Solid Waste Transfer Station
Opportunity Analysis - Final Report

Prepared for:
Regional Service Commission 8
and Regional Service
Commission 12

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March 24, 2014
Sign-off Sheet

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Amanda Hopkins SWANA Certified

Reviewed by ____________________________

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Cathy Smith M.A., H.B.A.
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Introduction

In 2012, the province of New Brunswick implemented a regional services model, which saw the development of 12 regional service commissions, each of which would provide waste management services to the municipalities, communities and local service districts within their respective regions. The development of regional service commissions was intended to assist municipalities in realizing economies of scale by promoting partnership in the provision of services, use of infrastructure and overall sharing of costs and expertise.

Over time, the province has shifted from a large number of small ‘dumps’ to a small number of sanitary landfills. With only six active landfills in the province and 12 regional service commissions, many of the regions have either developed transfer stations, where waste is collected, consolidated and shipped to a neighbouring landfill, or have implemented direct haul to landfills in their own jurisdiction or to out of jurisdiction landfills. Since the implementation of these practices, changes over time have occurred with respect to costs for direct haulage, for transfer and for disposal fees at the landfills currently utilized by each of Regional Service Commissions 8 & 12. This and the fact that existing contractual agreements with private sector transfer station operators are nearing completion (within the next year and a half), has prompted this investigation into various alternative arrangements.

Stantec Consulting Ltd. was retained in 2013 by RSC 8 and RSC 12 to undertake this investigation in the form of a Solid Waste Transfer Station Opportunity Analysis. Beyond considerations with respect to potential alternative haulage, transfer and disposal arrangements, this analysis is also intended to create an overall strategy for both commissions by determining the sheer volume of waste requiring management by the commissions over the next twenty (20) years and how that waste is best managed including potential improvements to existing transfer station operations and opportunities for expanded materials diversion at the transfer stations. The scope of the study includes the determination, where appropriate, of the relative advantages and disadvantages of public versus private sector operation of transfer stations and any associated recommendation(s). This study considers the means by which both commissions can be responsive to ever-changing markets and programming needs as well as opportunities to improve on the “greener”, aspects of waste management, including reduced illegal dumping, increased diversion, energy efficiency and the like.

In this report, the existing haulage, transfer and disposal systems for each of RSCs 8 and 12 are documented to describe the ‘status quo’ with respect to waste and recyclable material flow, existing contract arrangements, existing infrastructure utilized and associated costs. This enables a comparison of the ‘status quo’ against a range of potential alternatives for each commission. Potential alternatives are described in this report along with an evaluation of associated costs.
Current System Review and Tonnage Projections

1.0 Current System Review and Tonnage Projections

This section provides a description of each RSC’s current haulage, transfer and disposal arrangements for the handling of waste and recyclable materials in each respective jurisdiction. Current costs and revenues for each RSC as it relates to this system are also discussed. Waste tonnage projections have been determined over a 20 year period based on current and historical waste generation data from each of the RSCs.

Waste disposal infrastructure in the province is illustrated in Figure 1. The arrows shown in Figure 1 indicate the current flow of waste from each jurisdiction to their destination landfills.

Figure 1: Current Waste Transfer Station and Disposal Facility Network.
1.1 RSC 8 (KINGS) WASTE TRANSFER SYSTEM

RSC 8 (Kings) provides waste management services to both residential and IC&I sectors and is comprised of the following municipalities and parishes:

- Parish of Norton  - Parish of Havelock  - Parish of Wickham and;
- Parish of Sussex  - Parish of Brunswick  - Village of Norton
- Parish of Springfield  - Parish of Kars  - Village of Sussex Corner
- Parish of Studholm  - Parish of Waterford  - Town of Sussex
- Parish of Upham  - Parish of Cardwell
- Parish of Johnston  - Parish of Hammond

Although the Parish of Hampton and Town of Hampton are within RSC 8’s jurisdictional boundaries, these two municipalities do not haul waste to Sussex, and alternatively direct haul waste to the Crane Mountain Landfill in the neighbouring RSC 9.

The map in Figure 2 below shows geographical boundaries of the commission.
Figure 2: RSC 8 Boundary Map.
In April 1995, the former Kings County Region Solid Waste Commission (now RSC 8) entered into agreement with the east neighbouring Westmorland-Albert Solid Waste Corporation (now RSC 7) to permit Kings to utilize the Solid Waste Management Facility at Berry Mills Road for disposal of all solid waste generated within Kings County. This agreement was for a term of 20 years, expiring on December 31, 2014, with a possible 15 year maximum extension upon mutual agreement between both commissions and upon the same terms and conditions in the existing agreement. The agreement between both commissions stipulates billing and record keeping requirements, tipping fee restrictions, waste tonnage minimums and overall operational requirements.

In 1994, Sussex Waste Management Ltd. constructed a transfer station in RSC 8, which commenced transfer station operations in May 1995. In April 1997, the former Kings County Region Solid Waste Commission (RSC 8) entered into an agreement for continued use of the transfer station to facilitate waste transfer to RSC 7 for a 20 year period, scheduled to expire April 30, 2015. Upon expiration of this agreement, RSC 8 will be provided with the option to purchase the transfer station and all existing equipment from Sussex at a purchase price of $1.00. Equipment currently used at the transfer station and that could be transferred to RSC 8 in the event that the facility is purchased by the commission includes a grinder, electronic truck scale, vertical baler and 2 open top trailers. Additional stipulations in this agreement include operating conditions including hours of operations, litter control and tipping fees, as well as general provisions and stipulations for the minimum tonnage of waste that is to be shipped to the Westmorland-Albert disposal facility on an annual basis.

These two agreements form the basis of the waste transfer and disposal program in RSC 8. As per these agreements all waste generated within RSC 8 from both residential and IC&I sources is collected either through municipal, local service district or provincial collection programs or private sector services and is delivered to the Sussex transfer station for processing.

1.1.1 Wet/Dry Collection and Transfer Program

Since RSC 8 transfers all solid waste to RSC 7, they are inherently required to segregate wastes in a way that complements the diversion and disposal programs in place at the Westmorland-Albert facility. As such, RSC 8 currently requires residents to separate their waste using a wet/dry program, where all wet waste is placed in a green transparent bag and all dry (recyclables) waste is placed in a blue transparent bag. The Westmorland-Albert landfill is currently the only facility within the province that operates a wet/dry program.
IC&I generators are not required to separate waste, and as such, all waste is treated as garbage, is hauled separately from residential waste, and is disposed of directly at the RSC 7 landfill, without sorting to remove divertible material. IC&I waste accounts for approximately half of all waste generated within RSC 8. As part of an agreement between the commission and Sussex transfer station, IC&I waste is collected through private sector services and delivered to the Sussex transfer station for processing. IC&I waste sent from Sussex to RSC 7 is currently not included in the ‘guaranteed minimum tonnage’ under the existing agreement.

As mentioned previously, waste collection services are provided through municipal, local service district or provincial programs, where waste is collected at curbside and is then hauled to the Sussex transfer station. At the Sussex transfer station, all blue and green bag waste is segregated into their own respective sections of the transfer station, where it is then loaded via front-end into two separate top-load 90m³ trailers (one for dry, blue bag waste, the other for wet, green bag waste). Once trailers are full, the loads are shipped directly to Westmorland-Albert in RSC 7. As per the existing agreement between RSC 8 and Sussex, operators at this facility are permitted to remove up to 22% of the waste that is dropped off at this facility for the purposes of diverting materials from landfill; this does not include waste or recyclables collected in blue or green bags.¹ Materials that are currently separated out at the transfer station include wood, metal and cardboard. Metal and wood are stockpiled outdoors at the facility. Cardboard is baled on site, and is stored in a separate material storage building. Once enough of these materials have been generated on site to warrant shipment, the diverted wastes are shipped to market.

**Promotion and Education**

Promotional and educational efforts to support the wet/dry collection program are provided by RSC 7 in consultation with RSC 8 as per the existing agreement. Information for new and existing residents on waste programs within RSC 8 are provided on the Commission’s website including:

- Battery Recycling Program;
- Electronics Waste Programs;

¹ Correspondence with Elissa Gollan on November 19, 2013.
1.6

- Household Hazardous Waste Program;
- Paint Stewardship Program; and,
- Wet/Dry Program

Additional information for the transfer station is also provided on the website including hours of operation, location, illegal dumping restrictions and tipping fee structure. RSC 7 also provides information on their website with regards to the wet/dry program including materials accepted, accepted containers and sorting requirements. Various promotional materials are distributed to residents throughout the year including a Waste Sorting Guide and HHW Sorting Guide.²

1.1.2 Current Transfer System Costs

In RSC 8, all disposal and hauling costs are paid by Sussex to Westmorland-Albert and the contracted hauling company. Costs for waste management within the commission include transfer station operations, recycling program, hauling of waste between the transfer station and Westmorland-Albert disposal facility, and disposal fees. To recover costs associated with waste management, Sussex structures their tipping fees for incoming waste to include both the cost for disposal in RSC 7 and any other operating costs including hauling, corporate costs, etc. The tipping fee structure at Sussex for 2014 is shown in Figure 3 below. Beginning in January 2013, an additional fee of $6.04 per tonne was added to the tipping fee charged at Sussex, which is remitted to RSC 8 to cover corporate expenses including administrative costs, wages, etc. In 2014, this administration fee was increased to $9.79 per tonne.

Figure 3: Breakdown of Tipping Fee Structure at Sussex Transfer Station in RSC 8.³

Sussex owns the two open top trailers used to facilitate hauling of waste from Sussex to the disposal facility and the transport trucks used to haul the trailers are contracted out. The exact cost per tonne to haul this waste is unknown. The costs for this contracted service are paid by Sussex, and are recovered through tipping fees charges as part of the operating costs at Sussex as shown above.

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³ Correspondence with E. Gollan March 18, 2014.
As per the existing agreement, RSC 8 pays a tipping fee to RSC 7 to receive wastes for either recycling or disposal at the Solid Waste Management Facility. The tipping fee covers the respective costs of these operations, insurance at the facility, as well as a basic promotional and educational program that is provided by RSC 7 to residents of RSC 8. To include RSC 8 in RSC 7’s promotional and educational program, the existing budget is expanded by 6% annually. Based on the current agreement, the tipping fee paid to RSC 7 is not to exceed that charged to municipal users of the facility, under the provision that RSC 8 delivers the guaranteed tonnage of residential waste (6,400 tonnes) annually. If the guaranteed minimum of waste is not met, an additional charge is added to the tipping fee to recover the costs paid by Westmorland-Albert to Tiru Inc., the waste disposal facility. Since RSC 8 has not historically met this minimum, tipping fees have been paid since establishment of the agreement as illustrated in Figure 4 below. Based on current projections, RSC 7 has estimated that the tonnage of waste received will not meet the minimum guaranteed tonnage and as such have increased the tipping fee by $5 per tonne beginning January 2014. The 2013 municipal tipping fee at RSC 7 is $67.03 per tonne, which is $2.97 less than what RSC 8 is currently charged.

Figure 4: Historical Tipping Fees Charged by RSC 7 to RSC 8 for Disposal.

In 2012, Sussex received a combined total of 12,154 tonnes of MSW from residential and IC&I sources. 2,299 tonnes of this waste was diverted through the recycling program at Sussex.

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4 Tipping fee information for all years was not available at the time of this report.
resulting in 9,855 tonnes being hauled for disposal to RSC 7 at a cost of $642,340 in disposal fees.\(^5\)

Material diverted from the SVTS in 2012 included wood, cardboard and metal from IC&I sources. Figure 5 below presents the composition of waste generated by RSC 8 in 2012.

**Figure 5: Composition of Waste in RSC 8 (tonnes).**

![Composition of Waste in RSC 8](image)

### 1.2 RSC 12 (Valley) Waste Transfer System

RSC 12, formerly known as Valley Solid Waste Commission (VSWC) is responsible for managing all solid waste generated within their commission boundaries. RSC 12 is located along the western portion of New Brunswick and is comprised of Victoria County in the northern half of the region and Carleton County, located in the southern half of the region. The map showing the geographical boundaries of both the commission and counties is provided in Figure 6 below.

\(^5\) SWM Tipping Cost and Diversion Calculation 2010 to 2012 spreadsheet.
Figure 6: RSC 12 Boundary Map.
Carleton County is the larger and more populated of the two counties and includes the following municipalities, parishes and local service districts (LSDs):

<table>
<thead>
<tr>
<th>Municipalities</th>
<th>Parishes and Local Service Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bath</td>
<td>Aberdeen</td>
</tr>
<tr>
<td>Bristol</td>
<td>Brighton</td>
</tr>
<tr>
<td>Centreville</td>
<td>Canterbury/ Meductic</td>
</tr>
<tr>
<td>Hartland</td>
<td>Debec</td>
</tr>
<tr>
<td>Woodstock</td>
<td>Kent</td>
</tr>
<tr>
<td></td>
<td>LSD Canterbury &amp; North Lake</td>
</tr>
<tr>
<td></td>
<td>Northampton</td>
</tr>
</tbody>
</table>

 Victoria County, located in the northern portion of the commission is the less populated of the two counties and includes the following municipalities, parishes and LSDs:

<table>
<thead>
<tr>
<th>Municipalities</th>
<th>Parishes, LSDs and First Nations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aroostook</td>
<td>Lorne LSD</td>
</tr>
<tr>
<td>Perth-Andover</td>
<td>Perth LSD</td>
</tr>
<tr>
<td>Plaster Rock</td>
<td>Gordon LSD</td>
</tr>
</tbody>
</table>

In 1997, the South West Solid Waste Commission (now RSC 10), Valley Solid Waste Commission (now RSC 12) and Commission de gestion enviro resources du nord-ouest (COGERNO) (now RSC 1) formed an agreement for the use and operation of disposal facilities between the three commissions, which was recently extended in December 2012 for an additional 15 year period, spanning until December 31, 2027. The agreement stipulates each commission’s roles and responsibilities in providing waste disposal services, hours of operation for landfill facilities, disposal fees, payment terms, and acceptable/unacceptable wastes.

RSC 12 also has an agreement with the Southern Valley Transfer Station (SVTS) to operate a transfer station to manage all residential and IC&I waste generated within Carleton County, which is set to expire on December 31, 2014. The SVTS is owned and fully operated by J. S. Bellis Ltd. (Bellis), who is responsible for maintaining transfer station operations and fulfilling their obligations with respect to waste acceptance, transfer and disposal. Under this agreement, Bellis is permitted to divert up to 10% of Carleton County’s municipal solid waste. Bellis may retain any tipping fees associated with receipt of separated recyclable material to offset the costs of operating the diversion program. Any waste received from the private sector at the transfer station is to be managed at Bellis’ sole discretion, and Bellis is able to charge a ‘reasonable’ fee for any sorted divertible material received from non-municipal sources at its

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6 Correspondence with Dave Whiting November 19, 2013.
facility. Additionally, the agreement stipulates the minimum amounts of waste to be sent to disposal facilities, tipping fee structure and reporting and billing requirements.

As per the agreement between the commissions, the waste generated within RSC 12 is to be sent to either of the two commission’s facilities, under a 50/50 (+/- 5%) split. Since the percentage of waste generated within Carleton County is much greater than that from Victoria County, the SVTS carefully monitors the total waste hauled to the two facilities and adjusts accordingly to meet the 50/50 criteria. Although waste is supposed to be equally distributed between the disposal facilities, RSC 12 has faced a number of challenges with respect to haulage to Cogerno including adverse weather conditions/road conditions, seasonal load restrictions and seasonal waste volume fluctuations which has resulted in sporadic distribution of wastes over the calendar year as shown in Table 1-1 below.

**Table 1-1: Waste Flow between RSC 12, RSC 1 and RSC 10 in 2013**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>To COGERNO (RSC 1)</td>
<td>19%</td>
<td>18%</td>
<td>18%</td>
<td>19%</td>
<td>25%</td>
<td>79%</td>
<td>84%</td>
<td>84%</td>
<td>16%</td>
<td>14%</td>
<td>80%</td>
<td>54%</td>
</tr>
<tr>
<td>To SWSWC (RSC 10)</td>
<td>81%</td>
<td>82%</td>
<td>82%</td>
<td>81%</td>
<td>75%</td>
<td>21%</td>
<td>16%</td>
<td>16%</td>
<td>84%</td>
<td>86%</td>
<td>20%</td>
<td>46%</td>
</tr>
</tbody>
</table>

Though waste is shipped in varying quantities throughout the year as a result of seasonal restrictions, the overall average percentage shipped for 2013 is anticipated to be a 45/55 (COGERNO/SWSWC) split, which is in compliance with the existing agreement.

Currently, all waste generated within Carleton County is managed through the SVTS and is then shipped to either COGERNO or SWSWC. In 1996, RSC 12 investigated the potential to construct and operate an additional transfer station in Perth to manage wastes generated within Victoria County, however, as a result of siting issues and cost, the commission elected direct haul for waste generated with Victoria County to COGERNO.

### 1.2.1 Garbage Collection and Transfer Program

In RSC 12, collection services are provided to residents by individual municipalities, LSDs or provincial programs. All industrial, commercial and institutional (IC&I) wastes are collected through private service providers. All solid waste collected within Carleton County is delivered to the SVTS for processing. At this time, any clean and accessible recyclable materials are separated from the waste, and any residual garbage is loaded into 90m³ trailers. Approximately 25 tonnes of waste are shipped per load to the COGERNO and SWSWC disposal facilities, which

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equated to an estimated 615 loads of waste hauled annually from the SVTS, or between 2 and 3 loads per day.

Any recyclable materials received at the SVTS are managed in a separate portion of the building equipped with segregated material storage bunkers and a baler. Once a large enough amount of a recyclable material is stored on site, the materials are shipped to appropriate markets for further processing.

IC&I waste generated within RSC 12 must also be sent for disposal only to designated landfills. IC&I waste generated within Carleton County is managed through the SVTS, where separated divertible materials are accepted at a lower tipping fee and are sent to material markets, and garbage is consolidated with residential MSW and is hauled to either the RSC 1 or RSC 10 disposal facilities. IC&I waste generated within Victoria County is either direct hauled to the RSC 10 disposal facility, or is hauled to the NWTS located in RSC 1, where it is then consolidated, compacted, and hauled to the RSC 10 facility. Figure 7 below illustrates the flow of waste within RSC 12 including direct haul, transfer and the recycle depot program.
1.2.2 Recycling Depot Program

In addition to transfer station services for garbage, the SVTS also offers a diversion program for clean, separated construction and demolition (C&D) waste, scrap metal, corrugated cardboard and other recyclables. The transfer station also provides and services 18 recycling depots through the Valley region for residents to divert recyclables; curbside collection of recyclables is not provided. All recyclables collected through the depot program are managed...
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separately from other wastes at the transfer station and are not included in the calculation of tipping fee costs.

Provincial beverage container deposit programs also exist in the province and are available to residents through a number of retailers.

1.2.3 Current Transfer System Costs

In RSC 12, all hauling and disposal costs to transport waste from the SVTS to the SWSWC landfill are paid by the SVTS. As per the current agreement, the SWSWC and COGERNO disposal facilities are only permitted to charge tipping fees to RSC 12 equal to or less than the current municipal disposal rate, which in 2012 resulted in disposal fees of $60 per tonne and $57 respectively. In addition to the cost for disposal, the SVTS incurs a cost of approximately $33.18 for transfer station operations and the recycling program and $14.80 per tonne which is remitted to RSC 12 to cover administration costs. To offset the costs for disposal, transfer station operations and administration fees, the SVTS charges a tipping fee of $107.98 for all municipal solid waste received at the facility. This fee is paid by all municipalities and members of the private sector who dispose of MSW at the transfer station. Construction and demolition wastes are accepted at a reduced cost of $65.00 per tonne as per the agreement between the SVTS and RSC 12 in efforts to reduce illegal disposal within the Valley region. Figure 8 below illustrates the methodology used in determining the tipping fee charged for MSW at the SVTS. Although the tipping fee for disposal at COGERNO is less than SWSWC, a majority of waste is delivered to the SWSWC from the transfer station, and as such, the higher tipping fee is used for calculating the tipping fee to be charged at the SVTS.

Figure 8: Breakdown of Tipping Fee Structure at SVTS in RSC 12.

1.3 Waste Tonnage Projections

This section focuses on the anticipated amounts of waste that both RSC 8 and RSC 12 will be required to manage over the next 20 years.

\(^8\) Agreement between Bellis Ltd. and RSC 12.
Upon comparison of Statistics Canada population data compiled from 2001, 2006 and 2011 for both RSC 8 and RSC 12, it has been determined that both commissions over that period have experienced a trend toward decreasing population growth. As such, it has been assumed that both commissions will experience minimal, if any growth over the 20 year planning period, and for the purposes of this report growth is considered static.

Since Statistics Canada does not report population or household data specific to each commission’s geographical boundaries, these numbers were derived based on the combined population and number of single family households for each LSD, municipality, parish, and first nation group (Communities) located within both the RSC 8 and 12 jurisdictions. The communities that were included in the population and household count for each commission were taken from the listed communities (Sections 1.1 and 1.2 above) in the existing agreements in place between commissions for use of disposal facilities. The populations for each commission are summarized in Table 1-2 below and form the basis for determining the residential waste generation rates in Section 1.3.1 and the amount of waste requiring management over the planning period.

<table>
<thead>
<tr>
<th>Regional Service Commission</th>
<th>Population</th>
<th>Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSC 8</td>
<td>27,440</td>
<td>7,844</td>
</tr>
<tr>
<td>RSC 12</td>
<td>46,940</td>
<td>21,084</td>
</tr>
</tbody>
</table>

1.3.1 Residential and Industrial, Commercial & Institutional (IC&I) Waste Projections

Waste managed at the transfer stations and direct hauled to disposal facilities include waste generated from both the residential and IC&I sector and is therefore representative of the total amount of waste generated within each commission. This gives a reasonably accurate picture of the amount of total waste that will require disposal in the long term should existing waste management programs (including diversion programs) remain unchanged.

To generate an accurate estimate of the amount of waste produced per capita in the residential sector for each commission, the waste generation rate was calculated using information from a variety of sources including 2011 Statistics Canada residential population data for communities within RCS 8, Sussex Transfer Station Tonnages and COGerno Received Waste Tonnages.

Waste projections were derived from the amount of waste received at the transfer station, diverted through recycling programs at the transfer station and being sent to landfill for disposal, which has been summarized in Table 1-3 below. The tonnages presented in this table are representative of both the current tonnages managed and reflect the annual amount of waste expected to require management over the planning period as there is no anticipated
population growth during this time. An average residential waste generation rate for 2012 of 383 kg/capita/year was determined for RSC 8 and 249 kg/capita/year was determined for RSC 12. In RSC 8, the waste generation rate is higher than that in RSC 12, which can be attributed to the differences in waste programming between the two commissions and reporting practices. For example, in RSC 8, the waste generation rate is inclusive of both blue and green (wet and dry) waste tonnages which includes recyclable materials, however, since RSC 12 manages recyclables through depots those diverted recyclables are not accounted for and the waste generation rate reflects residential garbage only.

In comparison to the province’s overall waste generation rate of 291 kg/capita/year of waste disposed in 2010, RSC 12 generates less residential waste per capita. Since RSC 8’s waste generation rate is inclusive of recyclable materials and does not allow for a reasonable comparison of the two rates, it is estimated that the waste generation rate for landfilled waste is comparable to the Province, and perhaps could be less, depending on the amount of material recovered at RSC 7’s waste sorting facility. Other provinces in Eastern Canada have varying waste generation rates, with Nova Scotians generating an average of 160 kg/capita/year of waste disposed (in comparison to national rates, Nova Scotia is the lowest) and Newfoundland and Labrador generating an average of 392 kg/capita/year of waste disposed. In comparison to other jurisdictions, both commissions generate what is considered to be an average amount of residential waste per capita. [1]

Typically the per capita waste generation rate is applied to population growth estimates to determine changes to the amount of waste expected to be generated year by year and over the planning period. As mentioned, population change is expected to be minimal over the planning period and this is assumed in the ‘static’ waste projections shown in Tables 1-3 and 1-4 below.

**Table 1-3: Waste Generation and Diversion in RSC 8 (2012).**

<table>
<thead>
<tr>
<th>Waste Generated</th>
<th>Residential (tonnes)</th>
<th>IC&amp;I (tonnes)</th>
<th>Total (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Generated</td>
<td>7,024*</td>
<td>5,967</td>
<td>12,991</td>
</tr>
<tr>
<td>Waste Diverted</td>
<td></td>
<td></td>
<td>2,466**</td>
</tr>
<tr>
<td>Waste to Landfill</td>
<td></td>
<td></td>
<td>10,525</td>
</tr>
</tbody>
</table>

*Includes 837 tonnes of waste collected from the Parish of Hampton and Town of Hampton that are disposed of at the RSC 9 landfill.  
**Includes 147 tonnes of composted diverted from the Parish of Hampton and Town of Hampton at the RSC 9 composting facility.

9 Correspondence with E.Gollan November 22, 2013.
As IC&I and residential wastes are combined prior to transportation to either COGERNO or South-West from the SVTS it is difficult to estimate the composition of residential vs. IC&I wastes being sent for disposal, however in 2012 approximately 8,774 tonnes of residential waste and 7,136 tonnes of IC&I waste were received at the SVTS.

Growth in the IC&I sector typically trends with population growth. Since the commissions are expected to experience minimal to no growth in population over the planning period the amount of waste generated from the IC&I sector has also been assumed to experience no significant change and projections are also based on waste generation data from 2012.

---

10 2010-2012 Waste Tonnage Data from J. Bourque at COGERNO.
11 Waste Transferred to COGERNO from SVTS is not separated into residential and IC&I loads.
12 Combination of residential and IC&I wastes - correspondence with Peter Morin on Dec. 20, 2013.
2.0 Waste Haulage, Transfer Station, Disposal & Diversion Options

A range of options are discussed in this section to determine what might be suitable, more cost-effective and environmentally friendly alternatives to existing haulage, transfer methodology, transfer station ownership and operating arrangements, and both disposal facility and waste diversion infrastructure use. In essence the following provides a ‘menu’ of waste management approaches that can be considered by RSCs 8 and 12 as alternatives to the ‘status quo’ systems in place.

Many of the options discussed below are available to both RSC 8 and 12 however the application of those options in a number of cases would be fundamentally different. There are some options that are only feasible for one or the other of RSC 8 or 12 and this has been discussed where applicable.

2.1 Curbside and Depot Collection Programs

Currently in both RSC 8 and RSC 12, waste collection services are provided to residents through individual municipalities, LSDs or provincial programs. The level of service provided varies between jurisdictions, with each community responsible for either providing or contracting out waste collection and disposal services to individual contractors who are paid either based on a fixed cost with fixed price escalations, or on a per household basis. With the recent development of regional service commissions, the Province envisions opportunities for economies of scale, partnerships, sharing of infrastructure and sharing of costs and expertise.

Under this new approach, both commissions could consider a more regionalized approach to curbside (and depot where appropriate) waste collection. In moving to a collection program managed at the commission level, both RSC 8 and 12 would have a greater degree of control over collection programs, better waste flow control through both transfer stations and landfills, better tracking and monitoring of program delivery and an opportunity to provide the same level of service throughout the commission for all residents. For example, where direct haul situations exist in the case of RSC 12 in Victoria County, each contractor is required to travel a considerable distance at the end of every collection day to dispose of waste collected from residents. This individual travel cost is passed on to municipalities and further to residents.

Also, because each small municipality is responsible for providing collection services, the relatively low number of serviced locations may not be attracting many competitive bids during the contracting process. If the commissions were to manage collection as an ‘upper tier’ the collection area would be much larger and could potentially attract more service providers to bid on contracts. This could result in a more competitive bidding process and possibly lower overall collection costs.
2.2 TRANSFER STATION OWNERSHIP AND OPERATION

In April 2015, RSC 8 will have the option of purchasing the existing Sussex transfer station for the price of $1.00. Other options available to the commission are to continue to maintain private sector ownership, develop a new transfer station facility at another location, or employ a direct haul system to both RSC 9 and RSC 7 landfills. RSC 12 cannot purchase the SVTS which is an established part of a larger set of business activities for the owner. RSC 12 can however consider the option of siting its own new transfer station prior to its contract termination date with the SVTS of December 31, 2014.

Ownership and operating options for each of RSC 8 and 12 are summarized in Table 2-1 and Table 2-2 as follows.

Table 2-1: RSC 8 - Transfer Station Ownership & Operating Options

<table>
<thead>
<tr>
<th>Private Sector Ownership</th>
<th>Public Sector Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negotiate new contract with existing operator (status quo)</td>
<td>Purchase transfer station and let RFP for private sector operation/negotiate with existing operator</td>
</tr>
<tr>
<td>Negotiate new contract with existing operator - negotiate new equipment to accommodate compaction of waste*</td>
<td>Purchase transfer station and operate with public sector employees</td>
</tr>
<tr>
<td></td>
<td>Purchase transfer station and operate with public and private sector employees (Hybrid)</td>
</tr>
<tr>
<td></td>
<td>Purchase transfer station, any operating scenario, upgrade with new equipment to accommodate compaction of waste*</td>
</tr>
</tbody>
</table>

*Technology options described further in Section 2.4.
Tables 2-1 and 2-2 list a number of options that form the basis of discussion throughout the rest of this report. This section is focused on the various opportunities and constraints, advantages and disadvantages for each of RSC 8 & 12 to own and possibly operate their own waste transfer station infrastructure in whatever form that may take.

### 2.2.1 Transfer Station Ownership

There are various considerations for RSC 8 & 12 with respect to transfer station ownership and some of those include but are not limited to:

- Financial impact of renovations, retrofits or equipment upgrades that may be required in the future;
- Funding, subsidies and grants available to improve operations or diversion programs at the transfer station;
- Tax implications;
- Risk apportioning and transference;
- Incentives for the private sector;
- Likelihood of contract default;

*Technology options described further in Section 2.4.*
SOLID WASTE TRANSFER STATION OPPORTUNITY ANALYSIS – FINAL REPORT

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- Public perception of responsibility;
- Control over processing and material handling (and possibly marketing);
- Control over facility environmental performance and approvals;
- Program flexibility (changes in materials, sorting, quantities, sources);
- Commission staff administrative requirements; and,
- Timing.

This is not necessarily an exhaustive list but represents key issues in the decision to own public sector infrastructure or to continue with status quo private sector ownership and operation.

There are many transfer stations operating in Canada that are owned by the private sector and almost exclusively for the purposes of transferring waste out of jurisdiction. These transfer stations, while not necessarily constructed for the specific purpose of transferring municipal waste, have utilized that capacity to do so where appropriate and some have also partnered with municipalities to utilize their transfer station sites for public drop off purposes (like Sussex). A number of municipalities in Canada also own transfer stations to facilitate either in or out-of-jurisdiction transfer of waste. Many have developed that transfer capacity similar to Sussex in a way that integrates their recycling (and in some cases organics) transfer capacity needs.

Many municipalities that own their own transfer stations own them out of the necessity for complete control. That is, they were owned and constructed for the purposes of necessarily transferring waste outside their own jurisdiction and to ensure uninterrupted long-term transfer capacity to that end. Ownership of the transfer station would ensure the long-term continued availability of transfer capacity for any export of any materials outside (or inside for that matter) the commissions regardless of the where the end receiver is located.

Generally, the greater degree of ownership is equal to greater degree of control which is desirable if a municipality wants to ensure uninterrupted long term use as discussed above, but also if they desire control over many aspects of materials handling including but not limited to material segregation, material loading, quality control of materials, materials marketing for recyclable materials, public access to the site, data management, added diversion and waste reduction programming and the like. These and other benefits of ownership and operation of these types of waste management facilities are summarized in Table 2-3 below. This is not to say these aspects can’t be managed under contract with the private sector to operate a municipally-owned facility but there is generally less control in that scenario. The option presenting the lowest degree of control by the commissions is the status quo system with private sector ownership and operation of facilities. This option generally represents the least amount of flexibility for the commissions to respond to changing waste management industry dynamics. Contracts are usually lengthy but industry change cannot be so easily predicted (e.g. broader
impacts like regulatory change or specific changes like new material markets and revenue) and easily incorporated into longer term contract arrangements. Other aspects of control include that over facility environmental and health and safety performance.

From a risk perspective not only does the facility owner bear complete control over environmental and health and safety matters (if the operator as well) but the owner therefore also bears the risk associated with any related non-compliance. Other risks like the risk of contract default is not an issue with public ownership and operation, is a slight risk with a private sector operator (but an operator can be replaced) and is a higher risk with private sector ownership and operation. Transfer stations are simple and straight-forward in design, operation and capital and operating cost forecasting and as such this risk is deemed minimal but not impossible.

Table 2-3 below summarizes these and other factors to consider in evaluating public versus private sector ownership.

Table 2-3: Factors to Consider in Public Sector versus Private Sector Ownership of the Transfer Station

<table>
<thead>
<tr>
<th>Factors</th>
<th>Public Sector Ownership</th>
<th>Private Sector Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funding, Subsidies and Grants Available</td>
<td>Environmental Trust Fund, other funding (GMEF) for private sector waste diversion infrastructure</td>
<td>Limited</td>
</tr>
<tr>
<td>Tax Implications</td>
<td>TBD</td>
<td>property taxes/utility taxes usually paid</td>
</tr>
<tr>
<td>Risk Apportioning and Transference</td>
<td>All Risk to RSC 8/12</td>
<td>No risk to RSC 8/12</td>
</tr>
<tr>
<td>Incentives for the Private Sector</td>
<td>Somewhat invested but only if operating the facility</td>
<td>Highly invested with ownership and operation</td>
</tr>
<tr>
<td>Likelihood of Contract Default</td>
<td>None</td>
<td>Small</td>
</tr>
<tr>
<td>Public Perception</td>
<td>Good</td>
<td>Not necessarily poor</td>
</tr>
<tr>
<td>Control over Processing, Marketing</td>
<td>High degree</td>
<td>Some degree</td>
</tr>
<tr>
<td>Control over Facility Environmental Performance</td>
<td>High degree</td>
<td>Some degree</td>
</tr>
</tbody>
</table>
### Program Flexibility

<table>
<thead>
<tr>
<th>Program Flexibility</th>
<th>High degree</th>
<th>Some degree</th>
</tr>
</thead>
</table>

### RSC 8 Administrative Requirements

<table>
<thead>
<tr>
<th>RSC 8 Administrative Requirements</th>
<th>Moderate but depends on site uses, staffing needs, public access</th>
<th>Low</th>
</tr>
</thead>
</table>

### Timing

<table>
<thead>
<tr>
<th>Timing</th>
<th>In the case of RSC 12 depends on ability to construct prior to December 31st, 2014 or must wait to next contract expiration date</th>
<th>Not an issue</th>
</tr>
</thead>
</table>

### Capital Cost

<table>
<thead>
<tr>
<th>Capital Cost</th>
<th>Borne completely by the public sector; use of existing or borrowed financial assets</th>
<th>Borne completely by the private sector in most cases unless negotiated otherwise</th>
</tr>
</thead>
</table>

Purchasing the existing transfer station has been identified as the preferred option by RSC 8 should continued use of the transfer station (as opposed to direct haul, further discussed in Section 3.1.2 below) be desired. At this time, with respect to transfer station operations, municipal ownership would be the most feasible option as the commission would not have to incur any costs associated with the development of a new facility including siting, approvals, equipment, etc., and in owning the facility, the commission would have greater control over costs and any future changes to the waste management program(s). The commission would also benefit from assuming ownership of this facility as most of the existing equipment including the scales, vertical baler, two open top trailers and electronic scale would be transferred to the commission along with the facility. Equipment not included in the transfer of ownership includes the existing loader vehicle, which the commission would be required to purchase separately. Although the two open top trailers would be included in the equipment transferred to the commission, it is recognized that due to the age of the existing trailers they would likely require replacement within the short term. Depending on the configuration that RSC 8 chooses to implement (status quo, Komar system, stationary compactor) at the transfer station, appropriately sized and configured trailers (open top, side opening) will need to be purchased at the commission’s expense. Also, with the foreseen move to a three stream system in the short term, it is recommended that the commission purchase a minimum of two (2) trailers to facilitate shipment of each stream individually.

#### 2.2.1 Transfer Station Operation

If either commission decides to own their own transfer station they will then be faced with the decision of who will operate it. Like with various ownership options each operating scenario has
its own nuances. Fundamental matters associated with each also include but are not necessarily limited to the following:

- Risk apportioning and transference;
- Health and Safety issues;
- Control over facility environmental performance;
- Control over handling, processing, marketing;
- Program flexibility;
- Control over data, monitoring and tracking;
- Management of public access to site where applicable; and,
- Staff administration requirements including development of operating contract clauses or staff supervision.

Transfer station operations are straightforward in nature with respect to daily operations, staffing and staff training requirements, capital and operating budget allocation, maintenance and data management. In cases where much more complex waste management technology is employed or even proprietary in nature we often recommend public sector (technology provider) operation of a facility, at minimum in the short-term. This is not the case for RSCs 8 or 12 and transfer stations could be effectively operated by either the public or the private sector.

The more important issues for RSCs 8 & 12 issues are the degree of control desired over the operation and whether either has the appetite/capacity to hire more RSC staff to meet transfer station staffing needs. Staffing requirements are dependent on the number of weekly operating hours desired by the RSCs, the extent of the services to be provided (e.g., new/additional public drop off facilities) and the nature of transfer station technology employed (see Section 2.4 below) and that could include unattended scale systems. Alternatively, a hybrid private/public operation scenario could also be considered where a public sector employee would operate the scale house; data control, tracking and performance monitoring, with private sector operation of the rest of the site.

Table 2-4 below briefly describes the advantages and disadvantages of each public and private sector operations.
### Table 2-4: Advantages and Disadvantages of Public and Private Sector Operation.

<table>
<thead>
<tr>
<th>Public Sector Operation</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>• High level of control over operations; can make immediate decisions with respect to operational changes, equipment improvements for greater efficiency and execute</td>
<td>• Wages and benefits are sometimes higher for public sector employees than for private sector employees</td>
</tr>
<tr>
<td></td>
<td>• Sometimes competing budgets (other public sector obligations; roads etc.) run risk of reduced operating and maintenance expenditures to address other priorities</td>
</tr>
<tr>
<td>• High degree of control over program changes like additional material re-use or recycling, changes to operating hours</td>
<td>• Greater RSC administrative requirements; direct staff supervision, human resources/hiring etc.</td>
</tr>
<tr>
<td>• High level of control over data management – inbound weights, contamination, waste audits, residual waste management – full access to facility</td>
<td></td>
</tr>
<tr>
<td>• High level of control over compliance with environmental and health and safety regulations, operating permits</td>
<td></td>
</tr>
<tr>
<td>• High degree of control over staff and staff training</td>
<td></td>
</tr>
<tr>
<td>• Control over facility preventative maintenance and uninterrupted service</td>
<td></td>
</tr>
<tr>
<td>• No profit margin in cost of service</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Private Sector Operations</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>• Wages and benefits for private sector employees are sometimes lower than for public sector employees</td>
<td>• Less control over operations and operational changes.</td>
</tr>
<tr>
<td>• Ensures consistency and adherence to</td>
<td>• Less control material handling, reuse and diversion</td>
</tr>
</tbody>
</table>

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2.8
stipulated service levels

- Private sector can sometimes more easily mobilize staffing for new initiatives
- Some portion of risk to the private sector with respect to environmental, health and safety compliance
- Private sector may have ability to leverage resources, bulk purchase and have access to technology, skills not accessible to the RSCs
- Oversight of contract only, no staff supervision

- Less control over data management
- Less control over compliance
- Less control over staff training, QA/QC and performance.
- Less control over H&S and implementation of corporate policies
- Less control over facility preventative maintenance
- May have to terminate operating contract for poor performance
- Less control over interaction with the public where applicable
- Profit margin inherent in the contract

A summary of key factors to consider for public versus private sector operations is provided in Table 2-5 below.

**Table 2-5: Factors to be Considered in Public Sector versus Private Sector Operation**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Public Sector Operation</th>
<th>Private Sector Operation</th>
<th>Public/Private Sector Hybrid Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Apportioning and Transference</td>
<td>All risk to RSC 8/12</td>
<td>Some risk to private sector</td>
<td>Shared risk between public and private sector</td>
</tr>
<tr>
<td>Health and Safety Issues</td>
<td>All control by RSC 8/12</td>
<td>Some control by RSC 8/12</td>
<td>Some control by RSC 8/12</td>
</tr>
<tr>
<td>Control over Facility Environmental Performance and Approvals</td>
<td>All control by RSC 8/12</td>
<td>Some control by RSC 8/12</td>
<td>Some control by RSC 8/12</td>
</tr>
</tbody>
</table>
In electing to purchase the transfer station, RSC 8 will need to decide whether they will operate the facility themselves, or contract operations out to either an alternative member of the public sector (another commission) or to the private sector. While the advantages and disadvantages of public vs. private sector operation are discussed above, this decision is predicated on whether or not the commission is willing to hire municipal staff to support it and/ or if the transfer station is to be configured with a CRC (as discussed in Section 2.8 below). In any case a traditional transfer station (in the order of 40 tonnes per day) generally only requires an equipment operator/maintenance and scale operator in the order of 2 FTEs. RSC 8 could also consider a hybrid operational agreement where a combination of public and private sector staff manage the site.

Again, for each of the RSCs there is no reason why either the public or the private sector could not operate an RSC owned transfer station; it comes down to the degree of control desired by each of the RSCs and the ability of each to adequately staff these facilities.

2.3 REQUEST FOR EXPRESSION OF INTEREST (REOI) FOR TRANSFER STATION CAPACITY IN RSC 12

An REOI is not a formal procurement of services but rather an organized manner of gathering information with respect to private sector level of interest and capability of providing various services. An REOI in no way commits RSC 12 to a future competitive bidding process and as the existing transfer station service contract ends December 31, 2014 RSC 12 should issue an REOI for transfer station capacity in the very near future.

The information obtained through an REOI process will enable the commission to determine private sector interest in developing new transfer station capacity. In the absence of any interest in this the commission is essentially restricted to negotiations with an existing local operator(s) as a formal and competitive Request for Proposal (RFP) process would not likely yield competitive bids. If however, there is competitive interest in the provision of this service RSC 12
could engage in a competitive RFP process for the Design, Build, Operate (DBO) of a new transfer station/transfer station capacity.

2.4 ALTERNATIVE WASTE TRANSFER STATION TECHNOLOGY & COMPACTION

As part of this study and in the assessment of appropriate transfer station technology approaches for each of the RSCs, Stantec engaged NexGen Municipal (see www.nexgenmunicipal.com). Recent conversations were held between Doug Vanderlinden of NexGen and Denis Goguen of the New Brunswick Department of Transportation and Infrastructure with respect to road restrictions and associated weight limits for hauling municipal solid waste (MSW). As part of this discussion it was determined that four (4) axle semi-trailers are now recognized in NB Regulation 2001-67, Vehicle Dimensions and Mass Regulation - Motor Vehicle Act, and as a result, special permits for these vehicles are no longer required. If the commissions were to haul waste using a quadrem semi-trailer, there would be an opportunity to significantly increase they payload and reduce overall hauling costs, so additional conversations were held to determine whether MSW would be an eligible material to be hauled using this equipment.

As per NB Regulation 2001-67, dry bulk products and liquid bulk products are permissible to be transported using a quadrem-semi trailer configuration (that also conforms to other vehicle requirements of the regulation). To determine whether municipal solid waste and dry municipal recyclables would qualify as a dry bulk waste or liquid bulk product, NexGen facilitated discussion between the NBDOT and Robert Murray of the Province of Newfoundland’s Department of Transportation. He was consulted in addition to representatives from other Atlantic provinces to determine the classification method used for dry bulk in other jurisdictions for these wastes. As a result of these conversations between representatives of the provinces and both Doug Vanderlinden and Denis Goguen, it was confirmed that the Province of New Brunswick will consider these wastes to be dry bulk products, and will therefore be allowed to be transported using quadrem-semi trailer configured trucks.

The net result of this interpretation of dry bulk allows the typical gross payload on a standard 48’ compaction trailer to increase from a range of 44,000 to 49,000 kg to higher range of 55,000kg. The ranges are very dependent upon exact axle spacing, payload distribution and trailer design. In addition, maximum payloads are limited by provincial road classification and possible seasonal spring frost restrictions.

A quad axle configuration would substantially increase the payload on a standard 48-53’ closed top walking trailer from the current legal 26-27 MT (actual 18 to 25 currently reported) to 33 MT for a quad axle and up to 37mt using a B train design. Although these additional hauling weights are now known to be permissible, these payloads generally cannot be achieved without some form of compaction technology. Further discussion on available compaction technologies, individual capabilities and opportunities for cost savings is discussed in further detail below.
Currently, at both Sussex and the SVTS, 48’ top load trailers are loaded with waste and shipped un-compacted to COGERNO and South-West at an estimated 20 MT to 25 MT per load. There are opportunities with this new determination for the RSCs to realize greater load weights and conversely fewer loads and lower haulage costs to their landfill destinations. Load weight restrictions at certain times of the year may still apply for RSC 12 but overall the benefit of compaction and higher load weights should create overall system efficiencies.

As summarized in Table 2-1 and Table 2-2 in Section 2.2 above, both RSC 8 and 12 could seek to retro-fit existing private sector operations through future negotiated contracts to add some form of compaction technology. In a publicly owned transfer station scenario this should also be implemented. In the case of RSC 8 this would take the form of a conventional stationary compactor(s) or newer Komar unit(s) being retro-fitted to the existing transfer station building upon its acquisition. In the case of RSC 12 this could take the form of a new Komar transfer station in Carleton County (and possibly another in Victoria County). These options will be assessed from a cost perspective in the next iteration of this report.

Conventional compaction equipment for transfer stations consists of a stationary compactor at the back end of the tractor trailer loading bay, usually recessed (see inset picture). A front-end loader feeds the compactor via hopper and the compactor compacts and pushes waste into an enclosed (usually with a walking floor) trailer. When the trailer is full it detaches from the compactor and gets pulled out of the loading bay. This configuration requires a front-end loader to feed the stationary compactor and further assessment is necessary to determine the feasibility of such a retro-fit for either RSC 8 or 12 existing private sector transfer stations. Both currently have recessed trailer loading bays but length and facility use/configuration may preclude this as a retro-fit option.

The new Komar system developed by NexGen Municipal can in contrast be configured in a way that is ‘self-feeding’, as shown in the figure below. This eliminates the need for the front-end loader and associated labour costs. This system in concert with an unattended scale system could significantly reduce labour and operating costs in a public sector owned and operated scenario for either RSC 8 or RSC 12. The Komar system features a high-powered auger that is used to facilitate compaction and ‘breaking down’ of any large or difficult to manage wastes. From the compaction unit, waste is pushed back into the trailer. Once full, the trailer is disconnected from the compaction unit, attached to the truck and is ready to be hauled. The feasibility of retro-fitting this to RSC 8 & 12 transfer stations needs further exploration as well.

In comparison to current industry standards, the current payloads achieved in both RSC 8 and RSC 12 of 20.8 MT and 25 MT respectively are considered to be low. Between a lack of compaction and required use of loaders on site to facilitate transfer operations, the cost to transfer wastes might be inherently high. As a result of recent discussions with the NB DOT, both...
commissions would be permitted to use quad axle semi-trailers to transport waste to disposal facilities, which would increase the allowable payload to an estimated 33 MT. The capital investment required to facilitate this will be addressed in the next iteration of this report.

For RSC 8, the Komar system could be used to achieve this required compaction level and Westmoreland-Albert (RSC 7) has confirmed this to be acceptable. If a front-end loader is still utilized the Komar rotary compaction augers still increase the efficiency of the loading process. The front-end loader would be used for loading purposes only and not for necessary additional ‘pounding’ into the trailer to achieve some desired un-compacted load weight. Again the Komar units can also be fed directly from collection vehicles via conveyor to avoid the double handling associated with a front-end loader. The compaction units are compatible with the existing wet/dry and are capable of handling up to 3.5 cubic yards per minute at 400 lbs/cubic yard for a total of 0.6 MT per minute and can be equipped with integral scales to provide weights while loading to warn operators when nearing full levels. A comprehensive review of the existing transfer station facility would be required to determine the most suitable application for this technology.

In RSC 12, the feasibility of installing the Komar system at SVTS would need further assessment. In the case of Victoria County, a modular Komar unit(s) could provide satellite disposal service to eliminate the need for collection contractors to direct haul ‘light load’ wastes to COGERNO and possibly lower overall system costs. More powerful Komar units could be used in RSC 12 (than RSC 8) as the only stream that would be compacted is garbage. These units are capable of handling up to 5 cubic yards per minute at 400 lbs/cubic yard for a total of 0.9 MT per minute.

In a new transfer station construction project for RSC 12 (e.g. for Carleton County and/or Victoria County) the self-feeding Komar system offers a more cost effective means to handle lower
volume materials than a new conventional transfer station design would. When determining the most suitable means for transfer of waste, a number of factors must be considered, primarily respect to waste tonnage throughput. In many cases where smaller tonnages of wastes are managed (as with both commissions), a transfer station can end up being oversized since the sizing of the tip floor, in this case, is not driven by the quantity of materials but rather the length of the transfer trailers as well as the need for and width of the overhead door to enable the delivery trucks to back into the building.

From a best practices standpoint it appears that some minimum tonnage limit is required to justify construction and operation of a traditional transfer station. In 2006, the Municipal-Industry Programs Committee (MIPC) of Waste Diversion Ontario (WDO) directed a KPMG-led project to identify Best Practices in municipal Blue Box recycling and to determine system costs under these best practices. While the R.W. Beck & KPMG Blue Box Program Enhancement and Best Practices Assessment Project was focused on Material Recovery Facility (MRF) operation best practices, many of the same principles apply to any infrastructure and its operation such as a transfer station and principally include the following:

- That processing options make use of the available processing capacity; that they
- have an integrated approach to design and management of operations (to take advantage of opportunities to share facilities or other resources); that they
- provide for a reasonable degree of redundancy to minimize down time/avoiding unnecessary duplication of infrastructure; that they
- match the scale and nature of operations and infrastructure to the tasks at hand and use appropriate technology; that they
- balance mechanization with the use of labour; that they
- avoid double handling of materials; and they

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• maintain a flexible and operational approach to changing needs/circumstances.

If RSC 12 determines the need for one or two new municipally owned transfer stations these best practices should be kept in mind. It is likely they would be better served by the Komar system than by construction of new conventional transfer stations because of the relatively low volume of waste managed in the system. This type of application has been employed in many other jurisdictions across Canada that generate relatively low volumes of waste but that must haul waste some significant distance for disposal.

### 2.5 ALTERNATIVE DISPOSAL FACILITY(IES)

By way of letter on August 7, 1997 to Richard Boone of the South-West Solid Waste Commission, the Minister of the Environment for the Province gave approval for RSC 12 to use only the RSC 1 or RSC 10 landfill facilities for disposal purposes. While granting permission to use these facilities, the Minister also stipulated that RSC 12 would not be granted permission at a later date to use any other alternative disposal facilities. However, more recently, with the development of the new solid waste commissions in the province, a study was undertaken in 2012 by the Department of Environment and Local Government Solid Waste Commissions entitled Report of the Auditor General to address the adequacy of the governance and oversight structure and processes for New Brunswick solid waste commissions. Through this review, the government learned that RSC 12 was not hauling their waste to the nearest landfill and as a result recommended that all commissions investigate the potential for cost savings by shipping their solid waste to alternative provincial landfills prior to renewing their existing agreements. As such and notwithstanding the existing arrangement and existing length of contract with each of RSCs 1 and 10 for RSC 12 it was determined that this ‘status quo’ would be assessed against other potentially viable options for each of RSC 8 & 12 as part of this study. Figure 9 below shows potentially feasible alternative disposal facility locations and possible mechanisms for material transfer/movement for each.

The feasibility the movement of waste for RSC 8 to either Fundy or Fredericton and for RSC 12 to Fredericton is discussed in this section as well as opportunities and constraints, relative advantages and disadvantages associated with these options.
Figure 9: Potential Alternative Transfer Network for RSCs 8 and 12.
2.5.1 **RSC 8 Transfer to RSC 9 (Fundy) or RSC 11 (Fredericton)**

RSC 8 could possibly transfer waste to the landfills operated in RSC 11 (Fredericton) and/or RSC 9 (Fundy) which are located approximately the same distance from the Commission as RSC 7. It does not however appear that there are any advantages to hauling material to either of these facilities for the following reasons:

- **RSC 11 tipping fees** are similar to what will be charged by RSC 7 in 2014 at $74.00 per tonne for MSW.
- **RSC 11 operates a two-stream MRF** – residents would be required to separate waste into three streams; garbage, fibres and containers.
- **RSC 11 operates a bin-based recycling program** – residents of RSC 8 would need to be provided with a grey and blue bin per household at the commission’s expense.
- **RSC 11 does not have the capability to divert organics**; all organics would be landfilled along with regular garbage.
- **RSC 9 tipping fees** are higher than what is charged at RSC 7 at $108 per tonne for MSW.
- **RSC 9 offers a reduced tipping fee** of $28 per tonne for compostable material (including food and yard waste). RSC 8 would be required to make substantial changes to their program if they were to move to this program as there are a number of materials currently included in the green bag that would not be acceptable in the compostable stream at RSC 9.
- **RSC 9 collects recycling materials through a depot system**; segregated materials are collected at depots, and transferred to the MRF at the landfill. It is unknown whether the depot program could be expanded to RSC 8, however residents would likely view this as a strong decrease in the current level of service.
- **RSC 9 operates an SSO program and has a composting facility at the landfill**; residents would need to be provided with kitchen catchers and green carts at RSC 8’s expense.

With RSC 8’s wet/dry program, residents are currently able to easily and conveniently set out materials in one of two streams, with very little sorting required. Utilizing facilities at other RSCs would mean substantial changes for residents in how their waste is collected including:

- Recycling would require sorting into at least 2 stream and may require residents to bring their recyclables to depots.
- Only certain organics could be set out for collection (e.g. no diapers) and it is likely that the amount of garbage requiring collection could increase due to residents being unwilling to participate in the program.
- Residents are also currently responsible for providing their own collection containers (e.g. blue or green bags) and no green bins or blue boxes are required, saving capital costs for the commission.
The advantages to maintaining the status quo with RSC 7 is that maximum diversion can be achieved through the sorting process at the Berry Mills Road facility, the program is simple and convenient for residents, transfer is easy since materials are already separated and no collection containers or modifications to infrastructure at the transfer station are required. The current transfer station can also accommodate a shift to a three-stream system for delivery to RSC 7 in the future.

RSC 8’s contract with RSC 7 could expire in December 2014 and this may present an opportunity to revisit the existing contract terms and conditions. The current ‘put or pay’ provision in the contract is in essence ‘backwards’ in thinking in that it penalizes RSC 8 for not generating enough waste when in fact industry convention is to penalize those who do generate waste (e.g. user pay programs, bag limits etc.). RSC 8 has not achieved the minimum tonnage requirement and based on population growth projections likely never will. In addition residents/consumers in Canada are becoming increasingly aware of their product packaging purchasing habits; shifting to the use of re-usable products; generally shifting from more wasteful behavior. This trend will continue to grow and as such continue to ensure that RSC 8 never meets the ‘put or pay’ requirement. This is not sustainable nor is it reasonable given the reality of the waste volumes actually generated in RSC 8. The contract should be structured in a way that RSC 8 is not penalized as the result of matters beyond its control and should be structured in a way that enables RSC 8 to reasonably predict future handling and disposal fees, price escalation etc. for budgeting purposes.

If RSC 8 elects to renegotiate the existing contract terms with RSC 7 and continue use of this disposal facility, consideration will need to be given to any future programming changes that may occur in RSC 7 that could affect RSC 8’s waste sorting requirements. For example, RSC 7 is currently in the process of considering moving to a three stream system. This change would require modifications to RSC 8’s current waste sorting system and would include a substantial P&E program, changes to the collection program and transportation requirements. It is expected that programming changes in RSC 7 will not take place at least until 2015/2016.

As identified above, RSC 9 accepts compostable waste (food and yard waste) at a reduced tipping fee in comparison to garbage. The current tipping fee charged for compostable waste by RSC 9 is $28 per tonne, whereas garbage is charged at a rate of $108 per tonne. In comparison to the 2014 rate paid by RSC 8 to dispose of waste at the RSC 7 landfill of $75, the tipping fee for garbage is significantly higher, however the opportunity to reduce costs for organic waste is available should RSC 8 divert residential organics through the RSC 9 composting facility.

This option would require RSC 8 to make modifications to their existing sorting program as there are a number of materials that are currently placed in the ‘wet’ or ‘green’ bag that would be unacceptable in the organics stream at the RSC 9 facility including personal hygiene products, diapers, cigarette butts, dryer sheets and waxed paper to name a few. In any case, whether RSC 8 chooses to continue use of the RSC 7 facility or begins using the RSC 9 facility to dispose of organic waste, the move to a three stream sorting program will be required. The option to
transfer organic waste to RSC 9 should only be considered upon expiration of the current disposal agreement with RSC 7 due to the existing minimum waste tonnage requirement.

2.5.2 RSC 12 Transfer to RSC 11 (Fredericton)

Waste from RSC 12 is hauled/transferred in two separate ways; direct haul from Victoria County to RSC 1 and consolidation of waste from Carleton County at the SVTS of which a portion is transferred to each of RSC 10 and to RSC 1. This section discusses the possibility of haul/transfer of waste to the landfill in Fredericton.

For Victoria County, the landfill in Fredericton is located slightly further from the landfill in RSC 1. Waste could be direct hauled to Fredericton instead. Tipping fees however would likely be approximately $7414 instead of $57/tonne. It is not likely that lower tipping fees could be negotiated with RSC 11 and in this scenario residential collection fees charged by collection contractors would increase as the result of the increased tipping fee and increased haul distance. Direct haul from Victoria County does not appear to be viable.

As an alternative, waste could be direct hauled by collection contractors to the NWTS located in Grand Falls and consolidated and hauled to RSC 11 for disposal. The tipping fee at this transfer station is approximately $100 which includes disposal at COGERNO where their waste is hauled. With higher tipping fees at Fredericton (than COGERNO) and a much greater haul distance to Fredericton this option would likely be more costly than the status quo. Direct hauled to the SVTS is also not viable for similar reasons.

Waste from Carleton County could also be transferred from the SVTS to the Fredericton landfill but at current tipping fees this would suggest the cost would be in the order of $121/MT compared to the current $107.98/MT charge at the SVTS.

Notwithstanding these ‘first impressions’ further analysis is undertaken in Section 3.0 below with respect to the impact of road restrictions, current travel routes and time for travel impacts (e.g. the landfill in Fredericton can be accessed via Hwy 2). These options also need to be considered in the context of new strategically municipal transfer station infrastructure with compaction capability.

2.6 DIRECT HAUL WASTE FROM RSC 8 TO RSCS 7 AND 9

In 2013, a Solid Waste Transportation Study was undertaken to determine the feasibility of direct hauling waste versus continued use of the Sussex Transfer Station. The Study found that unless collection vehicles were required to travel a distance greater than 4.5 hours from their collection areas to the disposal facility, that it would be more cost effective to direct haul waste. Of all serviced municipalities within RSC 8, only one municipality, Wickham was found to have a haul distance greater than 4.5 hours, creating a potential opportunity for cost savings for the

commission in moving to a direct haul system. Further details on the cost savings available to RSC 8 under a direct haul scenario are discussed in Section 3.1.2 below.

2.7 ADDITIONAL TRANSFER STATION CAPACITY IN VICTORIA COUNTY

A significant portion of residential and IC&I waste generated within Victoria County is direct hauled to the COGERNO landfill. The opportunity to develop a transfer station in the northern area of RSC 12 was investigated as an option to manage the waste from Victoria County, however due to the disposal costs at that time and siting issues the transfer station was not developed.

Since then, a privately owned and operated transfer station was constructed and has been operating out of Grand Falls, which currently collects some waste from the surrounding municipalities, as well as allows drop off of waste. The North West Transfer Station (NWTS) compacts and ships waste to the COGERNO landfill in RSC 1 at an estimated 10 MT per load. The NWTS also diverts a percentage of cardboard, wood and metal from the wastes received at their facility. All solid waste received at this facility is accepted at a charge of $100 per tonne.

As an alternative to the current direct haul scenario RSC 12 could consider partnering with the NWTS. Under the existing system, wastes collected from Aroostook, Tobique First Nation, Perth and Plaster Rock are all direct hauled to the COGERNO landfill, which is a minimum 3 hour round trip for each hauler. Between these 5 municipalities, waste is hauled, un-compacted, at relatively low tonnages (less than a tonne) an estimated 22 times per month\(^{15}\) from the municipalities to the landfill. To determine the estimated direct haul cost, the mileage, tonnage shipped per trip, disposal fees and fuel costs were all considered. Based on a calculation of the above factors, the current estimated direct haul and disposal costs for Victoria County is $74 per tonne.\(^{16}\)

Regardless of where RSC 12 hauls its waste there may be an opportunity to partner with NWTS for some economies of scale (lower cost per tonne) for all users and there may be an opportunity with the new interpretation for municipal solid waste as a dry bulk product to increase compaction from the current 10 MT per load. The impact to local collection contracts (e.g. lower hauling costs that should ensue) also need to be factored in. Again, and as discussed above a new appropriately sited municipal transfer station is also a consideration.

\(^{15}\) COGERNO Landfill Reports April 2012.
\(^{16}\) Assumes an average haul cost of $100 per trip and $57 disposal fee at COGERNO.
2.8 DIVERSION OPPORTUNITIES AT THE TRANSFER STATIONS

Currently, Sussex is permitted by RSC 8 to divert up to 22% of the gross waste stream received at the transfer station. At the facility, the waste diverted is primarily from the IC&I sector which includes programs for cardboard, wood, and metal. In RSC 12 the SVTS retrieves marketable material from the transfer station where feasible including clean and separated C&D wastes, metal, wood, and cardboard. All residential depot material is collected, segregated and shipped to market in the adjacent recycling centre portion of the building.

While these are good practices, many municipalities are taking waste reduction and diversion a step further and developing what they refer to as Community Recycling Centres (CRCs), Community Environmental Centres (CECs), Eco Stations, and EnviroDepots, all of which are fundamentally designed for the purpose of receiving source separated materials bound for beneficial end-markets. The focus is on waste recovery with secondary consideration given to disposal. CRCs can provide residents and commercial generators with convenient points of access to drop off materials that are not so easily managed at the curb e.g. shredded paper, building materials, electronics, household hazardous waste and bulky items like appliances, other scrap metal, carpeting and mattresses etc. CRCs can also be used to assist those managing waste materials that exceed curb-side pick-up limits or bin allowances where they may apply. There may also be construction and demolition materials worthy of segregation including drywall and shingles. A number of these materials could easily be managed using the same separation and storage techniques used on site for wood and metal in the form of outdoor storage piles. The diversion of these materials would not necessarily require additional infrastructure or modification to any existing infrastructure for RSC 8 but may require a new site (or with a new transfer station) or what might be significant site alterations at the SVTS for RSC 12.

There are a wide variety of CRC configurations, largely dependent on property size, other site uses, tonnages and types of materials managed and volume and type of vehicle traffic. Although the configurations can vary, the best practices approach is to design these facilities in a way consistent with the principles of the ‘waste hierarchy’. That is, facilities should be configured such that the most immediate and convenient infrastructure is that set aside for waste reduction (e.g. a reuse centre) if possible, followed by bins and/or bunkers dedicated to waste diversion, with the least convenient areas of the site dedicated to disposal of waste. If RSC 8 chooses to purchase the existing transfer station, the size and openness of the site would lend itself well to a CRC concept.
High volume materials (such as brush and yard waste) are usually managed on gravel pads, built at ground level and are separated by concrete block barriers (more for material separation purposes, not as push walls). Lower volume materials are usually managed via 40 yard bins (or smaller if appropriate), placed below grade through a conventional ‘saw tooth’ design or modular design.

Three (3) design concepts are pictured below. The first is the City of Hamilton’s Dundas CRC location. The area to the right includes twelve (12) bays where various material streams are separated for diversion. Residents pay no fee for materials dropped off in this area. The area to the left includes four (4) bays for garbage drop-off. Residents must pay a fee for dropping off material in this area.

City of Hamilton – Dundas CRC
The second design concept, shown below is a modular design (by way of example only) that can be constructed as a smaller facility to start and expanded to accommodate additional material separation needs over time.

Modular CRC Design

The conceptual design shown below and developed for the City of Winnipeg by Stantec also incorporates separate service vehicle access areas and ‘waste hierarchy’ principles. In this design, public space and green space are given importance, as these facilities can often be used as social gathering areas for some members of the community. This particular design incorporates a separate re-use centre building. While most materials are able to be stored outdoors (little to no risk of impacting commodity values), reuse centres and HHW depots require shelter/containment from natural elements and/or for health and safety reasons. Items that are accepted (e.g. furniture) and stored in the reuse areas must be kept free from being damaged by weather, machinery or pests.
In order to assess the feasibility of recycling additional materials it will be necessary to determine whether adequate markets do indeed exist and further, if they do exist, where processors are located and at what distance. A lack of market availability would simply preclude the commission from further assessment of that particular material. Furthermore, consideration should be given to the fact that market prices can be highly susceptible to variation from month to month and year to year.
Financial Analysis
March 24, 2014

3.0 Financial Analysis

This section provides a financial analysis of each of the options described in Section 2.0 which have been identified by each of the commissions as being preferred for further assessment. The analysis is intended to determine the feasibility of implementing each of the options as it relates to estimated capital and operating costs, land and location requirements where applicable, maintenance and staffing requirements and costs. Any impacts to other system components are identified if applicable.

3.1 RSC 8 Options and Costs

The current waste management programs (transfer and collection) are funded through tax or tipping fee based approaches and managed by individual municipalities and the transfer stations. Under this approach, residents pay for waste collection through taxes to their respective municipalities, who then pay the stipulated tipping fees to Sussex to dispose of waste. Sussex adjusts their tipping fee annually to account for the tipping fees charged by RSC 7, operational costs, and an administration fee to RSC 8.

Based on the options presented in Section 2.0 above and based on discussions with and feedback from RSC 8 committee members and staff, the following sections of this report analyses those options that the commission has expressed initial interest in pursuing and serves to further define the characteristics of a preferred waste transfer system. While some options have the potential to save costs others that focus more on gains in diversion (e.g. a CRC) present additional costs to the system.

In order to determine order of magnitude costs for each of the system options, assumptions with respect to programming changes both within RSC 8 as well as out of jurisdiction were made. Assumptions that were included in the development of cost estimates in the following sections include:

- RSC 8 will elect to purchase the Sussex Transfer Station upon expiration of the current agreement, should a direct haul scenario not be implemented.
- RSC 7 will move to a 3 stream program consisting of garbage, single stream recycling and organics.
- Use of the RSC 11 (Fredericton) facility will no longer be considered as a potential disposal facility due to higher tipping fees.
- Only compostable waste (food and yard waste) could be sent to RSC 9 (Fundy) for disposal.
- For the purposes of planning, all tipping fees are assumed to remain constant over the 10 year planning period.
3.2 ‘Put or Pay’ terms will be precluded from any future agreements with landfill commissions for use of disposal facilities.

3.1.1 Residential Curbside Collection

With curbside collection currently managed by individual municipalities and LSDs, the opportunity exists to streamline services through a regional collection system. While the commission could benefit from the regional provision of services from a ‘uniformity’ standpoint, it is unlikely that any significant reduction in rural collection costs would be experienced. In comparison to other jurisdictions across the country, collection RSC 8 costs in rural and urban areas are similar, if not lower than most, notwithstanding differences in hauling distances, population densities and curbside programming.

For example, in the County of Simcoe, Ontario, prior to the use of CNG trucks, collection costs per household per week were $1.23 in rural areas and $.95\(^{17}\) in urban areas. Similarly, in Wellington County the cost for collection in rural areas is approximately $5.90 and $2.39 per household per week in urban areas\(^{18}\). In contrast to other commissions within the province, RSC 8’s collection costs are relatively low, especially given that two separate streams are collected, where most others only garbage is collected. RSC 12’s costs for the collection of garbage only range from approximately $1.45 to $1.89 per household per week. As shown by way of other jurisdictional examples, as a result of low housing density and increased travel distance both between households and to waste management facilities, municipalities typically encounter higher collection costs in rural areas.

Therefore, it is likely that even with a regional collection contract in RSC 8 that the costs to provide collection service to rural areas would continue to exceed those of urban areas. The real benefit might be the provision of a uniform level of service and uniform promotion and education with respect to programming. There may also be a greater degree of control over the ability to monitor and track program performance.

Again while it is likely the case that collection costs would run higher in rural compared to urban areas that can really only be determined through a formal procurement process.

3.1.2 Direct Haul to RSC 7 and RSC 9 Landfills

Recently, a Solid Waste Transportation Study (Appendix A) was completed for RSC 8 which compared the costs of direct hauling waste to the RSC 7 landfill against the current ‘status quo’ system where waste is hauled to the Sussex Transfer Station and then to the RSC 7 landfill for disposal. Although the costs in the report are reflective of 2012 tipping fee rates, it is expected that the overall findings of the study would remain the same, as the tipping fee would increase by the same rate annually for both Sussex and the RSC 7 landfill, since the tipping fee charged at Sussex is determined based on disposal fees at RSC 7. Under the assumption that the average

\(^{17}\) County of Simcoe (Winnipeg Rate Model) Curbside Collection Modelling Comparison.

\(^{18}\) County of Wellington Curbside Collection Programme Award Notice. November 5, 2008.
cost per hour would be $85 for a 9-tonne truck (Solid Waste Transportation Study), it was determined that unless there was a travel distance of more than 4.5 hours, it would be more cost effective to direct haul waste to the RSC 7 landfill instead of to the Sussex transfer station. The only municipality within RSC 8 who currently transports waste to Sussex where the current practice would remain the most cost effective is Wickham, who has one of the lowest waste generation rates in the commission. A summary of the cost comparison of direct hauling waste to RSC 7 versus continued use of Sussex is provided in Table 3-1 below. Note that the costs estimates provided for Sussex assume ‘status quo’ operation of this facility and do not include the use of any compaction technology.

Table 3-1: Comparison of Transportation and Tipping Fee Costs for Direct Haul to RSC 7 versus Use of Sussex Transfer Station.  

<table>
<thead>
<tr>
<th>Municipalities</th>
<th>Total Cost - Sussex</th>
<th>Total Cost - RSC 7</th>
<th>Total Cost Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norton Village</td>
<td>$1,265.95</td>
<td>$1,088.03</td>
<td>$177.92</td>
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<tr>
<td>Sussex</td>
<td>$3,413.08</td>
<td>$2,629.25</td>
<td>$783.83</td>
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<td>Sussex Corner</td>
<td>$1,363.08</td>
<td>$1,190.11</td>
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<tr>
<td>LSDs</td>
<td></td>
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<td>Havelock</td>
<td>$1,696.88</td>
<td>$1,464.64</td>
<td>$232.24</td>
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<tr>
<td>Wickham</td>
<td>$933.45</td>
<td>$956.58</td>
<td>-$23.14</td>
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<td>Brunswick</td>
<td>$1,873.84</td>
<td>$1,809.74</td>
<td>$64.10</td>
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<tr>
<td>Upham</td>
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<tr>
<td>Norton</td>
<td>$3,717.90</td>
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<td>Kars</td>
<td>$2,635.65</td>
<td>$2,475.93</td>
<td>$159.72</td>
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<td>Waterford</td>
<td>$2,459.23</td>
<td>$2,162.08</td>
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<td>Studholm</td>
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<td>Hampton</td>
<td>$3,034.97</td>
<td>$2,443.18</td>
<td>$591.79</td>
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</table>

As demonstrated in the table above, Wickham is the only LSD who would not experience cost savings in direct hauling waste to RSC 7 as the travel distance is in excess of 4.5 hours. If the commission elected to move to a direct haul system and discontinue use of the transfer station, Wickham could consider the alternative of disposing of waste at the RSC 9 facility. Both the Parish of Hampton and Town of Hampton in RSC 8, who are also located on the west end of the commission currently direct haul their waste to RSC 9. Since both the hauling distance and tipping fees between RSC 9 and Sussex are very similar, Wickham would likely experience similar disposal and transportation fees to the current system of an estimated $48,500 annually.

With the exception of Wickham, if all other municipalities and LSDs were to direct haul waste to RSC 7, the estimated savings would be in the order of $189,732 annually, or approximately $15,811 monthly, reducing disposal and hauling costs by an estimated 12%. If the commission were to move to a direct haul model, continued operation of the Sussex transfer station would no longer be necessary which could save an estimated $271,111 annually in operations and maintenance costs. A direct haul scenario would also require significantly less capital investment from the commission in assuming ownership of the transfer station, as RSC 8 would not need to purchase any of the recommended equipment including a loader vehicle, compactor, etc. Alternatively, RSC 8 could also consider repurposing the transfer station as a CRC, which is further discussed in Section 3.1.6.

### 3.1.3 Transfer Station Ownership and Operation

If RSC 8 elects to assume ownership and maintain use of the transfer station, consideration will need to be given as to whether the facility will be operated by the public or private sector, or a combination of the two.

Typical costs associated with transfer station operations (2014) are presented in Table 3-2. Whether the commission elects to operate the facility or contract out operations, the costs involved with operating a transfer station will be similar. In a privately operated scenario, operators would adjust costs to account for some profit margin e.g. 15-20%. Costs would be determined through a contract negotiation process, and a fixed monthly or annual cost would be paid to the operator by the commission, or costs would be recovered through tipping fees as they are currently. Operating costs include a number of expenses associated with transfer station operation including staffing, materials and supplies, tipping fees and hauling costs. Revenue from sale of commodities is included as well as amortized capital costs for new equipment (loader, open top trailers). As current revenues from the sale of recyclable materials from Sussex was unavailable at the time of this report, potential revenues based on the type of material currently diverted (cardboard and metal), their respective tonnages diverted and current market values have been estimated for the purposes of identifying any potential offsets to operating costs.
In a private sector or hybrid public-private operated scenario the private sector operator would ideally be responsible for mobile equipment ownership and maintenance. This incents the operator to ensure proper care and maintenance as they are ‘vested’ in the equipment. The cost of building and fixed equipment replacement (e.g. baler, scale), maintenance and repair would be at the cost of the commission. In the hybrid model the commission would likely only take on staff responsibility for operation of the scale/scalehouse and associated accounting, recordkeeping and program monitoring (a portion of the estimated salaries shown in Table 3-2).

At the time of this report utility (heat, hydro) costs at the transfer station were unavailable and as such those costs would need to be considered as additional to those presented in the table on the following page.
### Table 3-2: Estimated Costs for Publicly Operated Transfer Station in RSC 8

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
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<td>Tipping Fees at RSC 7 @$75/tonne</td>
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<td>$(344,850)</td>
<td>$(344,850)</td>
<td>$(344,850)</td>
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<td>3 Open Top Trailers</td>
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<td>$18,000</td>
<td>$18,000</td>
<td>$18,000</td>
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<td>$18,000</td>
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<tr>
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<td>$50,000</td>
<td>$50,000</td>
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<tr>
<td><strong>Total Capital Costs</strong></td>
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<tr>
<td><strong>Total Annual Costs</strong></td>
<td>$743,875</td>
<td>$739,875</td>
<td>$741,875</td>
<td>$745,875</td>
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<td>$743,875</td>
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</table>
3.1.4 Compaction Technology

If RSC 8 elects to continue to use the transfer station instead of direct hauling waste, consideration could be given to the use of compaction technology either in the form of an integrated KOMAR system or a stationary compactor. Based on the most recent waste haulage data provided by Sussex for 2013, the transfer station ships an average of 265 loads of split black bag garbage and wet waste in addition to 189 loads of blue bag waste (dry) for a total of 454 loads annually to the RSC 7 waste facility. Assuming an hourly rate of $100 to haul the waste (includes use of tractor vehicle only), and hauling time of 2.5 hours, the annual estimated hauling costs for the status quo system are in the order of $113,500 annually for RSC 8.

In order to achieve the greatest compaction possible for each waste stream, (assuming a 3 stream waste system, discussed further in Section 2.5.1), it is recommended that the commission consider hauling blue and green bag waste together using a split trailer, and hauling black bag garbage separately. Higher compaction rates can typically be achieved with garbage than for organics or recyclables. If these wastes are hauled using 48’ walking floor trailers, the commission could reduce the number of loads annually by approximately 26% or 95 loads per year. Table 3-3 presents the annual cost savings to the commission with the use of the KOMAR compaction technology. Annual hauling costs presented in Table 3-5 are estimated to inflate at a rate of 2.5% annually accounting for inflation, increased fuel/operational costs.

Table 3-3: Estimated Haul Savings with KOMAR Compaction System for RSC 8.

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</thead>
<tbody>
<tr>
<td>Annual Hauling</td>
<td>$113,500</td>
<td>$116,338</td>
<td>$119,246</td>
<td>$122,227</td>
<td>$125,283</td>
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<td>$131,625</td>
<td>$134,916</td>
<td>$138,289</td>
<td>$141,746</td>
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<td>Hauling Savings</td>
<td>$23,789</td>
<td>$24,384</td>
<td>$24,994</td>
<td>$25,618</td>
<td>$26,259</td>
<td>$26,915</td>
<td>$27,588</td>
<td>$28,278</td>
<td>$28,985</td>
<td>$29,709</td>
<td>$266,520</td>
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</table>

As shown in the table above, the annual savings for RSC 8 would be relatively low and in the order of $24,000-$29,000. These nominal savings would result in a more than reasonable payback period for the capital cost associated with this system and as such the KOMAR system is not a recommended option for the commission.

An estimation of the capital costs associated with the installation of the KOMAR system and haul trailers is provided below. These costs are not reflective of costs associated with any building re-design/retro-fit necessary to accommodate this equipment.
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1) KOMAR EM40G for Packing Black Bags to 48’ High Cube Trailer $175,000
2) 48’ High Cube Trailer with AutoWeigh
   (2 trailers required at $171,505 ea.) $343,010
3) Power Upgrade – 200 amps at 575v to Power KOMAR Units
   (Avg. Demand 30kw/hr - approximately 1hr/day of use) $ Unknown

Total Capital Costs $518,010

3.1.5 Transfer of Organic Waste to RSC 9 (Fundy)

In order to assess future disposal needs and organics diversion potential for the commission it was necessary to estimate RSC 8’s waste composition by material type. In the absence of detailed, current waste audit and/or composition data from the commission, Stantec used waste composition and generation data from other municipalities across Canada that either closely reflect the same type of programming as the commission and/or reflected both similar programming but also similar demographics. It was determined that in Canada organic waste typically accounts for 35 to 40% of the municipal solid waste stream. In RSC 8’s case, the residential organic waste stream would account for approximately 2,300 tonnes annually. As discussed in Section 0 above, some materials included in RSC 8’s current ‘wet’ bag program would not be accepted in Fundy’s organics program, and as such have not been accounted for in the estimation of residential organics above.
Table 3-4 below presents the potential cost savings that could be realized by RSC 8 in transferring residential organics waste to RSC 9. The rates below assume that residential garbage and recyclables would continue to be transferred to RSC 7 for disposal and that the current tipping fees at both disposal facilities would remain constant over the 10 year period. While it is recognized that in moving to a 3 stream system it is possible that RSC 7 could implement a differential tipping fee structure in which recyclables and organics are charged at a lower rate than garbage it is difficult at this time to estimate what the tipping fee structure would be; as such, it is recommended that the commission re-evaluate the potential for cost savings when and if a differential tipping fee structure is implemented at RSC 7. Given that the RSC 9 facility is approximately the same distance from the Sussex Transfer Station as the RSC 7 facility, it is estimated that hauling costs would not be impacted.
### Table 3-4: Estimated Savings in Tipping Fees with Transfer of Organic Waste to RSC 9.

<table>
<thead>
<tr>
<th>Scenario A: Status Quo - all waste is transferred to RSC 7</th>
<th>Scenario B: Garbage and Recyclables to RSC 7, Organics to RSC 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tipping Fee at RSC 7 = $75/tonne</td>
<td>Organics Tipping Fee at RSC 9 = $28/tonne</td>
</tr>
<tr>
<td>Tipping Fee at RSC 7 for MSW = $75/tonne</td>
<td>Tipping Fee at RSC 7 for MSW = $75/tonne</td>
</tr>
<tr>
<td>Total Residential Waste = 6,187</td>
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<td>$464,025</td>
<td>$64,400</td>
</tr>
<tr>
<td>$464,025</td>
<td>$355,925</td>
</tr>
</tbody>
</table>

Based on the analysis shown above in
Table 3-4, if RSC 8 were to segregate residential organic waste and transfer to RSC 9, the commission could potentially realize cost savings in the order of $108,100 annually, assuming all organic waste is captured from the residential sector. To put this in perspective however, if the commission only captured approximately 60% of residential organic waste upon implementation of a three stream program, the commission would still save in the order of $64,000 annually in tipping fees.

### 3.1.6 Developing a CRC at the Sussex Transfer Station

The following section provides capital and operating costs associated with the inclusion of those best practices (previously discussed in Section 2.8) which could be implemented by the commission in the design, build, and operation of its own Community Recycling Centre and with respect to their applicability to the existing Sussex Transfer Station site.

These estimates are considered suitable for budgetary planning purposes. As with any facility of this nature, costs can vary depending on the overall quality of the installations and owner preferences.

The following capital cost estimates represent a basic functional facility with new containers, bins and holding tanks. Enhancements beyond basic functional needs would be at an additional cost. Capital costs have been broken down into two stages to allow for a phased implementation if desired. Operating costs are based on 1 FTE municipal employee responsible for CRC operations; these functions could be performed by either municipal or private sector operators, and assume that the existing transfer station equipment operator is on site. While a user fee schedule has yet to be determined, it has been presumed that much of the handling and disposal costs for the facility will be recovered from user fees or Stewardship Program contributions. Operating costs shown are net of fees and cost recovery revenue.

If we look at the previous analysis on the matter of direct haul it would suggest that the building could repurposed to facilitate CRC operations. In the cost estimates provided below we have assumed a carrying cost of $50,000 in order to repurpose this building to lend itself to CRC operations.

### Suggested Stage 1 Capital Costs (excludes sawtooth binwall):

1) Basic repairs and minor renovations to existing building $50,000
2) Paving and gravel pads $100,000
3) Purchase of HHW and Used Oil Containers $70,000
4) Kiosk/Signage/Line painting $50,000
5) Recycling and garbage bin purchases $75,000
6) Bunker block purchases $75,000
7) Landscaping/litter fence/fencing $30,000
8) Equipment(bobcat) and supplies $50,000
9) Design/project management/inspection $100,000
10) Contingency $100,000
3.12

Stage 1 total $700,000

Potential Stage 2 Capital Upgrades

1) Concrete sawtooth binwall $150,000  
2) C&D and brush, leaf and yard waste receiving and handling $100,000  
3) Design/project management/inspection $75,000  
4) Re-Use Program in Building or Trailer(Included in 1))  
5) Contingency $75,000  

Stage 2 total $400,000

Likely Site Development Capital Cost $1.1 million

Projected Site Annual Net Operating Costs

1) Site Attendants (1 FTEs) $45,000  
2) Waste Handling and Disposal (recovered through user fees)  
3) Used Oil, Paint and HHW (costs generally covered by stewards)  
4) Tires and E-waste (costs generally covered by stewards)  
5) Cardboard hauling and processing $3,000  
6) Re-Use (community operated or by site attendants)  
7) Utilities/maintenance/snowplowing $40,000  
8) Property taxes (assumed to be $0)  
9) C&D processing/handling (mostly user fees) $20,000  
10) Brush and yard waste handling (mostly user fees) $3,000  
11) Contingency $20,000

Net Operating Costs $131,000

3.1.7 Recommendations and Next Steps

In the case of RSC 8, the most cost effective options appear to be to proceed with a direct haul scenario for waste (to both RSC 7 and 9 landfills), and to purchase the existing transfer station upon expiration of the current agreement. By implementing a direct haul scenario, municipalities within the commission would no longer be required to support the cost of utilizing the transfer station.

The commission should consider a number of possible alternative uses for the transfer station site including continued and added waste diversion activities. The merits and costs associated with the concept of repurposing the transfer station as a CRC are discussed above but there may be other uses for the site that would also benefit the commission (i.e. truck, salt, other storage) could be considered as well.
3.2 RSC 12 OPTIONS AND COSTS

RSC 12 utilizes a similar cost recovery program to that in place in RSC 8, where costs to provide waste management services are recovered through tipping fees charged at the SVTS. While individual municipalities, parishes, LSDs and the like are responsible for arranging for collection of waste from residences, the other waste management services are provided through the commission in the form of the SVTS who currently provides depot based recycling services, diversion programs at the facility, and is responsible for transferring waste to both RSC 1 and RSC 10. In order to fund these programs and recover the administration costs (which are paid to the commission), the operational costs in addition to administrative fees are added to the current tipping fee charged at RSCs 1 and 10 in order to determine the tipping fee that is charged at the SVTS. The current operational cost per tonne at the SVTS is $33.18; administrative costs are $14.80.

Based on the options presented in Section 2.0 above and based on discussions with and feedback from RSC 12 the following sections of this report analyses those options that the commission has expressed initial interest in pursuing and serves to further define the characteristics of a preferred waste transfer system. While some options have the potential to save costs others that focus more on gains in diversion (e.g. a CRC) present additional costs to the system. In order to determine order of magnitude costs for each of the system options, assumptions with respect to programming changes both within RSC 8 as well as out of jurisdiction were made.

To further analyze and define which options would be most feasible for RSC 12, the order of magnitude capital and operating costs, system cost savings (if any), revenues, as well as potential for impact to other system components have been identified. Assumptions utilized for the purpose of developing cost estimates include:

- RSC 12 will continue to use the SVTS to facilitate transfer of waste to out-of-commission disposal facilities.
- Use of the RSC 11 (Fredericton) facility will no longer be considered as a potential disposal facility due to higher tipping fees. Preliminary estimates indicate an increased disposal cost of $258,607 annually based on current tipping fees; it is assumed at this time that RSC 11 would not provide reduced tipping fees to RSC 12.
- Due to the significant capital costs associated with the development of new transfer infrastructure, and lack of appetite for the commission to inherit new or additional financial obligations, RSC 12 has expressed interest in the continued use of the SVTS and determining whether there is an opportunity to increase efficiencies. As such it has been assumed that no new transfer station infrastructure will be developed in RSC 12.
- The existing garbage and recycling programs will be maintained over the 10 year planning period. No new waste streams will be introduced to the waste management program.
3.14

For planning purposes, all tipping fees are assumed to remain constant over the planning period.

3.2.1 Residential Curbside Collection

Similar to RSC 8, waste collection is managed by individual municipalities within the commission, which has resulted in varying levels of service as well as collection costs. In Plaster Rock, for example, where waste is direct hauled to COGERNO (approximately 85km away) via collection contractors, the current rate per household is $5.82/hh/month\textsuperscript{20}. In contrast, the cost to collect waste from the Village of Meductic and haul to the SVTS (approximately 20km away) is $7.57/hh/month\textsuperscript{21}. As demonstrated above, although the haul distance for Plaster Rock is more than four times the distance travelled by Meductic collection staff, the cost per household is significantly higher. Given that there is such a significant range in collection costs in RSC 12, there might be an opportunity to not only reduce collection costs in some areas, but also streamline the level of service provided with a uniform collection contract.

Notwithstanding the different geographies and population densities, other commissions (RSC 8 for example) within the province pay considerably less than RSC 12 for collection in both rural and urban areas. As savings in collection costs could only be determined through a formal procurement process, it is recommended that RSC 12 further consider a regional, commission administered collection contract.

3.2.2 Building Improvements

Discussions with the current SVTS operator have identified the need for some updating and repairs to the existing transfer station including but not limited to some structural repair at the top of doors and/or increasing door height and replacing the door.

If RSC 12 elects to continue use of the SWTS to facilitate transfer of waste following the expiration of the current agreement on December 31, 2014, discussions will need to be held with the facility operator to determine what arrangement in terms of cost sharing for any necessary facility upgrades would be agreeable to both parties.

In order to determine what a reasonable estimate of costs would be associated with upgrading the facility the commission could, in collaboration with Bellis undertake an engineering assessment/get cost quotations in 2014 and prior to negotiation of new contract terms.

3.2.3 KOMAR Compaction Technology

Given the current annual tonnage managed by RSC 12 of approximately 16,000 tonnes and current payload achieved of 25mt/load, it is estimated that the commission currently ships

\textsuperscript{20} Derived from current collection contract between Plaster Rock and North West Sanitation Services Ltd.

\textsuperscript{21} Derived from current collection contract between the Village of Meductic and Dow’s Garbage Disposal.
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approximately 279 loads of waste to RSC 1 and 357 loads to the RSC 10 landfill for a total of 636 loads shipped annually. Assuming an hourly rate of $125 for the use of a hauler tractor and trailer, this amounts to an estimated $318,200 in hauling costs for RSC 12 to ship waste from the SVTS annually.

With recent confirmation from the Province that a maximum of 55,000kg vehicle weight is permissible to transfer waste, this would allow the commission to use high cube 48’ walking floor trailers in order to achieve a 31.6 mt payload (assuming a 95% safety factor). While a B Train was considered it wasn’t deemed as efficient as B Trains necessitate swapping out trailers to dump at the landfill (which can add an additional .5 hours per trip). The use of a 48’ trailer as opposed to a B-Train setup also has significantly lower capital cost implications as only one KOMAR unit would be required instead of two.

The KOMAR system, described in Section 2.3, would provide the commission with the ability to achieve the compaction required to maximize the amount of waste shipped per load, and ultimately enable the commission to achieve maximum allowable payloads. With a KOMAR unit installed at the SVTS, the commission would reduce the number of loads shipped per year by an estimated 25% (or 128 loads). Table 3-7 below presents the estimated savings that the commission would experience with the installation of a KOMAR system. The savings shown in the table below are inclusive of haul savings as well as estimated savings associated with reduced labour/loader requirements and use of internalized trailers. Haul costs presented in the table below are estimated to inflate at a rate of 2.5% annually, consistent with economic growth and increased fuel/operational costs.

Table 3-7: Estimated Savings with KOMAR Compaction Technology for RSC 12.

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</thead>
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<tr>
<td>(Status Quo)</td>
<td>$318,200</td>
<td>$326,155</td>
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<td>$342,667</td>
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<td>Labour/Loader Savings</td>
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<td>Internalized Trailers</td>
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<td><strong>Total Haul Savings</strong></td>
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<td><strong>Total Overall Savings</strong></td>
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<td>$275,542</td>
<td>$2,544,554</td>
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</tbody>
</table>

As shown in the table above, potential overall savings could be in the order of $220,000 to $275,000 over a 10 year period with a Komar System. Bellis may also be able to save in operating costs with respect to labour/loader requirements as waste collection vehicles could ‘direct dump’ to a 30’ Z Pan Conveyor, which would directly feed the Komar compactor unit. The savings associated with the purchase of internalized trailers assumes that the commission would purchase 3 modified trailers in comparison to paying an estimated $20/hour cost to the haul company for the trailers. The costs shown in the table above could represent a strong business case for Bellis as an operator moving forward, and ultimately could result in cost savings for the municipalities serviced in RSC 12.
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March 24, 2014

Capital costs associated with the installation of a Komar system are provided below. While these costs are intended to reflect the purchase price for the equipment, it should be noted that an infrastructure assessment and building design component would be required and costs for these assessments, as well as any required building upgrades would be in addition to those costs presented below. If the commission elects to pursue the use of the Komar system it is recommended that these assessments be conducted by NexGen Municipal as a preliminary step in the design process.

1) KOMAR EM60G with Hydraulic Grabs and Stand – Installed (Includes Loading Conveyor - 30’ Long x 72’ Width on Raised Stand to Feed KOMAR unit)  
   $389,993

2) Custom Closed Top Trailers Configured to Accept Auger Compactors with Weigh in Place Reporting (3 Units at $171,505 ea.)  
   $514,515

3) Power Upgrade – 120 amps at 575v to Power KOMAR Units (Avg. Demand 40kw/hr - approximately 1hr/day of use)  
   $ unknown

4) Used Shuttle Tractor  
   $50,000

Total Capital Costs  
$954,508

If the capital costs associated with a Komar system installation were amortized over a 15 year period at a 6% interest rate, the annual cost would be $98,000, excluding any required modifications to the existing transfer building.

Again a site tour of the transfer station with NexGen is recommended to more definitively determine the feasibility of this option.

3.2.4 Siting and Development of a CRC

The SVTS property may be unsuitable for development of a CRC due to grading and size restrictions. If RSC 12 is to pursue the development of a CRC, the commission would be required to lease/utilize/acquire a suitable site. A number of considerations with respect to site location including previous site use, accessibility, proximity to users and cost would need to be included in undertaking a site selection process for this intended use. Furthermore, the commission would also be required to decide whether the facility would be operated by the public sector, private sector, or a combination of the two. With respect to cost sharing and risk allocation, the concept of public versus private sector ownership would be similar to that of a transfer station, as discussed in Section 2.2 above.

The costs provided in Section 3.1.6 above and with respect to RSC 8 again provide a basic functional facility that can be phased if appropriate. They are applicable to RSC 12 as well and
again with any facility of this nature, costs can vary depending on the overall quality of the installations and owner preferences. Site acquisition costs are unknown.

3.2.5 Recommendations and Next Steps

Based on the above analysis it appears at this time that the most cost effective scenario for RSC 12 is to continue to utilize the existing SVTS and to engage Bellis in discussions regarding necessary building upgrades and the possibility of retrofitting the existing building for the installation of compaction equipment. It is recommended that an infrastructure assessment be completed at the facility in order to determine installation requirements and to fine tune associated costs.

Notwithstanding that the province requires that any municipal project exceeding $50,000 in value must be bid via a formal procurement process, it is quite possible that a formal procurement process (Request for Proposal) would not yield competitive bids. As such, it is recommended that the commission undertake an REOI process to assess the level of interest in developing/providing transfer station capacity, determine the value of a formal procurement process and if there is no competitive interest to request exemption from an RFP process and negotiate directly with the existing transfer station operator.

It is also recommended that the commission further explore a regional collection contract to determine whether opportunities to reduce collection costs and streamline the collection system exist. Existing contract expiration dates for municipalities would have to be factored in and matters of interruptions in service, violations of agreements, and other service issues would have to be considered.
Appendix A:

Solid Waste Transportation Study
Solid Waste Transportation Study for Regional Service Commission 8

January 15, 2014

Report prepared by: James Bornemann (1) and Mesha Sagram (2)

(1) Geomatics Analyst, Regional Service Commission 7, Planning Services. Primary contact: james.bornemann@csrrsc7.ca
(2) Student, Mount Allison University, Department of Geography and Environment

Acknowledgements: We would foremost like to recognize the assistance of Andrew Wort and Gena Alderson of Recycle SENB for their assistance in project management and data collection. Many people have contributed data and information for this project including Elissa Gollan, Patricia Munkittrick and Gerald Legacy of Regional Service Commission 8, and Daniel Goguen, NB Department of Local Government.
Introduction

We conducted a transportation study for the residential collection and delivery of solid waste in Regional Service Commission 8 (RSC8). The purpose of the study was to determine if it was more cost effective to transport solid waste to the transfer station in Sussex, as is the current practice, or directly to the central waste management facility in Moncton. This study was undertaken to determine if the costs associated with the longer travel time to Moncton are offset by the lower tipping fee may offset the lower tipping fee in Moncton.

This analysis was accomplished by using software that efficiently creates routes among a set of service locations. The software accounts for service times, truck capacities, and properties of the road network (such as speed limits and one-way streets). The routes for each service area were compared using start and end points at Sussex and Moncton. The cost of waste collection considered both the tipping fees at Sussex and Moncton, and transportation cost assigned by a cost per time travelled.

Methods

To prepare the network data for analysis, we collected and assembled pickup locations, waste and road data (data summarized in Table 1). Although waste collection differs by season, we performed the analysis on summer collection methods because we wanted to consider the higher costs involved with collection of private roads and seasonal residences. Waste collection by pickup location was calculated by dividing the total number of seasonal and permanent residences in the 2012 collection areas by the annual amount of waste produced within the area. Pickup locations were derived from SNB real property data and digital property maps. A road network was created that includes private roads and considers one-way streets and ramps. All the municipalities and LSD in RSC8 were analyzed except for Hampton (LSD) where waste data per household was not available. The data summarized by collection areas are shown in Figure 1 and the road network and stop locations are shown in Figure 2.

Table 1. Data used for network analysis.

<table>
<thead>
<tr>
<th>Service Area</th>
<th>Annual Contract</th>
<th>Permanent Units</th>
<th>Seasonal Units</th>
<th>2012 waste (tonnes)</th>
<th>Tonnes per Week in Service Area</th>
<th>Tonnes per Household</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kars</td>
<td>$53,000.00</td>
<td>1048</td>
<td>338</td>
<td>460.77</td>
<td>8.860961538</td>
<td>0.00639319</td>
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<tr>
<td>Studholm</td>
<td>$101,266.67</td>
<td>1602</td>
<td>98</td>
<td>744.86</td>
<td>14.32423077</td>
<td>0.008426018</td>
</tr>
<tr>
<td>Havelock</td>
<td>$41,666.67</td>
<td>533</td>
<td>96</td>
<td>300.22</td>
<td>5.773461538</td>
<td>0.009178794</td>
</tr>
<tr>
<td>Norton</td>
<td>$92,000.00</td>
<td>1717</td>
<td>53</td>
<td>883.27</td>
<td>16.98596154</td>
<td>0.009596588</td>
</tr>
<tr>
<td>Waterford</td>
<td>$65,000.00</td>
<td>902</td>
<td>298</td>
<td>466.94</td>
<td>8.979615385</td>
<td>0.007483013</td>
</tr>
<tr>
<td>Brunswick</td>
<td>$36,666.60</td>
<td>560</td>
<td>312</td>
<td>185.78</td>
<td>3.572692308</td>
<td>0.004097124</td>
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<tr>
<td>Upham</td>
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<td>104</td>
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<tr>
<td>Village of Norton</td>
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<td>7</td>
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<td>0.011812092</td>
</tr>
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<td>0</td>
<td>1377.02</td>
<td>26.48115385</td>
<td>0.012646205</td>
</tr>
<tr>
<td>Sussex Corner</td>
<td>Not available</td>
<td>653</td>
<td>0</td>
<td>566.44</td>
<td>10.89307692</td>
<td>0.016681588</td>
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<tr>
<td>Hampton LSD</td>
<td>Not available</td>
<td>1469</td>
<td>0</td>
<td>990</td>
<td>19.03846154</td>
<td>0.012960151</td>
</tr>
</tbody>
</table>
We assigned speed limits and hierarchy values to roads according to their road class. The hierarchy classifies network roads into 3 levels allowing the vehicle routing problem to favour certain roads over others. In our road network, highways were given a speed limit of 80 km/h with a hierarchy value of 1 (highest hierarchy priority). We assigned arterial roads, collector roads and routes a speed limit of 50 km/h and a hierarchy value of 2. Local roads were given a speed limit of 30 km/h and ramps were given a speed limit of 50 km/h, but they were both given a hierarchy value of 3 (lowest hierarchy priority). Unpaved roads with a speed limit of 50 km/h were assigned a new speed limit of 30 km/h and unpaved 30 km/h roads were assigned 20 km/h. We then allocated a stop time of 11 seconds to all single dwelling properties. Locations with more than one unit were given a stop time of 5.5 seconds per additional unit. Only parcels with less than 5 units were considered. Since local data was not available, stop times and speed limits were obtained from Ericsson et al., 2006, “Optimizing route choice for lowest fuel consumption – Potential effects of a new driver support tool”. Speed limits incorporate stops at traffic lights, stop signs as well as acceleration and deceleration.

Before running the analysis, we created zones that delineated the collection area for each nine tonne truck. Municipalities and LSDs that produced over nine tonnes of waste per week were sectioned into districts where the waste would be collected. The collection areas were based on the road network and the clustering of pick-up locations. Because of this, every truck picks up a maximum of nine tonnes in the network analysis. The only exception is the Town of Hampton which produces 19 tonnes of waste per week. Here the trucks are picking up 9.5 tonnes each since it is more efficient to use two trucks.
instead of three. For low density areas time was also considered in creating zones where truck may not be filled to capacity in a single work day. Seed points were interspersed throughout each zone, and were used as guides for the software to service one area before moving on to another area.

We used the network analysis “Vehicle Route Problem” tool in ESRI ArcGIS software to solve the routes for each municipality and LSD. We solved the analysis problem to determine the collection distance and time to both the Sussex and Moncton stations. After the routes were solved, we summarized the cumulative distance and time traveled to run each route going to Sussex and to Moncton. We calculated transportation costs considering $85 per hour to operate a 9-tonne truck. This cost considers wage, fuel and maintenance. Tipping fees for Sussex and Moncton are $110.00 and $67.00 per tonne of waste respectively. The total costs to each LSD or municipality consists of the tipping fee (amount of waste multiplied by the tipping fee) and transportation costs (length of time to collect and deliver waste multiplied by $85/h). We then subtracted the total Moncton cost from the total Sussex cost. Positive values means that it is less expensive to deliver waste to Moncton, and negative values means that it is less expensive to deliver waste to Sussex.

Results

By utilizing knowledge of tipping fees and the approximate cost to operate a 9-tonne truck ($85/hour), it was calculated what the difference in total costs are as the additional travel times to Moncton increase. It was found that the travel time of a 9-tonne truck to Moncton needs to be 4.5 hours longer than the travel time to Sussex to offset the lower tipping fee in Moncton (Figure 3). The calculation involved subtracting the total fees to Moncton by the total cost of Sussex and solving for differences in time between Sussex and Moncton. The total costs consider both the tipping fees and transportation costs.

Figure 3. This chart shows how the difference in total costs ($, vertical axis) changes for additional travel time to travel to Moncton. There are $387 cost savings to Moncton if the travel time is equal to the travel time to Sussex for a 9-tonne truck filled to capacity. These savings are due to the lower tipping fee in Moncton. There are only savings to transport waste to Sussex if the travel time is over 4.5 hours. Results would vary if trucks are not filled to capacity.
The results of the transportation analysis (Table 2) show that with the exception of Wickham it is less expensive to transport waste directly to Moncton. The results are shown geographically in Figure 4. The costs are $3,625/week and $188,529/year less to transport waste to Moncton that to the current transfer station in Sussex. A further breakdown of the analysis results is given in Appendix A.

Table 2. Comparison of total costs considering tipping fees and transportation to both Sussex and Moncton. A breakdown of the costs are given in Appendix A.

<table>
<thead>
<tr>
<th>Municipalities</th>
<th>Total cost - Sussex</th>
<th>Total cost - Moncton</th>
<th>Total cost comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norton Village</td>
<td>$1,265.95</td>
<td>$1,088.03</td>
<td>$177.92</td>
</tr>
<tr>
<td>Sussex</td>
<td>$3,413.08</td>
<td>$2,629.25</td>
<td>$783.83</td>
</tr>
<tr>
<td>Sussex Corner</td>
<td>$1,363.08</td>
<td>$1,190.11</td>
<td>$172.97</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LSDs</th>
<th>Total cost - Sussex</th>
<th>Total cost - Moncton</th>
<th>Total cost comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Havelock</td>
<td>$1,696.88</td>
<td>$1,464.64</td>
<td>$232.24</td>
</tr>
<tr>
<td>Wickham</td>
<td>$933.45</td>
<td>$956.58</td>
<td>-$23.14</td>
</tr>
<tr>
<td>Brunswick</td>
<td>$1,873.84</td>
<td>$1,809.74</td>
<td>$64.10</td>
</tr>
<tr>
<td>Upham</td>
<td>$2,117.83</td>
<td>$1,845.82</td>
<td>$272.00</td>
</tr>
<tr>
<td>Norton</td>
<td>$3,717.90</td>
<td>$3,203.83</td>
<td>$514.07</td>
</tr>
<tr>
<td>Kars</td>
<td>$2,635.65</td>
<td>$2,475.93</td>
<td>$159.72</td>
</tr>
<tr>
<td>Waterford</td>
<td>$2,459.23</td>
<td>$2,162.08</td>
<td>$297.15</td>
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<td>Studholm</td>
<td>$3,440.41</td>
<td>$3,057.51</td>
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<td>Hampton</td>
<td>$3,034.97</td>
<td>$2,443.18</td>
<td>$591.79</td>
</tr>
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</table>

Total (week) $3,625.56
Total (annual) $188,529.24
Figure 4. Weekly cost difference between the total costs of waste collection to Sussex and Moncton. Costs include both the tipping fees and transportation costs. The blue (negative) areas show where it is more cost effective to transport waste to Sussex. All other service area have positive values meaning it is less expensive to transport waste to Moncton.
Key findings and recommendations

Due to the lower tipping fee in Moncton, it was calculated that it is cost effective for waste to be transported directly to Moncton rather than to Sussex if there is up to 4.5 hours more travel time to Moncton. If there was more than 4.5 hours additional travel time, then it would be less expensive to transport waste to Sussex. The large amount of additional travel time demonstrates how the lower tipping fee in Moncton provides an incentive to transport waste to that location.

In all areas, except for Wickham, it was found to be cost effective to transport waste directly to Moncton rather than to the transfer station in Sussex. Combined total annual savings across all municipalities (excluding Hampton where data was insufficient) and LSDs in RSC8 were found to be $188,529/year considering an $85/km cost per time. The total savings are subject to the travel and stop times used in the analysis, and therefore reflect the quality of the model rather than current costs.

The findings of lower overall costs to Moncton are resilient to large increases in travel costs. Increasing transportation costs by 50% and 100% still resulted in savings to Moncton. A 50% increase in travel costs ($127.5/h) resulted in a total of $137,581 less annual costs to transport waste to Moncton in RSC8, and Wickham remained the only community where it was individually effect to transport waste to Sussex. A 100% increase in travel costs ($170/h) resulted in $85,633 annual savings to Moncton; individually, Wickham, Kars and Sussex Corner had lower costs to transport waste to Sussex. Only once transportation costs approach $250/h that it is efficient to transport waste to Sussex.

The analysis considered transportation using 9-tonne trucks. The use of 9-tonne trucks is cost effective if it can be filled and delivered in the same day. There are some areas, such as Wickham and Brunswick, where large distances are required to be travelled to collect small amounts of waste (2.10 and 2.08 tonnes per week respectively). In these areas, the use of smaller capacity trucks that have lower cost per unit time, and higher travel speeds may be beneficial.

The analysis constrained collection by municipal and LSD boundaries. Efficiencies can be gained by adjusting the boundaries such that trucks are filled near capacity before waste is deposited at the solid waste facility. Balancing the need to fill trucks to capacity and collect low density areas should also be considered when adjusting boundaries.

In the low population density LSDs (Havelock, Brunswick, Upham, Norton, Kars and Studholm) the calculated route travel time exceeds typical work days, and trucks would not typically be filled to capacity according to the amount of weekly waste. Due to the long distances traveled, these results are particularly sensitive to small inaccuracies in road speed limits, and additional travel time to isolated properties that are vacant. The quality of the results for these areas are therefore not as accurate as the higher population waste collection areas.
While great effort errors taken to minimize errors, as with all research there are a number of limitations to this study. The largest limitation was that we did not have local data on the travel and collections times on different road types and densities of pickup locations. As a result, we had to estimate these times from literature. While we could confirm the total times and costs are in the right order of magnitude, our results may be over- or under-estimated, but the relative difference between costs to Sussex and Moncton should hold true because the same assumptions were made for each cost calculation. Second, we assumed 100% occupancy while in fact vacancies exist. As a result route lengths are overestimated especially where there were isolated vacant properties. Third, large variation was found in the amount of waste per household (4 to 16 kg/week, Table 1). While natural variation occurs in the amount of residential waste, the magnitude of the difference indicates that there is some systematic reason for the large amounts of waste (such as mixing of ICI waste). To address these limitations, it is recommended that:

- Trucks are GPS tracked so travel speed on different road types and pickup densities can be more accurately calculated
- The location of vacant parcels are identified
- More accurate estimates of residential waste are provided
- Route times of each waste collection area (Appendix A) are verified with current drivers to ensure accuracy of the results

In conclusion, the results of the analysis indicate that the lower tipping fee in Moncton offsets the higher transportation costs required to transport the waste to Moncton rather than to Sussex. This finding is particularity true for high- and medium-density locations where 9-tonne trucks can be filled to capacity and travel to Moncton in a single day. Adjusting service boundaries for each truck capacity and travel time, and improving the data in the analysis could help in further optimizing the transportation. This study did not consider other factors that could affect the viability of Sussex transfer station such as future tipping fees and transportation costs, as well as environmental, social and other economic factors.
Appendix A

Table A.2. Transportation analysis results and costs to Sussex

<table>
<thead>
<tr>
<th>No. Trucks</th>
<th>Weekly Waste (tonnes)</th>
<th>Route time (h)</th>
<th>Route distance (km)</th>
<th>Time cost (Time * $85)</th>
<th>Tipping fee</th>
<th>Total cost - Sussex</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Municipalities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norton Village</td>
<td>1</td>
<td>6.77</td>
<td>6.13</td>
<td>229.48</td>
<td>$520.81</td>
<td>$745.14</td>
</tr>
<tr>
<td>Sussex</td>
<td>3</td>
<td>26.32</td>
<td>6.09</td>
<td>90.81</td>
<td>$517.69</td>
<td>$2,895.39</td>
</tr>
<tr>
<td>Sussex Corner</td>
<td>2</td>
<td>10.89</td>
<td>1.94</td>
<td>47.22</td>
<td>$164.84</td>
<td>$1,198.24</td>
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<tr>
<td><strong>LSDs</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Havelock</td>
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<td>5.30</td>
<td>13.11</td>
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<td>$1,114.27</td>
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<tr>
<td>Wickham</td>
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<td>305.28</td>
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<td>Brunswick</td>
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<td>$228.89</td>
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<td>Kars</td>
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<td>19.47</td>
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<td>$941.09</td>
<td>$2,093.88</td>
</tr>
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</table>
Table A.2. Transportation analysis results and costs to Moncton

<table>
<thead>
<tr>
<th>No. Trucks</th>
<th>Weekly Waste (tonnes)</th>
<th>Route time (h)</th>
<th>Route distance (km)</th>
<th>Time cost (Time * $85)</th>
<th>Tipping fee</th>
<th>Total cost - Moncton</th>
</tr>
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<tr>
<td><strong>Municipalities</strong></td>
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<td></td>
<td></td>
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<td>Norton Village</td>
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<td>6.77</td>
<td>7.46</td>
<td>365.43</td>
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<tr>
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<td>$865.70</td>
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<td>Sussex Corner</td>
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<td>10.89</td>
<td>5.42</td>
<td>312.33</td>
<td>$460.28</td>
<td>$729.84</td>
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<tr>
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<td></td>
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<td>$140.58</td>
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<td>868.74</td>
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