	$8,000
Access Road - Site is located on a 200 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$20,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$	$10,000
Concrete Pad – 91.5 m^2 of reinforced concrete, 0.15 m thickness, at a cost of $450/$m^3$	$6,176
Rolloff Bins – One 30 m^3 compactor bin and two 38 m^3 compactor bin at $16,000/unit and one open top bin @ $6000/unit	$54,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 200 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$7,000
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 220 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$14,400
Landscaping	$5,000
Sub-Total	$551,176
Contingency (10%)	$55,118
Engineering (15%)	$82,676
TOTAL	$688,970

Operational Costs

The estimated operational cost for the Terra Nova Waste Management Centre is $89,220/year. Refer to Table 5.32 for a detailed description of the estimated operational costs.

Table 5.32: Operational Costs for the Roll-off Bins for the Terra Nova WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 2: Transtor Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a 13 m x 30 m building. As a result of 3,528 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 59.31 m^3 (density = 150 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a daily collection schedule you require 2 - 31 m^3 transtor bins. Compaction units can not be integrated into the hydraulically tippable bins.

2. Approximately 23.37 m^3 (density = 200 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on collection schedule of twice per wekk you require 2 - 31 m^3 transtor bin. Compaction units can not be integrated into the hydraulically tippable bins.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 15 m x 15 m.

Capital Cost

Refer to Table 5.33 for a detailed description of the estimated capital costs.

Table 5.33: Capital Costs for the Transtor Bins for the Terra Nova WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate three transtor bins, unloading operations, and loading operations it was assumed the building would have to be approximately 13m x 30m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$312,000
Office/Trailer	$8,000
Access Road - Site is located on a 200 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$20,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$	$10,000
Transtor Bins – 4 - 31 m^3 transtor bins at $33,000/unit	$132,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 200 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$7,000
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 262 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,710
Landscaping	$5,000
Sub-Total	$673,710
Contingency (10%)	$67,371
Engineering (15%)	$101,057
TOTAL	$842,138

Operational Costs

The estimated operational cost for the Terra Nova Waste Management Centre is $89,220/year. Refer to Table 5.34 for a detailed description of the estimated operational costs.

Table 5.34: Operational Costs for the Transtor Bins for the Terra Nova WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 3: Tipping Floor with Loading Bay

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a 10 m x 30 m building. The site design accommodates a 53 ft compaction trailer which will be used to transport the waste. The loading area will be enclosed with a pre-engineered structure which will have a grade separated tipping floor. Municipal collectors can access and dump waste on the wet/dry tipping floor for loading and shipment.

Within the fenced facility, a separate dumping area (containing bins) is designated for public dumping. A separate area is also designed for construction/demolition materials, metal/white goods storage, and hazardous materials. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

The Terra Nova Waste Management Facility will receive 177.92 m^3/week (44.48 T/week) of dry waste and 25.96 m^3/week (23.37 T/week) of wet waste. As a result of the 49.5 maximum payload under the *Highway Traffic Act,* a 53-foot trailer can conservatively accommodate approximately 29 T of waste. One a weekly basis a trailer will make 3 trips from the transfer station to the waste management facility.

On the trip from the waste management centre to the transfer station, the trailer will always carry an empty container. It will connect to the loaded container and leave the empty one there for loading, so there will be no wait for loading.

Capital Cost

Refer to Table 5.35 for a detailed description of the estimated capital costs.

Table 5.35: Capital Costs for the Tipping Floor for the Terra Nova WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate a tipping floor, one loading bay, and loader operations it was assumed the building would have to be approximately 10m x 30m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$240,000
Office/Trailer	$8,000
53 ft Transfer Trailer	$80,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Access Road - Site is located on a 200 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$20,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 200 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$7,000
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$549,600
Contingency (10%)	$54,960
Engineering (15%)	$82,440
TOTAL	$687,000

Operational Costs

The estimated operational cost for the Terra Nova Waste Management Centre is $89,220/year. Refer to Table 5.36 for a detailed description of the estimated operational costs.

Table 5.36: Operational Costs for the Tipping Floor for the Terra Nova WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$40/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

5.1.7 VIRGIN ARM - CARTER'S COVE WASTE MANAGEMENT CENTRE

Approximately 3,638 metric tonnes of solid waste will be delivered to the Virgin Arm - Carter's Cove Waste Management Centre on a yearly basis. Of the 3,638 metric tonnes of waste delivered, 2,385 T will be dry waste and 1,253 T will be wet waste. Several assumptions were made, with respect to the costing and design of this facility. These include:

- Enclosed loading area (pre-engineered structure);
- Grade separated floor
- Upgraded paved access road;
- Onsite paving is required;
- 12.2 m weigh scale is required;
- Due to the potential volumes of water which would be required, water storage was incorporated into the water system.

A separate area is also included for construction/demolition materials, metal/white goods storage, and hazardous materials.

Design Option 1: Roll-off Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 50 m x 60 m fenced enclosure with a 20 m x 24 m building. As a result of 3,638 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 36.69 m^3 (density = 250 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of every second day you require 2 - 38 m^3 compaction roll-off bins. Since glass will break at a density of 300 kg/m^3, the limit for the compaction density of dry waste is 250 kg/m^3. A density of 250 kg/m^3 will not affect the quality of the dry waste stream.

2. Approximately 5.35 m^3 (density = 900 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a weekly collection schedule you require 1 - 30 m^3 compaction bin.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 15 m x 15 m.

Capital Cost

Refer to Table 5.37 for a detailed description of the estimated capital costs.

Table 5.37: Capital Costs for the Roll-off Bins for the Virgin Arm – Carter's Cove WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 50 m x 60 m. Assumed an average of 1.0 m excavation and backfill for the site at $10/ m^3.	$30,000
Pre-Engineered Building - To accommodate three rolloff bins, unloading operations, and loading operations it was assumed the building would have to be approximately 16 m x 22 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$281,600
Office/Trailer	$8,000
Access Road - Site is located on a 700 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$70,000
Onsite Paving - Assumed 500 m2 of paving at a cost of $20/m2 .	$10,000
Concrete Pad – 91.5 m^2 of reinforced concrete, 0.15 m thickness, at a cost of $450/$m^3$	$6,176
Rolloff Bins – One 30 m^3 compactor bin and two 38 m^3 compactor bins at $16,000/unit and one open top bin @ $6000/unit	$54,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 700 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$19,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 220 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$14,400
Landscaping	$5,000
Sub-Total	$613,676
Contingency (10%)	$61,368
Engineering (15%)	$92,051
TOTAL	$767,095

Operational Costs

The estimated operational cost for the Virgin Arm - Carter's Cove Waste Management Centre is $89,220/year. Refer to Table 5.38 for a detailed description of the estimated operational costs.

Table 5.38: Operational Costs for the Roll-off Bins for the Virgin Arm – Carter's Cove WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 2: Transtor Bins

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a 13 m x 30 m building. As a result of 3,638 T/year of solid waste being delivered to the waste management centre, the project team determined that:

1. Approximately 61.16 m^3 (density = 150 kg/m^3) of dry waste will be delivered to the waste management centre on a daily basis. Based on a daily collection schedule you require you require 2 - 31 m^3 transtor bins. Compaction units can not be integrated into the hydraulically tippable bins.

2. Approximately 24.09 m^3 (density = 200 kg/m^3) of wet waste will be delivered to the waste management centre on a daily basis. Based on a collection schedule of twice per week you require 2 - 31 m^3 transtor bins. Compaction units can not be integrated into the hydraulically tippable bins.

3. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

4. Construction/demolition materials, metal/white goods storage, and hazardous materials areas will be 15 m x 15 m.

Capital Cost

Refer to Table 5.39 for a detailed description of the estimated capital costs.

Table 5.39: Capital Costs for the Transtor Bins for the Virgin Arm – Carter's Cove WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate three transtor bins, unloading operations, and loading operations it was assumed the building would have to be approximately 13m x 30m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$312,000
Office/Trailer	$8,000
Access Road - Site is located on a 700 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$70,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Transtor Bins – 4 - 31 m^3 transtor bins at $33,000/unit	$132,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 700 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$19,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$736,100
Contingency (10%)	$73,610
Engineering (15%)	$110,415
TOTAL	$920,125

Operational Costs

The estimated operational cost for the Virgin Arm - Carter's Cove Waste Management Centre is $89,220/year. Refer to Table 5.40 for a detailed description of the estimated operational costs.

Table 5.40: Operational Costs for the Transtor Bins for the Virgin Arm – Carter's Cove WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

Design Option 3: Tipping Floor with Loading Bay

Description

The conceptual design demonstrates that the entire site is enclosed within an approximate 60 m x 70 m fenced enclosure with a 10 m x 30 m building. The site design accommodates a 53 ft compaction trailer which will be used to transport the waste. The loading area will be enclosed with a pre-engineered structure which will have a grade separated tipping floor. Municipal collectors can access and dump waste on the wet/dry tipping floor for loading and shipment.

Within the fenced facility, a separate dumping area (containing bins) is designated for public dumping. A separate area is also designed for construction/demolition materials, metal/white goods storage, and hazardous materials. One 38 m^3 open top roll-off bins will be supplied for bulk waste. This bin be placed outside of the building and will be emptied as required.

The Virgin Arm - Carter's Cove Waste Management Facility will receive 183.47 m^3/week (45.87 T/week) of dry waste and 26.77 m^3/week (24.09 T/week) of wet waste. As a result of the 49.5 maximum payload under the *Highway Traffic Act,* a 53-foot trailer can conservatively accommodate approximately 29 T of waste. A trailer will make 3 trips per week from the transfer station to the waste management facility.

On the trip from the waste management centre to the transfer station, the trailer will always carry an empty container. It will connect to the loaded container and leave the empty one there for loading, so there will be no wait for loading.

Capital Cost

Refer to Table 5.41 for a detailed description of the estimated capital costs.

Table 5.41: Capital Costs for the Tipping Floor for the Virgin Arm – Carter's Cove WMC.

Item	Cost ($)
Land Purchase - Assumed Solid Waste Management Commission would not have to purchase land.	$0
Site Preparation - Site grading, excavation, clearing, grubbing, etc. Assumed size of site would be 60 m x 70 m. Assumed an average of 1 m excavation and backfill for the site at $10/ m^3.	$42,000
Pre-Engineered Building - To accommodate a tipping floor, one loading bay, and loader operations it was assumed the building would have to be approximately 10 m x 30 m. The unit cost of the metal pre-engineered building including concrete bi-level is $800/$m^2$.	$240,000
Office/Trailer	$8,000
53 ft Transfer Trailers	$80,000
38 m^3 Open Top Bin - Bulk Waste Storage	**$6,000**
Access Road - Site is located on a 700 m gravel access road. It was assumed the access road would require some upgrading (including paving), at an assumed cost of $100/m.	$70,000
Onsite Paving - Assumed 500 m^2 of paving at a cost of $20/$m^2$.	$10,000
Weigh Scales - Inbound 40 ft weigh scales	$50,000
Water Supply - A water supply will be needed for employee use, washroom facilities, and facility washdown. Due to the location of the current incinerator, an artesian well and reservoir system is proposed. The cost of drilling an artesian well is $100/m to a depth of 100m. This cost also includes the onsite piping, storage tanks, and pumps.	$60,000
Power Supply - It was assumed that the nearest power supply is approximately 700 m from the site on the main road. The cost to extend the power supply was assumed at $25/m. Onsite electrical distribution was assumed to a lump sum of $2000.	$19,500
Septic Tank and Tile Field	$5,000
Fencing and Gates - 3m fence around perimeter of site (approx. 260 m perimeter) at $55/m. $2000 was assumed for the cost of gates and $300 was assumed for signage.	$16,600
Landscaping	$5,000
Sub-Total	$612,100
Contingency (10%)	$61,210
Engineering (15%)	$91,815
TOTAL	$765,125

Operational Costs

The estimated operational cost for the Virgin Arm - Carter's Cove Waste Management Centre is $89,220/year. Refer to Table 6 for a detailed description of the estimated operational costs.

Table 5.42: Operational Costs for the Tipping Floor for the Virgin Arm – Carter's Cove WMC.

ITEM	COST ($/year)
Staffing – One part time employee @ $15/hour + 35% payroll burden	$21,060
Loader (Rented) - 15/week@ 52 weeks/year@$90/hr	$56,160
Maintenance	$5,000
Snow Clearing	$5,000
Power Lighting, misc	$2,000
TOTAL	$89,220

5.2 TRANSPORTATION COSTS FOR TRANSFER STATIONS

The following sections provide the transportation cost for each transfer station to the three proposed Waste Management Facility Sites using Roll-off Bins, Transtor Bins, and 53 Ft Trailers.

5.21 ROLL-OFF BINS

Table 5.43: Transportation Cost using Roll-off Bins.

Transfer Station I.D.	Cost-Site #1	Cost-Site #2	Cost-Site #4
Buchan's Junction	$ 32,909	$ 33,754	$ 35,067
Point Leamington	$ 38,254	$ 39,662	$ 41,851
Virgin's Arm	$ 124,082	$ 127,462	$ 132,714
Fogo	$ 103,670	$ 105,078	$ 107,267
Gander Bay South	$ 92,475	$ 95,292	$ 99,669
Indian Bay	$ 167,477	$ 170,857	$ 176,109
Terra Nova	$ 128,353	$ 131,733	$ 136,985
Total	**$ 687,220**	**$ 703,839**	**$ 729,661**

5.2.2 TRANSTOR BINS

Table 5.44: Transportation Cost using Transtor Bins.

Transfer Station I.D.	Cost-Site #1	Cost-Site #2	Cost-Site #4
Buchan's Junction	$ 38,393	$ 39,379	$ 40,911
Point Leamington	$ 49,730	$ 51,561	$ 54,406
Virgin's Arm	$ 144,762	$ 148,706	$ 154,833
Fogo	$ 82,936	$ 84,063	$ 85,813
Gander Bay South	$ 46,238	$ 47,646	$ 49,834
Indian Bay	$ 195,390	$ 199,333	$ 205,461
Terra Nova	$ 149,746	$ 153,689	$ 159,816
Total	**$ 707,195**	**$ 724,377**	**$ 751,074**

5.2.3 53 FT TRAILERS

Table 5.45: Transportation Cost using 53ft Trailers.

Transfer Station I.D.	Cost-Site #1	Cost-Site #2	Cost-Site #4
Buchan's Junction	$ 30,227	$ 30,903	$ 31,953
Point Leamington	$ 22,262	$ 22,938	$ 23,988
Virgin's Arm	$ 74,449	$ 76,477	$ 79,628
Fogo	$ 53,662	$ 54,338	$ 55,388
Gander Bay South	$ 48,288	$ 49,640	$ 51,741
Indian Bay	$ 104,386	$ 106,414	$ 109,565
Terra Nova	$ 80,912	$ 82,940	$ 86,091
Total	**$ 414,186**	**$ 423,650**	**$ 438,356**

Results of the Transportation Cost Investigation for the proposed transfer station locations revealed that the most cost-effective method of transporting waste to the Regional Waste Management Facility is via 53 ft trailers and the least cost-effective is via transtor bins. Also, the most cost-effective location for the Regional Waste Management Facility, with respect to transportation cost, is at Proposed Site #1 and the least cost effective id Proposed Site #4.

5.3 SUMMARY OF COSTING

Table 5.46: Combined Capital , Operational, and Transportation Cost for all Transfer Stations

Transfer Station		Roll - Off Bins			Transtor Bins			Tipping Floor		
		Proposed Site 1	Proposed Site 2	Proposed Site 3	Proposed Site 1	Proposed Site 2	Proposed Site 3	Proposed Site 1	Proposed Site 2	Proposed Site 3
Buchan's Junction	Capital Costs	544,258			743,875			671,375		
	Operational Costs[2]	117,129	117,974	119,287	122,613	123,653	125,131	114,447	115,123	116,173
Fogo	Capital Costs	673,345			785,125			671,375		
	Operational Costs[2]	187,893	189,298	191,487	167,156	168,283	170,033	137,882	138,558	139,608
Gander Bay	Capital Costs	681,158			834,188			679,188		
	Operational Cost[2]	176,695	179,512	183,889	130,458	131,866	134,054	137,508	138,860	140,961
Indian Bay	Capital Costs	1,126,470			1,279,500			1,124,500		
	Operational Cosst[2]	256,697	260,077	265,329	284,610	288,553	294,681	198,606	200,634	203,785
Point Leamington	Capital Costs	673,345			785,125			671,375		
	Operational Costs[2]	122,474	123,882	126,071	133,950	135,781	138,626	106,482	107,158	108,208
Terra Nova	Capital Costs	688,970			842,138			687,000		
	Operational Costs[2]	212,573	215,953	221,205	233,966	237,909	244,036	221,292	223,320	226,471
Virgin Arm - Carters Cove	Capital Costs	767,095			920,125			765,125		
	Operational Cosst[2]	208,302	211,682	216,682	228,982	232,926	239,053	163,669	165,697	168,848
Total Cost	Capital Costs	5,154,641			6,190,076			5,269,938		
	Operational Cosst[2]	1,281,763	1,298,378	1,323,950	1,301,735	1,318,971	1,345,614	1,079,886	1,089,350	1,104,054
Total Capital and Operational Costs		6,436,404	6,453,019	6,478,591	7,491,811	7,509,047	7,535,690	6,349,824	6,359,288	6,373,992

[1] - Operational Cost is first year of operation only.

[2] – Operation Costs also includes Costs of Transporting Waste to Regional Waste Management Facility.

Based on the summary results of the capital, operational, and transportation cost for the proposed transfer station locations provided in Table 5.46, the most cost-effective alternative is the Tipping Floor Option and the least cost-effective alternative is the Transtor Bin Option. The final cost will be influenced by the selection of the Regional Waste Management Site and the Alternative Costing Scenario selected by the committee.

Appendix A
Alternative Approaches to Engineered Landfills

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Alternative Daily Covers

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Waste Handling and Storage

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Tarpomatic

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Herhof Stabilat Method

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Appendix B
Transfer Station Locations

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