

**Material Recovery Facility Evaluation and Optimization
Study
The City of Cornwall
CIF # 357**

Final Report

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Executive Summary

This Study examined three (3) options to determine the optimal operation for the facility to serve the City's Blue Box program as well as determine the potential to increase capacity to become a regional MRF or transfer facility to serve municipalities of Eastern Ontario.

Option 1 – Upgrade existing materials recovery facility (MRF) for the City's own use (5,000 tonnes per annum);

Option 2 – Upgrade the existing MRF to serve as a Regional facility for municipalities in Eastern Ontario (15,000 and 25,000 tonnes per annum, excluding the Ottawa region); and

Option 3 – Convert MRF to a Transfer Facility (5,000 & 15,000 tonnes per annum).

To enhance the existing MRF with new equipment suitable to manage a broader spectrum of material than what is currently handled in the City program, with capacity to process 5,000 tonnes per annum (TPA) represents a high investment in capital and operating costs, based on a City owned and operated structure. Economies of scale exist when a regional approach is applied to the overall capital investment. The increase in tonnage throughput reduces the overall cost per tonne and increases the potential for material revenue.

Table 1 depicts the Single Stream Regional MRF for 25,000 TPA as the more cost effective MRF scenario based on gross annual operating costs.

Table 1 Annual Gross Operating Cost per System

System	Single Stream Gross Operating Cost (\$/tonne)	Two Stream Operating Cost (\$/tonne)
Baseline (excluding revenue and tipping fees)		\$94/tonne
5,000 TPA	\$297/tonne	\$287/tonne
15,000 TPA	\$135/tonne	\$133/tonne
25,000 TPA	\$110/tonne	\$112/tonne

The risk associated with investing in MRF infrastructure is relying on costs to be offset by a stable revenue composite index. Recent market pricing has proven that material markets are volatile. It is also critical to examine the capital investment and equipment replacement costs associated with a newly constructed MRF. It can be expected that the MRF processing components and rolling stock will require replacement within 7 to 10 years. Investment in annual equipment reserves to fund future capital is recommended. Equipment reserve funds will impact overall annual costs.

Table 2 depicts that the capital and building/site work investment for a new MRF infrastructure to manage the broader spectrum of Blue Box materials is least favorable for the Single Stream Regional MRF (to manage 25,000TPA).

Table 2 Capital and Infrastructure Cost per System

System	Single Stream Capital Cost	Two Stream Capital Cost
5,000 TPA	\$4,308,325	\$4,528,325
15,000 TPA	\$5,191,925	\$5,884,925
25,000 TPA	\$8,347,625	\$8,787,625

The Transfer Facility option to manage either 5,000 or 15,000 TPA represents a more favourable full system approach when considering overall investment of municipal funds (capital and operating cost).

When considering the operating cost of the transfer systems as a standalone component, each of the transfer scenarios represent a higher annual operating cost than the City's baseline MRF costs as depicted in Table 3.

Table 3 Annual Gross Operating Cost Per System

System	Single Stream Gross Operating Cost (\$/tonne)	Two Stream Operating Cost (\$/tonne)
Baseline (Current System)		\$94/tonne
5,000 TPA-Traditional	\$185/tonne	\$191/tonne
5,000 TPA-Live Load	\$191/tonne	
5,000 TPA-Transtor	\$221/tonne	\$223/tonne
15,000 TPA-Traditional	\$147/tonne	\$155/tonne
15,000 TPA-Transtor	\$187/tonne	

It is important to consider the full system approach to Option 3. The Transfer Station scenarios are compatible with the footprint of the existing MRF and require minimal building modifications. The delivery timeframe for Transfer Station components range 8 to 10 week whereas much of the new MRF components range 8 to 10 months. Table 4 depicts the capital investment for the transfer station systems.

Table 4 Capital Cost Per System

System	Single Stream Capital Cost	Two Stream Capital Cost
5,000 TPA-Traditional	\$322,700	\$322,700
5,000 TPA-Live Load	\$425,000	\$425,000
5,000 TPA-Transtor	\$1,374,765	\$1,563,464
15,000 TPA-Traditional	\$850,700	\$1,174,700
15,000 TPA-Transtor	\$2,739,529	

In summary, the new Regional MRF Option could be considered provided that the City had a guaranteed inbound tonnage of 25,000 TPA, and established a competitive tipping fee/revenue rebate arrangement for participating municipalities. Alternatively, another reasonable option out of the three options examined would be to consider either a Traditional Regional Transfer Station to manage 15,000TPA or a City use only Traditional Transfer Station to manage the City's material.

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Appendix 3 Transfer Station Conceptual Drawings

Appendix 4 Transfer Station Cost Details

1.0 Introduction

The City of Cornwall (City) in conjunction with the Continuous Improvement Fund (CIF) retained 2cg Inc. (2cg) to undertake an Evaluation and Optimization Study (Study) of the City owned Material Recovery Facility (MRF). This Study was funded 100% by the (CIF), Project #357.

The City owned MRF was re-built in 2009 within the original facility footprint after a fire destroyed the building. The two stream processing facility (10,080 square feet) is publically owned and privately operated by HGC Management Inc. (HGC). The majority of the processing equipment with the exception of a baler/infeed belt and magnet is owned by HGC. The challenge facing the City is that the current operations contract expires in March, 2012.

This report presents the results of the Study.

2.0 Study Objectives

This Study examined three (3) options to determine the optimal operation for the facility to serve the City's Blue Box program as well as determine the potential to increase capacity to become a regional MRF or transfer facility to serve municipalities of Eastern Ontario.

The three main options examined were:

Option 1 – Upgrade the existing MRF for the City's own use;

Option 2 – Upgrade the existing MRF to serve as a Regional facility for municipalities in Eastern Ontario (excluding the Ottawa region)

Option 3 – Conversion of the MRF to a Transfer Facility

The Study included the following tasks:

- Describe program background;
- Establish a benchmark of the current state of the recycling program for the City (MRF processing costs and capacity);
- Analyze processing options to upgrade existing Cornwall MRF including capital and processing costs to process at a regional level (15,000 and 25,000 tonnes per annum -TPA) and to manage a wider range of plastic materials than what is currently being handled at the City MRF;
- Analyze transfer options to convert the existing MRF to a regional transfer station and manage a wider range of Blue Box plastic materials;
- Obtain feedback from surrounding municipalities to determine interest in participating in either a regional MRF or transfer station (TS) at the Cornwall location.



Information was gathered by 2cg from City staff, CIF, the MRF processing contractor, several equipment suppliers and building contractors. Supporting information was obtained during two site visits in the spring of 2011.

3.0 Program Background and Current Situation

3.1 Background

The City is located in the United Counties of Stormont, Dundas and Glengarry. The City has a population of 46,000 (21,500 households). Currently, the City provides processing service to South Stormont, and local commercial sector within the City limits. Until recently, (March 2010), the City also provided processing service to South Glengarry. The City applies a tipping fee to the two participating municipalities (\$25/tonne).

Figure 1 is a map depicting the City and the surrounding municipalities.



Figure 1 Map Depicting City of Cornwall and Surrounding Areas

3.2 Current Situation

The MRF is located within the City limits of Cornwall at the City owned Landfill Site (2590 Cornwall Centre Road). The site is home to a closed landfill site, an operating landfill site to service City ratepayers, a permanent household hazardous waste depot and the City owned MRF. The site is full fenced, equipped with dual weigh

scales (inbound and outbound) paved entrance and fully serviced by municipal water, sewer and 3 phase power. The total site area is 60 hectares with the operating landfill representing 30 hectares. The Certificate of Approval (A480109) for the MRF licenses the MRF to receive material from Ontario, Quebec and New York State, U.S. A.

Photo 1 depicts an aerial view of the MRF site and Figure SP-1 (Appendix 2) presents an outline of the existing site and building.



Photo 1 Cornwall MRF Property

The Certificate of Approval (C o A) stipulates that no more than 2,000 tonnes per month of recyclable material can be received at the City MRF representing an annual allowable tonnage of 24,000 tonnes per year. Currently, total throughput is roughly 300 tonnes per month representing approximately 3,600 tonnes per year.

The City owns the 10,080 square foot building, outside storage bins, the property, the horizontal baler (Excel Manufacturing 2R10D) and supporting metal infeed conveyor along with a magnetic ferrous separator. The remaining processing components, inclusive of all sorting platforms, feed conveyors, trommel screen, and rolling stock are owned by HGC. HGC is responsible for material marketing and general maintenance of the MRF. The City retains 100% of the material revenue from sale of material marketed by HGC.

Photos 2-7 depict the Cornwall Material Recycling Facility (MRF).



Photo 2 Elevated Tipping areas into Interior Bunkers

Unique to this facility is the method of receiving curbside collected material. Two stream material is tipped out of the collection trucks from an elevated ramp, into four 20 foot +/- wide concrete bunkers located within the MRF.



Photo 3 Concrete Bunkers inside the MRF

A traditional tipping floor area does not exist within this facility. Tipped fibre material is gathered by a skidsteer from the concrete receiving bunkers and fed onto a conveyor leading to an elevated sorting platform. All grade #8 newspapers (ONP#8) are negatively sorted off the end of the sort belt and fall beside the infeed belt leading to the baler. Old Boxboard (OBB), Old Corrugated Cardboard (OCC) and residual is positively pulled by approximately five (5) sort staff into sort chutes that drop into three metal bunkers attached to the elevated sort platform. The fibre line and container line do not run simultaneously partially due to the configuration of the baler infeed in relation to the sort platforms as well as the low tonnage throughput.



Photo 4 Fibre Sort Line

The horizontal baler and infloor infeed belt runs between the fibre and container sort lines.



Photo 5 Horizontal Baler

Tipped container material is removed from the concrete receiving bunkers by a skidsteer and fed into a hopper leading to the elevated container line. Material flows through a small trommel, to screen out fines. Fines fall onto the floor and are moved by the skidsteer to outside storage bunkers. Screened containers flow along an incline belt, across a magnet to an elevated sorting platform. Steel cans are mechanically removed and drop to an outside storage bin. Plastic, glass and aluminum continue to flow onto a sort belt. The same five sort crew from the fibre line positively pulls plastic grades # 1, #2, mixed plastics, clear glass, coloured glass and aluminum cans with residual as a negative sort.



Photo 6 Trommel and Container Feed Hopper

All container material is dropped into chutes leading to outside storage bins. Full bins are brought back inside the MRF for baling. Glass is stored in outside bunkers formed on the asphalt covered yard. The majority of the baled product is stored outside with the exception of aluminum and office paper.



Photo 7 Outside Bins for Sorted Containers

Processing is congested in the MRF due to lack of tipping floor space, the configurations of the inbound receiving area, and the position of the horizontal baler and infloor belt. Much of the material is handled several times from the point of receiving to point of outbound shipping.

3.3 Baseline Tonnage and MRF Costs

Baseline cost information was collected on the City MRF to establish status quo operational activities and costs to compare to alternative system costs. MRF costs were extrapolated from the 2010 Waste Diversion Ontario (WDO) Datacall for the City and verified with City staff.

Composition and Material Sales

In 2010, the composition of total Blue Box material managed at the Cornwall MRF (Residential and IC&I) were approximately 80% paper fibres and 20% containers by weight. The City's average composite index for the sale of all processed material (residential and commercial) in 2010 was \$124/tonne (\$448,194/3,608 tonnes). The City retained all revenue from sale of material. Comparably, the Ontario Price Sheet (Stewardedge) depicts the material sold composite index for the province to average \$124/tonne indicating that the City is at par with the provincial return on sale of material. All material received revenue, F.O.B. the MRF with the exception of coloured and mixed glass. Glass is manually colour separated into clear and coloured container glass, and hauled to Unical in Quebec. A processing fee is applied for coloured and mixed broken glass.

In 2010, the City marketed approximately total of 3,500 tonnes of material, representing 937 tonnes from S. Stormont and S. Glengarry and 2,564 tonnes from the City (residential and commercial, with some overlap from inventory in 2009). The City received \$14,055 in tipping fees from the two municipalities (\$25/tonne). The City also paid HGC an additional \$15/tonne to process the additional municipal material. The City retained all revenue from material sold inclusive of the two municipalities and the City's material). As a result, the total revenues (tipping and material sales) received by the City in 2010 was \$462,250.

The City's overall (Residential and IC&I) Blue Box material composition and revenue (based on 2010 material sold, excluding tipping) is depicted in Table 3.1. Tipping fees are excluded as part of the total revenue calculation for the purpose of future comparisons for system scenarios where costs reflect operational and capital costs and revenue reflects 100% rebate on sale of material based on current market value (May 2011).

Table 3.1 Cornwall Overall MRF Blue Box Composition and Material Sales (2010)

Material (2010)	Total Recovered (residential and ICI) 2010 (tonnes)	Total Composition %	Residential (tonnes)	Residential Composition %	Average Price Per tonne	Residential Revenue of Marketed tonnes	Total Revenue of Marketed tonnes
Fibres							
Boxboard	866	24.00%	627	25.98%	\$83	\$51,848	\$71,572
Newspaper	1,303	36.11%	944	39.11%	\$89	\$83,726	\$115,522
Corrugated Cardboard	655	18.15%	352	14.58%	\$146	\$51,556	\$95,948
subtotal fibres	2,824	78.27%	1,924	79.67%		\$187,131	\$283,042
Containers -glass							
Clear Glass	110	3.05%	79	3.29%	\$17	\$1,318	\$1,827
Coloured Glass	28	0.78%	20	0.83%	\$0	\$0	\$0
Mixed Glass	111	3.08%	80	3.33%	\$0	\$0	\$0
subtotal glass	249	6.90%	180	7.45%		\$1,318	\$1,827
Containers-metals							
Aluminum	39	1.08%	28	1.17%	\$1,499	\$42,341	\$58,445
Steel	102	2.83%	74	3.08%	\$233	\$17,314	\$23,784
subtotal metals	141	3.91%	103	4.25%		59,655	82,229
Containers -plastic							
PET	151	4.19%	110	4.54%	\$349	\$38,241	\$52,728
Mixed Plastics	65	1.80%	47	1.94%	\$3	\$144	\$200
Film	21	0.58%	15	0.63%	\$391	\$5,944	\$8,211
HDPE	51	1.41%	37	1.53%	\$391	\$14,422	\$19,958
subtotal plastic	288	7.98%	208	8.63%		\$58,752	\$81,096
Residual	106	2.94%			\$0	\$0	\$0
Totals	3,608	100.00%	2,415	100.00%		\$306,856	\$448,194

Throughput and Operational Costs

Currently, the City MRF operates on a single shift, five days per week. On average the MRF processes approximately 14 tonnes per day (2 tonnes per hour). Approximately 5 sort staff alternate between sorting fibre and container material supported by 2 equipment operators, 1 plant manager and a clerical staff person. The MRF is not operating at full capacity even on a single shift. Theoretically, if the existing processing equipment remained intact at the Cornwall MRF, it would have the ability to increase its existing throughput to 5,000 tonnes per year with the existing configuration provided there was either an increase in number of staff, hours of operation for a single shift or an additional shift.

Table 3.2 depicts the operating costs associated with processing all inbound material at the Cornwall MRF (2010). It should be noted that costs reflect the processing of the standard spectrum of plastic containers and are representative of the contract costs established in the 2005 tender which is scheduled for re-tender in the upcoming months.

Table 3.2 Cornwall MRF Costs (2010)

Item	Cost
HGC Contract Cost	\$283,922
Sight Security/Scale	\$4,520
Municipal Costs (% staffing)	\$5,863
Building Repairs	\$14,348
Insurance	\$1,200
Site Maintenance	\$1,616
Glass Tipping fees	\$4,248
Glass Shipping	\$5,532
Taxes/other	\$17,000
Total	\$338,248
Total Tonnes Processed (inclusive of residual)	3,600
Cost Per Tonne	\$93.96
Cost Per HH (21,500HH)	\$15.73

Operating costs specific to staff are embedded within the overall contract costs with HGC. It is estimated that approximately 80% of the costs associated with the HGC contract can be recognized as labour with remaining costs attributed to fuel, maintenance and baling wire.

In 2010, the total cost associated with the Cornwall MRF was approximately \$338,248. Revenue from sale of all material was \$448,194. Fees received from outside municipal contracts were \$14,055. **As a result, in 2010, the revenues received by the City for the MRF operations exceeded the gross operating costs.**

For the purpose of comparing upcoming scenarios, the gross costs will be used to reflect a baseline. In 2010 the gross cost per tonne to manage and process all inbound tonnes received at the Cornwall MRF (marketed and residual) averaged \$94/tonne.

Summary of Current Situation

A summary of the current situation is depicted in Table 3.3. Currently, the City has relatively low operating costs to manage the current throughput of Blue Box materials

but is limited to expansion due to processing contract constraints and the current configuration of the receiving and baling area of the MRF.

Table 3.3 Cornwall MRF Costs (2010)

Item	Units	Data
Throughput	TPA	3,608
Gross Operating Costs	\$	\$338,248
Gross Operating Cost Per Tonne	\$/tonne	\$94
Material Sales	\$	\$448,194
Tipping Fee	\$/tonne	\$14,005
Net Operating Costs	\$/tonne	-\$35/tonne

In 2010, the City averaged a net revenue gain of approximately \$35/tonne to manage the City MRF.

The next 3 main sections of the report outline projected costs (capital and operational) associated with expanding the MRF to a larger throughput capacity of Blue Box material (inclusive of broader spectrum plastics) including:

- 5,000 tonne per annum (TPA)
- 15,000 tonnes per annum (TPA)
- 25,000 tonnes per annum (TPA)

It is understood that the City's current practice is to tender for an operating contractor to supply labour and processing components on a cost per tonne basis over a fixed timeframe. The intent of this Study is to provide the City and CIF with an overall cost (capital and operational) for the purpose of comparing systems.

Using the following key assumptions:

- New equipment purchased and owned by the City (2011 rates);
- The facilities are capable of managing a broader spectrum of plastics as per WDO direction;
- Operated by the City (municipal staff, utilities, maintenance);
- Referencing potential for revenue (May 2011 revenue rates); and,
- Applying 5% residual rates for two stream and 10% residual rates for single stream.

These costs will be used as forecast planning for the City when tendering for a preferred option in 2011. Cost details are depicted in Appendix 1.

4.0 Option 1 - MRF Upgrade for the City's Own Use

This part of the Study reviewed the operations and costing of the facility based on a 5,000 TPA throughput using new equipment and allowing for flexibility to manage a wider range of plastic materials.

4.1 Capital Expenditures

Overview

Using new MRF processing components and the existing infrastructure of the baler infeed conveyor, and baler, this system is intended to work within the existing building (10,080 square feet) and an extension of the building to the east. Subject to further design work and the final selection and layout of processing equipment an extension of 60 feet was used to gain an additional approximately 3,800 square feet of space to allow for more processing equipment, a tipping floor and indoor storage. Inspection of the existing MRF layout determined that the location of the baler and the method of receiving material into segregated bunkers restrict overall space and material flow. The intent is to reposition the baler and infeed belt to the west to create a tipping floor area on the east side and allow for inside storage of processed containers and fibre material.

The capital costs for both the two and one stream systems include a building extension, site works, some internal modifications to the building, and new equipment (processing components including, permanent steel platforms and sort bunkers, variable speed rubber conveyor belts, all drives and motors), freight, installation of equipment (single stream and two stream). Further, capital costs include exit lighting and signage; dry sprinkler system; all necessary building inspections (fire, health and safety); new rolling stock; engineering, environmental and permitting fees; and a contingency sum. Figure SP-2a (Appendix 2) depicts a site plan showing the building extension and Figure SP-2b (Appendix 2) shows a conceptual layout of the intake, processing and storage areas for a two stream system in the enlarged building.

Further information on the capital works is presented below;

Building Extension

- Eastern extension of 60 feet

Site Works



- Possible roadwork at eastern entrance area of the MRF after extension, new hard standing on the south side, drainage works and landscaping.

Internal Modifications to the Building

The cost estimates include re-positioning of the baler, concrete work to fill original baler pit, and install new conveyor pit for baler infeed.

Description of New Equipment (one and two stream)

Essentially the variable between one and two stream is the infeed belt and location of a screen. Single stream offers one primary infeed belt and two stream offers two separate infeed belts, complementary to the current two stream system of the City. Both systems have a rated throughput of 5,000 TPA; 20 tonnes per day, reflecting a 260 day work year and operating on a single shift.

The main infeed line is equipped with a drum feed leveler to maintain material flow and prevent rollback of product. The PVC infeed belt (2 pieces with variable speed) lead to a variable speed sort conveyor equipped with automatic pull cord 'stop/start' feature and emergency stop controls (E-stop), metal conveyor frame bolted to metal sorting platform/walk way. The drop chutes are metal fabrication and the sort belts are PVC belting. All metal is galvanized and painted. It is proposed that the sorting platform not be enclosed. Heating is a radiant heater suspended from the ceiling (consistent to current method of heating sort areas). The fibre sort line has positions for 4-6 sort staff with 4-6 drop chutes leading to 4 fixed process bunkers. The bunkers are metal and equipped with front loading doors that are manually controlled by floor staff.

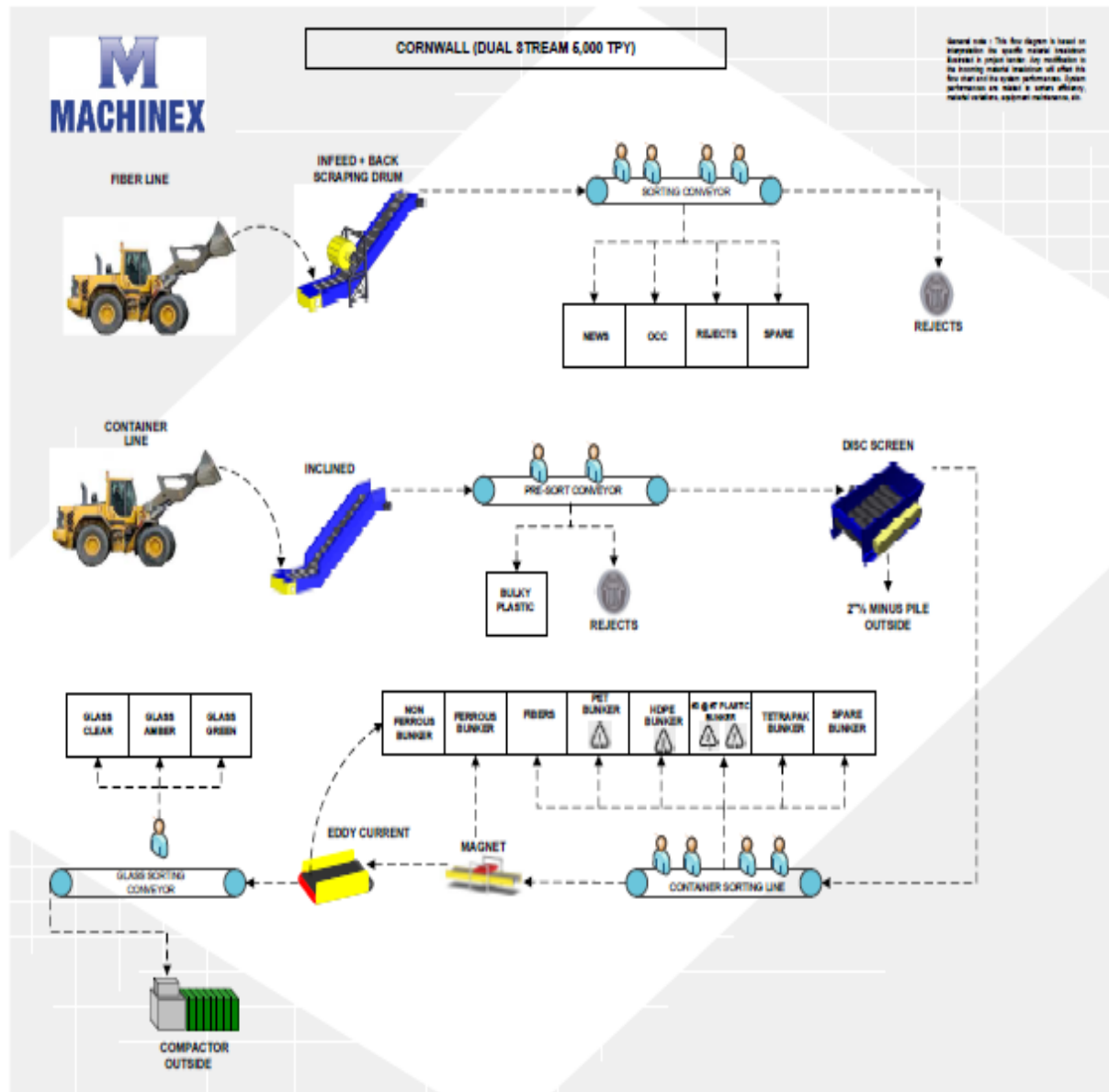
To accommodate the growing range of plastic materials, the container line offers a presort sort area for 2 staff to remove larger plastic buckets and pails or possibly bagged film material. The presort line leads to a disc screen to remove the fines (2.5 inch diameter). The fines can be coveyored outside into existing concrete bunkers or material can be managed inside the MRF. Containers travel over the disc screen so a container line that supports 4-6 sort staff to positively remove plastic and polycoat/Tetrapak material from the belt. This line has 8 fixed sort bunkers under the sort platform inside the MRF to offer flexibility for various grades of material and for inside processing. At the end of the container sort line is an overhead magnet to mechanically remove steel and an eddy current to mechanically remove aluminum.

Currently, the Cornwall MRF manually segregates clear and coloured glass and markets the material. Coloured glass is a negative revenue commodity and all glass has a cost associated with shipping. Many MRF's are choosing not to colour segregate glass to reduce overall operating costs. The proposed MRF configuration offers flexibility to separate coloured glass when the market dictates better return, with space for 3 sort staff. Based on current market pricing, it is advisable to

generate either a clear and mixed glass grade or a full mixed grade and devote 1 staff person to the glass line for quality control.

Anticipated delivery timeframe of the system components is 6 to 8 months with installation time being 5-7 days. Figure 2 depicts a conceptual layout to manage 5,000 TPA using a two stream approach.

Figure 2 Conceptual MRF Layout (5,000 TPA-Two Stream)



The following items of work were included where appropriate in the estimates of capital expenditure for this option:

Building Construction to include the following:

- Site and ground preparation, removal of bins, asphalt , concrete blocks, and paving areas
- Excavate for and construct reinforced concrete slab including granular sub base , geo-membranes and drainage
- Structural Steel
- Remove outer cladding and roller doors
- Install roof, outer cladding and roller doors
- Mechanical- Electrical works
- Install roof drainage
- Decommission fuel tank
- Provide new fuel tank
- Contractors Insurance
- Contractors Management, Surveying and QS
- Health and Safety

Site Works to include the following:

- Cut and fill earthworks for new road and paved yard area
- Drainage for new road and hardstand yard
- Granular material for new roads
- Asphalt and/or concrete for new road and paved yard area
- Signage and lining on roads
- Contractors Insurance
- Contractors Management, surveying and QS
- Health and Safety

Internal Modifications to Structure and/or Layout of Equipment

- Relocate Baler
- Contractors Insurance
- Contractors Management, Surveying and QS
- Health and Safety

Rolling Stock Requirements

A full size loader is not planned for this scale of throughput. The 5,000 TPA MRF could manage with a skidsteer and forklift, similar to the current rolling stock utilized by HGC.



Estimated Annual Operating Costs

The estimates of Annual Operating Costs included the following items where applicable:

Principal Costs

- Staff Salaries & Wages
- Benefits (25% of Wages)
- Other Management Costs staff, vehicles, office expenses
- Weigh bridge operation
- Pay back Capital on Loan
- Interest on Loan
- Materials and Supplies (Cleaning and H&S for staff)
- Baling Wire
- Electricity
- Gas
- Equipment Maintenance
- Rolling Stock Maintenance
- Fuel for Plant
- Building Insurance
- Telecommunications
- Security
- Pit maintenance (cleaning)
- Building Maintenance/Repairs
- Site Maintenance -snow, litter, dust/mud, pest control
- Municipal Taxes
- Glass Shipping Fees
- Glass Tipping Fees
- Residual Waste Tipping fees

Other Provisional Costs

- Engineering and Environmental Consulting Fees
- Environmental Monitoring Fees
- Fees to MOE
- External Legal Fees
- External Accounting Fees

Engineering and Environmental Assessment

- 10% estimate of total costs

Contingency

- 10% estimate of total costs

4.2 Revenue

To make an estimate of potential revenues from the sale of recovered materials, for Option 1, the present day material composition by weight (approximately 80% fibres and 20% containers) was assumed as this Option is an enhancement of the current system and intended for the City's own use. Allowing for 5% residual waste with no revenue from processing a two stream collection and 10% residual waste from processing single stream collection and applying May 2011 commodity prices for budget purposes, it can be estimated that the City could potentially capture \$655,000 and \$612,000 of revenue from the two and single streams, respectively.

Table 4.1 depicts a summary of potential revenue for one and two stream systems based on the assumed composition (weight based) of 80% fibre and 20% containers. Residual disposal rates are not factored as part of this scenario. These costs are accounted for in the estimates of Annual Operating Costs.

Table 4.1 Potential Revenue for 5,000 TPA MRF (One and Two Stream).

Material	Price Per tonne (May 2011)	Assumed Composition		Quantity (tonnes)	Revenue	Quantity (tonnes)	Revenue
Fibres		Two Stream	One Stream	Two Stream		One Stream	
Boxboard	\$73	23.50%	23.00%	1,175	\$85,775	1,150	\$83,950
Newspaper	\$126	35.50%	35.00%	1,775	\$223,650	1,750	\$220,500
Corrugated Cardboard	\$169	18.00%	16.00%	900	\$152,100	800	\$135,200
subtotal fibres		77.00%	74.00%	3,850	\$461,525	3,700	\$439,650
Containers-glass							
Clear Glass	\$27	3.00%	3.00%	150	\$4,050	150	\$4,050
Coloured Glass	\$0	1.00%	1.00%	50	\$0	50	\$0
Mixed Glass	\$0	3.00%	3.00%	150	\$0	150	\$0
subtotal glass		7.00%	7.00%	350	\$4,050	350	\$4,050
Containers-metals							
Aluminum	\$1,974	1.00%	0.50%	50	\$98,700	25	\$49,350
Steel	\$318	2.50%	2.00%	125	\$39,750	100	\$31,800
subtotal metals		3.50%	2.50%	175	\$138,450	125	\$81,150
Containers-plastic							
PET	\$748	4.00%	3.50%	200	\$149,600	175	\$130,900
Mixed Plastics	\$89	2.00%	1.50%	100	\$8,900	75	\$6,675
Film	\$22	0.50%	0.50%	25	\$550	25	\$550
HDPE	\$692	1.00%	1.00%	50	\$34,600	50	\$34,600
subtotal plastic		7.50%	6.50%	375	\$193,650	325	\$172,725
Residual							
	\$0	5.00%	10.00%	250	\$0	500	\$0
Totals		100.00%	100.00%	5000	\$655,175	5000	\$612,375

4.3 Summary of Costs and Revenues

Tables 4.2 and 4.3 summarize estimated capital and operational costs based the aforementioned costing categories and reflecting May 2011 pricing. Annualized capital costs use 6.5% lending rate over a 10 year period amortization period. Costs are for budgeting purposes and are subject to change based on further engineering design studies. When allowing for impacts to long term operation costs for all three scenarios, consideration should be given to maintaining an annual equipment reserve fund in preparation of equipment replacement within the 10 year planning period.

Table 4.2 Estimated Costs (Capital and Operational) for 5,000 TPA MRF (Single Stream)

Comparator	Units	Costs (5,000 TPA)
Gross Capital Cost	(\$)	\$4,308,325
Annualized Capital Costs	(\$/yr)	\$618,374
Annualized Operational Costs	(\$/yr)	\$866,065
Total Annual Cost	(\$/yr)	\$1,484,439
Cost Per Tonne	(\$/tonne)	\$297
Revenue Per Tonne	(\$/tonne)	\$122/tonne
Revenue/Cost Ratio	Ratio	.41

Table 4.3 Estimated Costs (Capital and Operational) for 5,000 TPA MRF (Two Stream)

Comparator	Units	Costs (5,000 TPA)
Gross Capital Cost	(\$)	\$4,528,325
Annualized Capital Costs	(\$/yr)	\$649,950
Annualized Operational Costs	(\$/yr)	\$786,965
Total Annual Cost	(\$/yr)	\$1,436,915
Cost Per Tonne	(\$/tonne)	\$287
Revenue Per Tonne	(\$/tonne)	\$131/tonne
Revenue/Cost Ratio	Ratio	.46

5.0 Option 2-Regional MRF Evaluation

Building on the information and costing from Option 1, the Study evaluated the cost and operations for the MRF to serve as a regional facility. Two scenarios were evaluated:

- Scenario 1 – managing 15,000 TPA of Blue Box material
- Scenario 2 – managing 25,000 TPA of Blue Box material

Option 2 considers the implications to the City's operations cost as well as the full facility costs and revenue projections under the different tonnage scenarios described above. The estimated capital and operating costs for Scenario 1 and Scenario 2 include the same assumptions as Option 1 with additional processing components and building modification to extend the building to accommodate inside processing and maximize indoor storage of processed (baled) materials.

5.1 Scenario 1 – 15,000 TPA MRF

This part of the Study reviewed the operations, potential costs and revenues of the facility based on a 15,000 TPA throughput using new equipment and allowing for flexibility to manage a wider range of plastic materials.

5.1.1 Estimated Capital Expenditures

Overview

Using new MRF processing components and the existing infrastructure of the baler infeed conveyor, and baler, this system is intended to work within the parameters of the existing building (10,080 square feet) with an extension of the building foot print to the east to gain additional floor space. Subject to further engineering design, equipment selection and layout an extension of 80 feet or approximately

5,000 square feet was used to provide space for a tipping floor, processing and internal storage. Figure SP-3a (Appendix 2) depicts the possible building extension and potential area of site works for this option.

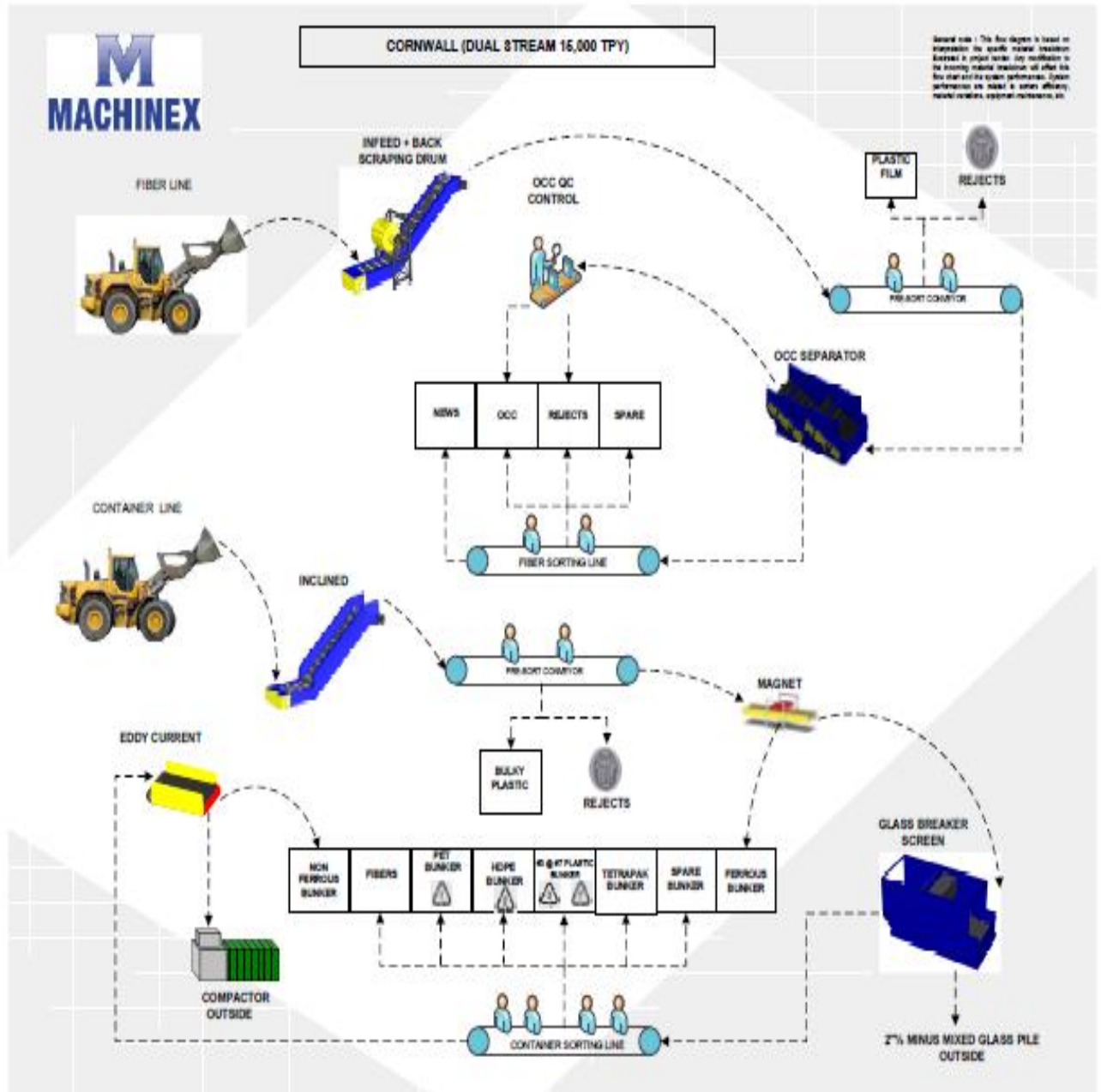
The capital costs for both the two and one stream systems include a building extension, site works, some internal modifications to the building, and new equipment (processing components, permanent steel platforms and sort bunkers, variable speed rubber conveyor belts, all drives and motors), freight, installation of equipment (single stream and two stream). Further capital costs include exit lighting and signage; dry sprinkler system; all necessary building inspections (fire, health and safety); new rolling stock; engineering, environmental and permitting fees; and a contingency sum.

Description of New Equipment (one and two stream)

The processing equipment will be similar to Option 1 with the addition of a 3 bunker pre-sort line, a cardboard screen (OCC Screen), a fibre screen, fibre quality control booth, an aluminum classifier (air blower), a reject transfer conveyor, a Compactor for either glass or residual and a glass clean up system. Both systems have a rated throughput of 15,000 TPA 60 tonnes per day, reflecting a 260 day work year and operating on a single shift. The additional fibre screens are impacted by loose film (plastic bags) and compacted material. Screens circulate dust within a MRF. As a result, this system includes enclosed mezzanines equipped with climate controls.

Anticipated delivery timeframe of the system components is 8 to 10 months with installation time being 7 -10 days. Figure 3 depicts a conceptual layout to manage 15,000 TPA using a two stream approach.

Figure 3 Conceptual MRF Layout (15,000 TPA-Two Stream)



The capital works that were considered in the cost estimates were as per Option 1 except a building extension of 80 feet was included, additional processing equipment was added in as described above and in relation to Rolling Stock, a full size loader is planned for this scale of throughput, supported by a skidsteer loader with grapple bucket and forklift with rotating forks.

5.1.2 Estimated Annual Operating Costs

The estimates of Annual Operating Costs included the same items as Option 1.

5.1.3 Revenue

To make an estimate of potential revenues from the sale of materials, for Option 2, it was assumed that a more common material composition (approximately 70% fibres and 30% containers by weight) to reflect residential Blue Box programs in the area. An output composition was derived using the existing Cornwall composition, and assuming a higher containers content, lower fibres content and assuming 5% residual waste from processing a two stream collection and 10% residual waste from processing single stream. Revenues were generated for this derived recovered materials composition profile by applying May 2011 pricing data for the various commodities. For budget purposes, it can be estimated that this facility could potentially capture \$2,976,000 revenue from the two stream upgrade and \$2,535,000 from the single stream upgrade.

Table 5.1 depicts a summary of potential revenues for one and two stream systems based on the assumed composition by weight of approximately 70% fibre and 30% containers. Residual disposal rates are not included here but are accounted for in the estimation of annual costs for this scenario.

Table 5.1 Potential Revenue for 15,000 TPA MRF (One and Two Stream)

Material	Cornwall 2010	Price Per tonne (May 2011)	Assumed Composition (%)		Quantity (tonnes) and Revenues		Quantity (tonnes) and Revenues	
Fibres			Two Stream	One Stream	Two Stream		One Stream	
Boxboard	23.65	\$73	21.4	21.4	3,215	\$234,689	3,215	\$234,689
Newspaper	35.58	\$126	32.2	32.2	4,837	\$609,419	4,840	\$609,840
Corrugated Cardboard	17.89	\$169	16.3	16.3	2,445	\$413,205	2,445	\$413,205
subtotal fibres	77.1		70.0	70.0	10,497	\$1,257,313	10,497	\$1,257,734
Containers Glass								
Clear Glass	3.00	\$27	3.0	3.0	450	\$12,150	450	\$12,150
Coloured Glass	0.76	\$0	1.0	1.0	150	\$0	150	\$0
Mixed Glass	3.03	\$0	3.0	3.0	450	\$0	450	\$0
subtotal glass	6.8		7.0	7.0	1,050	\$12,150	1,050	\$12,150
Containers - metals								
Aluminum	1.06	\$1,974	2.0	1.5	300	\$592,200	225	\$444,150
Steel	2.79	\$318	4.0	4.0	600	\$190,800	600	\$190,800
subtotal - metals	3.9		6.0	5.5	900	\$783,000	825	\$634,950
Containers - plastics								
PET	4.12	\$748	6.0	4.5	900	\$673,200	675	\$504,900
Mixed Plastics	1.77	\$89	3.0	1.5	450	\$40,050	225	\$20,025
Film	0.57	\$22	1.0	0.5	150	\$3,300	75	\$1,650
HDPE	1.39	\$692	2.0	1.0	300	\$207,600	150	\$103,800
subtotal containers - plastics	7.9		12.0	7.5	1,800	\$924,150	1,125	\$630,375
Residual	4.40	\$0	5.0	10.0	750	\$0	1,500	\$0
Totals	100.0		100.0	100.0	15,000	\$2,976,613	15,000	\$2,535,209

5.1.4 Summary of Costs and Revenues

Tables 5.2 and 5.3 summarize estimated capital and operational costs based on the aforementioned costing categories and reflecting May 2011 pricing. Annualized capital costs use 6.5% lending rate over a 10 year period amortization period. Costs are for budgeting purposes and are subject to change based on further engineering design studies and contingency for equipment reserve infrastructures.

Table 5.2 Estimated Costs (Capital and Operational) for 15,000 TPA MRF (Single Stream)

Comparator	Units	Costs (15,000 TPA)
Gross Capital Cost	(\$)	\$5,191,925
Annualized Capital Costs	(\$/yr)	\$745,197
Annualized Operational Costs	(\$/yr)	\$1,275,245
Total Annual Cost	(\$/yr)	\$2,020,442
Cost Per Tonne	(\$/tonne)	\$135
Revenue Per Tonne	(\$/tonne)	\$169
Revenue/Cost Ratio	Ratio	1.25

Table 5.3 Estimated Costs (Capital and Operational) for 15,000 TPA MRF (Two Stream)

Comparator	Units	Costs (15,000 tpa)
Gross Capital Cost	(\$)	\$5,884,925
Annualized Capital Costs	(\$/yr)	\$844,663
Annualized Operational Costs	(\$/yr)	\$1,148,245
Total Annual Cost	(\$/yr)	\$1,992,908
Cost Per Tonne	(\$/tonne)	\$133
Revenue Per Tonne	(\$/tonne)	\$198
Revenue/Cost Ratio	Ratio	1.49

5.2 Scenario 2 - 25,000 TPA MRF

This part of the Study reviewed the operations, potential costs and revenues of the facility based on a 25,000 TPA throughput using new equipment and allowing for flexibility to manage a wider range of plastic materials.

5.2.1 Estimated Capital Expenditures

Overview

Using new MRF processing components and the existing infrastructure of the baler infeed conveyor, and baler, this system is intended to work within the parameters of the existing building (10,080 square feet) and an extension to the north and the east to gain an additional circa 14,000 square feet of space. Figure SP-4a (Appendix 2) depicts potential building extensions and areas of site works to accommodate the new building plan and access arrangements.

The capital costs for both the two and one stream systems include a building extension, site works, some internal modifications to the building, and new equipment (processing components, permanent steel platforms and sort bunkers, variable speed rubber conveyor belts, all drives and motors), freight, installation of equipment (single stream and two stream). Further, capital costs include exit lighting and signage; dry sprinkler system; all necessary building inspections (fire, health and safety); new rolling stock; engineering, environmental and permitting fees; and a contingency sum.

Description of New Equipment (one and two stream)

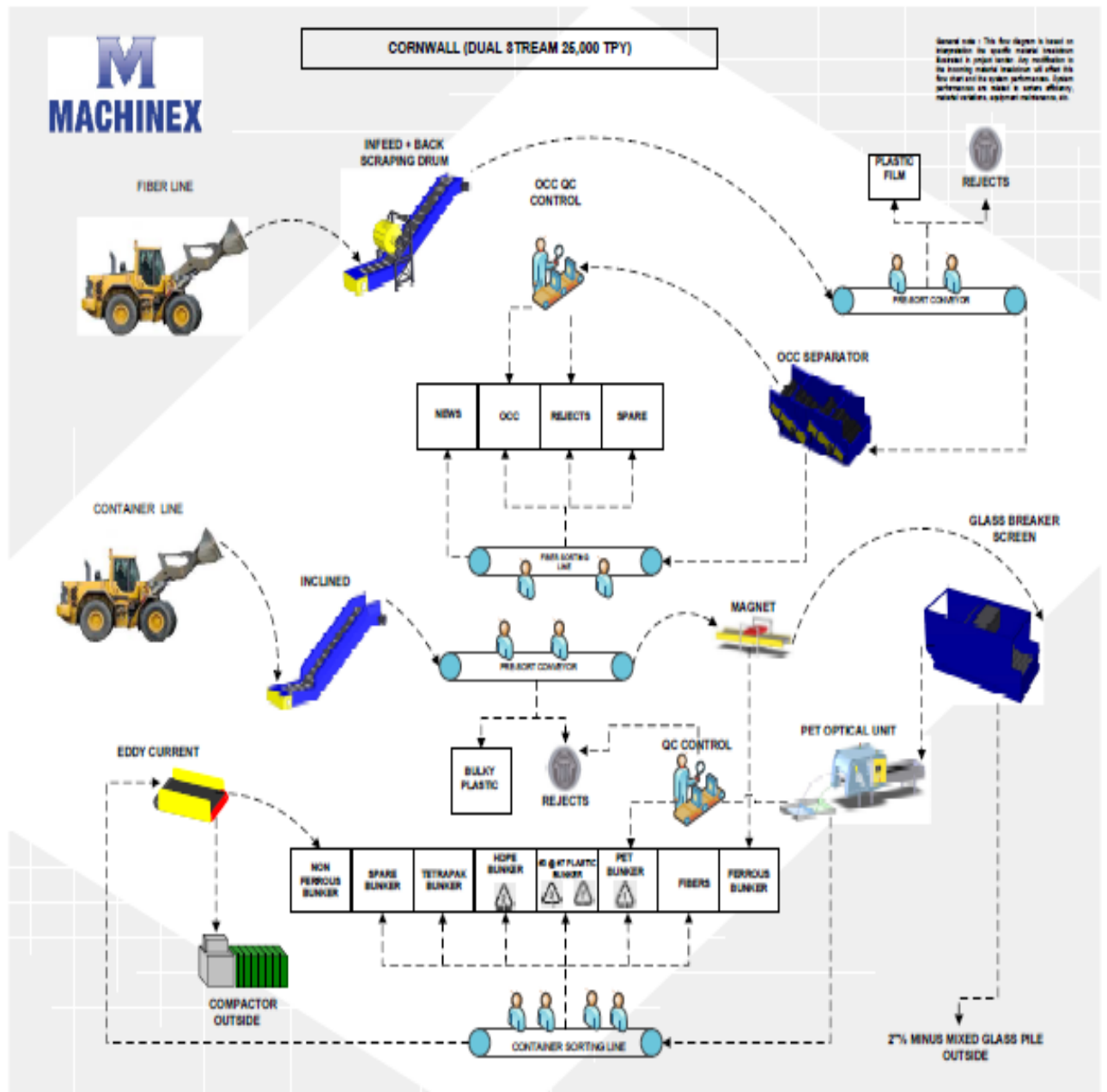
Similar to Option 1 and Option 2 components with the addition of a 4 bunker pre-sort area, 1 OCC and 1 Fibre Screen, 1 Finishing Screen, 2 Fibre Quality Control areas, an Dual Optical Sort system for the container line with flexibility to add a second Optical sort unit in the future to accommodate the broad range of plastics. Similar to Option 2, enclosed mezzanines, a magnet, eddy current, aluminum air blower, reject transfer, compactor & glass clean up system.

Both the single stream and two stream systems have a rated throughput of 25,000 TPA, 96 tonnes per day, reflecting a 260 day work year and operating on a single shift. The conceptual design does not include a second baler or a larger production baler. The existing baler is rated to manage this throughput but it is anticipated that the lifespan would not meet the 10 years amortization period used for the other scenarios. For this exercise, the price of a new baler has not been factored into the costs as it was determined that the unit could be refurbished as part of the annual operating costs (floor, shear and ram replacement).

The throughput rating of this facility if it were to reach an annual throughput of 25,000 TPA would exceed the current Certificate of Approval by 1,000 TPA. An amendment to the existing Certificate of Approval would be required for this throughput or the throughput could be held at a maximum of 24,000 TPA. Optical sorting equipment intended for the plastic sorting requires that material not be overly compacted.

Anticipated delivery timeframe of the system components is 8 to 10 months with installation time being 10-12 days. Figure 4 depicts a conceptual layout to manage 25,000 TPA using a two stream approach.

Figure 4 Conceptual MRF Layout (25,000 TPA-Two Stream).



The capital works that were considered in the cost estimates were as per Option 1 and Option 2 scenario 1 except with a building extension of 60 feet to the east and 63 feet to the north as shown on Figure SP-4a (Appendix 2) was included, additional processing equipment was added in as described above and in relation to Rolling Stock a full size loader is planned for this scale of throughput, supported by two skidsteer loaders with grapple buckets and two forklifts with rotating forks.

5.2.2 Estimated Annual Operating Costs

The estimates of Annual Operating Costs included the same items as Option 1 and Option 2 scenario 1.

5.2.3 Revenue

To make an estimate of the potential revenues from the sale of materials, for Option 2-Scenario 2 (25,000 tpa), a material composition of approximately 70% fibres and 30% containers, and 5% residual waste from processing a two stream and 10% residual waste from processing a single stream was assumed, It was estimated that this facility could potentially capture \$4,961,000 revenue from the two stream upgrade and \$4,225,000 from the single stream upgrade.

Table 5.4 depicts a summary of potential revenues for one and two stream systems based on the assumed composition of approximately 70% fibre and 30% containers. The cost of disposal of residual wastes is not included in this part of assessment as these are accounted for in the estimate of Annual Costs at a standardized rate of \$100/tonne.

Table 5.4 Potential Revenue for 25,000 tpa MRF (One and Two Stream)

Material	Cornwall 2010	Price Per tonne (May 2011)	Assumed Composition (%)		Quantity (tonnes) and Revenues		Quantity (tonnes) and Revenues	
Fibres			Two Stream	One Stream	Two Stream		One Stream	
Boxboard	23.65	\$73	21.4	21.4	5,360	\$391,280	5,360	\$391,280
Newspaper	35.58	\$126	32.2	32.2	8,062	\$1,015,812	8,062	\$1,015,812
Corrugated Cardboard	17.89	\$169	16.3	16.3	4,078	\$689,182	4,078	\$689,182
subtotal fibres	77.1		70.0	70.0	17,500	\$2,096,274	17,500	\$2,096,274
Containers Glass								
Clear Glass	3.00	\$27	3.0	3.0	750	\$20,250	750	\$20,250
Coloured Glass	0.76	\$0	1.0	1.0	250	\$0	250	\$0
Mixed Glass	3.03	\$0	3.0	3.0	750	\$0	750	\$0
subtotal glass	6.8		7.0	7.0	1,750	\$20,250	1,750	\$20,250
Containers - metals								
Aluminum	1.06	\$1,974	2.0	1.5	500	\$987,000	375	\$740,250
Steel	2.79	\$318	4.0	4.0	1,000	\$318,000	1,000	\$318,000
subtotal - metals	3.9		6.0	5.5	1,500	\$1,305,000	1,375	\$1,058,250
Containers - plastics								
PET	4.12	\$748	6.0	4.5	1,500	\$1,122,000	1,125	\$841,500
Mixed Plastics	1.77	\$89	3.0	1.5	750	\$66,750	375	\$33,375
Film	0.57	\$22	1.0	0.5	250	\$5,500	125	\$2,750
HDPE	1.39	\$692	2.0	1.0	500	\$346,000	250	\$173,000
subtotal containers - plastics	7.9		12.0	7.5	3,000	\$1,540,250	1,875	\$1,050,625
Residual	4.40	\$0	5.0	10.0	1,250	\$0	2,500	\$0
Totals	100.0		100.0	100.0	25,000	\$4,961,774	25,000	\$4,225,399

5.2.4 Summary of Costs and Revenues

Tables 5.5 and 5.6 summarize estimated capital and operational costs based on the aforementioned costing categories and reflecting May 2011 pricing. Annualized capital costs use 6.5% lending rate over a 10 year amortization period. Costs are for budgeting purposes and are subject to change based on further engineering design studies and contingency for equipment reserve infrastructures.

Table 5.5 Estimated Costs (Capital and Operational) for 25,000 TPA MRF (Single Stream)

Comparator	Units	Costs (25,000 TPA)
Gross Capital Cost	(\$)	\$8,347,625
Annualized Capital Costs	(\$/yr)	\$1,198,135
Annualized Operational Costs	(\$/yr)	\$1,552,930
Total Annual Cost	(\$/yr)	\$2,751,065
Cost Per Tonne	(\$/tonne)	\$110
Revenue Per Tonne	(\$/tonne)	\$169
Revenue/Cost Ratio	Ratio	1.54

Table 5.6 Estimated Costs (Capital and Operational) for 25,000 TPA MRF (Two Stream)

Comparator	Units	Costs (25,000 TPA)
Gross Capital Cost	(\$)	\$8,787,625
Annualized Capital Costs	(\$/yr)	\$1,261,288
Annualized Operational Costs	(\$/yr)	\$1,544,105
Total Annual Cost	(\$/yr)	\$2,805,393
Cost Per Tonne	(\$/tonne)	\$112
Revenue Per Tonne	(\$/tonne)	\$198
Revenue/Cost Ratio	Ratio	1.77

6.0 Option 3-Conversion of MRF to a Transfer Station Facility

Incorporating the information from the evaluations of Option 1 and Option 2, this section of the report presents an evaluation of the possible conversion of the City MRF to a Transfer Station Facility. This option examined two scenarios:

- Scenario 1- Managing 5,000 tonnes of Blue Box material (1 & 2 Stream)
- Scenario 2-Managing 15,000 tonnes of Blue Box material (1& 2 Stream)

This evaluation reviewed the implications to convert and operate the current MRF to a transfer station facility. This included the estimated capital and operating costs for the different scenarios similar to Options 1 and 2 with focus on Transfer Station operations. Factors that were considered included:

- Facility layout and material process flow for 2 stream curb side collection system and a single stream curbside collection system;
- Types and costs of different equipment to accommodate handling the different tonnages and accommodating increased tonnages within a 10 year time horizon;
- Determining the optimum flexibility of design to allow for changes and expansion in transfer operations to include limited processing of fibres and transfer of containers only; and
- Projected operating costs (including annualized capital costs, tipping fee at a third party processor and 100% material rebate) for different possibilities.

To establish comparative system costs between upgrading the existing MRF and transferring blue box tonnages to a third party processor, several components were considered;

- Point of transfer (assumed a distance of 100km one way);
- Truck travel time (assumed 2.5 hours one way inclusive of loading/unloading);
- Method of transfer (roll-off and trailer);
- Tonnages to transfer for operational cost estimates;
- Projected tonnages for facility footprint and structure requirements;
- Processing fee (\$100/tonne); and
- Revenue from third party processor (100% rebates).

Three methods of transfer that were considered;

1. Traditional transfer station, within existing building, using stationary compactors transferring material in either a B-train roll-off configuration for smaller loads or walking floor trailers for larger loads.
2. Transtor system supported with compacting transfer trailers without a building.
3. Live loading walking floor trailers within existing building, without the aid of stationary compactors for the 5,000 TPA scenario only.

6.1 Convert MRF to a 5,000 TPA Traditional Transfer Station – one or two stream

Overview

This system is intended to work within the existing building (10,080 square feet) without any inside modifications. Material could continue to be received in the existing receiving bunkers either as single stream or two stream and the baler and infeed can remain in its current location.

The capital costs for both the two and one stream systems include new equipment, freight, installation of equipment (single stream and two stream). Further, capital costs include exit lighting and signage; dry sprinkler system; all necessary building inspections (fire, health and safety); new rolling stock; engineering, environmental and permitting fees; and a contingency sum.

Description of New Equipment (one and two stream)

This system allows flexibility for the City and the ability to manage their own material with minimal disruption of services. This system has the flexibility to incorporate the City's existing baler and infeed configuration in the event that the City requires an immediate short term solution to manage its existing material. This system allows for an option of the direct baling of comingled fibres (OCC, OBB, ONP, office mix) without the need of a sorting line. Comingled container material could be transferred to a third party processor. The City could continue to collect two stream materials and



use the existing receiving bunkers of the MRF. The City would require a full time equipment operator to manage inbound material and operate the baler and a floor person to assist with the daily activity. All inbound comingled fibre could be baled (not sorted) and picked up by a third party processor on a revenue rebate basis. A stationary compactor installed at the west end of the building could manage comingled container material that could be transferred in 40 yard roll-off containers. Third party processors would conduct the processing of the container material.

Alternatively, with the low tonnage throughput, this system can operate as a full transfer station and use one stationary compactor to process fibres and container material (either two stream or single stream). The baler could be used for baling dedicated loads of cardboard from the commercial sector if deemed suitable by the City.

Anticipated delivery timeframe of the system components is 4-6 weeks with installation time being 2-3 days. Figure TS-1 (Appendix 3) depicts a conceptual layout to manage 5,000 TPA using either single or two stream approach.

6.1.2 Estimated Capital Expenditures

The following items of work were considered in the estimate of capital costs to convert the existing MRF to a 5,000 TPA traditional transfer station:

New Equipment - Supply and Install

- Weigh scale software
- Stationary Compactor with skid plates for concrete floor
- 40 cubic yard bins and swing bins
- Hopper and conveyor to compactor
- Delivery and Installation
- Electrical/Structural Engineer and inspections/certificates
- Contractors Insurance
- Contractors Management, Surveying and QS
- Health and Safety
- Maintaining existing footprint and concrete infrastructures and baler location

Rolling Stock Requirements

A skidsteer and forklift is planned for this scale of throughput. The forklift is only for movement of baled material.

6.1.3 Estimated Annual Operating Costs

Operating costs factor transfer site operations (skidsteer/forklift operator, floor spotter/back up operator, office staff person, utilities, fuel) and transfer

costs derived from a recent transfer report prepared for CIF (July 2011). Transfer costs depict highway tractor costs of \$43/hour, trailer/roll off average at \$18/hour, and driver average at \$29/hour for a total transfer haul rate of approximately \$90/hour. Tipping fee has been estimated at \$100/tonne with destination travel time approximately 2.5 hours one way, factoring in time to load, haul and unload material at the processing site. The assumption of 100% revenue rebate using same calculations as in the MRF scenarios was applied. Load weights will vary depending on method of loading, composition and time of year.

It is anticipated that the City could retain a third party hauling contractor to provide the transfer truck and trailer on a cost per tonne rate. This method would reduce the capital investment cost associated with rolling stock capital and maintenance.

Summary of Costs 5,000 TPA Transfer Station

Tables 6.1 and 6.2 summarizes estimated capital and operational costs for single stream and two stream scenarios based the aforementioned costing categories and reflecting May 2011 pricing. Annualized costs use 6.5% lending rate over a 10 year amortization period. Costs are for budgeting purposes and are subject to change based on further engineering design studies.

Table 6.1 Estimated Costs (Capital and Operational) for 5,000 TPA Transfer Station (Single Stream).

Comparator	Units	Costs (5,000 TPA)
Gross Capital Cost	(\$)	\$322,700
Annualized Capital Costs	(\$/yr)	\$46,317
Annualized Operational Costs	(\$/yr)	\$878,812
Total Annual Cost	(\$/yr)	\$925,129
Cost Per Tonne	(\$/tonne)	\$185
Revenue Per Tonne	(\$/tonne)	\$122
Revenue/Cost	Ratio	0.66

Table 6.2 Estimated Costs (Capital and Operational) for 5,000 TPA Transfer Station (Two Stream).

Comparator	Units	Costs (5,000 TPA)
Gross Capital Cost	(\$)	\$322,700
Annualized Capital Costs	(\$/yr)	\$46,317
Annualized Operational Costs	(\$/yr)	\$910,955
Total Annual Cost	(\$/yr)	\$957,272
Cost Per Tonne	(\$/tonne)	\$191
Revenue Per Tonne	(\$/tonne)	\$131
Revenue/Cost	Ratio	0.68

6.2 Convert MRF to a 15,000 TPA Traditional Transfer Station – one or two stream

Overview

This system uses one large compactor with the flexibility to running two stream or single stream material through the unit. This system is supported with walking floor trailers intended to be situated at the existing loading bay doors, working within the footprint of the existing facility.

Anticipated delivery timeframe of the system components is 6-8 weeks with installation time being 3-4 days. Figure TS-1 (Appendix 3) depicts a conceptual layout to manage 15,000 TPA using either single or two stream approach.

6.2.1 Estimated Capital Expenditures

The following items of work were considered in the cost estimate to convert the existing MRF to a 15,000 tpa traditional Transfer Station:

New Equipment - Supply and Install

- Weigh scale software
- Stationary Compactor and support stand
- Hopper and supports and various mechanical controls
- Delivery and Installation compactor and hoppers
- 53 foot Trailers
- Electrical/Structural Engineer and inspections/certificates
- Contractors Insurance
- Contractors Management, Surveying and QS
- Health and Safety
- Maintaining existing footprint and concrete infrastructures and baler

Rolling Stock Requirements

A loader, a skidsteer and forklift is planned for this scale of throughput. The forklift is only for movement of baled material.

6.2.2 Estimated Annual Operating Costs

The estimates of Annual Operating Costs included the same items as Method 1.

Summary of Costs 15,000 tpa Transfer Station

Tables 6.3 and 6.4 summarizes estimated capital and operational costs of single and two stream scenarios based the aforementioned costing categories and reflecting May 2011 pricing. Annualized costs use 6.5% lending rate over a 10 year amortization period. Costs are for budgeting purposes and are subject to change based on further engineering design studies.

Table 6.3 Estimated Costs (Capital and Operational) for 15,000 TPA Transfer Station (Single Stream)

Comparator	Units	Costs (15,000 TPA)
Gross Capital Cost	(\$)	\$850,700
Annualized Capital Costs	(\$/yr)	\$122,101
Annualized Operational Costs	(\$/yr)	\$2,075,864
Total Annual Cost	(\$/yr)	\$2,197,965
Cost Per Tonne	(\$/tonne)	\$147
Revenue Per Tonne	(\$/tonne)	\$169
Revenue Per Cost	Ratio	1.15

Table 6.4 Estimated Costs (Capital and Operational) for 15,000 TPA Transfer Station (Two Stream)

Comparator	Units	Costs (15,000 TPA)
Gross Capital Cost	(\$)	\$1,174,700
Annualized Capital Costs	(\$/yr)	\$168,605
Annualized Operational Costs	(\$/yr)	\$2,161,518
Total Annual Cost	(\$/yr)	\$2,330,123
Cost Per Tonne	(\$/tonne)	\$155
Revenue Per Tonne	(\$/tonne)	\$198
Revenue Per Cost	Ratio	1.28

6.3 Transtor System – one or two stream

Overview

This system varies from the traditional system as it does not require a protective building and minimal labour. For the purposes of this Study, it is proposed that this system be sited behind the MRF. Detailed site inspections have not been conducted and costs are based on capital costs and estimated site works based on initial site inspections.

Transtor systems are designed to be self contained operating units that do not require additional operational infrastructure such as truck spotters or loader operators. Instead of material being tipping onto a tipping floor or loaded into a stationary compactor, this system is designed for material to be directly tipped into a semi-automated container. The container is equipped with a lid that retracts when the truck driver pushes a button on the side mounting of the container. When the container is full, another button can be manually operated to hydraulically lift and tip the container directly inside an on-site compacting trailer. The collection container is designed for maximum loading of the compacting trailer and minimal windblown litter.

All capital costs for the Transtor system include the anticipated site development costs, including engineering, bin walls, concrete footings, grading, ramps, lighting, and safety barriers. In addition to detailed site preparation costs, it is suggested that the capital costs incorporate municipal ownership of the compaction trailer and back-up trailer (switch trailer) to maintain efficient site operations. The trailer costs include 4 axle compaction trailer (53' with Engine), upgraded tires, hydraulic lid lock system, battery operated remote control with trailer mounted receiver, trailer mounted oil tank and oil heater, hydraulic pumps and trailer air compressor and a trailer 'Auto-pack' program to adjust compaction rate to various commodities.

Anticipated delivery timeframe of the system components is 6-8 months with installation time dependent on the level of work required for site development.

Photo 8 depicts a typical configuration of a Transtor system supported by a compacting trailer.



Photo 8 Transtor and Compacting Trailer

6.3.1 Estimated Capital Expenditures

This system is offered for information purposes and may be a consideration in the future as it is currently not compatible with the existing configuration of the on-site building (MRF). This system is intended to eliminate the need for an enclosed structure and the requirements of staff. Recent observations made by the manufacturer (NexGen) and some municipal clients using the Transtor for Blue Box material (City of Dryden, County of Haldimand) have found it preferable to have site staff operating the Transtors to ensure full trailer utilization and to monitor compaction rates. NexGen is currently in the process of testing the utilization of high capacity auger compaction systems to reduce transportation costs and lower overall site development costs. Preliminary testing and payload proofs of the auger system will be completed by the Fall of 2011.

For the purpose of this exercise the following items of work were considered in the cost estimate to for 5,000 and 15,000 TPA Transtor Transfer Station:

New Equipment - Supply and Install

- 53 Yard Transtor Units (2 Transtors for 5,000 TPA and 4 Transtors for 15,000 TPA)
- 53 foot compacting Trailers (inclusive of a swing trailer for back-up)
- Electrical/Structural Engineer and inspections/certificates
- Concrete Support Structures, Fencing and Barriers
- Contractors Insurance
- Contractors Management, Surveying and QS
- Health and Safety

Rolling Stock Requirements

Loaders are not required for this system. Tractor trailers are necessary to have on-site to be live loaded to maintain effectiveness of system.

6.3.2 Estimated Annual Operating Costs

The estimates of Annual Operating Costs included the similar items as the previous Methods.

Summary of Costs

Table 6.5 summarizes estimated capital and operational costs based the aforementioned costing categories and reflecting May 2011 pricing for single stream Blue Box material. Annualized costs use 6.5% lending rate over a 10 year period. Costs are for budgeting purposes and are subject to change.

Table 6.5 Estimated Costs (Capital and Operational) for 5,000 TPA Transtor System (Single Stream)

Comparator	Units	Costs (5,000 TPA Transtor System)
Gross Capital Cost	(\$)	\$1,374,765
Annualized Capital Costs	(\$/yr)	\$197,320
Annualized Operational Costs	(\$/yr)	\$906,036
Total Annual Cost	(\$/yr)	\$1,103,356
Cost Per Tonne	(\$/tonne)	\$221
Revenue Per Tonne	(\$/tonne)	\$122
Revenue/Cost	Ratio	0.68

Table 6.6 summarizes estimated capital and operational costs based the aforementioned costing categories and reflecting May 2011 pricing for two stream Blue Box Material.

Table 6.6 Estimated Costs (Capital and Operational) for 5,000 TPA Transtor System (Two Stream)

Comparator	Units	Costs (5,000 TPA)
Gross Capital Cost	(\$)	\$1,563,464
Annualized Capital Costs	(\$/yr)	\$224,404
Annualized Operational Costs	(\$/yr)	\$890,792
Total Annual Cost	(\$/yr)	\$1,115,196
Cost Per Tonne	(\$/tonne)	\$223
Revenue Per Tonne	(\$/tonne)	\$131
Revenue/Cost	Ratio	0.59

Table 6.7 summarizes estimated capital and operational costs based the aforementioned costing for single stream only for 15,000 TPA. Extending to two stream for this tonnage become cost prohibitive at this time.

Table 6.7 Estimated Costs (Capital and Operational) for 15,000 tpa Transtor System (Single Stream)

Comparator	Units	Costs (5,000 tpa)
Gross Capital Cost	(\$)	\$2,739,529
Annualized Capital Costs	(\$/yr)	\$393,205
Annualized Operational Costs	(\$/yr)	\$2,404,659
Total Annual Cost	(\$/yr)	\$2,797,864
Cost Per Tonne	(\$/tonne)	\$187
Revenue/Tonne	(\$/tonne)	\$169
Revenue/Cost	Ratio	0.91

6.4 Live Load Transfer System – 5,000 TPA - one or two stream

Overview

This system is intended to work within the existing building (10,080 square feet) without any inside modifications. Material could continue to be received in the existing receiving bunkers either as single stream or two stream and the baler and infeed can remain in its current location and could potentially be used to manage corrugated cardboard from the IC&I sector or for baling mixed fibres.

The capital costs do not include any internal processing equipment. Costs reflect the purchase of a new walking floor truck and trailer with a back up swing trailer. Further, capital costs include exit lighting and signage; dry sprinkler system; all necessary building inspections (fire, health and safety); new rolling stock; engineering, environmental and permitting fees; and a contingency sum.

It should be noted that the City could investigate opportunities to contract the trailer and truck service provider to eliminate the capital investment and ownership maintenance of this capital.

Anticipated delivery timeframe of the truck and trailer system components is 3-4 months with no installation requirements. Figure TS-1 (Appendix 2) depicts a conceptual layout to manage 5,000 TPA traditional transfer station that can also be used for the Live Load configuration with the truck and trailer positioned where the compactor is proposed.

6.4.1 Estimated Capital Expenditures

The following items of work were considered in the estimate of capital costs to convert the existing MRF to a 5,000 TPA Live Load transfer station:



New Equipment - Supply and Install

- Weigh scale software
- Truck tractor and 53 foot walking floor trailer with additional swing trailer
- Contractors Insurance
- Contractors Management, Surveying and QS
- Health and Safety
- Maintaining existing footprint, concrete infrastructures and baler location

Rolling Stock Requirements

A skidsteer and forklift is planned for this scale of throughput. The forklift is only for movement of baled material if the City chooses to use the baler.

Estimated Annual Operating Costs

The estimates of Annual Operating Costs included the same items as Method 1.

Summary of Costs 5,000 TPA Live Load Transfer Station

Table 6.7 summarizes estimated capital and operational costs based the aforementioned costing categories and reflecting May 2011 pricing. Annualized costs use 6.5% lending rate over a 10 year amortization period. Costs are for budgeting purposes and are subject to change based on further engineering design studies.

Table 6.7 Estimated Costs (Capital and Operational) for 5,000 TPA Live Load Transfer Station (Single Stream).

Comparator	Units	Costs (5,000 TPA Live Load)
Gross Capital Cost	(\$)	\$425,800
Annualized Capital Costs	(\$/yr)	\$61,115
Annualized Operational Costs	(\$/yr)	\$895,955
Total Annual Cost	(\$/yr)	\$957,070
Cost Per Tonne	(\$/tonne)	\$191
Revenue Per Tonne	(\$/tonne)	\$122
Revenue/Cost	Ratio	0.64

7.0 System Summary

Table 7.1 summarizes all three options, depicting on-site operating cost estimates and one-time purchase of new equipment to manage the required tonnage throughput and allowing for flexibility in material volumes (e.g.: accounting for broader spectrum of plastics). All three scenarios reference potential revenues received from the sale of material processed directly from the MRF based on Ontario market pricing (May 2011).

Transfer station costs factor in on-sight operating costs, one-time purchase of new equipment, one-way transfer costs, tipping fees and full revenue rebate based on May 2011 pricing.

Table 7.1 System Summary Table

System	No. of Streams	Comparator	Units	5,000 tpa	15,000 tpa	25,000 tpa
Option 1 MRF Upgrade	1	Capital Cost	(\$)	\$4,308,325		
		Annualized Capital Cost	(\$/yr)	\$618,374		
		Annual Operational Cost	(\$/yr)	\$866,065		
		Total Annual Cost	(\$/yr)	\$1,484,439		
		Cost per tonne	(\$/tonne)	\$297		
		Revenue per tonne	(\$/tonne)	\$122		
		Revenue/Cost	ratio	0.41		
	2	Capital Cost	(\$)	\$4,528,325		
		Annualized Capital Cost	(\$/yr)	\$649,950		
		Annual Operational Cost	(\$/yr)	\$786,965		
		Total Annual Cost	(\$/yr)	\$1,436,915		
		Cost per tonne	(\$/tonne)	\$287		
		Revenue per tonne	(\$/tonne)	\$131		
		Revenue/Cost	ratio	0.46		
Option 2 Regional MRF	1	Capital Cost	(\$)		\$5,191,925	\$8,347,625
		Annualized Capital Cost	(\$/yr)		\$745,197	\$1,198,135
		Annual Operational Cost	(\$/yr)		\$1,275,245	\$1,552,930
		Total Annual Cost	(\$/yr)		\$2,020,442	\$2,751,065
		Cost per Tonne	(\$/tonne)		\$135	\$110
		Revenue per tonne	(\$/tonne)		\$169	\$169
		Revenue/Cost	ratio		1.25	1.54
	2	Capital Cost	(\$)		\$5,884,925	\$8,787,625
		Annualized Capital Cost	(\$/yr)		\$844,663	\$1,261,288
		Annual Operational Cost	(\$/yr)		\$1,148,245	\$1,544,105
		Total Annual Cost	(\$/yr)		\$1,992,908	\$2,805,393
		Cost per tonne	(\$/tonne)		\$133	\$112
		Revenue per tonne	(\$/tonne)		\$198	\$198
		Revenue/Cost	ratio		1.49	1.77
Option 3 Transfer Station Traditional	1	Capital Cost	(\$)	\$322,700	\$850,700	
		Annualized Capital Cost	(\$/yr)	\$46,317	\$122,101	
		Annual Operational Cost	(\$/yr)	\$878,812	\$2,075,864	
		Total Annual Cost	(\$/yr)	\$925,129	\$2,197,965	
		Cost per tonne	(\$/tonne)	\$185	\$147	
		Revenue per tonne	(\$/tonne)	\$122	\$169	
		Revenue/Cost	ratio	0.66	1.15	
	2	Capital Cost	(\$)	\$322,700	\$1,174,700	
		Annualized Capital Cost	(\$/yr)	\$46,317	\$168,605	
		Annual Operational Cost	(\$/yr)	\$910,955	\$2,161,518	
		Total Annual Cost	(\$/yr)	\$957,272	\$2,330,123	
		Cost per Tonne	(\$/tonne)	\$191	\$155	
		Revenue per tonne	(\$/tonne)	\$131	\$198	
		Revenue/Cost	ratio	0.68	1.28	
Option 3 Transfer Station NexGen	1	Capital Cost	(\$)	\$1,374,765	\$2,739,529	
		Annualized Capital Cost	(\$/yr)	\$197,320	\$393,205	
		Annual Operational Cost	(\$/yr)	\$906,036	\$2,404,659	
		Total Annual Cost	(\$/yr)	\$1,103,356	\$2,797,864	
		Cost per tonne	(\$/tonne)	\$221	\$187	
		Revenue per tonne	(\$/tonne)	\$122	\$169	
		Revenue/Cost	ratio	0.68	0.91	
	2	Capital Cost	(\$)	\$1,563,464		
		Annualized Capital Cost	(\$/yr)	\$224,404		
		Annual Operational Cost	(\$/yr)	\$890,792		
		Total Annual Cost	(\$/yr)	\$1,115,196		
		Cost per tonne	(\$/tonne)	\$223		
		Revenue per tonne	(\$/tonne)	\$131		
		Revenue/Cost	ratio	0.59		
Option 4 Transfer Station Top Load Trailer	1 and 2	Capital Cost	(\$)	\$425,800		
		Annualized Capital Cost	(\$/yr)	\$61,115		
		Annual Operational Cost	(\$/yr)	\$895,955		
		Total Annual Cost	(\$/yr)	\$957,070		
		Cost per tonne	(\$/tonne)	\$191		
		Revenue per tonne	(\$/tonne)	\$122		
		Revenue/Cost	ratio	0.64		

8.0 Conclusions

To enhance the existing MRF with new equipment suitable to manage a broader spectrum of material with capacity to process 5,000 TPA represents a high investment in capital and operating costs, based on a City owned and operated structure. Economies of scale exist when a regional approach is applied to the overall capital investment. The increase in tonnage throughput reduces the overall cost per tonne and increases the potential for material revenue. Table 8.1 depicts the Single Stream Regional MRF for 25,000 TPA as the more cost effective MRF scenario based on gross annual operating costs.

Table 8.1 Annual Gross Operating Cost per System

System	Single Stream Operating Cost (\$/tonne)	Two Stream Operating Cost (\$/tonne)
Baseline (Current System)		\$94/tonne
5,000 TPA	\$297/tonne	\$287/tonne
15,000 TPA	\$135/tonne	\$133/tonne
25,000 TPA	\$110/tonne	\$112/tonne

The risk associated with MRF infrastructure is relying on costs to be offset by a stable revenue composite index. Recent market pricing has proven that material markets are volatile. It is also critical to examine the capital investment and equipment replacement costs associated with a MRF. It can be expected that the MRF processing components and rolling stock will require replacement within 7 to 10 years. Investment in annual equipment reserves to fund future capital is recommended. Equipment reserve funds will impact overall annual costs. Table 8.2 depicts the capital and building/site work investment of new MRF infrastructure to manage the broader spectrum of Blue Box materials is least favorable for the Single Stream Regional MRF to manage 25,000TPA.

Table 8.2 Capital and Infrastructure Cost per System

System	Single Stream Capital Cost	Two Stream Capital Cost
5,000 TPA	\$4,308,325	\$4,528,325
15,000 TPA	\$5,191,925	\$5,884,925
25,000 TPA	\$8,347,625	\$8,787,625

Option 3 - Transfer Station Scenario to manage either 5,000 or 15,000 TPA represent a more favourable full system approach when considering overall investment of municipal funds (capital and operating cost).

When considering only the operating cost component of the transfer systems, each of the transfer scenarios represents a higher annual operating cost than the City's baseline MRF costs.

Table 8.3 depicts the Annual Gross Operating Cost per System.

Table 8.3 Annual Gross Operating Cost Per System

System	Single Stream Operating Cost (\$/tonne)	Two Stream Operating Cost (\$/tonne)
Baseline (Current System)		\$94/tonne
5,000 TPA-Traditional	\$185/tonne	\$191/tonne
5,000 TPA-Live Load	\$191/tonne	
5,000 TPA-Transtor	\$221/tonne	\$223/tonne
15,000 TPA-Traditional	\$147/tonne	\$155/tonne
15,000 TPA-Transtor	\$187/tonne	

The Transfer Station scenarios are compatible with the existing footprint of the existing MRF and require minimal building modifications. The delivery timeframe for Transfer Station components range 8 to 10 week whereas much of the new MRF components range 8 to 10 months. Table 8.4 depicts the capital investment for the transfer station systems.

Table 8.4 Capital Cost Per System

System	Single Stream Capital Cost	Two Stream Capital Cost
5,000 TPA-Traditional	\$322,700	\$322,700
5,000 TPA-Live Load	\$425,000	\$425,000
5,000 TPA-Transtor	\$1,374,765	\$1,563,464
15,000 TPA-Traditional	\$850,700	\$1,174,700
15,000 TPA-Transtor	\$2,739,529	

In summary, the new Regional MRF Option could be considered provided that the City had a guaranteed inbound tonnage of 25,000 TPA, otherwise, the preferred option would be to consider either a Traditional Regional Transfer Station to manage 15,000TPA or a City use Traditional Transfer Station to manage 5,000 TPA. It is anticipated that the annual operating costs would be reduced based on entering into a long term contract with a hauling contractor and transfer station service provider.

Appendix 1

MRF Cost Details

City of Cornwall Materials Recycling Facility - CIF Project No. 357 - Summary of Estimated Capital Expenses for Various MRF Options

Capital Cost Estimates Cornwall MRF		Costing Scenarios											
		500 tpa				1,000 tpa				2,500 tpa			
		One		Two		One		Two		One		Two	
Item No.	Description	Units	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity
1	Building Construction	m ²	3,750	\$472,500	37,500	\$472,500	5,000	\$650,000	50,000	\$650,000	13,500	\$1,792,500	1,350,000
2	Site Works	m ²	1,500	\$112,500	1,500	\$112,500	1,300	\$97,500	1,200	\$97,500	3,000	\$225,000	\$225,000
3	Internal Modifications to Structure and/or Layout of Equipment	sum	1	\$30,000	1	\$30,000	1	\$50,000	1	\$50,000	1	\$50,000	\$50,000
4	New Equipment - Supply and Install	LS	1	\$3,096,750	1	\$3,296,750	1	\$3,570,750	1	\$4,200,750	1	\$5,000,750	\$5,400,750
5	Rolling Stock	sum		\$149,000		\$149,000		\$301,000		\$301,000		\$369,000	\$398,000
S.1	Shovel	No	2	\$104,000	2	\$104,000	1	\$52,000	1	\$52,000	2	\$104,000	\$104,000
S.2	Tractor	No	1	\$45,000	1	\$45,000	1	\$45,000	1	\$45,000	2	\$90,000	\$90,000
S.3	Loader with 1.5 cubic yard bucket	No	0	\$0	0	\$0	1	\$204,000	1	\$204,000	1	\$204,000	\$204,000
6	Engineering, Environmental Assessment, Permitting	sum	1	\$61,500	0	\$0	1	\$77,750	1	\$77,750	1	\$200,750	\$200,750
7	Contingency	sum	1	\$384,075	0	\$0	1	\$527,825	1	\$527,825	1	\$780,225	\$780,225
A.	Total excluding demolition and reconstruction of offices			\$4,303,325		\$4,323,325		\$5,198,325		\$5,198,325		\$6,347,625	\$6,787,725

Annual Cost assuming 30 year amortization and 6.5%													
Total A above				\$618,374		\$648,950		\$745,197		\$844,863		\$1,198,135	\$1,261,288
Total A Annual Costs													
Principal				\$480,833		\$452,833		\$519,199		\$585,483		\$834,763	\$878,763
Interest				\$87,541		\$197,118		\$226,000		\$256,374		\$363,372	\$382,525
check				\$618,374		\$648,950		\$745,197		\$844,863		\$1,198,135	\$1,261,288

City of Cornwall Materials Recycling Facility - CIF Project No. 357 - Summary of Estimated Annual Costs for Various MRF Options

Facility Data

Facility Name	3,500 tpa	5,000	5,000	15,000	15,000	25,000	25,000
Facility location							
CRA No.							
Through put	3,500	5,000	5,000	15,000	15,000	25,000	25,000
No. of Tonnages	3,000	4,500	4,500	12,450	13,200	20,700	22,000
No. of PEs cleared	1	1	1	1	1	1	1
No. of Streams Forward	2	2	2	2	2	2	2
Organic Stream	0	0	0	0	0	0	0
Recycle material	5	10	10	10	10	10	10
Quantity of material	250	500	500	1,500	1,500	2,500	2,500
Quantity of gas	7	7	7	7	7	7	7
Quantity of oil	200	300	300	1,000	1,000	1,500	1,500
No. of staff	5	17	15	20	20	23	23
No. of staff including sorters	2	5	5	6	6	9	9
Building Floor Area - gross footprint	11,340	13,060	13,060	15,120	15,120	23,940	23,940
Processing Floor area	10,810	13,330	13,330	14,590	14,590	23,410	23,410
Processing Floor area (net/ftic)	1,094	1,238	1,238	1,355	1,355	2,175	2,175
External Paved Site Area	7	7	7	7	7	7	7
Reference Year for costs	2,010	2,010	2,010	2,010	2,010	2,010	2,010

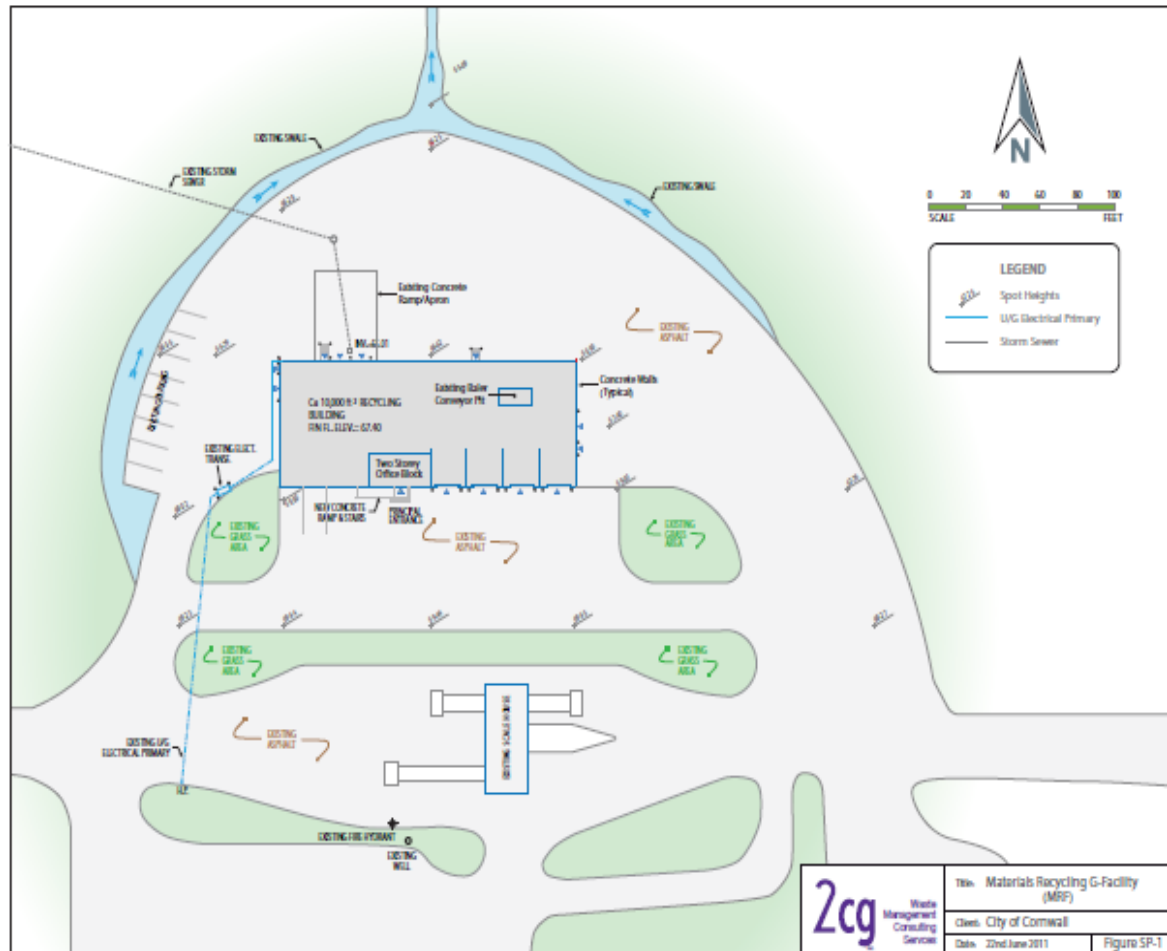
Estimated Annual Operating Costs

Item Description	3,500 tpa	5,000 tpa	5,000 tpa	15,000 tpa	15,000 tpa	25,000 tpa	25,000 tpa
	Two	One	Two	One	Two	One	Two
Staff and other Management Costs	255,394.50	377,200.00	323,900.00	697,450.00	694,150.00	667,075.00	753,850.00
Amortized Capital Costs	0.00	619,379.80	649,950.40	745,187.00	844,663.32	1,108,124.62	1,261,207.62
Materials and Supplies	4,000.00	30,155.00	32,851.00	70,798.00	72,090.00	103,421.00	111,825.00
Utilities	0.00	49,675.00	49,675.00	141,510.00	141,510.00	233,015.00	233,015.00
Maintenance Costs	25,364.00	40,825.00	40,825.00	75,400.00	75,400.00	119,425.00	119,425.00
Building Stock Costs	31,000.00	31,000.00	31,000.00	31,000.00	31,000.00	31,000.00	31,000.00
Miscellaneous Building Costs	18,100.00	31,105.00	31,105.00	34,020.00	34,020.00	53,865.00	53,865.00
Water Management Costs	3,780.00	61,025.00	34,021.00	183,075.00	183,075.00	303,121.00	303,121.00
Other Provisional External Service Costs	0.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
Total Annual Operating Costs	\$334,139	\$1,484,489	\$1,436,715	\$2,020,442	\$2,092,305	\$2,731,000	\$2,808,390
Cost per Tonne	986.67	\$296.89	\$287.38	\$334.70	\$132.36	\$110.04	\$127.22

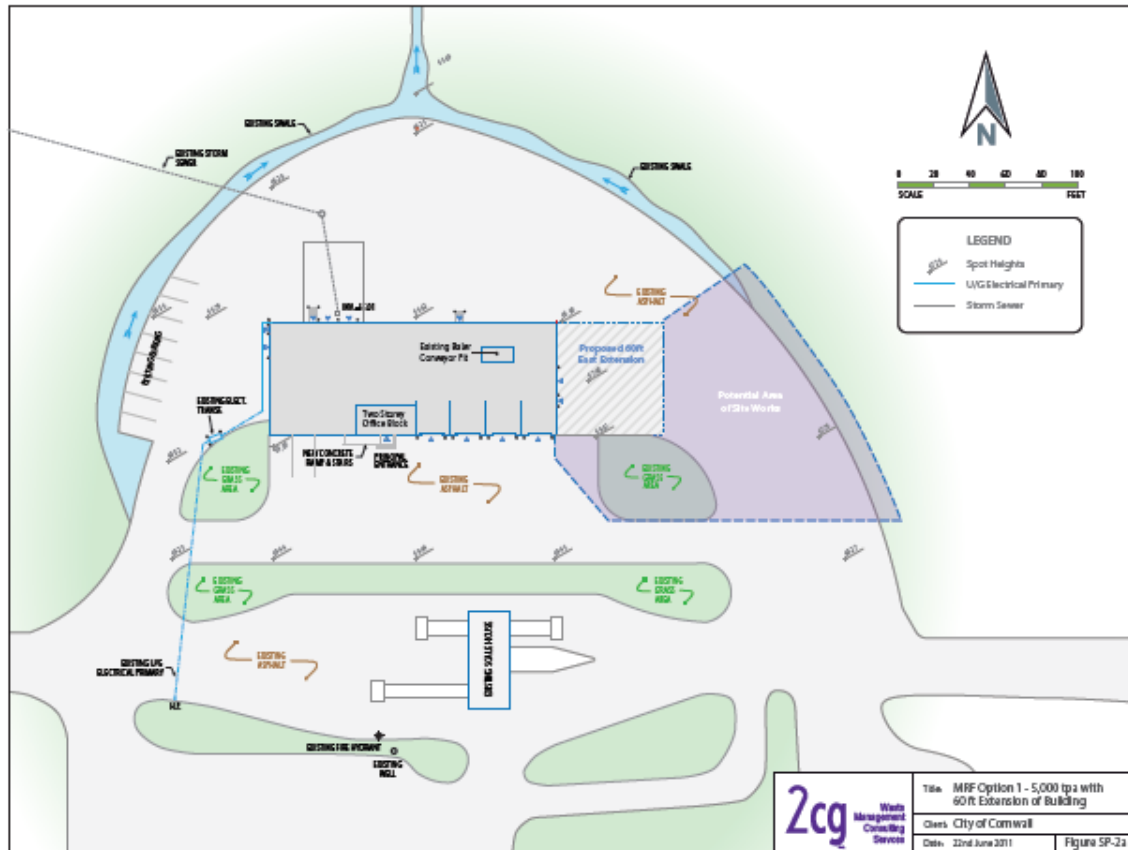
Appendix 2

MRF Conceptual Drawings

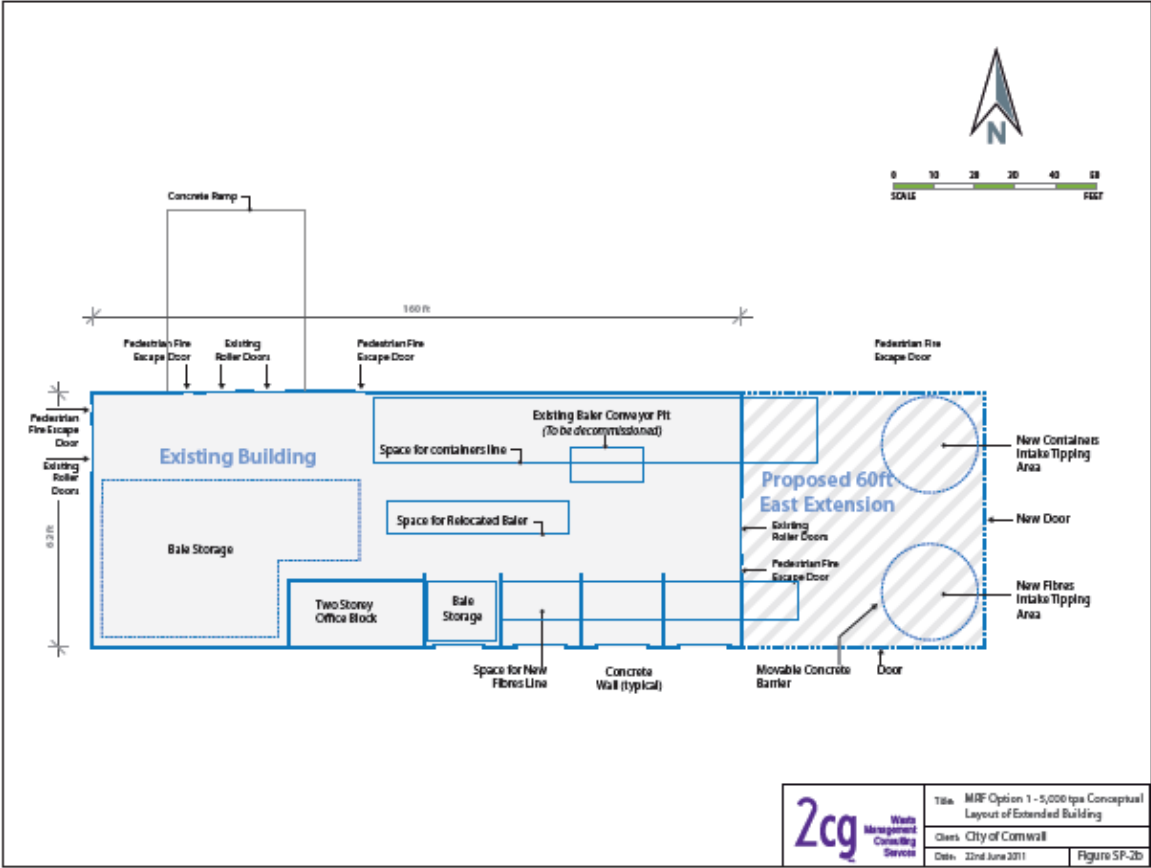
Overview of Existing Site and Infrastructures



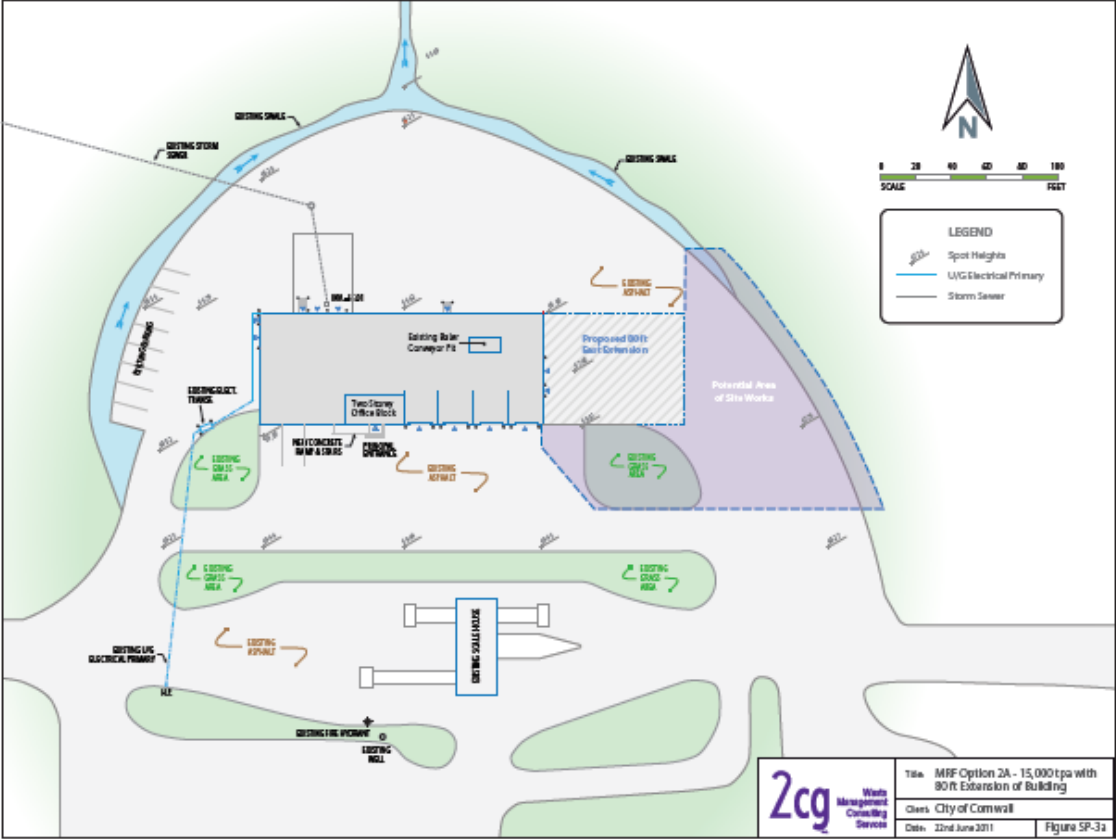
Option 1 - 5,000 TPA Overviews



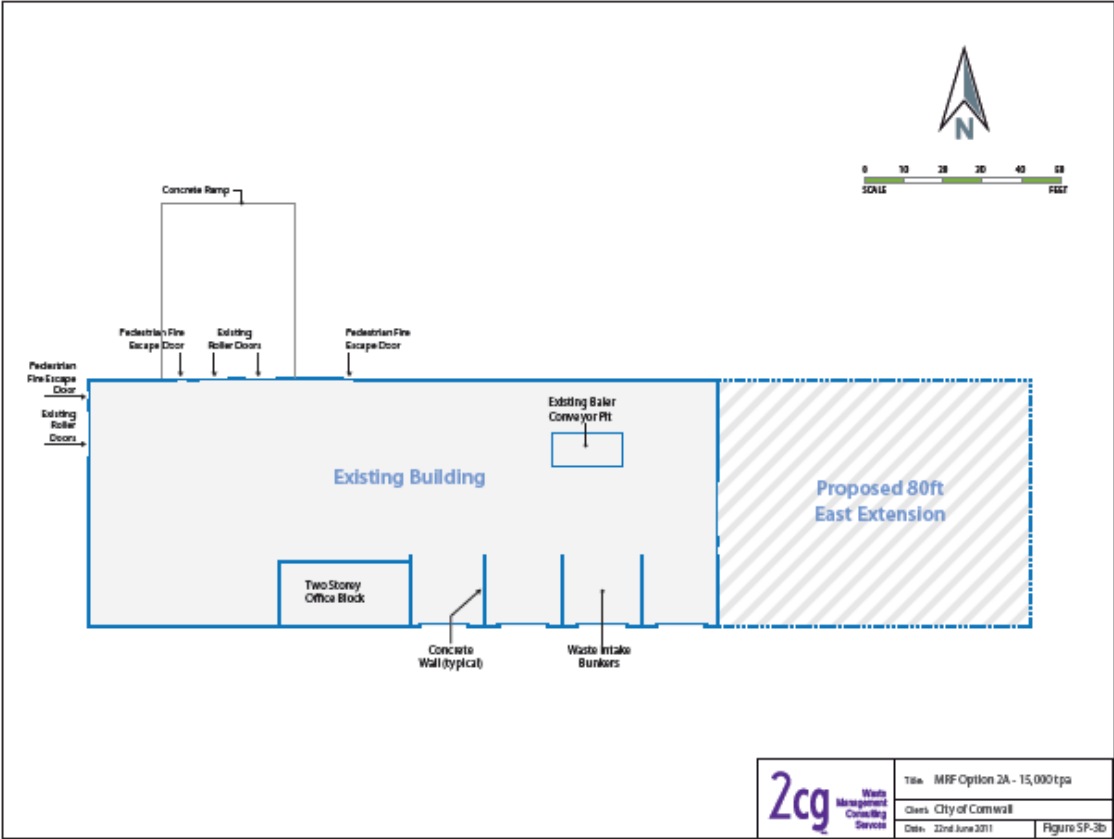
Option 1 - 5,000 TPA MRF



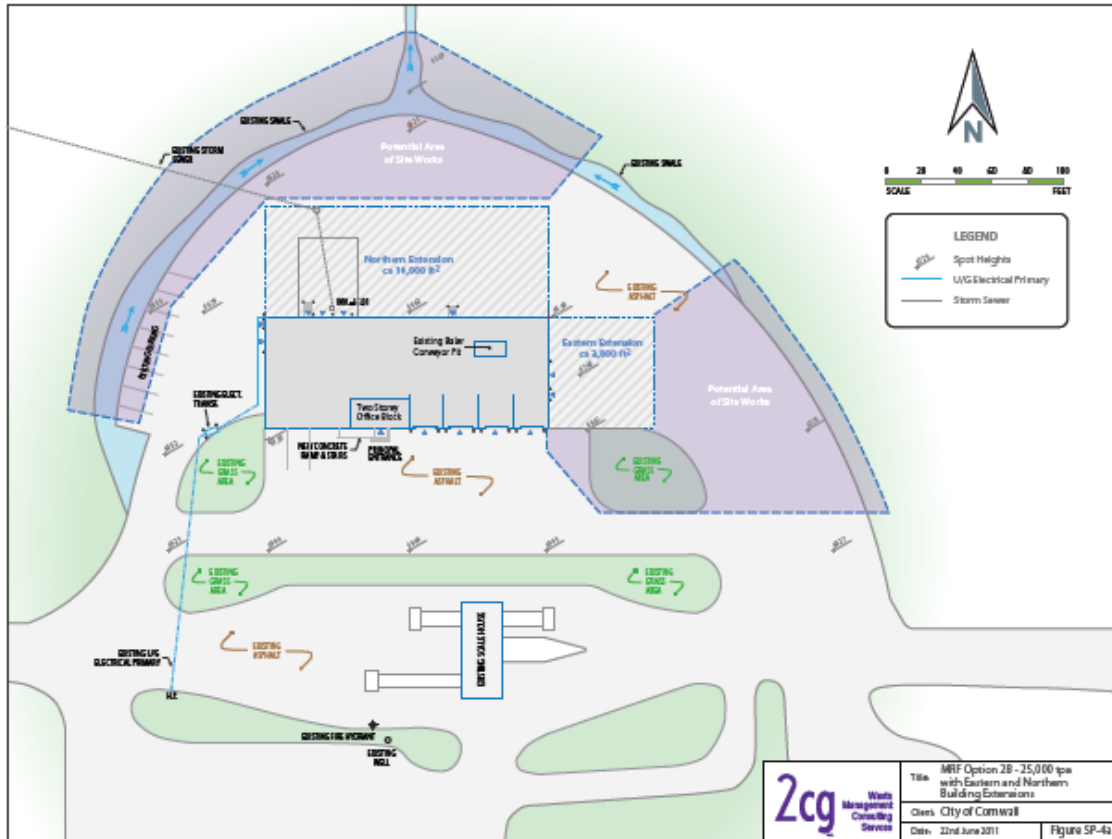
Option 2 - 15,000 TPA MRF Overviews



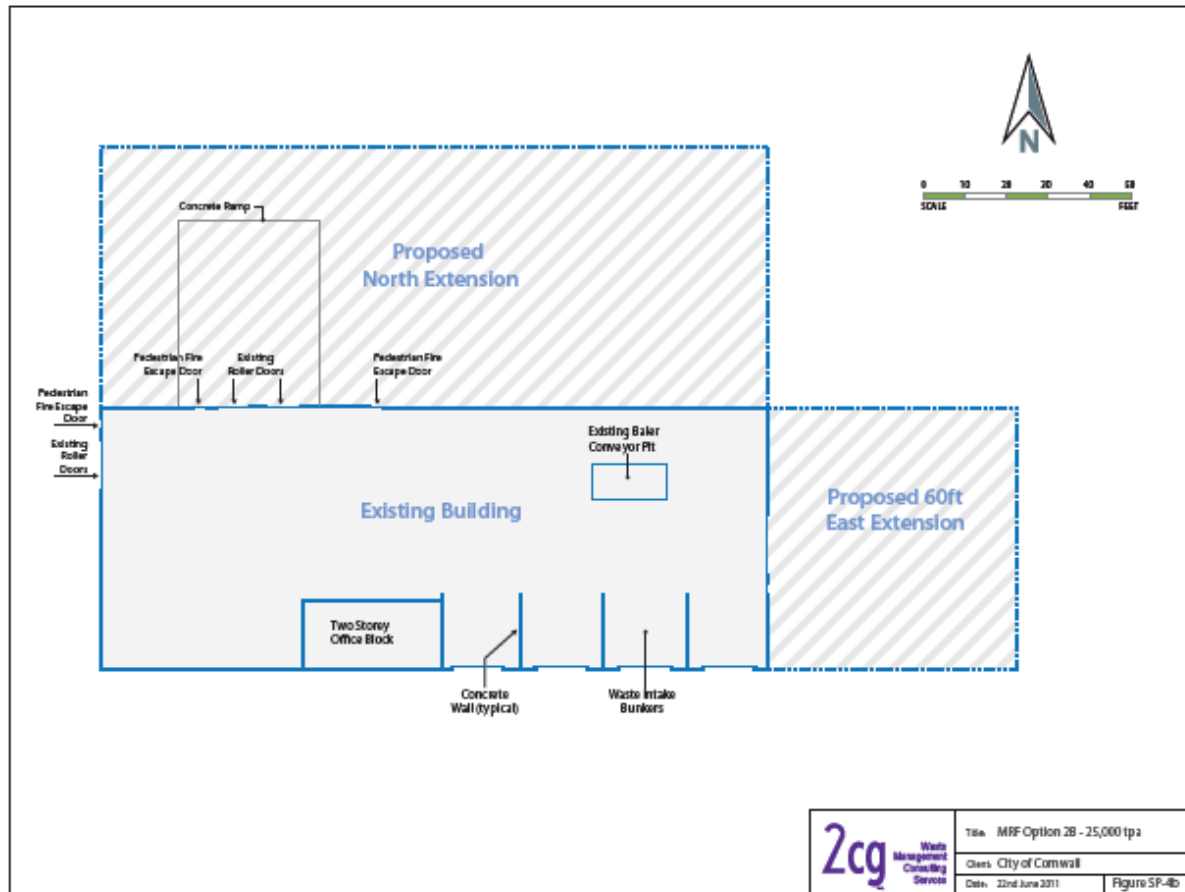
Option 2 - 15,000 TPA MRF



Option 2 - 25,000 TPA MRF Overviews



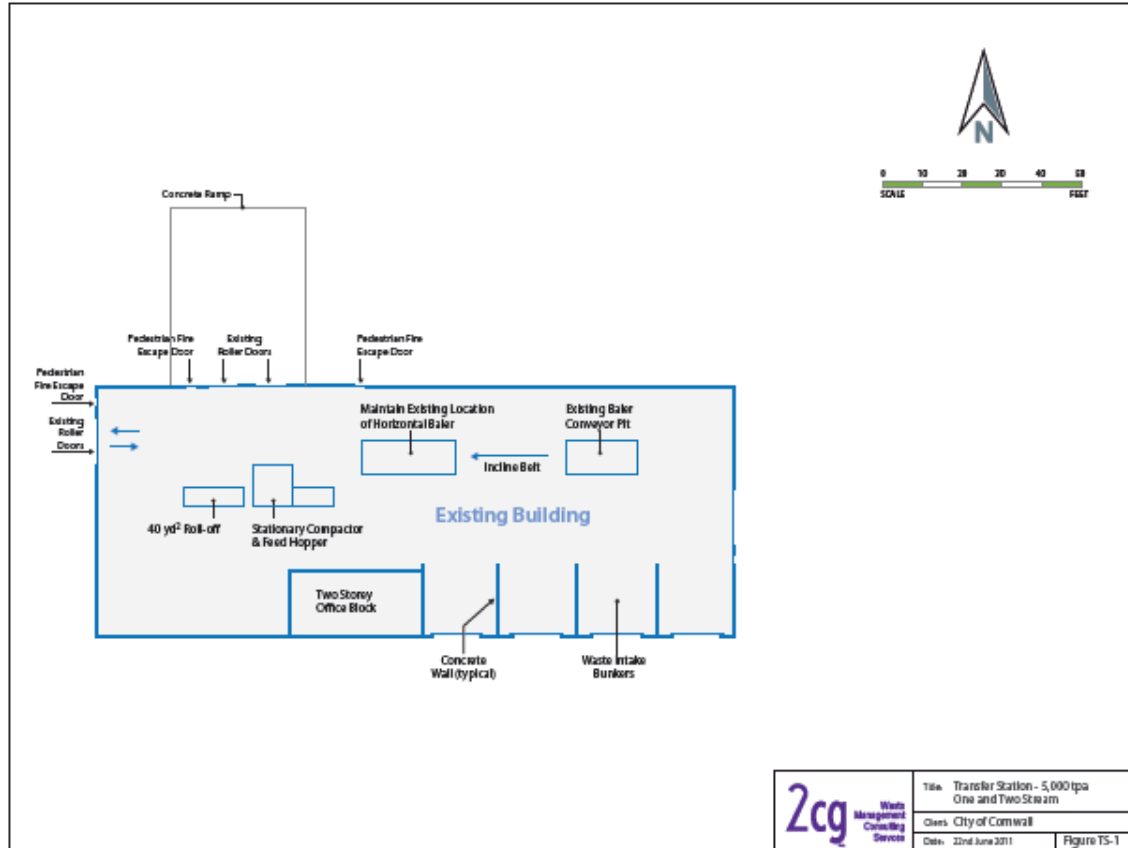
Option 2 - 25,000 TPA MRF



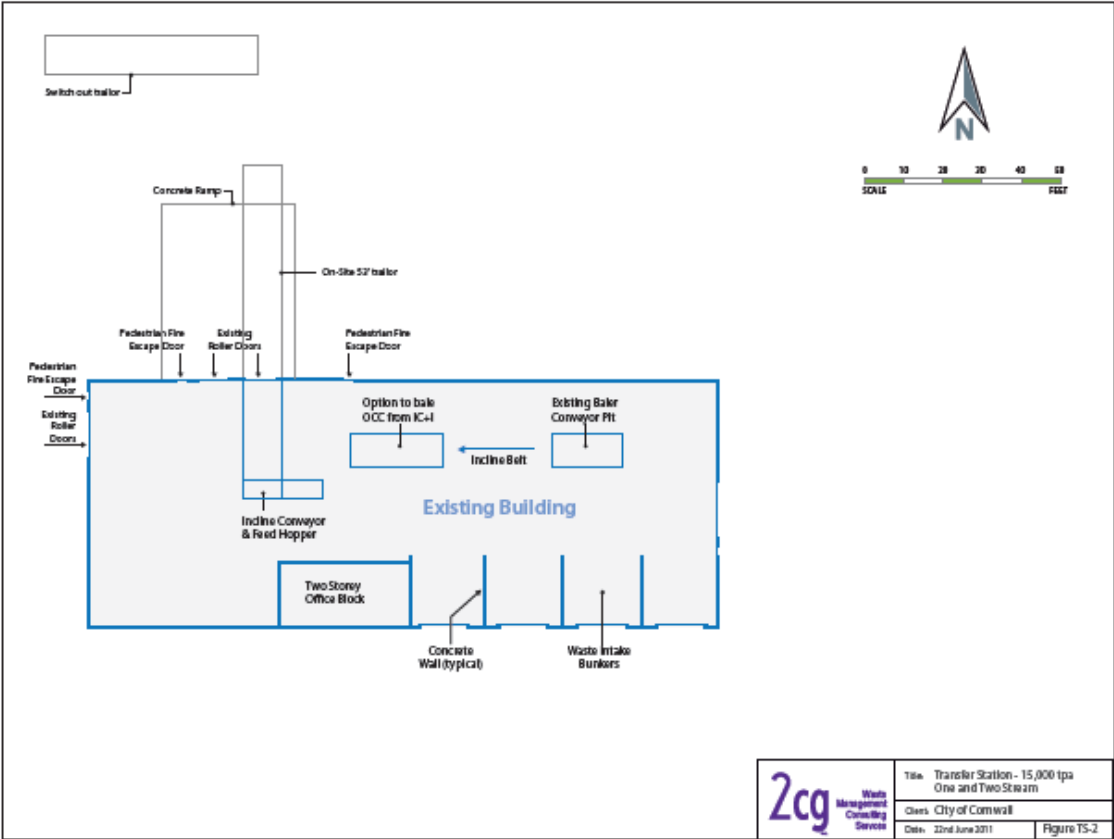
Appendix 3

Transfer Station Conceptual Drawings

Option 3 - 5,000 TPA Transfer Station



Option 3 - 15,000 TPA Transfer Station



Appendix 4

Transfer Station Details (Trip Frequency and Costs)

City of Cornwall Materials Recycling Facility - CIF Project No. 357 - Summary of Estimated Annual Costs for Various Transfer Station Options

Estimated Annual Operating Costs TS Options

Item Description	5,000 Tpa		5,000 Tpa Top Load		15,000 Tpa		50,000 Tpa Transfer		15,000 Tpa Transfer One	
	One	Two			One	Two	One	Two	One	Two
Staff and other Management Costs	340,400.00	340,400.00	340,400.00	340,400.00	340,400.00	340,400.00	339,450.00	340,400.00	340,400.00	487,000.00
Annualized Capital Costs	46,317.13	46,317.13	46,317.13	46,317.13	122,100.87	168,804.68	0.00	224,403.92	393,204.61	1,98,000.00
TRANSFER STATION COSTS							99,450.00	99,450.00	99,450.00	99,450.00
Materials and Supplies	2,775.00	2,775.00	2,775.00	2,775.00	2,775.00	2,775.00	0.00	0.00	0.00	0.00
Utilities	452,000.00	452,000.00	452,000.00	452,000.00	136,500.00	136,500.00	0.00	0.00	0.00	0.00
Maintenance Costs	365,000.00	365,000.00	365,000.00	365,000.00	69,100.00	69,100.00	16,000.00	16,000.00	32,000.00	32,000.00
Building Stock Costs	11,000	11,000	11,000.00	11,000.00	11,000.00	11,000.00	0	0	0	0
Miscellaneous Building Costs	22,600.00	22,600.00	22,600.00	22,600.00	22,600.00	22,600.00	0.00	0.00	0.00	0.00
Waste Management Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Provisioned Element Service Costs	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
Total Annual Operating Costs	\$344,722	\$344,722	\$344,722	\$344,722	\$544,558	\$599,100	\$354,900	\$544,754	\$1,511,275	\$76,774
Cost per Tonne	\$68.95	\$68.95	\$68.95	\$68.95	\$108.91	\$119.82	\$70.98	\$108.95	\$282.25	\$15.35

SUMMARY OF ESTIMATED ANNUAL COSTS AT CITY OF CORNWALL MB (2011 PRICING)

Facility Data

[illegible]

Estimated Annual Operating Costs

Item No.	Item Description	Unit	5,000 Yrs	15,000 Yrs	25,000 Yrs
1	Leaf Solution & Water	Yrs	452,600.00	540,640.00	501,003.00
2	Benefit (25% of Water)	25% of a Yrs	114,640.00	103,360.00	125,295.00
3	Other Maintenance Costs, utilities, office expenses	Yrs	5,200.00	10,400.00	20,800.00
4	Highly Inhabitable Area	Per 1 habitation	0.00	0.00	0.00
5	Water Capitalization	Yrs	412,802.50	531,492.50	390,462.50
6	Interest on Water	Yrs	179,376.99	201,526.69	231,596.69
7	Interest on Utilities (housing and 148.5)	Per 1 Yr of Leaf	15,775.00	18,550.00	21,275.00
8	Interest on Water	Per 1 Yr of Leaf	17,830.00	19,400.00	22,130.00
9	Benefit	to trees Per 1	35,000.00	105,000.00	175,000.00
10	Leaf	to trees Per 1	10,500.00	31,500.00	52,500.00
11	Equipment Maintenance	to trees Per 1	16,500.00	49,500.00	82,500.00
12	Building Stock Maintenance	No.	3,000.00	3,000.00	3,000.00
13	Leaf for Plant	No.	30,000.00	30,000.00	30,000.00
14	Building Insurance	Building area/2	7,625.00	8,316.00	13,367.00
15	Infrastructure	per user	4,175.00	5,010.00	7,515.00
16	Security	Building area/2	2,772.00	3,024.00	4,788.00
17	Per maintenance (cleaning)	n.o. of jobs	4,000.00	4,000.00	4,000.00
18	Building Maintenance/cleaners	Building area/2	17,325.00	18,900.00	29,925.00
19	Building Maintenance/owner, floor, roof, paint, pest control	PS	3,000.00	3,000.00	3,000.00
20	Marketplace Taxes	Building area/2	20,790.00	22,680.00	35,010.00
21	Water Supply Taxes	to trees	5,552.00	21,000.00	35,000.00
22	Water Tapping fees	to trees	4,248.00	12,075.00	20,125.00
23	Leaf and Water Tapping fees	to trees	50,000.00	150,000.00	250,000.00
	Subtotal		1,418,600.49	1,970,096.19	2,706,882.38
24	Other Providers of Costs				
25	Engineering and Environmental Consulting fees	PS	15,000.00	15,000.00	15,000.00
26	Environmental Monitoring fees	PS	10,000.00	10,000.00	10,000.00
27	fees to MOC	PS	5,000.00	5,000.00	5,000.00
28	external legal fees	PS	5,000.00	5,000.00	5,000.00
29	external Accounting fees	PS	5,000.00	5,000.00	5,000.00
	Subtotal Providers of Costs		40,000.00	40,000.00	40,000.00
	Total Annual Operating Costs		\$1,458,600.49	\$2,010,096.19	\$2,746,882.38
	Cost per 1 Tonnes		\$291.172	\$242.22	\$109.87

